VISIONIAS

ECONOMY

PART 2

Student Notes:

INFRASTRUCTURE

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1. Introduction

Infrastructure is the support system on which depends the efficient working of a modern industrial economy. Modern agriculture also largely depends on it not only for speedy and large-scale transport of seeds, pesticides, fertilizers, and the produce by making use of modern roadways, railways and shipping facilities, but also on insurance and banking facilities because of its need to operate on a very large scale.

Infrastructure contributes to economic development of a country both by increasing the productivity of the factors of production and improving the quality of life of its people. It provides supporting services not only for industrial and agricultural production, but also for domestic and foreign trade and commerce. These services include roads, railways, ports, airports, dams, power stations, oil and gas pipelines, telecommunication facilities, the country's educational system including schools and colleges, health system including hospitals, sanitary system including clean drinking water facilities and the monetary system including banks, insurance and other financial institutions. Some of these facilities have a direct impact on the working of the system of production while others give indirect support by building the social sector of the economy.

2. Relation between Infrastructure & Economic Development

Infrastructure works both directly and indirectly on a number of determinants of economic development, such as follows:

- **Increase in investment**: It opens up possibilities of investment by making available a number of necessary inputs and services, opening up the size of the market as well as increasing the supply elasticity and efficiency of factors of production. Thus, adequate quantity, quality and reliability of infrastructure are key to the growth of any economy. For example, the development of agriculture to a considerable extent depends on infrastructure - development of irrigation, power credit, transportation, marketing, education and training, research and development and other facilities.
- **Industrial development**: It also depends on a sound infrastructure base to a large extent.
- **Employment generation**: Infrastructure plays a significant role in the generation of employment opportunities. They improve mobility, productivity and efficiency of labour.
- **Trade & commerce**: Infrastructure facilities play a vital role in the development of trade and commerce. In fact they act as a platform for the expansion of trade and other commercial activities at a rapid speed.

Thus, infrastructure development can have a significant impact on economic growth. For low-income countries basic infrastructure such as water, irrigation and to lesser extent transport are important. As the economies mature into middle-income category, the share of power and transport and telecommunications in infrastructure and investment increases. Also, infrastructure not only contributes towards the development of backward regions and removal of regional imbalance but also acts as an instrument of social change. Extensive studies undertaken by the World Bank show that 1% increase in investment in the stock of infrastructure leads to a corresponding 1% increase in the Gross Domestic Product of a nation.

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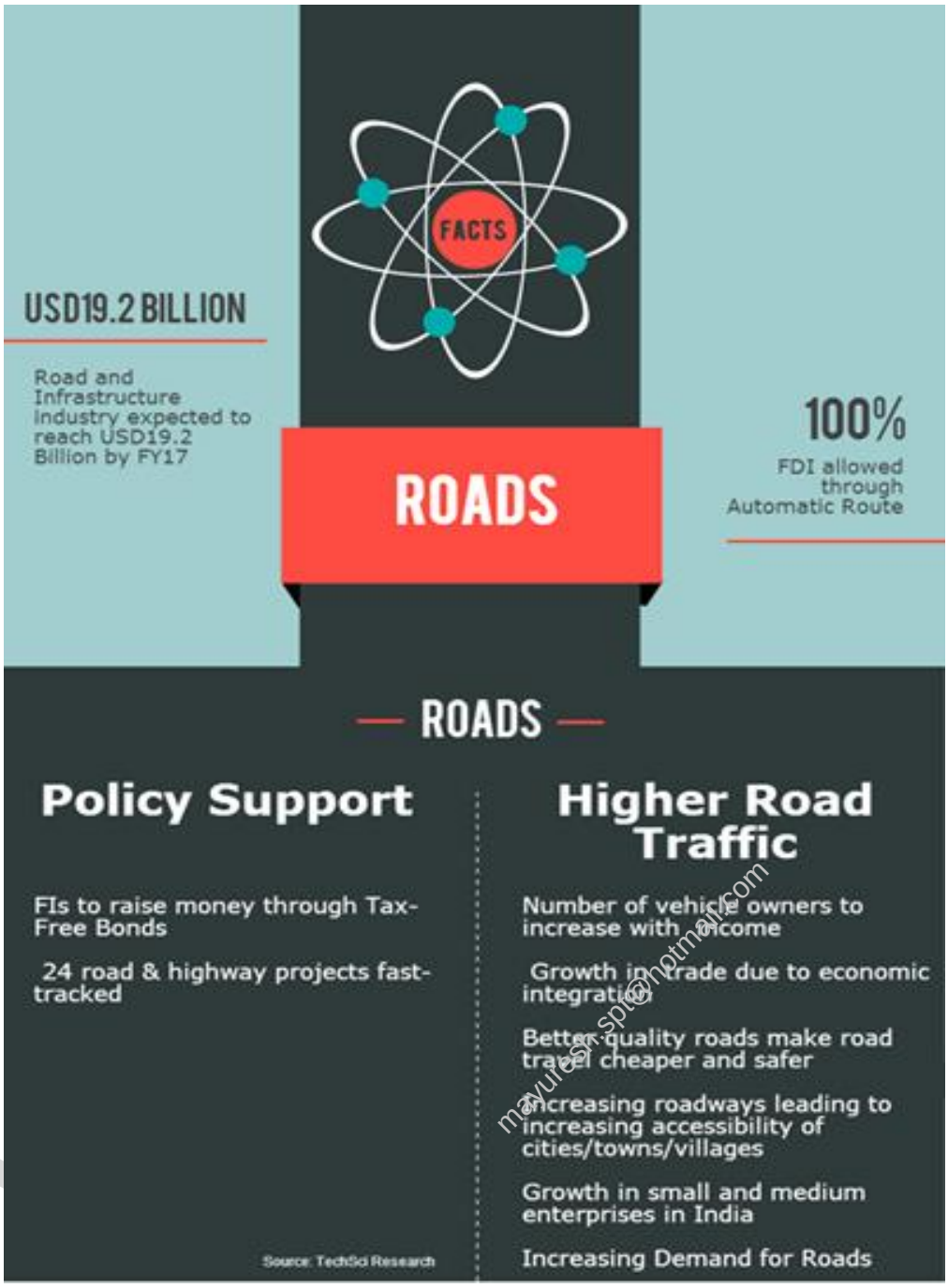
3. Roads and Road Transport



National Highways, which are the responsibility of the Central Government, account for around 2 per cent of the total road network in India and had total length of 1,15,435 Km in June 2017. National Highways carry **around 40% of** the total traffic across the length and breadth of the country.

The development of the roads got a big boost with the launching of a seven-phase programme - NHDP (National Highways Development Project), vested with National Highways Authority of India (NHAI), for the development of National Highways in the country and PMGSY (Pradhan Mantri Gram Sadak Yojana). NHDP aimed at primarily strengthening and widening the high density corridors of NHs. On the other hand the PMGSY was designed *to improve the accessibility of habitations in the rural areas*.

The private sector has emerged as a key player in the development of road infrastructure in India. Increased industrial activities, along with increasing number of two and four wheelers have supported the growth in the road transport infrastructure projects. The government's policy to increase private sector participation has proved to be a boon for the infrastructure industry with a large number of private players entering the business through the public-private partnership (PPP) model. Recently, the Government has launched **Bharatmala Pariyojana** which is expected to provide NH linkage to 550 districts, and be a major driver for economic growth in the country.

Road Classification in India

- The **Indian Road Congress** classifies Indian Roads into 5 categories:
  - **National Highways**
  - **State Highways**
  - **Major District Roads**
  - **Other District Roads**
  - **Village Roads**
- Indian Road Congress is a semi-official body setup by government in 1934 on the recommendations of the Jaykar Committee. It is the apex body in the country for road engineers and regularly updates the requirements such as width, sight distance etc.
- Until 2010, National Highways were numbered according to the **National Highways Act of 1956.**
- Post 2010, **east-west highways have odd numbers while north-south highways have even numbers.**
- Only the **central government has the authority to classify any stretch of road as National Highway.**
- The **National Highways Authority of India**, created as per the National Highways Authority Act, 1988 is responsible for the upkeep of National Highways.
- The PWD departments of respective states are responsible to look after state highways.

Also, the Government has permitted 100 per cent foreign direct investment (FDI) in the road sector, thus facilitating several foreign companies in entering into partnerships with Indian players to capitalise on the sector's growth.

3.1. Government Initiatives

In the Union Budget 2018-19, the Government of India has allotted Rs. 83,374 crore to NHAI for roads and highways.

The government has fixed the national highways project award target at 20,000 km for the current fiscal (2018-19), up 25 per cent over the previous year (2017-18). Some of the recent developments are as follows:

- The Government of India plans to introduce a new framework on renegotiation of Public Private Partnership (PPP) contracts, which will allow renegotiations based on sector-specific issues, especially for national highways and ports, and provide greater flexibility to the parties involved.
- The National Highways Authority of India (NHAI) seeks to improve execution of highway projects by delegating powers to its Regional Officers (RO) for hiring of equipment and laborers to demolish structures falling within the project, which will enable NHAI to make encumbrance free land available more speedily to the concessionaire/contractors.
- The Ministry of Road Transport and Highways plans to set up Land Acquisition (LA) cells across the country, which will work towards resolving issues related to land acquisition and ensure speedy compensation disbursal by the state governments.
- The Ministry of Road Transport and Highways plans to build five more green-field expressways across the country, which are expected to reduce travel time and propel economic growth.
- The Cabinet Committee on Economic Affairs (CCEA) has approved a hybrid annuity model for implementing highway projects, which adopts a more rational approach to allocation of risks between the government and the private developer, and is hence expected to revive highway projects construction in India.

- With the objective of reviving private investment in the roads sector, the Ministry of Roads and Highways is now working on two more models for attracting capital. One model proposes allowing bidding of a road project on the basis of the least present value, and the other envisages selling off road projects that have been built using government funds.
- NHAI has signed a Memorandum of Understanding (MoU) with the National Remote Sensing Centre (NRSC) under Indian Space Research Organisation (ISRO) and North East Centre for Technology Application and Research (NECTAR) to use spatial technology such as satellite data to monitor and manage National Highways.
- The Union Budget 2017-18 accorded thrust to multi-modal transport planning and synergizing investments in railways, roads, waterways and civil aviation.
- Tax exemption is given on Masala Bonds to help mobilize more investments.
- The Government has constituted the National Road Safety Council as the apex body to take policy decisions in matters of road safety.
- Under the World Bank Technical Assistance program, the Ministry of Road Transport and Highways got a study conducted on Logistics Efficiency Enhancement. The Study Report has made several recommendations including, inter-alia, development of Economic Corridors, feeder routes and removal of choke points, along with development of Logistics Parks on National Highways. The recommendations have been accepted and the work of developing Logistics Parks at identified locations in partnership with State Governments and other stakeholders in a phased manner, has been entrusted to the National Highways Authority of India (NHAI).
- The Government has launched Indian Bridge Management System (IBMS) for carrying out inventory and condition assessment of all the existing bridges on National Highways.
- Construction of India's longest highways tunnel - the Chenani- Nashri tunnel in Jammu & Kashmir.

3.2. Way Ahead

The government, through a series of initiatives, is working on policies to attract significant investor interest. The Indian government plans to develop a total of 66,117 km of roads under different programmes such as National Highways Development Project (NHDP), Special Accelerated Road Development Programme in North East (SARDP-NE) and Left Wing Extremism (LWE). The government has identified development of 2,000 km of coastal roads to improve the connectivity between ports and remote villages.

NHAI plans to build 50,000 km of roads worth US$ 250 billion by 2022 as part of a long-term goal of doubling the length of the national highway network to 200,000 km.

3.2.1. NHDP

NHDP is being implemented under following 7 phases:

- 4-laning of Golden Quadrilateral and North-South and East-West Corridors (NHDP I & II)
- Upgradation of 12,109 km (NHDP-III)
- 2-laning of 20,000 km with paved shoulders (NHDP-IV)
- 6-laning of 6,500 km (NHDP V)
- Development of 1000 km of expressways (NHDP-VI)
- Other Highway projects of 700 km (NHDP-VII), includes ring roads, service roads etc.

The progress under NHDP has been somewhat slower than anticipated. Some of the major hurdles in its implementation are:

- Timeliness in awarding contracts
- Difficulties in acquiring land
- Securing environmental clearances

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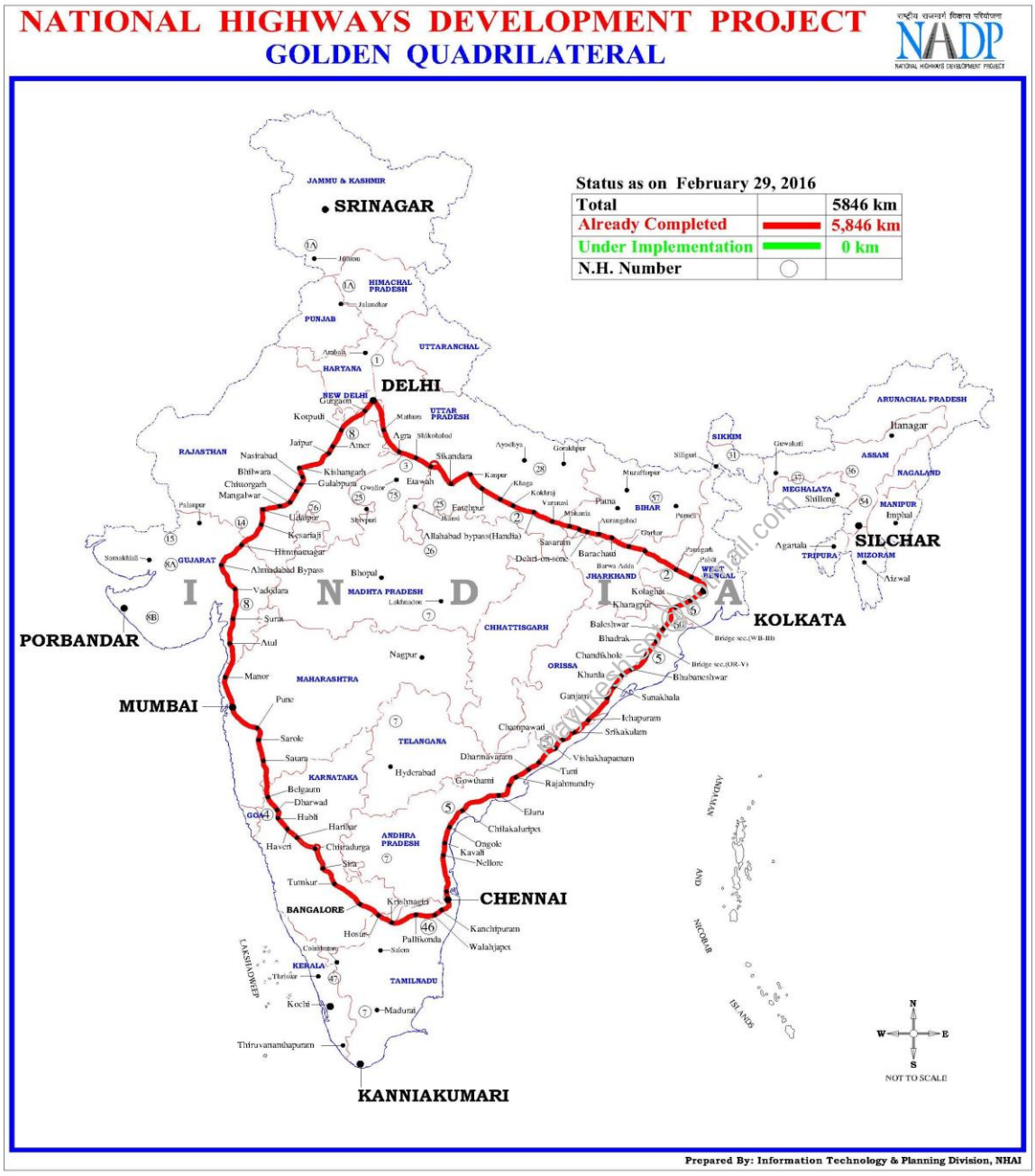
- Shortages in construction capacity
- In a 2012 Report, the World Bank alleged the presence of fraudulent and corrupt practices by Indian contractors.

Suggestions

Within the phases of NHDP, the program relating to two-laning of single lane roads needs to be accelerated to enhance energy efficiency and safety.

Further optimization of energy and transport is achievable with the accelerated construction of service lanes for local traffic in all existing four-lane and six-lane roads. Financing of these roads should rely on user charge principle in form of tolls and continuing with the existing Central Road Fund through additional levies on petrol and diesel.



3.2.2. Pradhan Mantri Gram Sadak Yojna(PMGSY)

PMGSY was launched on 25th December 2000 with the objective of providing all-weather roads to the eligible unconnected rural habitations.

Criteria of eligibility:

- All habitations having a population of 500 (as per 2001 census) and above in plain areas.
- All habitations having a population of 250 and above in:
  - Hill States
  - Desert Areas
  - Tribal Areas (Schedule V)
  - Tribal and backward districts under IAP (Integrated Action Plan)
- The Government of India in 2013, approved a scheme of PMGSY II which envisages upgradation of existing major rural links to rural growth centres where cost of upgradation will be shared by states also.
- The Phase-III of PMGSY is also being finalised, wherein Sustainable Maintenance of Roads and Financial Incentives to best performing States will be the key focus areas.
- The Ministry of Rural Development is planning to give a financial incentive of 5 percent to the best performing States for maintenance of roads. There are 8 to 9 States in the country which are building standard and durable rural roads well before the scheduled target.
- Sensing the importance and urgency of rural roads for national development the target date for completion of PMGSY-I has been preponed from 2022 to 2019. Working towards this accelerated target, sanctions have been given to 1,66,012 habitations (93%) against the target of 1,78,184 eligible habitations. PMGSY through its all-weather roads has contributed this key ingredient of development to 11,499 new unconnected habitations for the first time in 2017-18.
- Less than 1% eligible habitations remain to be sanctioned for new connectivity under PMGSY, remaining 6% habitations are either not-feasible or sanctioned by the States from their own resources. Connectivity has been provided to 1,52,124 habitations (including 16,380 habitations connected by the States). In addition, 2109 habitations of 100-249 population have been connected. Under the program, 5,50,533 kms of road length has been constructed.

Suggestions for Improvement

- The current mandate of PMGSY needs to be expanded to achieve universal connectivity as these roads serve as entry point for poverty alleviation and provision of access to social infrastructure such as education and health.
- Some rural roads could witness traffic volumes that may justify widening to intermediate or two-lane.
- Fiscal federalism theory would suggest that since rural roads serve as the primary redistributive tool for the government, they should continue to be funded by grants from the center.
- For the financing of these roads, the current CRF (Central Road Fund) accruals and RIDF (Rural Infrastructure Development Fund) of NABARD may need to be augmented.
- The strategy of some states to raise funds through market committee fees on agricultural produce can be emulated by other states as well. Some funds for earth work can be leveraged from MGNREGA.

3.3. Additional Schemes/Initiatives

3.3.1. Special Accelerated Road Development Programme for North-Eastern Region (SARDP-NE)

It envisages improvement of road connectivity to the State capitals with district headquarters in the north-eastern region.

3.3.2. Road Requirement Plan (RRP) for improvement of road connectivity in Left Wing Extremism (LWE)

The Government has approved the plan in March, 2015 to develop road networks in the LWE affected areas of 34 Districts in 8 States in India.

3.3.3. Central Road and Infrastructure Fund

Budget 2018 amended the Central Road Fund Act, 2000, and renamed the Central Road Fund (CRF) the Central Road and Infrastructure Fund. The Fund has been created by the central government for the collection of cess on petrol and high speed diesel (HSD) oil. Presently Rs. 8 per liter is collected as cess on petrol and high speed diesel (HSD) oil. Earlier, the fund was distributed solely for the development and maintenance of NHs, state roads, rural roads and for railway over-bridges/under-bridges and other safety features as provided in Central Road Fund Act, 2000. The objective of the amendment is to use proceeds of the road cess under CRIF to finance other infrastructure projects also such as waterways, some portion of the railway infrastructure and even social infrastructure, including education institutions and medical colleges. The government also constituted a ministerial panel headed by the Finance Minister to decide on fund allocation for infrastructure projects from the CRIF.

3.3.4. Border Roads Organization

BRO is a road construction executive force, integral to and in support of the Army. It started operations in May 1960 with just two projects namely Project Tusker (renamed Project Vartak) in the East and Project Beacon in the West.

The BRO has not only linked the border areas of the North and North-East with the rest of the country but has also developed the road infrastructure in Bihar, Maharashtra, Karnataka, Rajasthan, Andhra Pradesh, Andaman and Nicobar Islands, Uttarakhand and Chhattisgarh.

In addition, it has been entrusted with construction of roads in Tajikistan, Afghanistan, Bhutan and Myanmar. It successfully completed 215 km Delaram-Zaranj road in Afghanistan despite the prevailing insurgency.

3.3.5. Motor Vehicles (Amendment) Bill, 2017

Motor Vehicle (Amendment) Bill was passed by the Lok Sabha in April 2017.

Key provisions of 2017 bill

- **Third party insurance:** The 2017 Bill removes the cap on liability for third party insurance as provided for in the 2016 amendment bill.
- **Scheme for providing interim relief to claimants seeking compensation under third party insurance:** The 2017 Bill removes the provisions related to penalties under the scheme.
- **Funds for hit and run accidents:** A motor vehicle accident fund has been constituted for the treatment of injured person, compensation to the person hurt or to the representatives of person died in hit and run case. The requirement of crediting the Fund with a cess or tax in the 2016 bill has been removed.

- **Guidelines for aggregators**: State governments were to issue licenses to aggregators in conformity with guidelines issued by the central government, which was made optional in the 2017 bill.
- **Agency for road safety:** The 2017 Bill provides for a National Road Safety Board (as recommended by Sundar committee) to be notified by central government.
- **Road design and engineering**: The 2017 Bill provides that any contractor or consultant responsible for the design, construction, or maintenance of the safety standards of roads would need to adhere to specified standards by state/central government and would be held responsible through penalty for road accidents.
- **Hassle-free and quick services**: The Bill proposes increasing validity of driving licenses, getting learning licenses online and omitting the requirement of minimum qualification to get a driving license issued.
- **Stricter penalties:** for offences such as drunken driving, dangerous driving, non-adherence to safety norms by drivers (like wearing helmets etc.). The bill has proposed three-year jail term for parents of minors who are caught driving with 10-fold increase in compensation to victim.
- **Aadhaar:** It is required to apply for driving license.

Benefits of the new bill

- **Integrated approach:** Liability is being fixed at every stage making everyone equally responsible to ensure road safety
- **Digitization**: It will make it difficult to obtain bogus driving licenses as it will be linked with Adhaar and e-registration of vehicles will discourage theft and encourage portability in terms of transfer of vehicle registration from one state to another.
- **Rule bound:** When implemented, obtaining a driving license without a test would be impossible for anyone, including politicians.
- **Road safety:** Specifically targeting traffic offenders, stringent penal provisions and identifying priority areas would improve road safety.

Challenges

- Police force need to be made professional and accountable if we want to reduce traffic fatalities, which stood at 1,46,133 in 2015.
- State governments must prepare for an early roll-out of administrative reforms prescribed in the amended law, such as issuing learner's licenses online
- Research shows that imposing stricter penalties tends to reduce the level of enforcement of road rules. According to IIT Delhi's Road Safety in India report of 2015, the deterrent effect of law depends on the severity and swiftness of penalties as well as the perception that the possibility of being caught for violations is high.

3.4. New Initiatives

3.4.1. Bharatmala

This has been envisaged as an umbrella program that will subsume unfinished parts of NHDP and also focus on the new initiatives like development of Border and International connectivity roads, Coastal & port connectivity roads, National Corridors Efficiency improvements, Economic corridors development and others.

3.4.2. SetuBharatam Program

It is for building bridges for safe and seamless travel on National Highways. The aim is to make National Highways free of railway level crossings by 2019 by building Railway Over Bridges/

Under Passes. 1500 old and worn down bridges will be improved by replacement/ widening/strengthening.

3.4.3. Promoting Road Safety

The Government has increasingly focused on improving safety, efficiency and sustainability in the transport sector as only a safe system can be sustainable in the long run. A few steps taken in this regard are as follows:

A National Road Safety Policy had been approved, outlining various policy measures like promoting awareness, establishing road safety information data base, encouraging safer road infrastructure, enforcement of safety laws etc. The Ministry has evolved a multi-pronged strategy to tackle the problem based on the 4 E's viz Education, Engineering (both of roads and vehicles) Enforcement and Emergency Care. A National Road Safety Council had also been constituted as the apex body to take policy decisions in the matter of road safety.

Top priority has been accorded to correction of black spots on National Highways and adopting regulatory measures for improving automobile safety. The Ministry has requested the States to send proposals for correction of black spots and 10% of the Central Road Fund (CRF) has been permitted to be used for undertaking road safety measures. Road safety has been made an integral part of road designing, safety audits are being taken up for selected stretches of National Highways. As short-term measures rumble strips, reflective stickers at junctions, fixing signboard/ cautionary board, providing signage and speed restrictions are being used. As long-term measures construction of vehicular under-pass, By-pass, flyover and 4-laning are being taken up.

An amount of Rs. 1100 crore has been made available for the road safety purposes during the years 2015-16 and 2016-17. The Ministry has stressed upon States / UTs to set up State Road Safety Councils, formulate an action plan for improving road safety, implement it in a concerted manner, fix a definite, time bound target for fatality reduction and identify and allocate adequate manpower, financial and other resources for implementing the strategy to achieve the targets set.

The Ministry has launched a media campaign to promote road safety. NGOs have been sensitised to work on Road Safety.

Vehicular Safety Standards are being set for all classes of vehicles. Trucks are prohibited from carrying protruding rods; Anti-locking Brake System (ABS) made mandatory on Heavy Vehicles; Cars to have provision for fitment of at-least one child seat. Car Crash Standards to be made mandatory w.e.f. 1st April, 2018; ABS/CBS for Two Wheelers mandated w.e.f. 1st April, 2018; AHO (Automatic Headlight On) made mandatory for Two Wheelers to make them more conspicuous; Bus Body Code for safer and comfortable buses; Truck Body Code for safe cabins to drivers and other road users; Mandatory Fitment of Speed Governors on Transport Vehicles to avoid over speeding.

Buses with IT enabled safety measures under NIRBHAYA SCHEME: As per notification issued by the Ministry all public service vehicles, (except two and three wheelers, e-rickshaws) have to be equipped with or fitted with vehicle location tracking device and one or more emergency buttons.

Indian Bridge Management System (IBMS) launched: IBMS is being developed to create an inventory of all bridges in the country and rate their structural condition so that timely repair and rehabilitation work can be carried out based on the criticality of the structure.

Model Institutes of Drivers Training and Research (IDTR): The Ministry is implementing a scheme for setting up of Model Institutes of Drivers Training and Research (IDTR) under which it

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provides a grant up to Rs. 17.00 crore for each centre, as also Rs. 05.00 crore grant for setting up smaller Regional Driving Training Centres (RDTC). The IDTRs are expected to be the mother institutes which will train the trainers and also guide and monitor the smaller institutes.

Model Automated Centers for checking fitness of the vehicles: Under this scheme, the Ministry is providing a grant of Rs. 14.40 crore for each center.

Effective Trauma Care: NHAI provides ambulances at a distance of 50 km on its completed stretches of National Highways. Cranes and ambulances are provided to various State Governments under the National Highway Accident Relief Service Scheme for development on National Highways.

Pilot Projects for Cashless Treatment of Road Accident Victims were done on Gurgaon-Jaipur, Vadodara-Mumbai stretch of NH 8 and Ranchi-Rargaon-Mahulia stretch of NH 33. Now it is proposed to implement this scheme along the Golden Quadrilateral, North South and East West Corridors (about 13500 km) at an estimated cost of about Rs. 250 Crore.

Good Samaritans Guidelines: Guidelines have been issued by the Ministry to prevent the harassment of "Good Samaritans" who help road accident victims. The Supreme Court has accepted these guidelines and has asked states for implementation.

3.4.4. Skill Development

The Ministry of Road Transport and Highways has issued guidelines for Skill Development of Drivers and Mechanical Staff in the Road Transport Sector and of Workmen in the Highways Construction Sector with a view to meet the manpower requirements of the road transport and highways sector and simultaneously creating additional avenues of employment. The workmen training will be conducted by the Directorate General of Training (DGT), Ministry of Skill Development & Entrepreneurship and Government of India. Drivers training will be imparted in driver training centres run by private promoters or State Road Transport Undertakings or the apex body of SRTUs, namely, the Association of State Road Transport Undertakings (ASRTU).

3.4.5. Roadside Amenities

India has experienced significant increase in passenger and freight movement on national highways. Consequently, providing adequate amenities along these roads to ensure convenience and safety of passengers and drivers is a priority. Hence, the Ministry of Road Transport & Highways (MoRTH) has decided to develop Wayside Amenities along the National Highways. Such Wayside Amenities (WSA) shall be branded as 'Highway Haat'. The complexes will provide facilities for car and bus passengers and truckers to relax, revive and refresh, thus helping to reduce driver fatigue, resulting in making roads travel safe and comfortable.

3.4.6. National Highways Interconnectivity Improvement Project

This is a project to ensure safe, fast and all weather movement of traffic on National Highways, mostly located in backward regions. Development of 1120 kms of National Highways in the States of Karnataka, Odisha, Bihar, Rajasthan and West Bengal have been approved. The projects are already taken up for implementation and 429 kms have been completed. The civil works are expected to be completed by July, 2019 and maintenance works are expected to be completed by July, 2024.

3.4.7. Logistic Efficiency Enhancement Programme (LEEP)

It is aimed at enhancing the freight transportation in India through improving cost, time, tracking and transferability of consignments through infrastructure, procedural and Information Technology (IT) interventions. The parks are expected to serve four key functions: freight aggregation and distribution, multimodal freight movement, storage and warehousing, and

value-added services such as custom clearances. MoRTH has shortlisted 15 locations with the highest freight movement for the development of multimodal logistics parks worth Rs. 32,853 crore. The locations are in the states of Maharashtra, Punjab, Gujarat, Rajasthan, Tamil Nadu, Karnataka and Telangana. 44 Economic Corridors, 170 feeder routes and inter-city corridors, 35 logistics parks and 191 choke points have been identified for development to improve logistics efficiency of National Highways.

3.4.8. Highway Construction Policies

The following are the major policy interventions undertaken this year:

Recycling of operational highway assets using the Toll-Operate-Transfer (TOT) Model: The Model has been developed by MoRTH and approved by the CCEA in August, 2016. As per the Model, the right of collection of Toll Fees for operational public funded NH projects is to be assigned for a pre-determined concession period (30 years) to concessionaires against upfront payment of a lump-sum amount. O&M obligations of such projects shall be with the concessionaire till the completion of concession period. This Model facilitates long term O&M of constructed NH projects through private sector efficiency. This is a big investment opportunity for long term institutional investors - both domestic and international like pension funds, insurance funds, wealth funds etc. in addition to banks. Initially, 75 public funded NH projects with aggregate length of around 4,500 km and annual toll revenue collection of around Rs 2,700 crores have been identified for the Model. The Model Concession Agreement (MCA) has been developed and the first round of bidding for projects shall be taken up in near future.

Hybrid Annuity Model (HAM): As per the model, 40% the Project Cost is to be provided by the Government as 'Construction Support' to the private developer during the construction period and the balance 60% as annuity payments over the operations period along with interest on the outstanding amount. The payable interest rate is linked to market rates (Bank Rate + 3.00%). There is separate provision for O&M payments by the Government to the concessionaire. The private party does not have to bear the traffic and inflation risks. The Model has been successful in reviving PPPs in the sector, which is evident in the interest being shown by the market for such projects. Till now, 33 NH projects with an aggregate length of around 1,800 km and involving cost of around Rs. 29,450 crores have been already awarded under the Model. Many more are in matured stages of bidding.

3.5. Green Initiatives

Taxi Policy Guidelines: The committee, constituted by the Ministry of Road Transport and Highways, to review issues relating to taxi permits and propose taxi policy guidelines to promote urban mobility, submitted its report. The committee has recommended that city taxies should be allowed to run on App Based platforms. The policy recommendations also ensure that bigger aggregators do not undercut the traditional cabs. The major focus of the policy is to ensure safe, secure and affordable ride to the common public so as to help in reducing congestion as well as pollution in the cities. The policy also recommends that the app used by aggregators is validated for its integrity by an agency authorized by Ministry of Electronics and Information Technology. It is expected that the policy would help in a healthy growth of the taxi industry. The policy is recommendatory in nature and would help to provide a particular framework to help the States in framing detailed regulations.

Vehicle Fleet Modernization Programme: The concept note on 'Vehicle Fleet Modernization Programme' to enable the replacement of old, heavy and medium commercial vehicles as they contribute the maximum of vehicular pollution was placed on MoRTH's official website for information and comments from concerned Ministries and Departments and other stakeholders. The policy proposes that old vehicles would get the following financial benefits: -

The scrap value of the vehicle and incentives from Original Equipment Manufacturers (OEMs) and incentives from government.

MoRTH has issued a **notification mandating implementation of Bharat Standards-VI (BS-VI)** emission norms from 1st April 2020 for all vehicles. This is a significant step to combat vehicular pollution in the country.

India ready for flex - fuel automobiles: India has put in place all required regulations for the use of Flex-fuel like ethanol mixed with petrol.

Vehicle manufacturers will have to give details about the emission and noise levels of each vehicle they produce: Manufacturers of all kinds of motor vehicles as also E-rickshaws and E-carts will have to give detailed declaration about the emission levels of the vehicle they have manufactured

Ethanol-fuelled Bus: Notification was issued for mass emission standards for flexi-fuel ethanol E85 and ED95. This Notification will enable vehicle manufacturers to manufacture vehicles running on bio-ethanol E85 and ED95. A bio-ethanol fuel bus is already under trial in Nagpur.

Bio-CNG and Bio-Diesel: Notification has been issued for norms for the use of Bio-CNG for testing and exhaust emission for vehicles running on Bio-CNG. With this notification, the vehicle manufacturers can manufacture, sell and get vehicles fuelled by Bio-CNG in the country. Draft Notification was also formulated for Mass Emission Standards for Bio-diesel (B 100) fuelled vehicles.

Retro fitment of existing polluting vehicle into electric hybrid and electric vehicle permitted: Enabling regulations have been finalized and demonstration of technology completed successfully**.**

National Green Highways Project: The initial plantation drive on 1,500 km of National Highways at a cost of about Rs. 300 crore was launched as part of the **Green Highways (Plantation, Transplantation, Beautification and Maintenance) Policy 2015** on 1st of July, 2016. The Policy aims to develop eco-friendly National Highways with the participation of community, farmers, NGOs and private sector. The policy will help to improve aesthetics of the project corridors, reduce the impact of air pollution and reduce accidents by cutting down glare from approaching vehicles. Under the **Green Highways Project** the government has made it mandatory to set aside 1 per cent of the total project cost of any NH contract to a Green Fund corpus that will be used for plantation purposes. Afforestation is expected to help in sequestering approximately 12 lakh mt carbon annually.

'Adopt a Green Highway' Program was launched in July, 2016. It seeks to engage corporates, Public Sector units, Government organizations and other institutions for developing green corridor along National Highways through plantation and allied activity on avenue, median and other available nearby land patches.

'Kisan Harit Rajmarg Yojana' is a pilot scheme to extend green belt beyond the existing '***Right of Way***' of highways by engaging farmers and providing alternative livelihood option to the nearby communities.

A National Green Highways Mission Mobile App has also been launched to enable the management to monitor all the projects with real time data from the fields. The technology will assist in identifying the bottlenecks quickly and ensure speedy and successful implementations of the projects.

E-rickshaw policy of Government has helped in reducing pollution to a great extent. E-carts and E-rickshaws have been freed from permit requirements.

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3.6. E- Initiatives

E-tolling: In order to remove traffic bottle neck at toll plazas and ensure seamless movement of vehicles and hassle-free collection of toll, the Government has implemented a nationwide Electronic Toll Collection based on passive Radio Frequency Identification (RFID) conforming to EPC Gen-2, ISO 18000-6C standards. It provides for electronic collection of toll through FASTags.

E- Tolling was facilitated in a big way after demonetization. After the initial suspension of toll collection in November 2016, when tolling was resumed from 3rd December, elaborate arrangements were made for payment of fees through swipe machines and E wallets and FASTags at all toll plazas on the National Highways. Collection of fee through electronic means was just about 5 percent in Oct-Nov 2016. This rose to about 11 percent by mid-December.

PMIS: An online state-of-the-art real time Project Monitoring and Information System (PMIS) has been developed to digitally monitor 2000+ projects executed by multiple agencies. The PMIS has detailed dashboards for every project and generates custom reports required for project reviews. Customized dashboards have been developed for the Minister of Road Transport and Highways for regular monitoring of progress.

INFRACON is the National Portal for Infrastructure Consultancy Firms and Key Personnel. This portal acts as a kind of bridge between consultancy firms working in the road engineering and construction sector and domain experts and key personnel who are deployed both for project preparation and supervision. The portal hosts the credentials of consultancy firms and key personnel and has linkages to Aadhar and Digi-locker for data validation and purity. 474 consultancy firms and 2387 key personnel under various categories are already registered with the portal.

INAM-PRO has been developed as a web-based application (www.inampro.nic.in) for Infrastructure and Material Providers. It is a kind of a web based market place that brings together the material providers and the prospective buyers on a common platform. The platform was launched in March, 2015 to facilitate contractors and cement buyers engaged in executing central/state funded roads and highways and bridge construction projects to place cement orders online with the registered cement companies offering cement at competitive rates in the vicinity of project execution locations. Given the success of INAM-PRO with cement, other materials like steel and steel slag have also been brought on this platform so as to make this as a comprehensive e-market place for infrastructure providers.

Driving License and Registration Certificates have been linked with the Digilocker scheme as a part of the key initiative under Digital India. With this integration people will no longer need to carry around physical copies of their RCs and Driving Licences. They can instead access digital copies of the same on their mobile phones via the DigiLocker mobile app. Driving Licenses and Vehicle Registration documents can now be issued directly to the DigiLockers of individuals in digital formats. These digital copies can be shared with other departments as identity and address proof. They will also be used for on the spot verification through the citizen's mobile, by various law enforcement authorities like the Traffic Police. Besides being convenient for people, this will also result in assured authenticity of such documents and reduction of administrative overhead.

3.7. Road Connectivity Projects with Neighbouring Countries

India is funding construction of 69 Bridges on the Tamu-Kyigone-Kalewa Road (149.70 kms) Section and construction of 120.74 kms road between Kalewa and Yargi section of the India-Myanmar-Thailand (IMT) Trilateral Highway, in Myanmar to improve connectivity with South East Asia by road. The Trilateral Highway starts from Moreh (Manipur) in India up to Mae Sot in

Thailand through Myanmar. Construction of 130 km length stretch of road connecting Moreh (India) / Tamu (Myanmar) to Kalewa in Myanmar has already been completed by Border Roads Organization of India. For construction of 69 bridges including approach roads in the Tamu-Kyigone-Kalewa road section (149.70 kms) and construction/upgradation of the Kalewa-Yargi road section (120.74 kms) of the IMT Trilateral Highway in Myanmar, appointment of Consultants to finalise tender documents and award of contracts has already been completed.

Seamless entry of Bangladesh truck into India: History was written at the Inland Customs Depot in Patparganj in East Delhi in September 2016 when for the first time a cargo truck from Bangladesh drove in with a Delhi bound consignment, having come seamlessly through customs free borders on a trial basis under BBIN Motor Vehicles Agreement.

India-Myanmar-Thailand (IMT) Motor Vehicle Agreement: A trial run of passenger vehicles on the IMT Trilateral Highway up to Naypitaw in Myanmar was carried out during 9-14 November, 2015 in which Indian vehicles travelled to Myanmar on Imphal-Mandalay-Bagan-Naypitaw route and back and Myanmar vehicles joined the Indian vehicles on the return journey from Naypitaw to Imphal and returning to Myanmar.

BBIN Corridor: Under the study on LEEP, a strategic initiative called the Bangladesh Bhutan India Nepal (BBIN) corridor development aimed to improve economic cooperation and regional connectivity is under consideration. Various interventions like upgrading road connectivity within BBIN region, development of feeder routes and up-gradation of land ports are under consideration.

3.8. Recommendations of Rakesh Mohan Committee (National Transport Development Policy Committee (NTDPC))

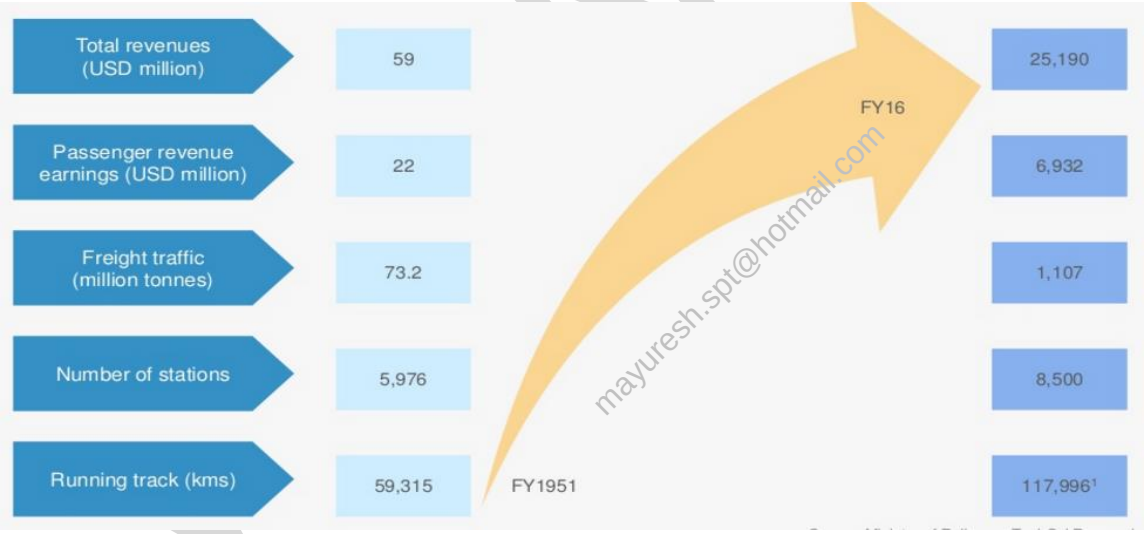
- Roads should not be looked at in isolation, but as part of an integrated multi-modal system of transport. The planning and development of the primary road network must tie up with planning of railways' dedicated freight corridors and other segments of rail network, connectivity with ports, airports, SEZs, logistic hubs, major tourist centres and linkage with neighbouring countries.
- The current program of PMGSY should be expanded to achieve universal connectivity to all habitations on time bound basis.
- There is need for continuous upgradation of technology in the auto industry, especially the commercial vehicle sector, to meet the objectives of better comfort, productivity, energy efficiency, safety and emission standards in line with international practices and standards.
- Private sector financing in the highways will remain confined to commercially viable and high traffic density stretches. It will be prudent, therefore, to enhance the availability of public sector funding.
- The existing network of National Highways and State Highways may be expanded in tune with the economic growth and development of industrial hubs, SEZs, ports, tourist centers and connectivity to international routes – Asian Highways and the European Road Network.
- For capacity augmentation of state highways every state should formulate and implement programmes on the lines of NHDP.
- The accruals to the CRF may be enhanced by making levy of cess on fuel on ad valorem basis rather than the system of a fixed amount of Rs. 2 per litre (which was fixed in the year 2005). This may be enhanced to Rs. 4 per litre to enhance accruals to the CRF.
- There is a need for review of the current policy of user fees (tolls) on National Highways. A two-lane should be considered a minimum facility to be provided out of government budget in respect of primary roads (NHs and SHs) with no direct user charge. Toll should be

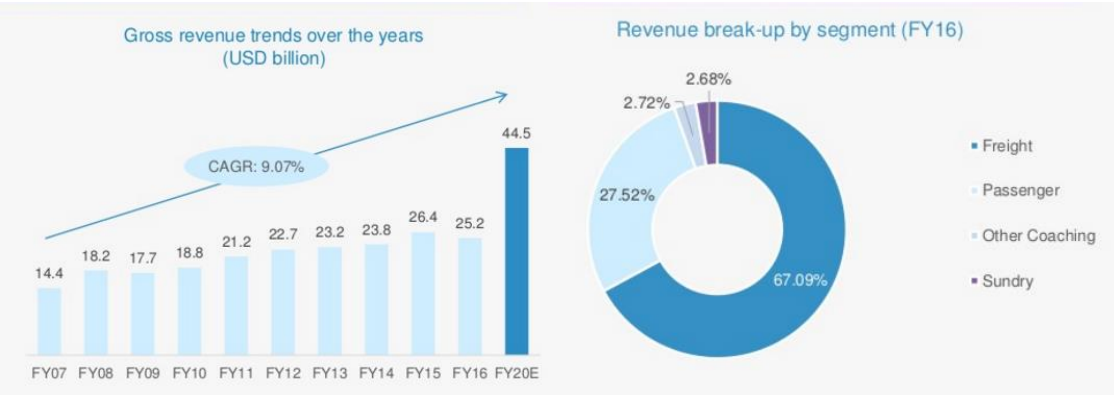
levied on multi-lane highways, both access controlled non-access controlled, as also spot improvement projects such as bridges, tunnels, flyovers, bypasses.

- Special needs of connectivity to ports, airports, mining areas and development of power plants should be factored in development of the road programmes.
- States should encourage citizen and user oversight through undertaking road user satisfaction surveys.
- A dedicated road design institute should be set up, which should function under the umbrella of MoRTH. Similar institutes should be set up in each state PWD and Rural Roads Agency.
- The MoRTH should entrust all National Highways and National Expressways to NHAI, and only planning, policy and budget functions should remain with the MoRTH.
- Establish Road Safety and Traffic Management Board as recommended by the Sundar Committee.

4. Railways

The Indian Railways had a modest beginning in 1853 when the first train journeyed from Mumbai to Thane, covering a distance of 34 km. Today, Indian Railways is the world's eighth biggest employer and had 1.331 million employees at the end of 2015-16. In 2015–2016 Indian Railways had revenues of US$26 billion, which consists of US$17 billion freight earnings and US$6.9 billion passengers' earnings. It had operating ratio of 90.5% in 2015-16. As on the end of 2015-16, Indian Railways' rolling stock comprised over 251,256 Freight Wagons, 70,241 Passenger Coaches and 11,122 Locomotives (39 steam, 5,869 diesel and 5214 electric locomotives).





The national railway network is divided into 17 zones, which are further subdivided into divisions. There are a total of 68 divisions. There are thirteen undertakings under the control of the Ministry of Railways.

4.1. Rolling Stock

Over the years, Indian Railways has not only achieved self-sufficiency in production of rolling stock (locomotives, wagons, freight trains) in the country but also supply rolling stock to other countries and other non-railway customers.

In the spirit of '**Make in India'**, crucial steps have been taken:

- After agreement for setting up two loco factories in India with an order book of about Rs. 40,000 crore, a similar bid process started for train sets for Rajdhani and Shatabdi services; current procurement to be increased by 30%.
- Production units and workshops to aim at generating annualised revenues of about Rs. 4,000 crore by 2020 through manufacturing products for domestic and international markets.

Following are the manufacturing units of Indian Railways:

- Diesel Locomotive Works (DLW), Varanasi
- Chittaranjan Locomotive Works (CLW)
- Rail Coach Factory (RCF), Kapurthala
- Integral Coach Factory (ICF), Chennai
- Rail Wheel Factory (RWF), Bangalore
- Diesel loco Modernization Works (DMW), Patiala

4.2. Dedicated Freight Corridors (DFCs)

The Indian Railways' quadrilateral linking the four metropolitan cities of Delhi, Mumbai, Chennai and Howrah, commonly known as the Golden Quadrilateral; and its two diagonals (Delhi-Chennai and Mumbai-Howrah), adding up to a total route length of 10,122 km carries

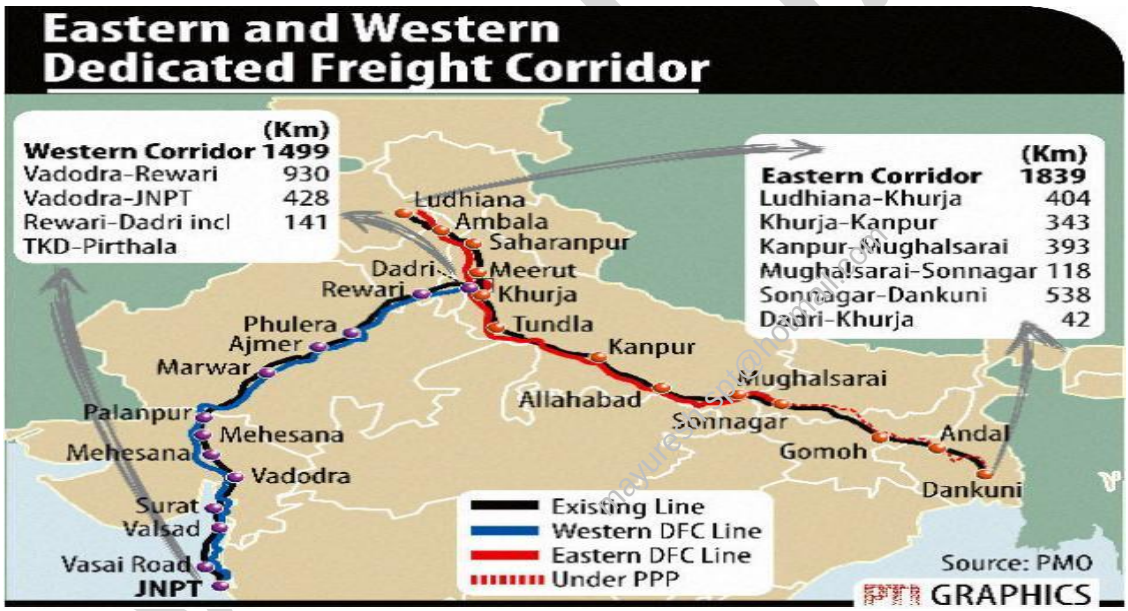
more than 55% of revenue earning freight traffic of IR. The existing trunk routes of Howrah-Delhi on the Eastern Corridor and Mumbai-Delhi on the Western Corridor are highly saturated, with line capacity utilization varying between 115-150 per cent.

The surging power needs requiring heavy coal movement, booming infrastructure construction and growing international trade has led to the conception of **the Dedicated Freight Corridors**. The Sanctioned Dedicated Freight Corridors are:

- **Western Dedicated Freight Corridor, (Dadri, U.P to Jawaharlal Nehru Port, Mumbai—1,468 km) (WDFC)**
- **Eastern Dedicated Freight Corridor, (Ludhiana Punjab to Dankuni West Bengal—1,760 km) (EDFC)**

Being executed by the **Dedicated Freight Corridor Corporation of India Limited (DFCCIL),** a Special Purpose Vehicle set up under **the Ministry of Railways in 2006**, the two dedicated freight corridors will provide relief to the railways' heavily congested Golden Quadrilateral along the western and eastern rail routes, and facilitate fresh industrial activity and multi-modal value-addition services hubs along the corridors**.**

It is proposed to take up three freight corridors - North-South connecting Delhi to Chennai, East-West connecting Kharagpur to Mumbai & East Coast connecting Kharagpur to Vijayawada - on high priority to ensure structuring, award and implementation in a time-bound manner through innovative financing mechanisms including PPP.



The diversion of freight to DFCs on trunk routes will free up the existing network for the kind of capacity expansion needed for passenger movement.

The commissioning of the WDFC and EDFC projects, spanning over 3360 route kms, will not only help the railways regain its market share of freight transport but bring about fundamental changes by reduction in unit cost of transportation, smaller organization and management cost, with higher efficiency and lower energy consumption. In the execution of the two dedicated freight corridors, the DFCCIL aims to follow a low carbon path, adopting various technological options which can help them to operate with greater energy efficiency.

4.3. Commission of Railway Safety

The Commission of Railway Safety, working under the administrative control of the Ministry of Civil Aviation of the Government of India, deals with matters pertaining to safety of rail travel

and train operation. It is charged with certain statutory functions as laid down in the Railways Act (1989), which are of an **inspectorial, investigatory & advisory nature.** Thus, it assists in ensuring that all stipulated measures are taken in regard to the soundness of rail construction and safety in train operation. The Commission functions according to certain rules viz. Statutory investigation into accidents rules framed under the Railways Act and Executive instructions issued from time to time. It also undertakes similar functions with respect to Metro Railways in different cities of the country.

4.4. Key Developments

4.4.1. Passenger Amenities and Services

- Personalised take away bedrolls service launched.
- Initiation of "Janani Sewa" announced i.e. Hot Milk, Hot Water and Baby Food items at stations and children's menu items on trains.
- Optional Travel Insurance for e-ticket passengers launched.
- Policy decision taken to provide sub quota of 33% to women within reserved categories for the allotment in catering units.
- Self Help Groups have been roped in to make local cuisines available through E-Catering Services of its PSU IRCTC.
- The Alternate Train Accommodation Scheme (ATAS) also known as VIKALP now available on sectors viz. Delhi-Howrah, Mumbai, Chennai, Bangalore and Secunderabad is now being extended to other sectors and instructions have been given to Zonal Railways to this effect.
- Compensation rate payable to railway accident victims has been doubled.
- Flexi fare system for Rajdhani/Duronto and Shatabdi trains introduced.

4.4.2. High Speed Trains

- India's first semi-high speed train christened as Gatimaan Express capable of running at a maximum speed of 160 Kmph between H.Nizamuddin and Agra Cantt flagged off. Train hostesses to provide hospitality services on-board.
- High speed train between Mumbai-Ahmedabad corridor already sanctioned and under implementation with financial & technical assistance from Japan.
- Other high speed corridors along the diamond quadrilaterals are under exploration.
- Field trials for Spanish Talgo Train held for saving substantial travel time.
- Mission Raftaar launched to work towards increasing speed of existing trains in Indian Railways.
- Protocol for undertaking feasibility study of speed raising of Nagpur-Secunderabad Railway Corridor signed Between Indian Railways and Russian Railways

4.4.3. Railways Development Authority

The Union Cabinet has approved the setting up of a regulator for the railways — the Rail Development Authority (RDA). The regulator will perform four primary functions — tariff determination; ensuring fair play and level playing field for stakeholder investment; setting efficiency and performance standards; and dissemination of information.

4.4.4. Digital India Initiatives

- Printing of Bar Code on unreserved tickets introduced to prevent fraud.
- India's first High Speed Public Wi-Fi Service at Mumbai Central station inaugurated.
- Implementation of E-enabled Track Management System (TMS) & Mobile Application of TMS on Indian Railway and Track Inventory Management System inaugurated on Northern Railway.

- Hand Held Terminals given for TTEs.
- Integrated (Facebook & Twitter) Social Media Platforms for grievance redressal launched. On an average 12,000 tweets and 400 posts per day are received from Railway Ministry's Twitter & Facebook accounts. Social Customer Relationship Management System has been launched to handle such large number of tweets/posts.
- Go India Smart Card introduced on pilot basis in select sectors (New Delhi- Mumbai, New Delhi-Howrah) to facilitate cashless transactions and to reduce the time taken at booking counters.

4.4.5. Finance

- Starting Budget 2017-18, Railway budget has been merged with General Budget.
- The Cabinet approved Productivity Linked Bonus to railway employees

4.4.6. Safety

- A fortnight long massive safety drive launched to focus on measures to prevent derailments.
- Indian Railways is working on an action plan on eliminating unmanned level crossings from the railway network. The exercise is a sub-mission of the Railways "Mission Zero Accident". Regular awareness campaigns are underway to sensitize the public about taking precautions while crossing unmanned level crossing.
- TRI-NETRA - Terrain imaging for diesel drivers Infrared, Enhanced Optical & Radar Assisted system trial launched.
- An action plan has also been chalked out for retro-fitting of the existing 45,000 ICF designed coaches with better safety features over the next 3 to 4 years.
- It is decided that Indian Railways would completely switch over to the production of LHB coaches, which are designed with better safety features like anti-climbing and anti-telescoping.
- Japan and Korea have been roped in to improve the safety performance of Indian Railways.

4.4.7. Security

- Fitment of CCTV In Amritsar-New Delhi Shan-E-Punjab Express inaugurated. Shan-E-Punjab Express becomes the First India Train fitted with CCTV surveillance cameras. Surveillance Systems while monitoring security shall not compromise on privacy of rail passengers. Four to six cameras per coach installed with Digital Video Recorder Facial Recognition in Unambiguous Light and in Low Light Conditions especially in aisle areas.
- Rescue of children by RPF under "Operation Muskaan – II".

4.4.8. Electrification and Signalling

- Record electrification of 1775 km in a year in Indian Railways, had been achieved up to 15th Dec. 2016. This is 20% higher than the previous record electrification of 1479 rkm achieved during the same period for calendar year 2015.

4.4.9. Green Initiatives

- 'First Green Train Corridor namely Rameswaram - Manamadurai' free from human waste discharge inaugurated.
- Okha-Kanalus and Porbandar-Wansjaliya Sections in Gujarat of Western Railways inaugurated as Green Corridor Sections (free from human waste discharge from trains).

4.4.10. Memorandum of Understanding

- Memorandum of Understanding (MoU) signed between Ministry of Railways and Governments of Kerala, Andhra Pradesh, Telangana, Chhattisgarh, Haryana and Odisha for "Formation of Joint Venture Companies for Development of Railway Infrastructure" in these States.
- A Memorandum of Understanding (MoU) signed between Ministry of Railways and Indian Space Research Organization (ISRO) for developing applications in the field of Remote Sensing and Geographic Information System (GIS) for remote sensing at unmanned railway crossing, including all geospatial solutions and customized software solutions for providing reliable, efficient & optimal solutions to Railways in it various areas of operation thereby benefiting the rail user.

4.5. Various Committees for Reforms

4.5.1. Recommendations of Rakesh Mohan Committee (National Transport Development Policy Committee (NTPDC))

The Government of India set up the NTDPC in the year 2010, under the chairmanship of Dr. Rakesh Mohan. The aim of NTDPC was to provide a long-term transport policy for the country up to the year 2029-30.

- Increase in investment in railways from 0.4 per cent of GDP in 11th plan to 0.8 per cent in 12th plan and 1.1 per cent in 13th plan and beyond.
- Separation of railways management and operations from the Government. The Ministry of Railways in the future should be limited to setting policies. A new Railways Regulatory Authority should be setup, which would be responsible for overall regulation including the setting of tariffs. The management and operations should be carried out by a corporatized entity, the Indian Railway Corporation (IRC) (to be setup as a statutory corporation).
- Accounting system to be revamped into a company account format in line with the Indian GAAP (Generally Accepted Accounting Principles).
- Indian Railways should take steps to capture a significant share of the fast growing FMCG, Consumer Durable and Information Technology, containerized cargo and other segments like automobiles, etc, where its presence is negligible.
- Strategy for passenger services should include augmentation of supply, shift of focus to long distance and inter-city transport, upgradation of speed and development of select High Speed Rail corridors.
- Improved connectivity to industry clusters as well as significant ports, based on their current and projected traffic volumes.
- Development of 15-20 logistics parks at the main network hubs such as Mumbai, Bangalore, Delhi NCR etc.
- Construction of six Dedicated Freight Corridors (DFCs) on top priority.
- Establishment of National Board for Rail Safety & Establishment of Railway Research and Development Council.
- Setting up a National Railway Construction Authority, partially independent of Ministry of Railways, to expedite delivery of projects.
- Multiple services and cadres of Railways at the management level need to be rationalized and coalesced into fewer services.
- Indian Railways should expedite the execution and operationalization of identified inter-connectivity projects.

4.5.2. The Bibek Debroy Committee

"Mobilization of Resources for Major Railway Projects and Restructuring of Railway Ministry and Railway Board" is the theme of the Report. The final Report was submitted in June, 2015 and reviews almost all areas of Indian Railways operations. The key recommendations of this committee are as follows:

- **Transition to commercial accounting**: The financial statements of Indian Railways need to be re-drawn, consistent with principles and norms nationally and internationally accepted.
- **Streamline recruitment & HR processes**: There is a multiplicity of different channels through which people enter the railway services. It essentially recommended unifying and streamlining the process.
- **Establishment of Independent Regulator RRAI**: setting up an overarching Railway Regulatory Authority of India (RRAI) as an independent regulatory body. The Railway Board should continue only as an entity for the Indian Railways (PSU).
- **Encouraging private entry**: Private entry into running both freight and passenger trains in competition with Indian Railways should be allowed and private participation in various railway infrastructure services and non-core activities like production and construction, should be encouraged.
- **Indian Railway Manufacturing Company**: The Committee proposes that all these existing production units whether it is for coaches or locomotives should be placed under a government SPV known as the Indian Railway Manufacturing Company (IRMC).
- **Raising resources**: An Investment Advisory Committee may be set up, consisting of experts, investment bankers and representatives of SEBI, RBI, IDFC and other institutions for raising resources for investment.
- **Social costs & JVs to bear them**: Constructing new suburban lines should be undertaken as joint ventures with state governments. There are too many Zones and Divisions and thus a rationalization exercise is required.
- **Changing relationship between government & Railways**: A separate Railway budget should be phased out progressively and merged with the General Budget.
- **Decentralisation**: Decentralisation should happen at the bottom level duties.
- **Non- core areas**: Separation of activities like running of hospitals, schools, catering, real estate development, manufacturing of locomotives, coaches and wagons from the core business of running trains.

Clearly, the panel has articulated a very far sighted report with major changes that will take time for completion. Once implemented, it will surely have an optimising effect on the current state of railways.

4.6. Challenges and Suggestions

Indian Railways have suffered from the absence of a comprehensive framework for capacity expansion over the last 60 years.

Consequently **only incremental changes** have taken place in form of gauge conversion, doubling of lines, some modernisation of signals etc., along with continuous addition of new lines on uneconomic routes.

A significant blot is the increasing number of **railway accidents**. Nearly 25 per cent of the total railway track in India is considered over-aged and is due for replacement. A multi – pronged approach is essential with focus on introduction of newer technologies (Train Collision Avoidance System, Train Protection Warning System (TPWS), *Vigilance Control Device)* mechanization of maintenance, early detection of flaws etc. to reduce human dependence in the first place, along with upgrading the skills of human resources alongside periodical safety audits.

Indian Railways have to play a dual role of revenue **earning as well as meeting the social obligations (**"Split Personality disorder")**.** However, with saturation of trunk routes and low quality of services and reliability, the revenue growth has registered a slowdown.

Presently, the network is plagued by **infrastructure and carrying capacity constraints** and most of the routes on the High Density Network (HDN) have already reached saturation in line capacity utilisation. Network expansion and expansion freight handling capacity is largely the need of the hour.

The expenditure on railways as a percentage of total transport sector expenditure has declined considerably over the last two decades. The Twelfth Plan pointed out how urgent investments in the railways were needed and said "If consistent growth of 7-10 per cent per annum is to be achieved over the next 20 years, there is a pressing need for unprecedented capacity expansion of the railways for both freight and passenger traffic in a manner that has not taken place since Independence."

While, the railways have been suffering from severe capacity constraints and remains underinvested, the road sector has witnessed a surge in investments (both private and public). As a result of severe capacity constraints and distortions in relative allocation of resources, Indian Railways has seen a fall in share of both passengers and goods transported.

3 pillars of the strategy for Indian Railways has been proposed by the Government:

- ***Nav Arjan*** *or New revenues* (focus on new sources of revenue)
- ***Nav Manak*** *or New norms* (optimising outgo on each activity); and
- ***Nav Sanrachna*** *or New Structures* (revisiting all processes, rules, and structures)

A guided approach to the overhaul of Indian Railways, supported by organisational changes and certain strategic decisions regarding relative allocation of resources between rail and road; undoubtedly will be a boon for India's growth.

4.7. Key Issues

a) Interconnected, hierarchical transport network

India must adopt a holistic approach in designing integrated transport networks. Hierarchical connectivity, intermodal access and fit-for-purpose network standards should be emphasized. Network expansions and capacity enhancements must be assessed for their impact on the existing network, and within and across networks. But, with substantial logistics infrastructure yet to be built, India can still make amends to reach a more desirable and efficient state for its transport system.

b) Causality and Timeliness

Both sides of the causality between demands for transport and other goods and services should be considered in making the case for new infrastructure spending. Infrastructure should be programmed in anticipation of future demand. It is frequently easier, cheaper and faster to do this than post hoc construction that increases capacity at the margin. Once created, maintenance should be regular, timely and pre-emptive, rather than rehabilitative and this should become an important part of the asset management system of each mode of transport. Allowance should also be made for allowing dynamic responses to changing situations.

c) Rebalancing and Capacity

India's transport networks are severely constrained for capacity. Railways in particular, despite being a more reliable and energy efficient mode, have been losing out to roads for the want of capacity augmentation at various fronts. Increased funding has not translated

into commensurate increases in the capacity of physical infrastructure, essentially due to greater investment focus on new and sometimes unhelpful infrastructure creation rather than on capacity augmentation.

d) Funding

Different characteristics of different transport modes warrant different funding models. Opportunities for improving the source of public funding exist for all modes, to better match costs and benefits for economic efficiency. Problems are especially rife in how the railways are funded. While retaining the role for the government in infrastructure funding, there is need for stepping up private investment to both fill the investment gap and also allow increased flow of public investment in perhaps commercially unviable but economically and socially important investment decisions.

e) Pricing

A complex web of subsidies, tariffs and taxation policies applies to transport in India. This results in distorted pricing that does not serve as an efficient allocative signal, and creates opportunities for wasteful leakages and rent-seeking. More sophisticated and less distortionary pricing can result in powerful tool in government's armoury to shape transport markets.

f) Urban Transport

A clear framework of supply side measures and equally important demand side gradual approach of progressively introducing restraints on personalised modes of transport, while strengthening public transport, is needed to meet the demands of the burgeoning urban population. It is, however, essential to make rational and customised decisions when choice for investment in one form of public transport system vis-a-vis another is considered as opposed to a "one size fits all" kind of widespread replication of a particular model.

g) Governance and Institutions

India's unique and dated system of institutional governance has resulted in a transport system that favours isolated decisions, with the result that there is little intermodal coordination, and a system that is beset by unclear responsibilities, politicisation of investment, and weak accountability. The overall outcomes are characterised by inefficiency and waste.

h) Skills and Human Resources

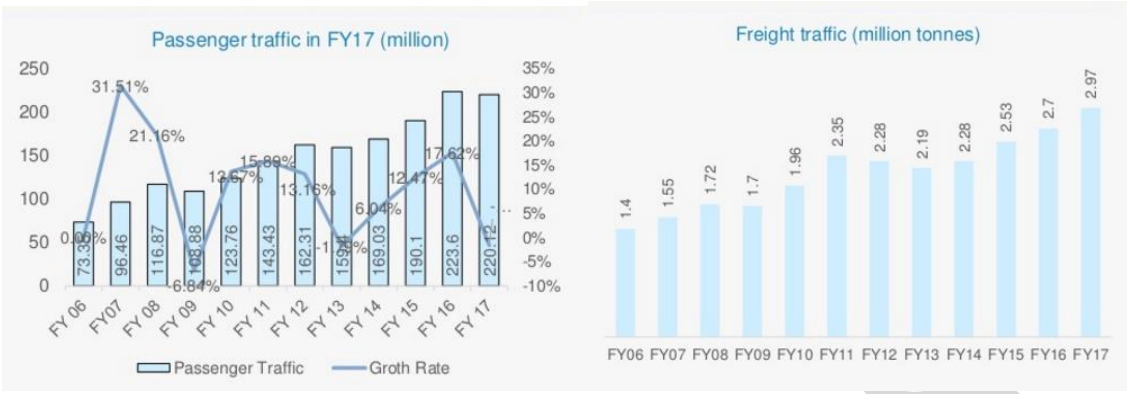
India urgently requires people adept at following with respect to infrastructure development: planning, project identification and development; efficient and transparent contract procurement, administration, and operation and management. The severe shortage of skilled transportation professionals must be addressed forthwith.

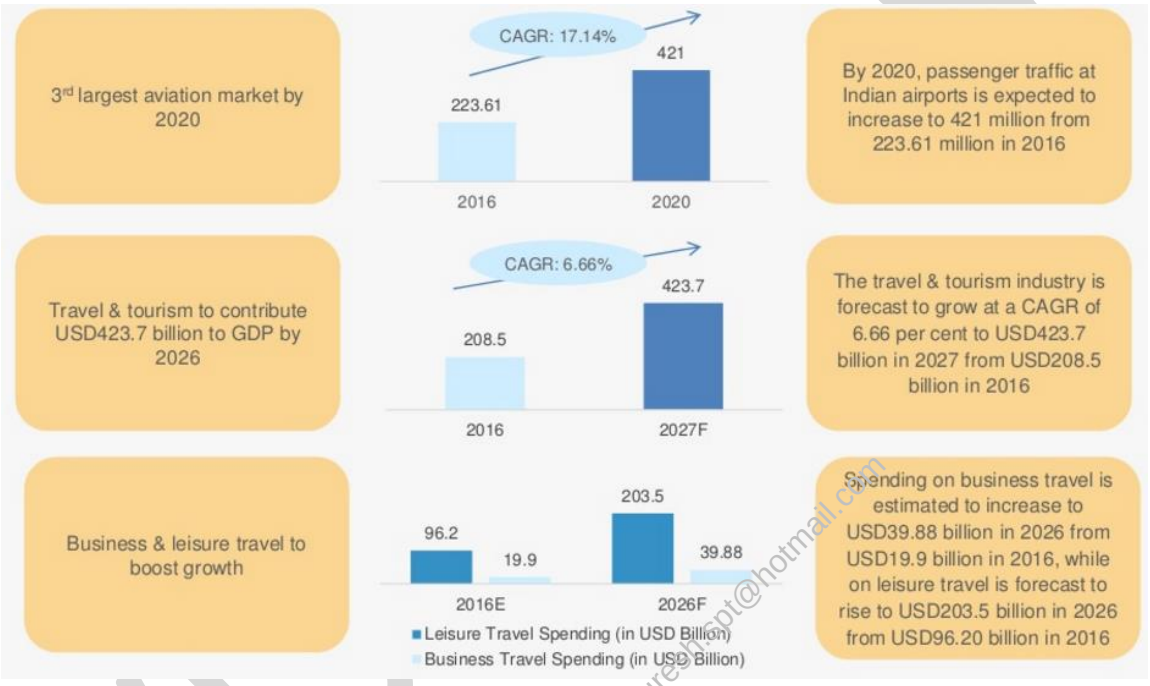
5. Civil Aviation

In the last decade, the Civil Aviation sector has grown at a phenomenal pace. India has emerged as the world's ninth largest civil aviation market.

The total passenger traffic stood at 220.12 million in FY17, which recorded 190.1 million in FY15 in India. During FY06-17, passenger traffic grew at a CAGR of 10.51% in the country. Total freight traffic registered a CAGR of 6.8 per cent over FY06-16. The growth in passenger and freight traffic has been made possible by growth in total aircraft movement, which recorded a CAGR of 5.59 per cent over FY07-17.

The Government of India (GOI) has opened airport sector to private participation and six airports across major cities are being developed under the PPP model. The Airports Authority of India (AAI) aims to bring around 250 airports under operation across the country by 2020.





5.1. Agencies related to Civil Aviation

5.1.1. Director General of Civil Aviation (DGCA)

DGCA is the regulatory body in the field of civil aviation under the Ministry of Civil Aviation. The DGCA currently has no recruiting powers. It is responsible for:

- Regulation of air transport services to/from and within India in accordance with the provisions of the Aircraft Rules, 1937.
- Licensing of pilots, aircraft maintenance engineers and monitoring of flight crew standards.
- Registration of civil aircraft.
- Laying down airworthiness requirements for civil aircrafts registered in India and grant of certificate of airworthiness to such aircrafts.
- Investigation of minor air accidents and incidents and rendering technical assistants to courts/commissions of enquiry appointed by the government.
- Safety oversight and surveillance of air carriers and aerodromes.
- Rendering advice to Government on matters pertaining to air transport including bilateral air services agreements with foreign countries.

- Type certification of Aircraft.
- Processing amendments to the Aircraft Act, 1934 and Aircraft Rules, 1937 and other acts relating to civil aviation, with a view to implementing the provisions of the Chicago convention in India.

5.1.2. Bureau of Civil Aviation Security (BCAS)

The BCAS was established as a cell in the DGCA in 1978 on the recommendations of the Pandey Committee constituted in the wake of hijacking of an Indian Airlines flight in 1976. The role of this cell was to coordinate, monitor, inspect and train personnel in Civil Aviation Security matters.

The BCAS was reorganized into an independent department on 1st April 1987 under the Ministry of Civil Aviation following the Kanishka tragedy in June 1985.

The main responsibility of BCAS is to lay down standards and measures in respect of civil flights at international and domestic airports in India and Indian operators at foreign airports.

The BCAS is the regulator for civil aviation security in the country. It is responsible for laying down the standards for pre-embarkation security anti-sabotage measures in respect of civil flights and ensuring their compliance through regular inspections and security audits.

5.1.3. Airports Authority of India (AAI)

AAI is a PSU under the Ministry of Civil Aviation engaged in development and building of airport infrastructure & managing airports across the country. AAI came into existence in 1995 with the merger of the then two authorities (National Airports Authority and International Airports Authority of India).

AAI has the responsibility of creating, upgrading, maintaining and managing civil aviation infrastructure both on the ground and air space in the country. The main functions of AAI include construction, modification & management of passenger terminals, development & management of cargo terminals, development & maintenance of apron infrastructure including runways, parallel taxiways, apron etc., Provision of Communication, Navigation and Surveillance which includes provision of DVOR / DME, ILS, ATC radars, visual aids etc., provision of air traffic services, provision of passenger facilities and related amenities at its terminals thereby ensuring safe and secure operations of aircraft, passenger and cargo in the country.

Induction of latest state-of-the-art equipment, both as replacement of old equipments and also as new facilities to improve standards of safety of airports in the air is a continuous process. Adoptions of new and improved procedure go hand in hand with induction of new equipment. Some of the major initiatives in this direction are introduction of Reduced Vertical Separation Minima (RVSM) in the India air space to increase airspace capacity and reduce congestion in the air; implementation of GPS and Geo Augmented Navigation (GAGAN) jointly with ISRO which when put to operation would be one of the four such systems in the world.

5.1.4. Pawan Hans Helicopters Limited (PHHL)

PHHL is a government company under the Companies Act 1956 with the primary objective of providing helicopter support services to the oil sector in offshore exploration, operating in hilly and inaccessible areas and make available charter flights for promotion of travel and tourism. PHHL has emerged as one of Asia's largest helicopter operators having an operational fleet of 42 helicopters.

5.1.5. National Civil Aviation Policy (NCAP 2016)

The Union Cabinet recently cleared the Civil Aviation Policy in order to boost the domestic aviation sector and provide passenger-friendly fares. This new policy aims at providing various benefits to domestic airline passengers.

Aim of the Policy

- India to become 3rd largest civil aviation market by 2022 from 9th.
- Domestic ticketing to grow from 8 crore in 2015 to 30 crore by 2022. To grow domestic passenger traffic nearly four-fold to 300 million by 2022.
- Airports having scheduled commercial flights to increase from 77 in 2016 to 127 by 2019.
- Cargo volumes to increase by 4 times to 10 million tonnes by 2027.
- Enhancing ease of doing business through deregulation, simplified procedures and e-governance.
- Promoting 'Make In India' in the Civil Aviation Sector.
- Ensuring availability of quality certified 3.3 lakh skilled personnel by 2025.

Highlights of NCAP

Regional Connectivity Scheme

- Capping of fare: Rs 1,200 for 30 minutes and Rs 2,500 for hour-long flights.
- Revival of airstrips/airports as No-Frills Airports at an indicative cost of Rs. 50 crore to Rs. 100 crore.

Route Dispersal Guidelines (RDG): MoCA will categorize the air traffic routes into 3 categories.

5/20 rule scrapped

- Replaced with a scheme which provides a level playing field.
- All airlines can now commence international operations provided that they deploy 20 aircraft or 20% of total capacity, whichever is higher for domestic operations.

Bilateral Traffic Rights

- Government of India will enter into 'Open Sky' ASA on a reciprocal basis with SAARC countries and countries located beyond 5,000 km from Delhi. i.e. these countries will have unlimited access, in terms of number of flights and seats, to Indian airports, leading to increased flight frequencies.

Ease of Doing Business

- A single window for all aviation related transactions, complaints, etc.
- More focus on ease-of-doing business as government plans to liberalize regime of regional flights.

Infrastructure Development

- Restoration of air strips at a maximum cost of Rs. 50 crore through Airports Authority of India (AAI).
- Four Heli-hubs to be developed. Helicopter Emergency Medical Services to be facilitated.
- Development of Greenfield and Brownfield airports by State governments, private sector or in PPP mode to be encouraged.

Future tariffs at all airports will be calculated on a 'hybrid till' basis. Under 'hybrid till', only up to 30 per cent of the non-aeronautical revenues, which include segments like retail, food & beverages and parking, would be used for cross-subsidisation of aeronautical charges.

5.2. Challenges & Recommendations

- Airline balance sheets are unstable, with most failing to register profits over multi-year periods.
- At various times, airfares have been unsustainably low or unjustifiably high, and there has been no clear regulatory response.
- The cyclical anxiety over government subsidies to Air India, and the consequent effects on the Industry, often results in little more than a fresh capital injection.
- Some issues have also arisen regarding perceived high charges in some of the new private airports.
- New airport projects are announced with overlapping or insufficient catchment areas, without regard for airspace issues or the potential for airlines to operate there.
- India's civil aviation sector is facing acute shortages in manpower (pilots, cabin crew, air traffic controllers, ground staff etc). This shortage is primarily due to a significant lack of training infrastructure, including training academies, instructors and equipment.
- Aviation Turbine Fuel (ATF) is much more expensive in India than regional airports offshore. ATF accounts for almost 40% of the operating cost of Indian carriers as against a figure of 20% for international carriers.
- Amidst all this, the industry is hamstrung by a tortuous system of taxes, cesses, rules and regulatory restrictions.
- Aviation is part of a multi-modal network. Every decision on air transport infrastructure should ultimately be able to be traced back to a sense of place and purpose within the wider transport network that is inclusive of all modes. Network-centric thinking should prevail while planning air transport infrastructure. Efforts should be directed at building complementary regional, national and international air networks.

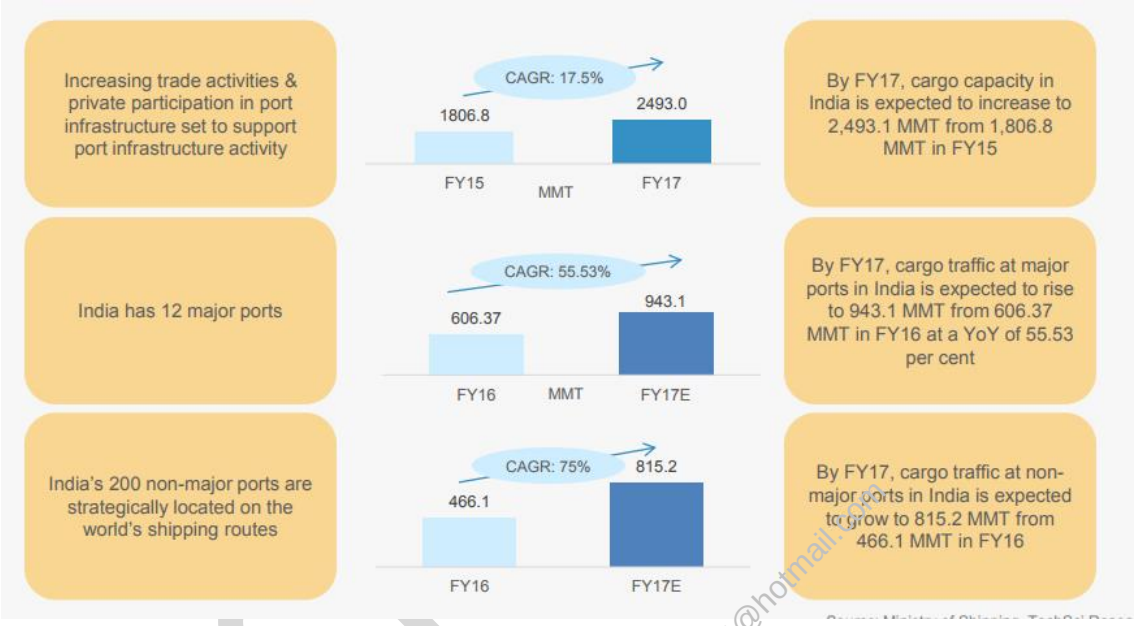
5.3. Recommendations of NTDPC

- A National Master Plan should be devised and maintained, which identifies clear economic reasons for building airports in generally specified locations.
- An Airport Approval Commission should be established within the MoCA (Ministry of Civil Aviation) to review the business plans of proposed airports prior to granting clearance.
- Capacity at airports to process cargo should be augmented urgently.
- Substantial investments will be required to ensure that the Air Navigation Services can continue to deliver on an exceptional record of aviation safety.
- The regulatory and policy functions should be clearly separated. The Ministry should focus on devising the national policy and on encouraging and guiding state governments in their efforts to develop the aviation sector.
- The DGCA should be replaced with a Civil Aviation Authority (CAA) responsible for the operational regulation of airlines and aircraft covering areas such as air-worthiness, safety and licensing, with separate divisions for air space management, environment, competitiveness, and consumer protection.
- State governments should play a much more active role in the airport sector since aviation is a key enabler of local economic development.
- The AAI should be separated into two distinct functions: Airport Operations and Air Navigation Services. Each function should be corporatized.
- Conditions should be created that allow Indian MRO (Maintenance Repairs and Overhaul/Operations) industry to grow rapidly. India has strong comparative advantages to become a world-leading centre of MRO.
- The taxation regime that applies to the entire industry from aircraft purchase to aviation turbine fuel to insurance and lease rentals should be revised.

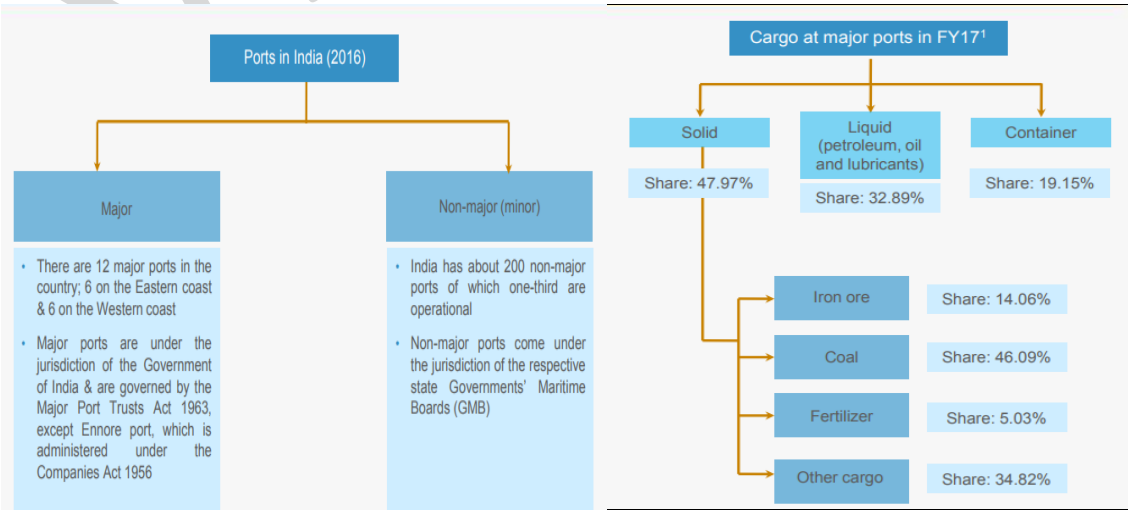
- A plan for progressive disinvestment of government's stake in Air India over a period of three to five years, based on phased scheme with defined milestones should be identified.
- Aviation Turbine Fuel pricing policy should be reformed.
- New standards of safety should be established to keep pace with the demands of increased traffic.
- The sector's training infrastructure needs to be urgently improved.

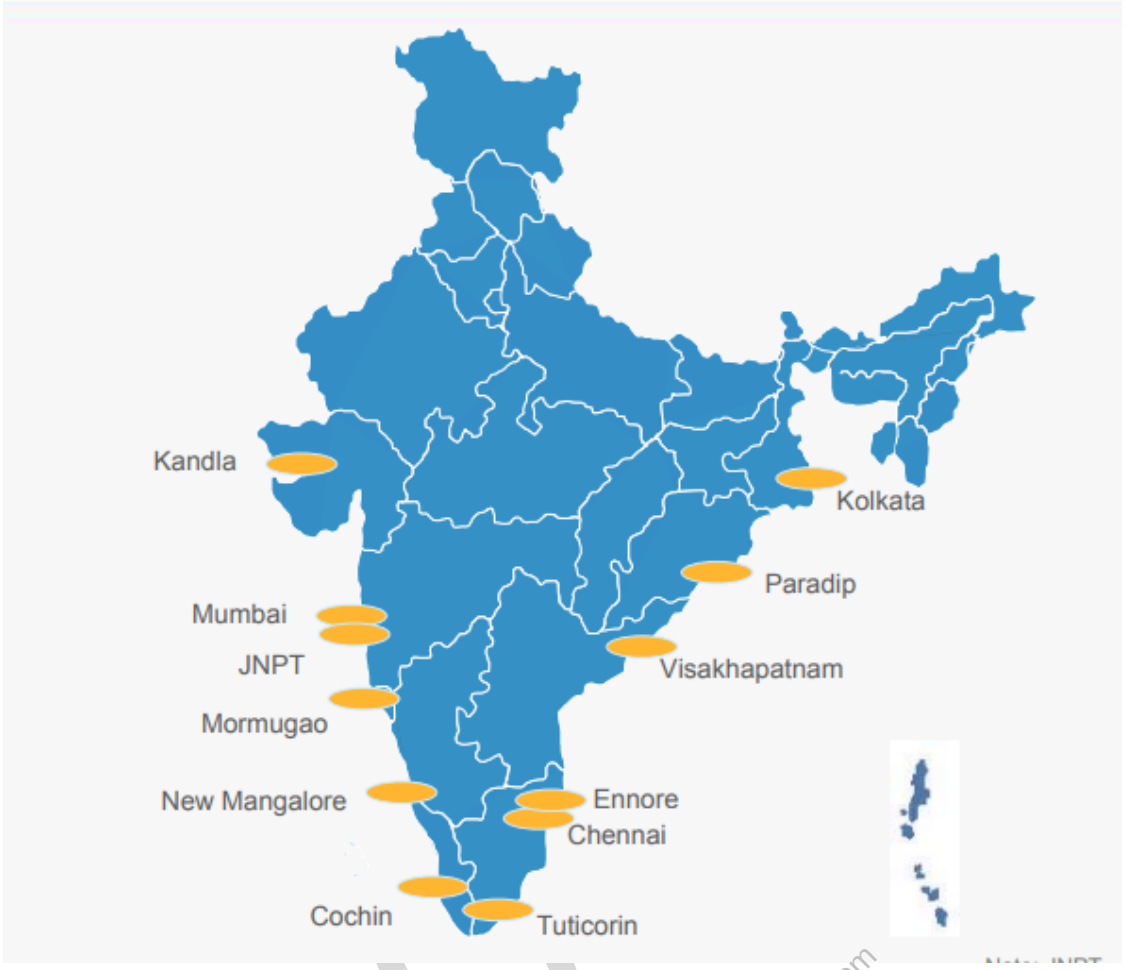
6. Ports and Shipping

The cargo traffic of Indian ports increased at a CAGR of 7.4 per cent during FY07–17. Cargo traffic in 2017 at major ports is expected to reach 943.1 MMT. Non-major ports are gaining shares & a major chunk of traffic has shifted from major ports to non-major ports. The contribution of non-major port's traffic to total traffic rose to 43.5 per cent in FY16 from 28.6 per cent in FY07. Cargo traffic at non-major ports stood at 466.1 MMT in FY16.



Today India has 13 major ports and 200 notified non-major ports along the coastline and islands. Major ports are administered by the union government under the Major Port Trusts Act of 1963, with one exception, Ennore Port, which is administered under the provisions of the Companies Act, 1956. Non-major ports are administered by nine maritime states and three union territories within their respective coastlines.



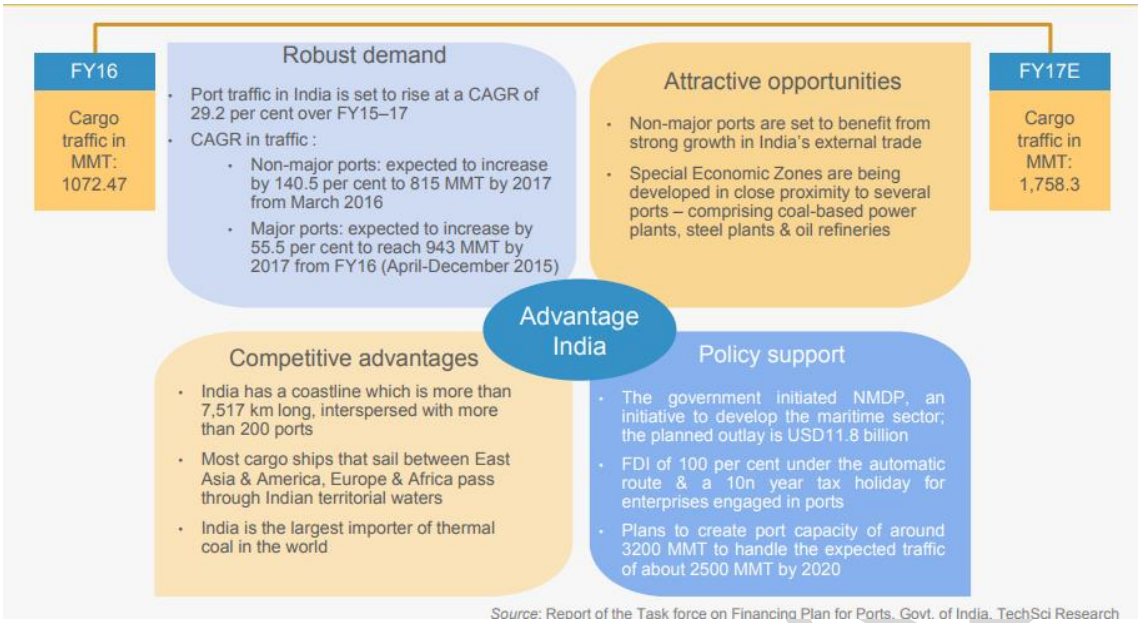


In keeping with general policy of economic liberalisation, the port sector was opened to private sector participation in 1997. Accordingly, a regulatory body known as Tariff Authority for Major Ports (TAMP) was introduced for regulating both vessel-related and cargo-related tariffs. TAMP was also made responsible for regulating rates for lease of properties in respect of major port trusts and private operators. Currently 100% FDI is allowed in the shipping sector in India.

6.1. National Maritime Development Programme (NMDP)

The objective of NMDP is to upgrade and modernise the infrastructure in India considering global standards as the benchmark. The share of private sector in the ports sector mainly consists of commercially viable projects like operation and development of berths, terminals etc. Public funded projects would cover the activities like creation of common user infrastructure facilities. It comprises of a large number of projects covering all major ports entailing activities like:

- Construction/up-gradation of berths
- Deepening of channels
- Rail/road connectivity
- Tonnage acquisition
- Maritime training
- Coastal shipping
- Aids to navigation
- Shipbuilding and
- Building up of Inland Water Transport (IWT) infrastructure.



Source: Report of the Task force on Financing Plan for Ports, Govt. of India, TechSci Research

6.2. Shipping

95% of the country's trade by volume (68% in terms of value) is moved by sea. India has one of the largest merchant shipping fleet and ranked 17th among the developing countries with average age of the fleet being 18.03 years. India had a total of 1299 ships comprising of 11.24 MGT as on 31.10.2016. Out of the total tonnage, 900 vessels of about 1.52 million GT are engaged in coastal trade and remaining 399 vessels are plying in overseas trade. Despite growth in tonnage, the percentage of cargo carried by Indian flag ships has reduced from 40.7% in 1987-88 to 7.45% of total EXIM trade in 2014-15.

6.3. Coastal Shipping

Coastal shipping is energy efficient, environment friendly and economical mode of transport in the Indian transport network and a crucial component for the development of domestic industry and trade. India, with her 7,516 km of coastline, has hinterland of about 3,80,000 sqkms, covering 9 maritime states, apart from Lakshwadeep in the Arabian Sea and Andaman & Nicobar Islands in the Bay of Bengal. The EEZ of India has also seen a huge growth in exploitation of subsea assets. India has a long coastline studded with major and non-major ports providing congenial and favourable conditions for the development of this alternate mode of transport.

6.4. Inland Water Transport

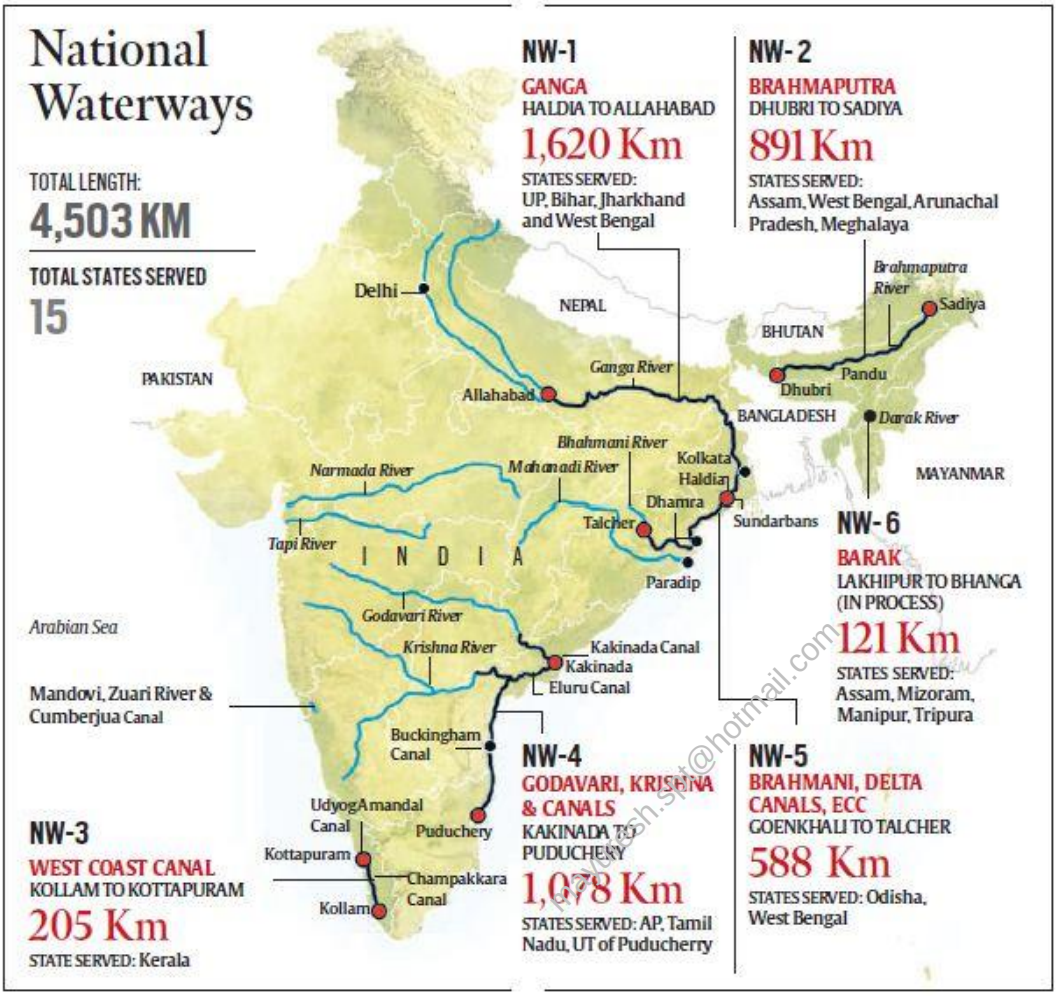
India has over 14,500 km of navigable waterways. Development of Inland Water Transport (IWT) infrastructure has several advantages, such as:

- Fuel efficiency
- Environmental friendliness
- Cost effectiveness
- Decongestion of road and rail networks particularly for movement of bulk goods and hazardous goods.

The Inland Waterways Transport (IWT) sector remained dormant for a long time and lost its relevance and importance in the overall transport sector. Considering its potential in terms of fuel savings, environment friendliness and cost effectiveness for transportation of bulk goods, dangerous goods, etc., it is necessary that wherever potential for IWT corridors exists, this

mode is developed with basic infrastructure so that its utilization is increased for transportation of cargo and passengers.

Various actions are being taken to develop IWT infrastructure and the focus is on cargo- related projects.. To provide a thrust to the IWT sector, the National Waterway Act, 2016 declaring 111 national waterways, including the 5 national waterways declared earlier has been enforced w.e.f. 12th April, 2016. The process for preparation of techno economic feasibility (TEF) study/Detailed Project Report (DPR) of new national waterways is also initiated. As per the feasibility reports received so far, 32 new national waterways and five national waterways declared earlier are to be developed in the next three years.



Inland Waterways Authority of India (IWAI) was set up in 1986 for regulation and development of inland waterways for the purpose of shipping and navigation. As per The National Waterways Act, 2016, 111 waterways have been declared as National Waterways (NWs) including the five then existing NWs.

6.4.1. Jal Marg Vikas Project

Jal Marg Vikas Project for capacity augmentation of National Waterway - 1 (River Ganga) from Haldia to Varanasi (Phase -I) by facilitating navigation of 1500-2000T Ships has been commissioned with the technical and financial assistance of World Bank at an estimated cost of Rs. 5639 cr. The project envisages various sub-projects such as fairway development, navigational aids, construction of multi-modal terminals at Varanasi, Sahibganj and Haldia, construction of new navigational lock at Farakka, bank protection work, LNG vessels etc.

6.5. Shipping Corporation of India

The Shipping Corporation of India was established on October 2nd, 1961, by the amalgamation of Eastern Shipping Corporation and Western Shipping Corporation.

Starting out as a marginal Liner Shipping Company with just 19 vessels, the SCI has today evolved into the largest Indian Shipping Company. The SCI also has substantial interests in various segments of the shipping trade. SCI's owned fleet includes Bulk carriers, Crude oil tankers, Product tankers, Container vessels, passenger-cum-Cargo vessels, Phosphoric Acid/Chemical carriers, LPG/Ammonia carriers and Offshore Supply Vessels. Sailing through for nearly five decades, the SCI today has a significant presence on the global maritime map.

As the country's premier shipping line, the SCI owns and operates around one-third of the Indian tonnage, and has operating interests in practically all areas of the shipping business; servicing both national and international trades.

In view of the demand from Indian trade, the SCI has diversified into a large number of areas. The SCI is today the only Indian shipping Company operating: break-bulk services, international container services, liquid/dry bulk services, offshore services, passenger services. In addition, the SCI mans and manages a large number of vessels on behalf of various government departments and organizations.

The Government of India conferred "Navratna" status to SCI in August 2009 - enhanced autonomy and delegation of powers to the Company towards capital expenditure, formation of Joint Ventures, mergers, etc.

6.6. Shipbuilding Industry in India

The Government owned Cochin Shipyard Limited and Hindustan Shipyard Limited are the major shipyards in India. There are more private shipyards but they are severely limited by capacity and size of ships they can build. The Indian shipbuilding industry does not only produce Indian and International cargos, but also provides facilities to complete ship repair. Cochin shipyard is the largest shipyard in the country.

Shipbuilding industry is divided into the following:

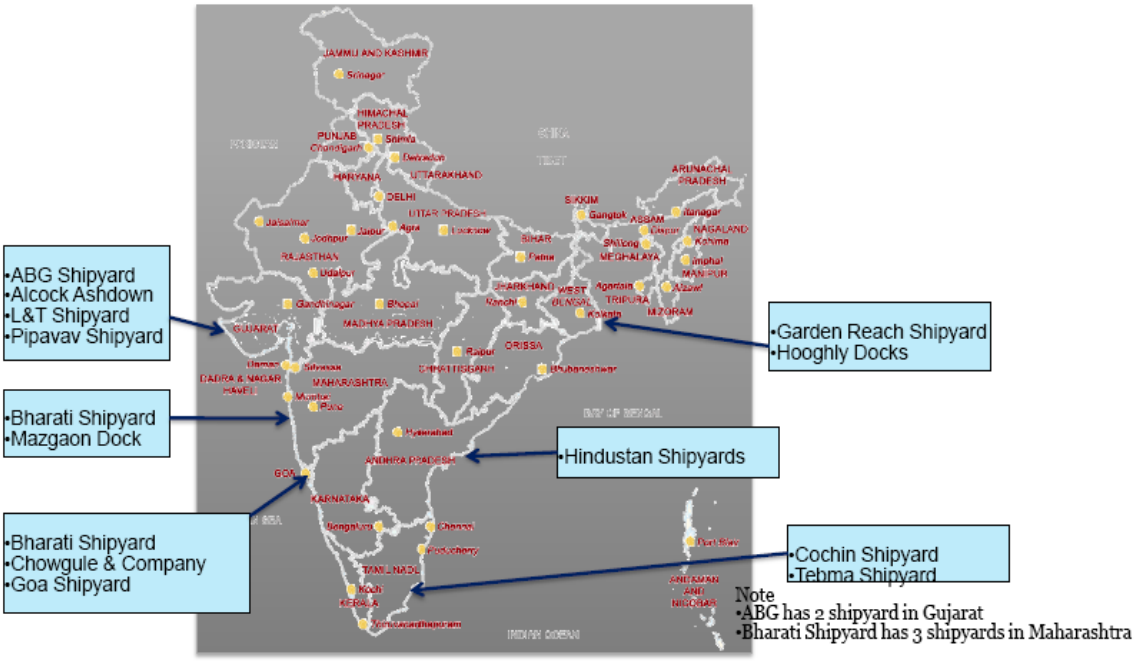
a) New shipbuilding yards

New shipbuilding yards are mainly active in building commercial and defense vessels. Commercial vessels are primarily built for European owners, and defense vessels are for the Indian Navy. Major yards are ABG Shipyard, Bharti Shipyard, Modest, Pipavav Shipyard, L&T Shipyard, Cochin Shipyard, etc.

b) Ship repair

The Indian ship repairs industry consists of around 7 ship repair units (SRU's): Alcock Ashdown & Co. Limited, Chennai Port Trust, Hindustan Shipyard Limited, Mumbai port Trust, Cochin Shipyards, Garden Reach Shipbuilders and Mazgaon Dock Limited have been given the permanent approvals as SRU's.

Major Shipyards in India



SWOT Analysis of Indian Shipbuilding Industry

Strengths	Weaknesses
•Government allowing 30% cash subsidies to new shipbuilding yards in India •Large coastline for ships •Strong labour force •Low cost labour	•Lack in building high capacity shipyards •Lack of trained engineers and skilled labour •Government support and initiative for shipbuilding is negligible •No financing support to shipbuilding companies from the government
Opportunities	**Threats**
•Requirements of equipment and ancillaries in new Indian shipbuilding yards •Demand for offshore oil exploration and production in Indian shores and abroad through collaborations •Increase in demand in India for offshore platforms and their repair facilities	•Order cancellation in new shipbuilding due to untimely delivery by shipyards •Lack of government recognition •Shipbuilding industry does not have countrywide presence •Lack of professionals and R&D facilities

Global recession in the shipbuilding industry has affected the financial position of a number of yards especially in the private sector. Due to market downturn post 2008 and lack of government policy support, all shipyards other than the defence shipyards are facing challenging times with very few global shipbuilding orders coming in. The Indian shipbuilding industry has continued to concentrate on defence and offshore sector vessels. The fleet expansion plans of Indian Navy and the vessels for the Indian Coast Guard are the two prime segments which were targeted by the Indian shipyards. Lack of orders from the Indian commercial ship owners and the lack of government policy support adversely affected the Indian shipbuilding outlook. In the year 2016, the Government has taken following initiatives to strengthen shipbuilding industry:

- **Infrastructure status for shipyards**: With this inclusion, shipyards will be able to avail flexible structuring of long term project loans, long term funding from Infrastructure Funds at lower rates of interest and for a longer tenure equivalent to the economic life of their assets, relaxed ECB norms, issuance of infrastructure bonds for meeting working capital requirements.
- **Financial assistance and eligibility support for Indian shipyards**: The Government of India has introduced a Rs. 4000 crore Shipbuilding Financial Assistance Policy for a period of 10 years to encourage domestic shipbuilding.
- **Simplification of procedure for tax compliance**: To promote ease of doing business in the sector, in the Union Budget 2016-2017, Government of India has issued simplified procedure for tax compliance for the shipyards while procuring duty free goods for shipbuilding and ship repair.

6.7. Key Developments

6.7.1. Sagar Mala Project

The prime objective of the Sagarmala project (Blue Revolution) is to promote port-led direct and indirect development and to provide infrastructure to transport goods to and from ports quickly, efficiently and cost-effectively. Therefore, the Sagarmala Project shall, inter alia, aim to develop access to new development regions with intermodal solutions and promotion of the optimum modal split, enhanced connectivity with main economic centres and beyond through expansion of rail, inland waterways, coastal and road services.

It is a strategic and customer-oriented initiative of the Government of India to **modernize India's Ports** so that port-led development can be augmented and coastlines can be developed to contribute in India's growth.

Sagarmala Programme is now moving from the conceptualization and planning to the implementation stage. **The National Perspective Plan (NPP),** for the comprehensive development of India's coastline and maritime sector, has been prepared and was released at the maiden Maritime India Summit 2016, on 14th April, 2016, by the Hon'ble Prime Minister.

As part of Sagarmala, more than 400 projects, at an estimated infrastructure investment of more than Rs. 7 lack crore, have been identified across the areas of port modernization & new port development, port connectivity enhancement, port-linked industrialization and coastal community development. These projects will be implemented by relevant Central Ministries, State Governments, Ports and other agencies primarily through the private or PPP mode.

The **Sagarmala Development Company (SDC)** was incorporated on 31st August 2016for providing equity support to residual projects under Sagarmala.

Port Modernization & New Port Development-Master Plans have been finalized for the major ports. Based on the same, 142 port capacity expansion projects (total cost: Rs. 91,434 cr.) have been identified for implementation over the next 20 years. Out of this, 30 projects (total cost: Rs. 11,612 cr.) have been proposed for implementation starting FY 2016-17.

Port connectivity enhancement: Indian Port Rail Corporation Limited (IPRCL) has taken up 25 works across 9 major ports. Out of this, 8 works have already been awarded and 5 more are targeted for award in the remaining part of FY 2016-17. Out of 79 road connectivity projects identified under Sagarmala, 45 projects will be done by Ministry of Road Transport and Highways and NHAI, including 18 projects under the Bharatmala scheme.

To promote **port-led industrialization**, 14 Coastal Economic Zones (CEZs) covering all the Maritime States and Union Territories have been proposed. A CEZ is conceptualized as a spatial-economic region which could extend along 300-500 km of coastline and around 200-300 km

inland from the coastline. Each CEZ will be aligned to relevant major and non-major ports in the State and is envisaged to tap synergies with the planned industrial corridors.

As part of the **coastal community development** objective of the Sagarmala Programme, the Ministry of Shipping is taking up a number of initiatives/projects. Notable among them are the coastal community skilling projects and projects for development of marine fisheries sector.

The projects identified under Sagarmala Programme are expected to mobilize more than Rs. 7 Lakh Cr of infrastructure investment, double the share of domestic waterways (inland & coastal) in the modal mix, generate logistic cost savings of Rs. 35,000-40,000 Cr per annum, boost merchandize exports by USD 110 Billion and enable creation of 1 Cr new jobs, including 40 Lakh direct jobs, in the next 10 years.

6.7.2. Major Port Authorities Bill, 2016

With a view to promote the expansion of port infrastructure and facilitate trade and commerce, the bill aims at decentralizing decision making and to infuse professionalism in governance of ports. The new Major Ports Authority Bill, 2016 would help to impart faster and transparent decision making benefiting the stakeholders and better project execution capability. The Bill is aimed at reorienting the governance model in central ports to landlord port model in line with the successful global practice. This will also help in bringing transparency in operations of Major Ports.

6.7.3. Revamped Merchant Shipping Bill to replace Merchant Shipping Act, 1958

In order to promote ease of doing business to meet new challenges facing merchant shipping sector – to increase tonnage under Indian flag and share of Indian seafarers, safeguard rights and privileges of seafarers, enhance safety and security of vessels and life at sea, to develop Indian coastal shipping and trade and to ensure compliance of India's obligations under international conventions and to replace old redundant provisions with contemporaneous provisions, the Merchant Shipping Bill, 2016 has been introduced in Parliament to replace existing Merchant Shipping Act, 1958.

6.7.4. Admiralty Bill, 2016

The Admiralty (Jurisdiction and Settlement of Maritime Claims) Bill, 2016 has been passed by the Parliament in July, 2017. Admiralty jurisdiction relates to powers of the High Courts in respect of claims associated with transport by sea and navigable waterways. Under the present statutory framework, the admiralty jurisdiction of Indian courts flow from laws enacted in the British era. The proposed Bill consolidates the existing laws relating to admiralty jurisdiction of courts, admiralty proceedings on maritime claims, arrest of vessels and related issues and repeals five obsolete British statues on admiralty jurisdiction in civil matters. The Bill confers admiralty jurisdiction on High Courts located in coastal states of India and this jurisdiction extends upto territorial waters. This legislative proposal will fulfill a long-standing demand of the maritime legal fraternity.

6.7.5. Maritime India Summit, 2016

The maiden Maritime India Summit, 2016 was organized by the Ministry of Shipping in Mumbai from April 14-16, 2016. The objective of the Summit was to create awareness of the untapped potential of Indian maritime sector and showcase investment opportunities. The focus was on presenting India as an attractive investment destination.

6.7.6. Measures to improve Efficiency

The tariff guidelines were revised to provide flexibility to port operators to align the tariff closer to market tariff subject to achievement of certain performance standards. 100% FDI is being

allowed in PPP Projects in the Port Sector. The Model Concession Agreement is being amended so as to take care of the contingencies affecting the execution of PPP Projects. A new Major Ports Authority Act to replace existing Major Ports Act, 1963 to provide greater autonomy and modernization of institutional structure is under consideration. A new berthing policy and stevedoring policy has been formulated.

With a view to enable Major Ports to handle larger vessels the Ministry has prepared an action plan for increasing the draft in Major Ports. The outer harbor in Visakhapatnam Port has very deep draft of more than 18 mtrs. It is proposed to create a draft of more than 18 mtrs, in Mormugao Port, Kamarajar Port (Ennore).

6.7.7. Special Initiatives in Ports

As part of promoting Ease of Doing Business to promote and facilitate business at ports, a number of activities which include elimination of manual forms, direct port delivery, installation of container scanners at ports, RFID based automation system etc. have been undertaken. Further, as part of the Swachh Bharat Abhiyan, Green Agenda, new schemes have been formulated for providing financial assistance to Major Ports for green initiatives and also for building their capacity for combating oil pollution. Major Ports are taking up renewable energy projects to generate more than 150 MW (solar & wind energy) in the next five years. Focus is being given on setting up of Special Economic Zones (SEZs) and Coastal Economic Zones around major ports.

6.7.8. Vision Document for Coastal Shipping, Tourism and Regional Development

Coastal shipping provides benefit in the form of less environmental pollution due to lower per km consumption of fuel. However, unavailability of consolidated cargo, return cargo and general lack of awareness among shipper community make coastal shipping unviable. On the contrary, the high penetration level of road followed by rail coupled with the ability to effect door-to-door movement of cargo makes the field tougher for coastal shipping.

In order to increase the share of coastal shipping and inland water transportation to 10% by 2019-20 and to promote cruise tourism leading to development of coastal regions, the Ministry of Shipping has prepared a vision for “Coastal Shipping, Tourism and Regional Development” in consultation with stakeholders along with an action plan to achieve the objective. The key elements of the vision are to increase share of coastal/IWT mode from 7% to 10% by 2019-20, development of coastal shipping as end to end supply chain, integration of IWT and coastal routes, development of regional centres to generate cargo for coastal traffic, development of domestic cruise industry and, promotion of lighthouse tourism.

6.8. Challenges

Over the years, cargo handling capacity of major ports has steadily increased. However, traffic demand clearly outpaced capacity additions, resulting in port congestion. The share of coastal shipping in India’s domestic transport is miniscule, despite the various benefits it offers. India’s ports are **highly constrained for capacity** and are expected to remain so in the near future.

At present, there is no comprehensive and coherent strategy for the location of ports in the country or for the overall investment programme in these ports. Till now, investment in major and non-major ports has been done in a somewhat haphazard piecemeal fashion, resulting in suboptimal hinterland connectivity, inadequate infrastructure and drafts, and low levels of containerisation, all these in turn having a bearing on port congestion, cargo evacuation and higher transaction costs. One clear manifestation of the inadequacy is that at present, a good proportion of India’s maritime trade is transshipped in Colombo or Singapore because of lack of capable ports on the Indian coastline to handle large container ships.

Current investment trends may lead to significant waste and inefficiencies in the building of transport links that connect with burgeoning non-major ports. While physical infrastructure grew rather arbitrarily, there has also been little progress towards the generally accepted and successful landlord model of port governance.

Ports in India, essentially the major ports or those owned by the Indian government and run as trusts, widely follow a hybrid format of the long obsolete service port model and the preferred landlord model of port management followed globally. This has resulted in a conflict of interest between the port trusts and the private sector, with the former acting both as port regulators and providers of commercial services in many instances.

In the service port model, the port authority owns the land and all available assets—fixed and mobile—and performs all regulatory and port functions. Here, the port trust is both the landlord and the cargo terminal operator.

While the service port model in India was consistent with a centralized economy, it does not fit well in a market-oriented economy.

In the landlord port model, the publicly governed port authority acts as a regulatory body and as landlord while private companies carry out port operations—mainly cargo handling activities. Here, the port authority maintains ownership of the port while the infrastructure is leased to private companies that provide and maintain their own superstructure and install their own equipment.

Currently, most of the major port trusts in India carry out terminal operations as well, resulting in a hybrid model of port governance.

Also, development of port infrastructure has traditionally been driven largely by public investment. The limited number of private investors that port development and expansion has attracted has been due to unique economic characteristics of seaports.

- Provision of basic port infrastructure such as sea locks, breakwaters, port basins, common areas, and main hinterland connectivity entails large fixed costs. Such infrastructure is common to all port terminal operations and is typically funded through public investment.
- Relatively large minimum initial capacity of port infrastructure is required from a technical standpoint. Moreover, port infrastructure is frequently indivisible, implying that increase in port capacity can only be realised in quantum chunks.
- The initial development costs cause large capital investment opportunity losses as a result of underutilised capacity during the initial phases of port lifecycle.

Consequently, private investors invest primarily in port terminal facilities but not in underlying infrastructure. Typically, private investors develop terminal infrastructure under the BOT model on behalf of the public port authority under a concession of 30-40 years.

The Indian ports and shipping sector suffers from poor incentives, lack of clarity in the regulatory structure coupled with overlapping jurisdiction of institutions charged with sector oversight and a debilitating prevalence of ad hoc and piecemeal decision making. Neither the regulatory structure nor capacity has kept pace with the enormous growth in traffic witnessed in the last decade due to India's increased integration with the global economy. Coastal shipping as well as inland water transport has grown far less optimally than what would have been ideally desirable, given the low unit transportation cost and environmental impact.

6.9. Recommendations of NTDPC

- Four to six mega ports should be created over the next 20 years, with two to three on each coast.

- There is an immediate need to make appropriate legislative and policy changes to move the major ports to the landlord port model and to transform the port trusts to statutory landlord port authorities. All the terminal operations of port trusts would need to be corporatized as public sector corporations,
- A new regulatory authority, Maritime Authority for Ports (MAP), should be constituted under a modernised Indian Ports Act, suitably empowered to regulate competition and port conservancy across all the major and non-major ports in the country.
- It is important that the Indian shipping industry be provided a level playing field for it to grow and compete globally with vessels under other flags. This will require rationalisation of restrictive policies, particularly related to imposition of a variety of direct/indirect taxes.
- Priority should be accorded to coastal ships by setting up coastal terminals at the major ports and identifying and developing five or six non-major ports on the east and west coasts as designated coastal ports.
- Adequate rail and road connectivity must be provided to these coastal terminals.
- Efforts should be made to develop deeper stretches of the rivers for IWT/navigational purposes (at least 2.5 m, preferably 3.0 m LAD (Least Available Depth) for round-the-year navigation).

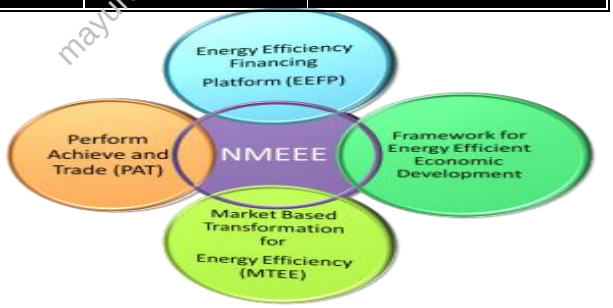
7. Energy

Energy is a key driver of economic growth. Sustainable, stable and reasonably priced energy is essential for the fruits of economic development to reach the bottom of the pyramid.

India is the fourth largest consumer of energy in the world after USA, China and Russia. In 2015, India had overtaken Japan as the world's third largest oil consuming country behind US and China. However, India is not endowed with abundant energy resources. It must, therefore, meet its development needs by using all available domestic resources of coal, uranium, oil, hydro and other renewable resources, and supplementing domestic production by imports. Meeting the energy needs of achieving 8-9% economic growth while also meeting energy requirements of the population at affordable prices, therefore, presents a major challenge.

Break up of Total Installed Capacity

Fuel	MW	% of Total
Total Thermal	2,21,626	67.1%
Coal	1,95,603	59.2%
Gas	25,185	7.6%
Oil	838	0.3%



Hydro (Renewable)	44,594	13.5%
Nuclear	6,780	2.1%
RES* (MNRE)	57,260	17.3%
Total	**330,261**	

* Installed capacity in respect of RES (MNRE) as on 31.03.2017.

7.1. Projected Energy Demand

India is set to contribute more than any other country to the projected rise in global energy demand, around one-quarter of the total. India's urbanisation is a key driver of energy trends: an additional 315 million people – almost the population of the United States today – are expected to live in India's cities by 2040. As per International Energy Outlook 2015, oil demand will increase to 10 million barrels/day by 2040 and natural gas consumption will also triple to 175 billion cubic metre.

The ability to meet the increasing energy demand depends on our ability to expand domestic production in critical energy sub sectors, notably petroleum, gas and coal, and meeting the balance requirement through imports.

7.2. Energy Efficiency

A number of initiatives have been taken up by the Government to ensure promotion of energy efficiency in the country like Standards & Labelling programme for appliances by the Bureau of Energy Efficiency (BEE), Perform Achieve and Trade (PAT) Scheme, Energy Conservation Building Codes (ECBC), Unnat Jyoti by Affordable LEDs for All (UJALA) & Street Lighting National Programme (SLNP), Promotion of Energy Efficient Fans and Agriculture pump sets, among others.

7.2.1. Energy Efficiency Mission

The following were the main components of the Energy Efficiency Mission.

- **Standards and Labelling of Equipment & Appliances**: The scheme is invoked for 21 equipment/appliances including 7 for which it is mandatory. It provides users with information on the energy use of a model, and its relative efficiency as compared to others. It has been made mandatory for air conditioners, refrigerators, distribution transformers and tube lights.
- **Energy Efficiency in Buildings**: The Energy Conservation Building Code 2017 (ECBC 2017) has been developed by the Ministry of Power and Bureau of Energy Efficiency (BEE). In order for a building to be considered ECBC-compliant, it would need to demonstrate minimum energy savings of 25%. Additional improvements in energy efficiency performance would enable the new buildings to achieve higher grades like ECBC Plus or Super ECBC status leading to further energy savings of 35% and 50%, respectively. With the adoption of ECBC 2017 for new commercial building construction throughout the country, it is estimated to achieve a 50% reduction in energy use by 2030. This will translate to energy savings of about 300 Billion Units by 2030 and peak demand reduction of over 15 GW in a year. This will be equivalent to expenditure savings of Rs. 35,000 crore and 250 million tonnes of CO2 reduction.
- **Energy Efficiency in Industry**: Perform, Achieve and Trade (PAT) scheme, is a component under National Mission for Enhanced Energy Efficiency (NMEEE). PAT is a market based mechanism to enhance cost effectiveness through certification of excess energy savings in energy intensive industries that can be traded.
- **Energy Efficiency in Agricultural Pumping**: Smart BEE star rated Energy Efficient Agricultural Pump sets are to be distributed to farmers. Farmers can replace their inefficient agricultural pump sets free of cost. Pumps to come with Smart Control Panes that has a SIM card and a Smart Meter. Smart Control Panel will enable a farmer to switch on or switch off these pumps through his mobile and sitting at the comfort of his home. Smart meters ensure that the farmers can monitor consumption on a real time basis. Energy Efficiency Services Limited (EESL) is to distribute 2,00,000 BEE star-rated pump-sets to the farmers under this programme, which will lead to 30% of energy savings by 2019. This translates into an annual savings of approximately Rs. 20,000 crore on agricultural subsidies or a saving of 50 billon units of energy per year.
- **Residential Lighting**: The Bachat Lamp Yojana (BLY) was initiated to provide CFLs to households at the cost of incandescent bulbs.

> **Domestic Efficient Lighting Programme (DELP)** The Unnat Jyoti by Affordable LEDs for All (UJALA) scheme was launched to provide LED bulbs to domestic consumers aiming to replace 77 crore incandescent bulbs with LED bulbs. The e-procurement of LED bulbs through a transparent and competitive bidding process under UJALA has resulted in reduction of approximately 88% in procurement prices of LED bulbs from Rs. 310 in February, 2014 to Rs. 38 in August 2016, the retail price being reduced from Rs. 550 to Rs. 65, which is passed on to the consumers. A total of 5.96 crore of dwelling units have been provided LED bulbs under the UJALA scheme, as on 20.11.16.

- The **Street Lighting National Programme** (**SLNP**) aims to replace 3.5 crore conventional street lights with smart and energy efficient LED street lights by March, 2019.
- Energy Efficiency Services Limited (EESL) has issued Secured, Redeemable, Taxable, Non-Cumulative, Non-Convertible Bonds in the nature of Debentures in dematerialized form of Rs. 500 Crores in the month of September, 2016 for the purpose of financing the various

energy efficiency projects, which was fully subscribed. These Bonds are listed with Bombay Stock Exchange.

7.2.2. India Energy Security Scenario 2047

NITI Aayog has launched the India Energy Security Scenarios 2047 calculator (IESS 2047), an open source web based tool (now version 2.0). The tool aims to explore a range of potential future energy scenarios for India, for diverse energy demand and supply sectors leading up to 2047.

- It explores India's possible energy scenarios across energy supply sectors such as solar, wind, bio fuels, oil, gas, coal and nuclear and energy demand sectors such as transport, industry, agriculture, cooking and lighting appliances.
- The purpose of the IESS tool is to engage various stakeholders in the country's energy planning and facilitate informed debates at different levels. This tool will enable policy makers and parliamentarians make a more secure and sustainable energy future for India.

7.3. Energy Pricing

Energy prices have a key role to play both in promoting energy efficiency and in ensuring expansion of domestic supply. They promote energy efficiency by providing an economic incentive to shift to more energy efficient technologies, an objective that is helped by the various non-price actions discussed above.

Rational energy prices are also necessary to ensure expanded energy supply because otherwise energy producers will not generate the investible surpluses needed to fund the costs of exploration and production. Unfortunately, the structure of energy prices at present is very different from what it should be.

7.3.1. Pricing of Petroleum Products

Until 2002, the government set the price of petroleum products through the Administered Pricing Mechanism (APM), which followed the principle of allowing a predetermined return (rather than market-based prices) on investments in the oil sector. After 2002, only certain products (kerosene and LPG) remained regulated, while oil companies could set their own prices for other fuels. However, many oil marketing companies still set retail prices at below-market levels so they could claim under-recoveries (the difference between a global market price and the local price) from the Ministry of Finance for certain products at favorable rates.

The government began domestic fuel price reform and after freeing of prices of petrol in FY11 and diesel in FY15, the Centre picked up the entire subsidy on domestic cooking gas from FY16. Further, the pricing of petrol and diesel in domestic market is linked with international price of petrol and diesel and not with the price of crude oil.

The government has also taken steps to gradually reduce subsidy on kerosene, continuing the series of market-oriented reforms that have galvanised the petroleum sector and attracted big-ticket investment. The Union government has asked state oil companies to keep raising prices of subsidised kerosene by 25 paise every fortnight until the subsidy is eliminated, or until further orders. The fuel is still heavily subsidised but demand for kerosene is falling sharply because villages are being rapidly electrified and the government has supplied cooking gas connections to crores of poor people in the past three years. Delhi and Chandigarh are already kerosene-free cities.

The government has been aggressively discouraging use of subsidised kerosene, mainly used by the rural poor for lighting and cooking, as it is a polluting fuel and sometimes ends up as an adulterant at petrol pumps. Subsidised kerosene is also misused to adulterate diesel. By cutting

subsidies, the government is bringing the commodity closer to the market price, which will eventually stop diversion for adulteration as well as encourage consumers to switch to the cleaner liquefied petroleum gas (LPG).

The price of cooking gas is also being increased gradually to eventually align it with market rates.

Other reforms undertaken by the government include the end of the controversial profit-sharing system, which obliges the oil ministry to closely monitor oilfield expenditure, leading to bitter disputes with private investors. The new exploration policy also allows market price for gas and gives companies the freedom to carve out exploration blocks themselves.

7.3.2. Coal Prices

Coal India Ltd (CIL) shifted from useful heat value-based (UHV) pricing to gross-calorific value-based (GCV-based) pricing prior to its maiden IPO, to price coal on international parity prices. Since CIL offered coal at a deep discount of up to 50%, CIL has advised the government to change the pricing mechanism so that Indian coal prices were worked out on the basis of market forces and on the basis of international standards. There are even suggestions of a regulator, which would determine Indian coal prices.

Indian coal has high mineral content and a lower calorific value as against imported coal. India is not able to completely bridge the gap between demand and supply of coal as there is insufficient domestic availability of coking coal and power plants designed on imported coal will continue to import for their production. Thus coal imports by India will continue despite efforts by the Centre to step up production to bridge the demand-supply gap.

7.3.3. Electricity Prices

Though electricity prices are set by State regulators but most regulators have shown a tendency to hold back tariff adjustments, typically under political pressure and the discoms are also discouraged from seeking tariff revisions, which in turn affects the financial position of the discoms.

7.4. Oil and Gas Production

India is heavily dependent on imports for supplies of both oil and gas. India also increasingly relies on imported LNG. In 2014, India consumed 3.85 mbpd oil, while the consumption is estimated to reach 4.0 mbpd by FY16, expanding at a CAGR of 3.2 per cent during FY08–16. India also increasingly relies on imported LNG; the country is the 4th largest LNG importer in 2015 (as of September 2015) & accounted for 5.68 per cent of global imports.

Oil and gas exploration policies under NELP were designed to achieve rapid expansion of domestic production with the involvement of private investors. However, the results achieved were disappointing. While there was some increase in crude oil production and a significant expansion of domestic gas output, however domestic production of both oil and gas needed to be significantly improved.

7.4.1. Hydrocarbon Exploration and Licensing Policy (HELP)

The Union Cabinet approved the Hydrocarbon Exploration and Licensing Policy (HELP) on 10th March 2016. HELP replaced the erstwhile policy regime for exploration and production of oil and gas, known as New Exploration Licensing Policy (NELP), which had been in existence for 18 years.

Features of HELP

- **Uniform License**: It will enable the contractor to explore conventional as well as unconventional oil and gas resources including CBM, shale gas/oil, tight gas and gas hydrates under a single license, instead of the present system of issuing separate licenses for each kind of hydrocarbons.
- **Open Acreages:** It gives the option to a hydrocarbon company to select the exploration blocks throughout the year without waiting for the formal bid round from the Government.
- **Revenue Sharing Model**: Present fiscal system of production sharing contract (PSC) is replaced by an easy to administer "revenue sharing model".
- **Marketing and Pricing**: This policy also provides for marketing freedom for crude oil and natural gas produced from these blocks. This is in tune with Government's policy of "Minimum Government – Maximum Governance".

8. Power

8.1. Power Availability in India

There has been an increase in electricity generation from 967 BU in 2013-14 to 1048 BU in 2014-15 and 1107 BU in 2015-16 resulting in lowest ever energy deficit of 2.1% in 2015-16, which has further lowered to 0.7% (April-Oct, 2016) from 2.1% (2015-16). The National Peak Power Deficit is down to half at 1.6% in the same period as compared to 2015-16.

Since 2014, sweeping changes have characterized the power sector, including: record addition to generation capacity and the comprehensive initiative – Ujwal DISCOM Assurance Yojana (UDAY) – to improve the health and performance of the distribution companies.

In this context, the following issues of long term interest for the states and their power regulators are important: reducing the complexity of tariff schedules that may prevent consumers from fully responding to price signals, the impact of quality adjusted tariffs on the competitiveness of Indian industry and the impediments to creating one market for power.

8.2. Key Developments in Power Sector

8.2.1. Amendments in Tariff Policy

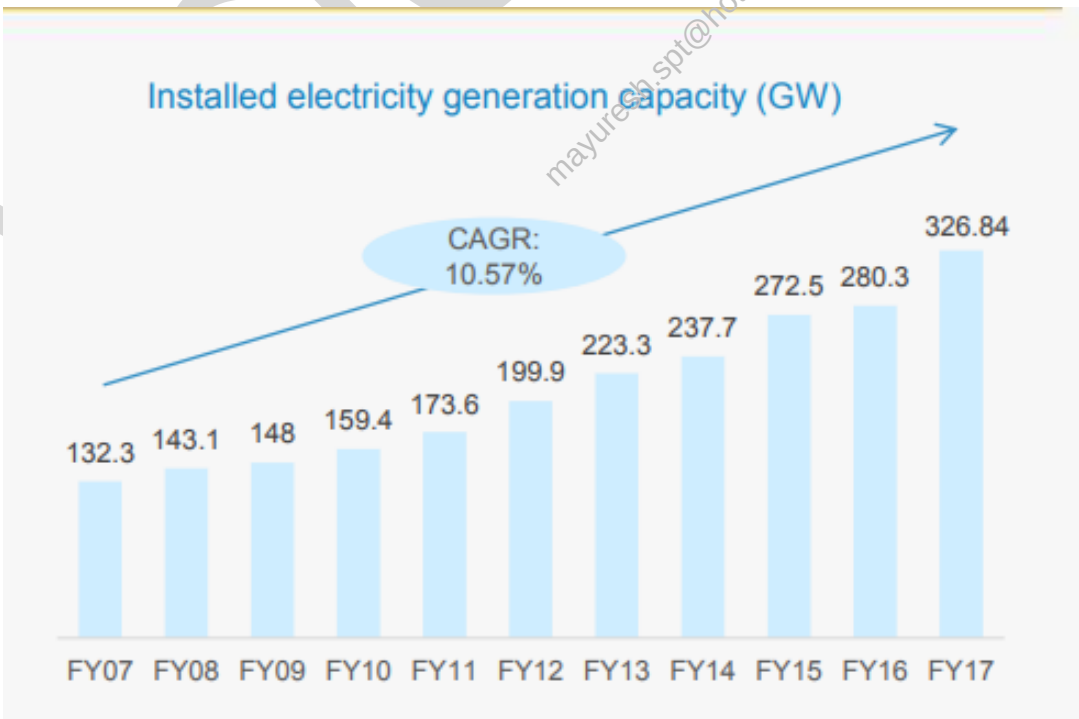
The Union Cabinet approved proposal for amendments in the Tariff Policy in January, 2016. It will provide the motivation to harness hydro as well as renewable capacity for energy security of the country.

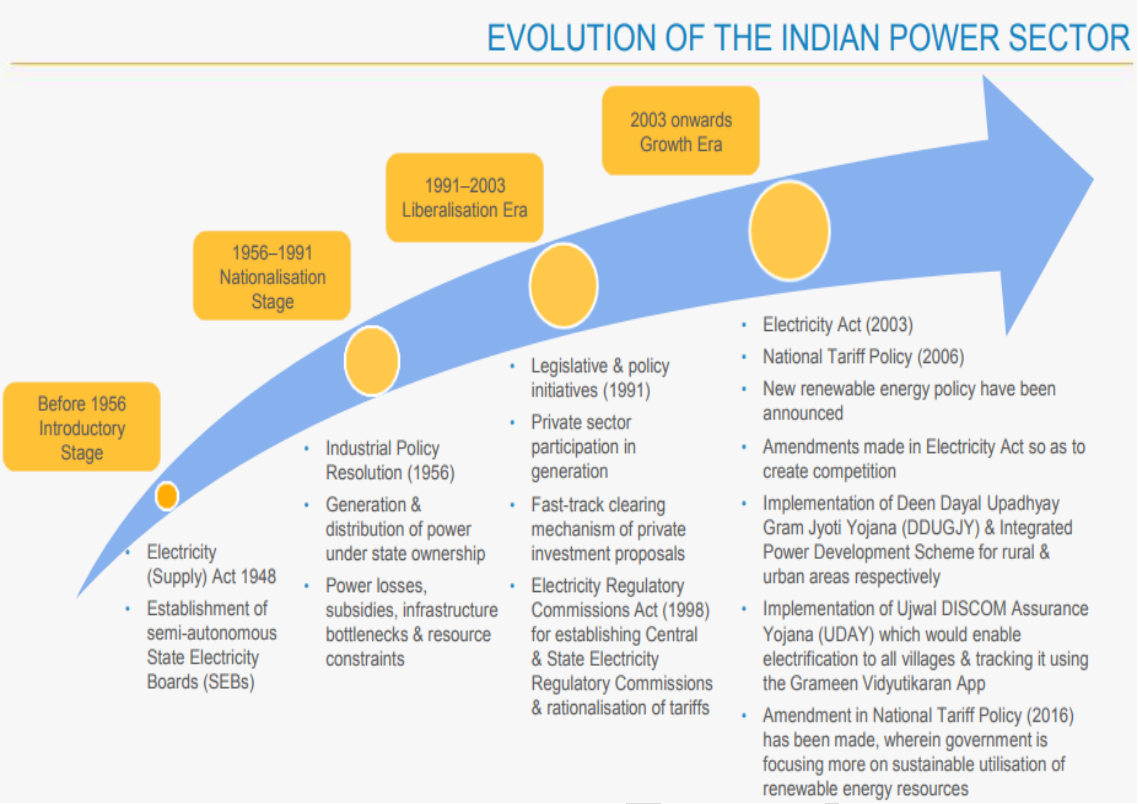
Main amendments are as follows:

- Promotion of Renewable Generation Obligation (RGO).
- Compulsory procurement by Discoms from waste-to-energy plants.
- Thermal Power Plants within 50kms of sewage treatment facilities to use treated sewage water.
- Hydro projects continued to be exempted from competitive bidding upto 15th August 2022.
- Use of Smart meters in a phased manner to enable 'Time of Day' metering.
- Inter-State and Intra-State transmission lines only through competitive bidding.
- Procurement of power from coal washery reject based plants of PSUs or their JVs on regulated tariff.
- Expansion of capacity of IPPs (on regulated tariff) from 50% to 100% of existing capacity.

8.2.2. Mobile Applications and Websites Launched to Ensure Accountability and Transparency

- **Grameen Vidyutikaran)GARV(app** to help citizens track rural electrification under Deen Dayal Upadhyaya Gram Jyoti Yojana)DDUGJY(.
- **GARV – II App,** launched on 20th December 2016, hosts the data in respect of about **6 lakh villages, with more than 15 lakh habitations having 17 crore people, that has been mapped for tracking progress on household electrification** in each of the habitations of these villages.
- **VIDYUT PRAVAH app** created to provide real time information of electricity price and availability
- **Unnat Jyoti by Affordable LEDs for All)UJALA(app** to keep track of LED distribution under the Domestic Efficient Lighting Programme)DELP(
- **URJA)Urban Jyoti Abhiyaan(MobileApp:** The Consumer Dashboard of the URJA App, provides for Urban Power Distribution Sector to enhance Consumer Connect, Project Monitoring of Urban Distribution Sector projects and providing information on the monthly performance on parameters like Consumer complaints redressal, Release of New service connection, Average number of interruptions faced by consumer, Number of consumers making e-payments, Energy lost / power theft i.e. AT&C loss.
- **E-Tarang app** is for monitoring the real time Status of Transmission System.
- **E-Trans app** is a platform for better price discovery in respect of Inter State Transmission projects to be awarded through tariff based competitive bidding)TBCB(process.
- **'DEEP)Discovery of Efficient Electricity Price(e-Bidding' portal:** The Portal will provide a common **e-bidding platform with e-reverse auction facility** to facilitate nation-wide power procurement through a wider network so as to bring uniformity and transparency in the process of power procurement.
- **Mobile app for Star Labelled Appliances:** BEE has developed a mobile app for Standards and Labelling Programme)S&L(for consumers, which is linked with S&L database of BEE and provides a platform to receive real-time feedback from consumers and other stakeholders.





8.2.3. Foreign Direct Investment

The existing (FDI) policy notified in June 2016 by DIPP for FDI in Power Sector provides for 100% FDI under automatic route for projects of power generation (except atomic energy), transmission, distribution and trading. The Government of India has also allowed FDI up to 49% in Power Exchanges registered under the Central Electricity Regulatory Commission (Power Market) Regulations, 2010, under the automatic route, subject to certain conditions, as laid down in the policy.

8.2.4. National Grid

Target of one nation-one grid-one frequency-one market-one price has been achieved through reforms, unbundling of the utilities, improved inter-state transmission capability, corresponding increase in generation capacity etc. In December, 2015, a single pan-India price at Rs. 2.30 per unit for power was discovered in the power exchange platform.

Available Transfer Capacity (ATC) of Southern Grid has increased to 5900 MW (i.e. by 71% in 2014-16) due to addition of a number of transmission lines. The ATC would be further enhanced by 625 MW by December 2016 with the commissioning of 765 MW at Angul-Srikakulum-Vimagiri line.

8.2.5. Ujwal DISCOM Assurance Yojana (UDAY)

Ujwal DISCOM Assurance Yojana (UDAY), a scheme for financial and operational turnaround of Power Distribution Companies was formulated and launched by the Government on 20th November, 2015 in consultation with the various stakeholders. The scheme aims to provide a permanent solution to legacy debts of approximately Rs.4.3 lakh crores and address potential future losses.

Features:

- It empowers DISCOMs with the opportunity to break even in the next 2-3 years. This is through four initiatives (i) Improving operational efficiencies of DISCOMs; (ii) Reduction of cost of power; (iii) Reduction in interest cost of DISCOMs; (iv) Enforcing financial discipline on DISCOMs through alignment with State finances.
- Under the scheme, state governments, which own the discoms, can take over 75 per cent of their debt as of September 30, 2015 and pay back lenders by selling bonds. For the remaining 25 per cent, discoms will issue bonds.
- UDAY is optional for all States. However, States are encouraged to take the benefit at the earliest as benefits are dependent on the performance.
- States accepting UDAY and performing as per operational milestones will be given additional / priority funding through Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY), Integrated Power Development Scheme (IPDS), Power Sector Development Fund (PSDF) or other such schemes of Ministry of Power and Ministry of New and Renewable Energy.
- Such States shall also be supported with additional coal at notified prices and, in case of availability through higher capacity utilization, low cost power from NTPC and other Central Public Sector Undertakings (CPSUs).

A Multi-Level Monitoring mechanism for Ujwal DISCOM Assurance Yojana (UDAY) has been put in place to ensure a close monitoring of performance of the participating States under UDAY. Also a web portal (www.uday.gov.in) has been created for monitoring purpose.

8.2.6. Smart Grid Mission

National Smart Grid Mission (NSGM) was launched on 27th March 2015. Funds allocated for NSGM were Rs.40 Crore & Rs.30 Crore for the years 2015-16 and 2016-17 respectively. The National Smart Grid Mission Project Management Unit (NPMU) is handholding States for speeding up development of Smart Grid Network in the country.

8.2.7. Rural Electrification

The big push to rural electrification came in 2005 with the launch of the Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) and then accelerated further in 2010-11, when there was a significant increase in budgetary outlay for this. However, the RGGVY programme failed to live up to its motives.

Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY): This scheme focuses on feeder separation (rural households & agricultural) and strengthening of sub-transmission & distribution infrastructure including metering at all levels in rural areas. This will help in providing round the clock power to rural households and adequate power to agricultural consumers***. The RGGVY has been subsumed in the new scheme as its rural electrification component.***

The scheme prioritizes feeder separation, metering at all levels (input points, feeders and distribution transformers), Micro grid and off grid distribution network, fortifying the sub-transmission and distribution network.

In this context, it needs to be noted that since 2005, a village has been deemed to be electrified if:

- Basic infrastructure such as distribution transformer and distribution lines are provided in the inhabited locality as well as the dalit basti/hamlet where it exists.
- Electricity is provided to public places such as schools, panchayat office, health centres, dispensaries, community centres, etc.
- The number of households electrified is at least 10 per cent of the total number of households in the village.

However, this requires only the provision of the electricity line to that point, not actual continuous access. It does not account for the regularity or consistency of the power received. So even if a few houses in a village receives only a couple hours of electricity a day for a few days in the year, the village is still deemed to be electrified. After electrification, therefore, there is the further process that is described as "intensification" by the government, in which individual households are electrified until all households are provided access.

This process is ongoing in all States and in all villages including those that have been deemed to be electrified for many years, such as in Punjab, Haryana and Maharashtra. So, the proportion of households with access to electricity differs significantly from the proportion of villages electrified.

In April, 2019, the Union Government announced achieving 100 percent rural electrification. But that does not mean universal access to electricity to all households. Only around 71 per cent of all households in the country have electricity (and even this need not be regular or reliable) — but this covers both urban and rural areas. Clearly, rural access would be lower than for urban households, and some have estimated that for India as a whole, only around 60 per cent of rural households have some access to electricity — which means that still two-fifths of rural households do not and universal access to reliable electricity is still a long way from being met in rural India.

8.3. Coal

As per International Energy Agency (IEA), India was the third largest producer and second largest importer of coal in 2014 in the world. India has large reserves of coal and by the end of FY16, total coal reserves in India stood at 308.802 billion tonnes. In wake of the surging domestic coal production, the country's power sector is becoming increasingly stable. Companies are developing captive coal fields to reduce price volatility & ensure uninterrupted supply of fuel to control generation cost. Government has enabled the power utilities for swapping their coal supplies with the nearest sources so as to save miscellaneous costs & decongest the rail network.

The growth of domestic coal supply to power plants has been around 6.2% during 2015-16. Coal based power generation during 2016-17 was 595.124 BU, showing a growth rate of 5.92% over the same period in the previous year. Till September, 2016, a total of 3000 MW of inefficient thermal generating capacity has been retired.

The Coal Mitra Web Portal, launched by Shri Piyush Goyal on 21st December, 2016, has been designed to bring about flexibility in Utilization of Domestic Coal by transferring the reserves to more cost efficient State/Centre owned or Private Sector generating stations, leading to lower generation costs and ultimately lesser cost of electricity for the consumers.

Separate e-auction window of coal for Power Sector is started. Third Party Sampling is done yo improve process of measurement of quality of coal

8.3.1. Coal Imports

On account of increased production of coal, imports have fallen from 217.78 Mte in 2014-15 to 199.88 Mte in 2015-16. The trend of fall in import of coal continued in 2016-17 wherein for the period April 2016-January 2017, coal imports have reduced by 2.59% as compared to the corresponding period of the previous year. However, import of coal is not solely dependent on the domestic production of coal. It also depends on other factors like power plant designed on imported coal and insufficient availability of coking coal of required grade.

Student Notes:

9. Renewable Energy

Over the years, renewable energy sector in India has emerged as a significant player in the grid connected power generation capacity. It supports the government agenda of sustainable growth, while, emerging as an integral part of the solution to meet the nation's energy needs and an essential player for energy access. It has been realized that renewable energy has to play a much deeper role in achieving energy security in the years ahead and be an integral part of the energy planning process.

There has been a visible impact of renewable energy in the Indian energy scenario during the last few years. Renewable energy sector landscape in India has, during the last few years, witnessed tremendous changes in the policy framework with accelerated and ambitious plans to increase the contribution of solar energy. There is a perception that renewable energy can now play a significant role, as also, there is a confidence in the technologies and capacity to do so.

Enlarging the scope of the Jawaharlal Nehru National Solar Mission symbolizes both, and indeed encapsulates the vision and ambition for the future. In addition, the launching of Renewable Energy Certificate (REC) mechanism helps in the creation of a Pan-India renewable energy market. The other significant achievements are introduction of solar specific purchase obligations; launching of improved cook-stoves initiatives; initiating coordinated research and development activities in solar PV and thermal; second generation biofuels, hydrogen energy and fuel cells, etc.

India has an estimated renewable energy potential of about 900 GW from commercially exploitable sources viz. Wind – 102 GW (at 80 meter mast height); Small Hydro – 20 GW; Bio-energy – 25 GW; and 750 GW solar power, assuming 3% wasteland.

In order to meet the energy demand, India has total installed power generation capacity of 307.27 GW as on 31.10.2016 from all resources. With 46.33 GW installed renewable power capacity, the renewable power has a share of about 15% to the total installed capacity.

During the year 2015-16, wind power capacity addition of 3.42 GW was made, which is highest ever wind power capacity addition in the country during a single year. The present wind power installed capacity in the country is around 34.29 GW. Now, in terms of wind power installed capacity India is globally placed at 4th position after China, USA and Germany.

India has a strong manufacturing base of wind power equipment in the country. Presently, there are 20 approved manufacturers with 53 models of wind turbines in the country up to a capacity of 3.00 MW single turbines. Wind turbines being manufactured in India are of international quality standards and cost-wise amongst the lowest in the world being exported to Europe, USA and other countries.

The wind power potential of the country has been reassessed by the National Institute for Wind Energy (NIWE), it has been estimated to be 302 GW at 100 meter hub-height. Online wind atlas is available on NIWE website. This will create new dimension to the wind power development in the country.

India has long coastline where there is a good possibility for developing offshore wind power projects. The cabinet has cleared the National Offshore Wind Energy Policy and the same has been notified on 6th October 2015. Certain blocks near Gujarat and Tamil Nadu coast line have been identified. NIWE is in process of doing the wind resource assessment in these coastal areas.

9.1. Policy Initiatives

The Government of India in its submission to the United Nations Framework Convention on Climate Change on Intended Nationally Determined Contribution (INDC) has stated that India will achieve 40% cumulative Electric power capacity from non-fossil fuel based energy resources by 2030 with the help of transfer of technology and low cost International Finance including from Green Climate Fund. As on 31st October, 2016, Solar Energy Projects with an aggregate capacity of over 8727.62 MW has been installed in the country.

The government is playing an active role in promoting the adoption of renewable energy resources by offering various incentives, such as generation-based incentives (GBIs), capital and interest subsidies, viability gap funding, concessional finance, fiscal incentives etc.

India has also launched **International Solar Alliance** which is a coalition of solar rich countries to collaborate on addressing the identified gaps in their energy requirements through a common approach.

In order to achieve the renewable energy target of 175 GW by the year 2022, the major programmes/ schemes on implementation of Solar Park, Solar Defence Scheme, Solar scheme for CPUs Solar PV power plants on Canal Bank and Canal Tops, Solar Pump, Solar Rooftop etc. have been launched.

Various policy measures have been initiated which include, inter alia, suitable amendments to the Electricity Act and Tariff Policy for strong enforcement of Renewable Purchase Obligation (RPO) and for providing Renewable Generation Obligation (RGO); setting up of exclusive solar parks; development of power transmission network through Green Energy Corridor project; identification of large government complexes/ buildings for rooftop projects; provision of roof top solar and 10 percent renewable energy as mandatory under Mission Statement and Guidelines for development of smart cities; amendments in building bye-laws for mandatory provision of roof top solar for new construction or higher Floor Area Ratio; infrastructure status for solar projects; raising tax free solar bonds; providing long tenor loans; making roof top solar as a part of housing loan by banks/ NHB; incorporating measures in Integrated Power Development Scheme (IPDS) for encouraging distribution companies and making net-metering compulsory and raising funds from bilateral and international donors as also the Green Climate Fund to achieve the target.

9.1.1. Draft Policy for 2nd Generation Ethanol

The Ministry of New and Renewable Energy has announced come out with draft policy for 2nd generation ethanol.

Significance

- The policy is for using resources other than molasses for producing ethanol, since there is a shortage of molasses.
- Ministries of New and Renewable Energy and Science and Technology will find a way to produce second-generation ethanol from biomass, bamboo, rice straw, wheat straw, and cotton straw etc. to power vehicles.
- Based on promotion to second generation ethanol government is planning to take up ethanol blending in petrol to 22.5 percent and in diesel to 15 percent.
- Govt. is ready to purchase the entire quantity of 2nd generation ethanol produced by the industry.
- To augment supplies of ethanol to oil marketing companies (OMCs), the policy for procurement of ethanol has been modified to smoothen the entire ethanol supply chain and to provide remunerative price of ethanol.

Benefits

- **Employment:** Making ethanol from bamboo in North-East, lakhs of people will get employment and several industries will come up, on the lines of successful industries in Italy. There is a potential to manufacture 40,000 litres of second generation ethanol here.
- **Environment-friendly:** For ex: Flex-fuel cars in Brazil run on new ethanol and pollution is minimal.
- Boost to ethanol production could cut India's huge crude oil imports bill, pegged at Rs 7 lakh crore per annum.

9.2. Key Developments

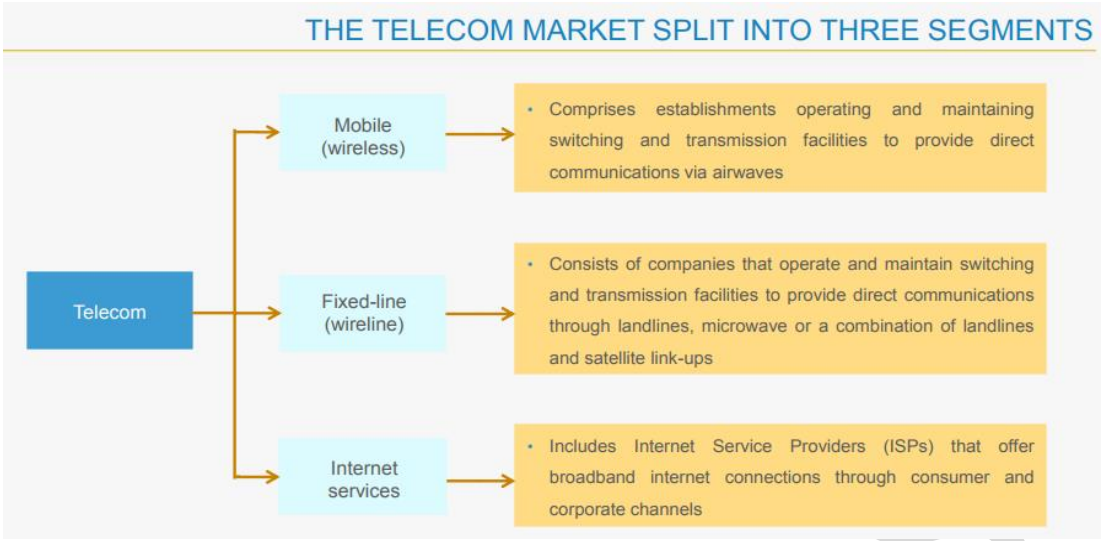
Green Energy Corridor: Rs.38,000 crore Green Energy Corridor is being set up to ensure evacuation of Renewable Energy. Power Grid Corporation of India Limited (PGCIL) has sought a loan assistance of US$ 1,000 million from the Asian Development Bank (ADB) comprising of Sovereign guaranteed loan of US$ 500 million and Non-Sovereign loan of US$ 500 million.

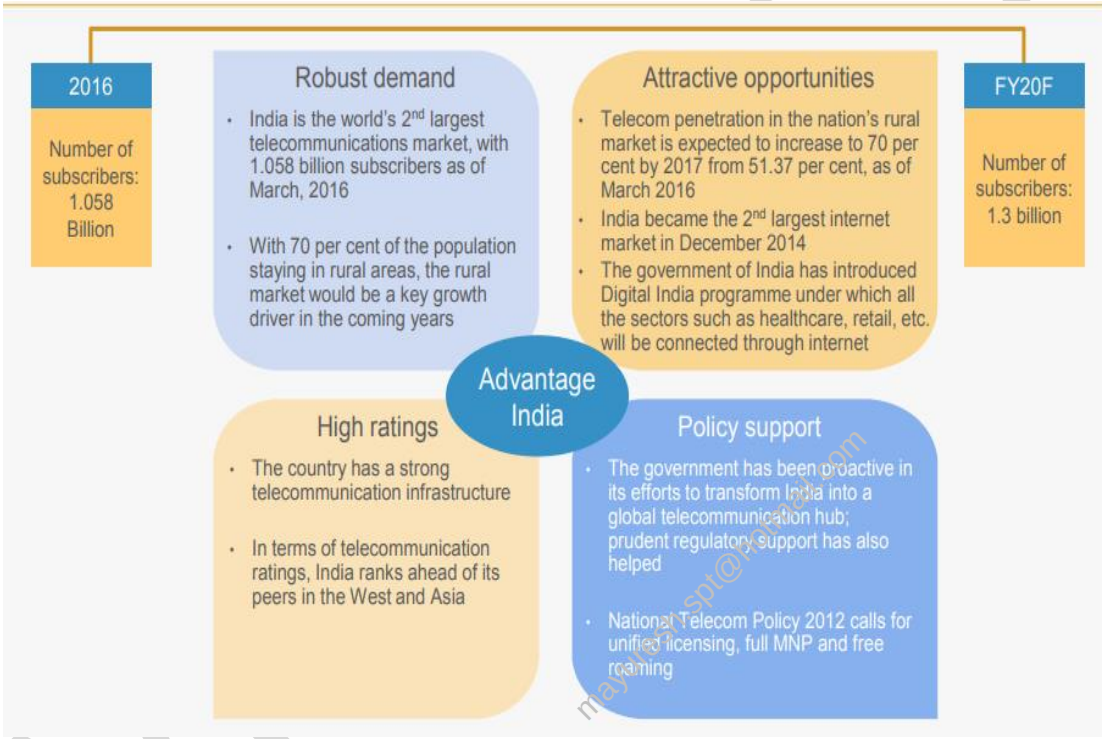
LOWEST SOLAR TARIFFS: Solar tariffs have fallen to an unprecedented low of Rs. 4.34 / kWh through reverse auction for one of six projects of 70 MW each to be put up in Rajasthan under the National Solar Mission. NTPC on 18.01.2016 conducted the reverse bidding for 420 MW solar power projects. However, the tariff had further fallen to Rs 3 per unit, which was quoted by Amplus Energy Solutions in an auction for rooftop solar power conducted by Solar Energy Corporation of India (SECI).

SKILL DEVELOPMENT-**Surya Mitra** Scheme has been launched for creating 50,000 trained solar photovoltaic technicians by March 2020. A total number of 5492 Surya Mitra's have been trained as on 30.09.2016 and more than 3000 are undergoing training. A network of over 150 Institutions, spread all over the country, have been created for implementing Surya Mitra scheme.

10. Telecommunications

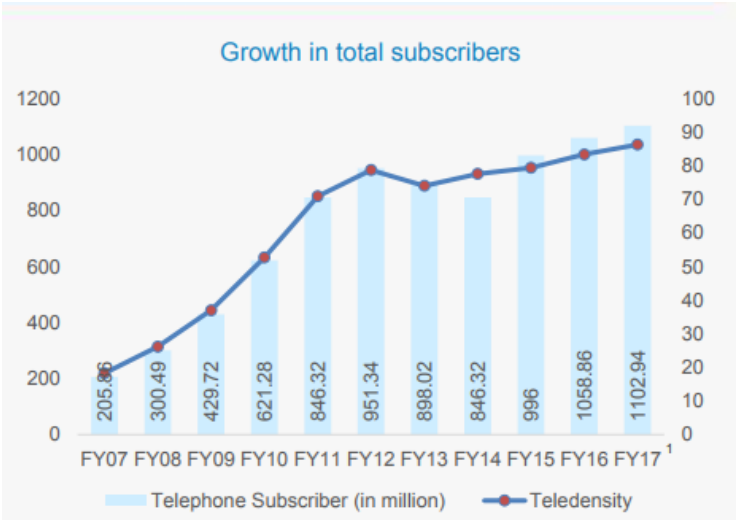
Telecommunications has evolved as a basic infrastructure like electricity, roads, water etc. and has also emerged as one of the critical components of economic growth required for overall socio-economic development of the country. The Indian telecom sector has registered a phenomenal growth during the past few years and has become the second largest telephone network in the world, only after China. A series of reform measures by the Government, the wireless technology and active participation by private sector played an important role in the exponential growth of telecom sector in the country. National Telecom Policy 2012 (NTP-2012) was announced with the primary objective of maximizing public good by making available affordable, reliable and secure telecommunication and broadband services across the entire country.





10.1. Present Status

- With a subscriber base of nearly 1074.23 million, as of September 2016, India accounted for the 2nd largest telecom network in the world.
- With 367.48 million internet subscriber, as of September 2016, India stood 3rd highest in terms of total internet users in 2016.
- Mobile based Internet is a key component of Indian



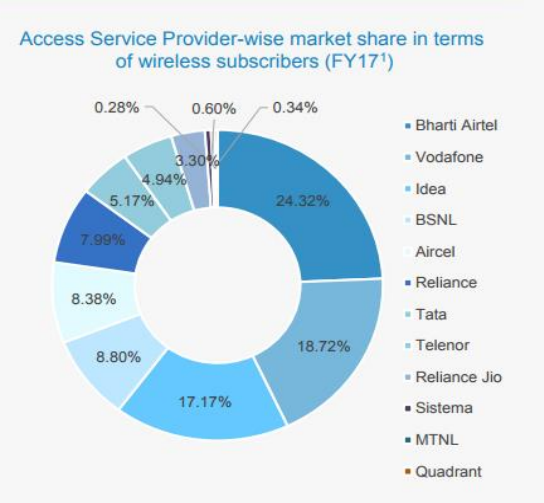
Internet usage, with 7 out of 8 users accessing internet from their mobile phones. Since 2012, the share of time spent on watching videos on mobile devices has grown by 200 hours a year.

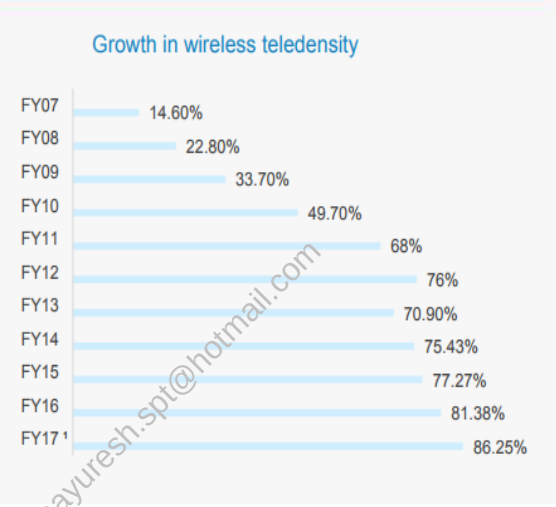
- As of September 2016, urban tele-density stood at 156.24 per cent and rural tele-density at 51.24 per cent.
- Availability of affordable smartphones and lower rates are expected to drive growth in the Indian telecom industry.
- In March 2016, the wireless segment (97.60 per cent of total telephone subscriptions) dominated the market, with the wireline segment accounting for an overall share of 2.4 per cent.

10.2. Tele-Density

Tele-density, which shows the number of telephones per 100 people, is an important indicator of telecom penetration in the country.

The mobile segment's tele-density surged from 14.6 per cent in FY07 to 86.25 per cent in FY17. In FY16, urban wireless tele-density stood at 148.73 while rural wireless tele-density stood at 50.88. There are over 62,443 uncovered villages in India; these would be provided with village telephone facility with subsidy support from the government's Universal Service Obligation Fund (thereby increasing rural tele-density).





10.3. Composition of the Market

As of October 2016, Bharti Airtel was the market leader, with a 24.32 per cent share in the wireless subscription, followed by Vodafone (18.72 per cent share). The top 5 players in the sector include - Bharti Airtel, Vodafone, Idea, Reliance and BSNL – accounting for 77.39 per cent of the wireless subscribers in the country. Total fixed-line subscription stood at 24.52 million, while tele-density reached 1.92 per cent due to wide usability of the wireless segment in FY17. In FY17, BSNL is the market leader with a 56.60 per cent share, followed by Bharti Airtel (15.53 per cent)

10.4. Broadband

Increase in Broadband connectivity is seen as an integral driver of improved socioeconomic performance. Broadband services empower masses and allow individuals to access new career and educational opportunities, help businesses reach new markets and improve efficiency and enhance the Government's capacity to deliver critical services like health, banking and

commerce to all of its citizens. The number of broadband subscribers reached 149.75 million at the end of March 2016. Broadband subscription in the country witnessed an increase at a CAGR of 19.18 per cent during FY07–171.

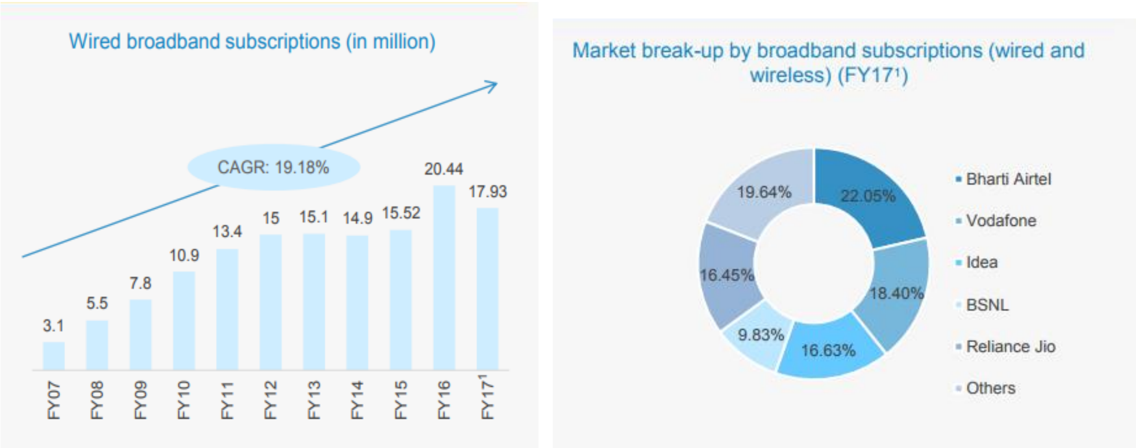


Figure: Number of broadband subscribers

Provision of Broadband in rural and remote areas helps in bridging the 'digital divide' and the widespread adoption of broadband in rural areas has a multiplier effect over the long-term. It can help improve productivity in rural areas, help overcome the constraints of an inadequate transport infrastructure and overall improve the quality of life in rural areas. Given the significant economic and social benefits, expanding affordable access to broadband has become a high priority for the Government. Various schemes have been launched for providing broadband connectivity to rural & remote areas.

10.5. National Telecom Policy 2012

The Government approved National Telecom Policy-2012 (NTP-2012) on 31st May 2012 which addresses the vision, strategic direction and the various medium term and long term issues related to telecom sector. The primary objective of NTP-2012 is maximizing public good by making available affordable, reliable and secure telecommunication and broadband services across the entire country. The main thrust of the Policy is on the multiplier effect and transformational impact of such services on the overall economy. It recognizes the role of such services in furthering the national development agenda while enhancing equity and inclusiveness. Availability of affordable and effective communications for the citizens is at the core of the vision and goal of the NTP-2012. The Policy also recognizes the predominant role of the private sector in this field and the consequent policy imperative of ensuring continued viability of service providers in a competitive environment.

The objectives of the NTP-2012 include the following:

- Provide secure, affordable and high quality telecommunication services to all citizens.
- Strive to create **One Nation - One License** across services and service areas.
- Achieve **One Nation - Full Mobile Number Portability** and work towards **One Nation - Free Roaming**.
- Increase rural tele-density from the current level of around 39 to 70 by the year 2017 and 100 by the year 2020.
- To recognize telecom, including broadband connectivity as a basic necessity like education and health and work towards **'Right to Broadband'**.
- *Provide affordable and reliable* broadband-on-demand by the year 2015 and to achieve 175 million broadband connections by the year 2017 and 600 million by the year 2020 at

minimum 2 Mbps download speed and making available higher speeds of at least 100 Mbps on demand.

- Provide high speed and high quality broadband access to all village panchayats through a combination of technologies by the year 2014 and progressively to all villages and habitations by 2020.
- Recognize telecom as Infrastructure Sector to realize true potential of ICT for development.
- Address the Right of Way (RoW) issues in setting up of telecom infrastructure.
- Mandate an ecosystem to ensure setting up of a common platform for interconnection of various networks for providing non-exclusive and non-discriminatory access.
- Enhanced and continued adoption of green policy in telecom and incentivize use of renewable resources for sustainability.
- Achieve substantial transition to new Internet Protocol (IPv6) in the country in a phased and time bound manner by 2020 and encourage an ecosystem for provision of a significantly large bouquet of services on IP platform.

Now, the Department of Telecommunications (DoT) has released draft of National Telecom Policy 2018 to facilitate growth of the sector and meet requirements of next generation technologies. Also, The telecom ministry has issued technology neutral telecom licences under the NTP 2012 which was delinked from spectrum. Other reforms that have been undertaken include finalisation of spectrum trading and sharing rules, full mobile number portability and increasing of spectrum supply for the industry.

However, the ministry is yet to meet certain targets like 2 megabits per second (Mbps) broadband speed for consumers, abolition of roaming charges across the country, promoting use of white spaces, simplifying network rollout issues, formation of the National Mobile Property Registry and, more importantly, empowering consumers by bringing their disputes with service providers under the jurisdiction of consumer forums.

The government has also notified abolition of wireless operating licence, a move that would facilitate ease of doing business. So far, the telecom service providers are required to obtain a separate licence for installing and operating base stations as also other wireless equipment, which is already covered as part of their main licences like the Unified Access Service Licence. Hence, the move to do away with a separate wireless operating licence reduces the hassles for telecom operators.

10.6. Manufacturing of Telecom Equipment

With the advent of next-generation technologies and operators rolling out 4G, 3G and broadband wireless access services, the demand for telecom equipment has increased rapidly. In an attempt to capitalize on this opportunity, the government and policy makers are focusing on developing the domestic manufacturing industry. Promotion of Telecom Equipment Manufacturing has also been included in the objectives of NTP-2012.

With a view to increase share of domestically manufactured electronic products which includes telecom equipment also, the Government has laid down the policy for providing preference to domestically manufactured electronic products (including telecom equipment) in procurement.

The Department of Telecommunications has accordingly notified telecom products to be procured by all the Ministries or Departments (except the Ministry of Defence) of Government and the agencies under their administrative control and for all Government funded telecom projects.

The Central Government's several initiatives to promote manufacturing in the country, such as 'Make in India' campaign appears to have had a positive impact on mobile handsets manufacturing in the country. Companies like Samsung, Micromax and Spice had been

assembling handsets in the country already. Xiaomi and Motorola, along with Lenovo have also started assembly of smartphones in India. Firms like HTC, Asus and Gionee too have shown interest in setting up a manufacturing base in the country.

10.7. Universal Service Obligation Fund

To give impetus to the rural telephony, Government formed a Universal Service Obligation Fund (USOF) by an Act of Parliament (Indian Telegraph (Amendment) Act, 2003). Various schemes have been launched by USOF with a view to improve the penetration of telecom facilities in rural and remote areas of the country.

The resources for implementation of USOF are raised through a Universal Service Levy (USL) which has presently been fixed at 5% of the Adjusted Gross Revenue (AGR) of all Telecom Service Providers except the pure value added service providers like Internet, Voice Mall, E-Mail service providers etc. In addition, the Central Govt. may also give grants and loans.

The Fund is to be utilized exclusively for meeting the Universal Service Obligation. The latter has been defined in the Act as the obligation to provide access to telegraph services to people in rural and remote areas at affordable and reasonable prices.

10.8. National Optical Fiber Network (NOFN)

Government approved a project, at a cost of `20,000 crore, for creating a 'National Optical Fiber Network' (NOFN) to connect all the 2,50,000 Gram panchayats in the country through optical fiber using which the telecom service providers like mobile operators, Internet Service Providers (ISPs), cable TV operators, content providers can launch various services in rural areas. Various applications for e-health, e-education, e-governance etc. are to be provided using this network. The project is being funded by USOF. The project is being carried out by a special purpose vehicle (SPV) called Bharat Broadband Network Ltd (BBNL) set up by the government and three companies including Bharat Sanchar Nigam Ltd (BSNL), Power Grid Corporation of India (PGCI) and RailTel Corporation of India (RailTel) works as a team in this SPV.

The Ministry of Finance has increased the Budget of BharatNet project to Rs. 10,000 crore for 2017-18, up from Rs 6,000 crore and aimed to provide high-speed broadband connectivity on optical fibre to 1.50 lakh gram panchayats by March 2018.

10.9. Transition to New Internet Protocol

IPv6 (Internet Protocol Version 6) is the next generation Internet Protocol. With depletion and exhaustion of address space provided by IPv4 (Internet Protocol Version 4), it becomes essential to transit to IPv6 which provides huge address space and many features for future needs. Countries around the world have started transition to IPv6. India is the first country in the world where any Government has released National IPv6 deployment roadmap with the policy decisions.

10.10. Regulatory Framework

The entry of private service providers brought with it the inevitable need for independent regulation. The Telecom Regulatory Authority of India (TRAI) was, thus, established with effect from 20th February 1997 by an Act of Parliament, called the Telecom Regulatory Authority of India Act, 1997, to regulate telecom services, including fixation/revision of tariffs for telecom services which were earlier vested in the Central Government.

TRAI's mission is to create and nurture conditions for growth of telecommunications in the country in a manner and at a pace which will enable India to play a leading role in emerging global information society.

One of the main objectives of TRAI is to provide a fair and transparent policy environment which promotes a level playing field and facilitates fair competition.

In pursuance of above objective TRAI has issued from time to time a large number of regulations, orders and directives to deal with issues coming before it and provided the required direction to the evolution of Indian telecom market from a Government owned monopoly to a multi operator multi service open competitive market.

The directions, orders and regulations issued cover a wide range of subjects including tariff, interconnection and quality of service as well as governance of the Authority.

The TRAI Act was amended by an ordinance, effective from 24 January 2000, establishing a Telecommunications Dispute Settlement and Appellate Tribunal (TDSAT) to take over the adjudicatory and disputes functions from TRAI. TDSAT was set up to adjudicate any dispute between a licensor and a licensee, between two or more service providers, between a service provider and a group of consumers, and to hear and dispose of appeals against any direction, decision or order of TRAI.

10.10.1. Net Neutrality

Net neutrality is the principle that individuals should be free to access all content and applications equally, regardless of the source, without Internet service providers discriminating against specific online services or websites.

Without net neutrality rules in place, ISPs can prevent users from visiting some websites, provide slower speeds for services like Netflix, or even redirect users from one website to a competing website. Net neutrality rules prevent this by requiring ISPs to connect users to all lawful content on the internet equally, without giving preferential treatment to certain sites or services.

In the absence of net neutrality, companies can buy priority access to ISP customers. Larger, wealthier companies like Google or Facebook can pay ISPs to provide faster, more reliable access to their websites than to potential competitors. This could deter innovative start-up services that are unable to purchase priority access from the ISPs. Also, if ISPs can charge online services to connect to consumers, consumers would ultimately bear these additional costs

The telecom regulator TRAI struck down differential pricing for internet services offered by telecom players to mobile users, in a bid to uphold the principles of net neutrality—serving a big blow to Facebook's Free Basics and other zero-rated platforms such as Airtel Zero.

10.11. Research & Development

C-DoT, an autonomous body, is Department of Telecom's R&D arm, committed to providing a wide range of cost-effective, indigenously developed and state-of-the-art total telecom solutions.

Starting from the single mission of providing a dial tone, C-DoT has grown to the level of a national centre for Research and Development in communication technology in many areas – Satellite communications, IN, ATM, DWDM, NMS, Wireless Broadband, GPON, NGN and Mobile Cellular systems. C-DoT's ATM technology has been mandated for use for onboard communication in Indian Navy ships. C-DoT has also been active in the area of providing telecom software solutions. C-DoT's umbrella NMS (Network Management System) solutions have made it possible to manage networks with elements from multiple vendors. The Data Clearing House (CLH) solution of C-DoT is commercially deployed for reconciling the roaming records between BSNL and MTNL.

C-DoT is also entrusted with the projects of national importance, like Central Monitoring System for telecom security and Secure Network for strategic applications.

10.12. Public Sector Undertakings (PSUs)

DoT has four PSUs under its administrative control. These are:

1. Mahanagar Telephone Nigam Limited (MTNL)
2. Bharat Sanchar Nigam Limtied (BSNL)
3. ITI Limited
4. Telecommunications Consultants India Limited (TCIL)

MTNL, set up in 1986, is a Navratna PSU and provides telecommunication facilities in India's key metros - Delhi and Mumbai. MTNL is the principal provider of fixed-line telecommunication service in these two Metropolitan Cities of Delhi and Mumbai and for GSM Mobile services

Four peripheral towns Noida, Gurgaon, Faridabad & Ghaziabad along with Delhi city and the areas falling under the Mumbai Municipal Corporation, New Mumbai Corporation and Thane Municipal Corporation along with Mumbai city, also come under the jurisdiction of the company. MTNL is providing triple play services i.e. voice, high speed internet and IPTV on its Broadband network. Total debt on MTNL reached Rs 19,418.23 crore at the end of December 31, 2016, from Rs 11,542.3 crore in 2012-13. The debt is over six times MTNL's annual revenue registered in 2015-16. In 2015-16, MTNL reported total annual revenue of Rs 3,197.41 crore and net loss of Rs 2,005.72 crore.

BSNL, fully owned by Government of India, formed in October 2000, provides telecom services across the length and breadth of the country excluding Delhi and Mumbai. BSNL is providing all types of telecom services namely telephone services on landline, WLL and GSM mobile, Broadband, Internet, leased circuits and long distance telecom service. Rural telephony is one of the focus areas of BSNL. BSNL also pays special emphasis on development of telecommunication facilities in North-Eastern region and in tribal areas. BSNL's revenue from operation has increased from Rs 26,153 crore in 2013-14 to Rs 27,242 crore in 2014-15, and to Rs 28,449 crore in 2015-16. During FY 2013-14, it posted a net loss of Rs 7019 crore and during FY 2014-15 it's net loss widened to Rs 8234 crore.

ITI Limited was established in 1948, to supply telecom equipments to the then telecom service provider, Department of Telecommunications. ITI started its operations in Bangalore in 1948, which were further extended to other areas by setting up manufacturing plants at Srinagar in Jammu and Kashmir, Naini, Rae Bareli and Mankapur, all in Uttar Pradesh and Palakkad in Kerala. The establishment of these plants at various locations was not only aimed at augmentation of manufacturing capacity but also development of social infrastructure.

TCIL, fully owned by Government of India, was set up in 1978 with the main objective of providing world class technology in all fields of telecommunications and information technology, to excel in its operations in overseas and in domestic markets by developing proper marketing strategies and to acquire state-of-the-art technology on a continuous basis. TCIL is a profit making PSU.

11. Kelkar Committee Report: Revisiting & Revitalizing the PPP Model of Infrastructure Development

In the Union Budget 2015-16, the Finance Minister had announced that the PPP mode of infrastructure development has to be revisited and revitalised. In pursuance of this announcement, a Committee on Revisiting & Revitalising the PPP model of Infrastructure Development was set-up which was chaired by Dr. Vijay Kelkar. A few of its recommendations are:

- Governance, Institutions and Capacity, enumerated as the 3 pillars of the PPP framework, were essential for institutional capacity building activities, hence should be vitalized.
- Government may develop a PPP law with endorsement from Parliament. It gives an authoritative framework to implementing executives along with an oversight responsibility to legislature and regulatory agencies.
- For evaluating and sending recommendations in time-bound manner for a stress in projects under PPP model, Infrastructure PPP Project Review Committee (IPRC) is proposed.
- Swiss Challenge Method of awarding contracts should be avoided and encourage Unsolicited Proposals.
- For sourcing long-term capital at low-cost, banks and financial institutions should be encouraged to issue deep discount bonds, also known as zero coupon bonds.
- The Prevention of Corruption Act, 1988 should be amended at the earliest to punish corrupt practices while saving those who made genuine mistakes in decision-making.
- The "One-size-fits-all" approach should be avoided and project-specific risk Assessment should be undertaken (Model Concession Agreement).

The committee emphasizes on several other points including Re-balancing of Risk Sharing & Reinvigorating the various Sectors. PPPs are an important policy instrument that will enable India to compress time in this journey towards economic growth and development. A successful and growing stream of PPPs in infrastructure will go a long way in accelerating the country's development process.

12. Previous Years Vision IAS GS Mains Questions

1. Is increasing energy efficiency an important way to contain energy demand, without jeopardising growth? Also give an account of the measures taken up for the same.

Approach:

In this question students have to make an attempt to highlight the importance of energy efficiency in a line or two. Thereafter, they have to explain the ways of achieving energy efficiency. Students are encouraged to go through the Energy chapter of 12th Plan to get a greater clarity.

Answer:

- Energy is central to the growth and development of any nation but inefficient energy subsidies, machines, plants etc. are greatly affecting country's energy prospects. Given the high prices in international market of oil and inability to produce energy domestically at cheaper rates, focus has to shift greatly towards energy efficiency in the country.
- Non-price initiatives have a very crucial role in promoting energy efficiency. National Mission on Enhanced Energy Efficiency which was launched in 2008 includes several ways to promote energy efficiency. The measures include labelling of consumer durables for energy efficiency, imposing targets for reducing energy use in energy intensive industries, introducing energy efficiency in buildings, etc. These programmes have resulted in avoided generation capacity of over 7,500 MW. Some of them have been discussed below:
- **Standards and Labelling of Equipment and Appliances**: Labelling has been introduced for 16 major energy consuming appliances, providing users with information on the energy use of a model and its relative efficiency as compared to others. It has been made compulsory for air-conditioners, refrigerators, tube lights etc.

Student Notes:

- **Energy Efficiency in buildings:** A national energy conservation building code has been introduced. Over 700 buildings are at various stages of construction.
- **Energy efficiency in industry:** 467 industrial unites from 8 sectors have been declared as designated consumers. Together they account for about 35 percent of the total energy consumption in India. Each designated consumer has been prescribed a target percentage reduction in its specific energy consumption to be achieved by 2014-2015**.** A major programme to enhance energy efficiency of small and medium enterprises is also being launched, focusing on the SME clusters, and the development of local consultants, equipment vendors, and financial institutions through replicable pilot projects.
- **Residential Lightning:** The penetration of energy-efficiency compact fluorescent lamps (CFLs) in the domestic sector has been relatively limited because of the high costs of CFLs. The Bachat Lamp Yojana (BLY) provides CFLs to households at the cost of incandescent bulbs.
- **Shift in modes of transport** from roads towards railways in the case of freights, greater use of public transport in cities, and use of inland water transport can also make a big difference to total energy use.

2. "In India, tertiary roads are given tertiary treatment". In this context, elaborate on the importance of developing rural roads in the country. Also highlight the success of PMGSY in ushering the much-needed bottom-up reforms.

Approach:

The statement tries to give a negative connotation but students need to highlight the existing poor state of rural roads in the country in brief. In the later part they should elaborate on importance of rural roads and successes of PMGSY. There is no need to cite the provision of PMGSY

Answer:

- Even after a decade, a large number of villages and habitations in rural areas remain unconnected due to lack of good quality roads. Around 44% of the rural population is not covered by the rural road network.
- The lack of roads means that an estimated 20-30 percent of the agricultural, horticultural and forest produce gets wasted because of inability to timely transport the produce to marketing and processing centres
- Rural roads comprise over 85 % of the road network and their being kept in serviceable condition is crucial to the rural / agricultural growth and affording means of access to millions of rural people to social facilities viz. medical, education as well as to market. Lack of maintenance affects the poor people badly as the time for access to markets and other social infrastructure is increased.
- Rural roads have been proved to be catalytic for economic development and poverty alleviation in rural areas

Success of PMGSY:

- Pradhan Mantri Gram Sadak Yojana (PMGSY) roads have resulted in significant benefits to rural households in form of easier access to health and educational facilities.
- It has enhanced school enrolment of students, and attendance of students and teachers. The road connectivity has increased the mobility of women as they can now travel alone in buses and cycles.

- One of the major benefits is access to markets, which increases employment and business opportunities, and encourages small-scale and cottage industry activities, roadside stalls, and shops in the villages. It has created employment opportunities to local people of around 460 million man days per year.
- Better roads have meant availability of irrigation facilities like bore pumps and use of tractors, enabling multiple cropping and efficient farming. Dairy and poultry farmers have also benefited. Roads have enhanced rural employment—both on- and off farm and encouraged setting up of small enterprises, including those by women.
- Rural infrastructure investments have benefitted the rural poor through increased incomes and improved consumption patterns.

3. Smart Grids will bring the Communication, IT and Power Technologies in unison and establish a comprehensive power infrastructure in the country". In light of this statement elaborate the role that can be played by smart grids in solving India's energy problems.

Approach:

This question demands one to list the advantages of Smart Grids as a concept, there is no need to get into technicalities of the Smart Grid in this question.

Answer:

India generates about 229GW of electricity making it one of the 5th largest electricity producer in the world. Much of the generated electricity is wasted during the transmission and this account to 40 percent of loss every year. Presently our electricity system is facing a number of challenges. These are shortage of power, power theft, and inaccessibility of electricity in rural areas, huge losses in the grid, poor reliability and inefficient power consumption. In order to tackle above problems including production waste and to support the demand of electricity Government has initiated a project by the name of Smart Grid

- Smart Grid envisages providing choices to each and every customer for deciding the timing and amount of power consumption based upon the price of the power at a particular moment of time
- Apart from providing choices to the consumer and motivating them to participate in the operations of the grid, causing energy efficiency and accommodating all generation and storage options, Smart Grid also envisages various properties for the Grid like self-healing and adaptive islanding. This all will enable electricity markets to flourish.
- Smart grids are sophisticated, digitally enhanced power systems where the use of modern communications and control technologies allows much greater robustness, efficiency and flexibility than today's power systems.
- Power utilities around the world are adopting smart grid technologies to make the power infrastructure robust, self-healing, adaptive, interactive and cost effective
- It will save around 15-20% of electricity in the country
- By reducing the peak demand, a Smart Grid can reduce the need for additional transmission lines.
- Lower operating and maintenance costs thereby meaning lower peak demand
- Would result in reduction in carbon emissions.

4. Despite one of the longest coastlines in the world, India's port facilities and shipping industry are beset by numerous problems. Explain. Discuss some of the corrective measures taken by the government to overcome these problems.

Approach:

The question is mainly focused on the problems of port infrastructure in India. So the answer should delve into the importance of the port infrastructure in current globalised world. The answer should focus on reasons for sub-optimal/inefficient port infrastructure. The second part asks the recent measures taken by the government to improve the port infrastructure.

Answer:

India's 7,500-km coastline with 13 major ports and its strategic location on world trade routes gives it a natural advantage to control and direct shipments. Yet, India has not managed to get a dominant grip on shipping, even in its own continent.

Challenges to the shipping industry:

- Rigid laws and a detached financial impetus.
- The unfriendly taxation structure, wherein the domestic shipping operators need to pay high taxes.
- The turnaround time at ports in India is one of the biggest handicaps.
- Inadequate infrastructure and the inability of the Indian ports to meet the rising demand in container traffic. This takes us to the next major problem of ineffective port facilities.

Though, the Indian Ports are the gateways to international trade, as they handle over 90% of foreign trade by volume. However, the existing port infrastructure is insufficient to handle trade flows effectively.

Challenges to the port facilities:

- The current capacity at major ports is overstretched, as 13 major Indian ports handle 56.7 percent of the all-India port throughput.
- The handling capacity of ports in India has remained limited, while the demand has been rising, resulting in port congestion.
- Several major ports lack sufficient draft for large crude tankers. Large vessels are berthed at Colombo, Singapore, or Dubai, and cargo is shipped to India later in smaller vessels, thereby escalating the freight cost.
- Weak hinterland connectivity reduces accessibility.
- Labor and equipment productivity levels are still very low due to the outdated equipment, poor training, low equipment handling levels by labor etc.

Some of the initiatives are:

- Sagar Mala project: It seeks to create a string of ports around India's coastline to safeguard maritime interests. It would give a boost to the shipping industry by evolving a model of port led development. It also aims to integrate the development of the ports, the industrial clusters and hinterland, and efficient evacuation system through rail, road, inland and coastal waterways resulting ports becoming the drivers of economic activity in the coastal areas.
- The government also signed a memorandum of understanding with Iran to develop the Chabahar port.

- The government prioritized the expansion and modernization of ports as part of its five-year plan initiatives in 2007. It has been instrumental in redefining the role of ports from mere trade gateways to integral parts of the global and logistics chain.
- Several projects are underway for the deepening of drafts at major ports as a part of the national maritime development program. For example, the Sethusamudram Shipping Canal Project.
- The Port sector has been thrown open to private sector participation for the provision of port facilities at various major ports.

The commissioning of power projects based on imported coal and the setting up of steel projects and offshore exploration and production projects are likely to drive the Indian ports sector in the near future.

5. Dedicated freight corridors have a huge potential to revive the manufacturing sector in the country Explain. What are the various issues which have slowed down the implementation of these projects?

Approach:

One can briefly list out the major DFC projects (envisaged and under construction). Thereafter, the answer should focus on importance of DFCs for manufacturing sector, a general discussion or benefits to economy at large will not fetch marks. Second part of the answer has to focus on reasons responsible for slowing down the implementation of DFC projects.

Answer:

Under the Dedicated Freight Corridor (DFC) Project, freight rail lines will be constructed along the Western Corridor between Delhi and Mumbai and the Eastern Corridor between Ludhiana, Delhi and Sonnagar.

How can DFCs help in reviving the manufacturing sector:

- Dedicated Freight Corridors are proposed to adopt world class and state-of-the-art technology. Significant improvement is proposed to be made in the existing carrying capacity by modifying basic design features. Both these improvements will allow longer and heavier trains to ply on the Dedicated Freight Corridors. This will provide infrastructure to allow heavy loaded trains to move.
- Its completion will have a major impact on improving transportation infrastructure which will enhance attractiveness of India as an investment destination including the manufacturing sector
- The time taken would be considerably, thereby reducing the shipping time.
- It would also introduce time tabled freight services and guaranteed transit time
- Once completed, the dedicated freight corridors will enable Indian Railways to improve its customer orientation and meet market needs more effectively thereby affecting the entire business ecosystem.
- Unlike the existing rail network, which runs on a combination of diesel and electrical locomotives, the proposed DFC corridor will operate entirely through electric locomotives, thereby lowering the transportation costs for the manufacturing sector which are considerably higher when compared to developed countries of the world.

Issues slowing the implementation of projects

- **Land Acquisition:** Like any other infrastructure projects, there are stretches of land that have been difficult to acquire for the government. For example, the western corridor of DFC was to pass through Panvel and then proceed towards Jawaharlal

Nehru Port Trust (JNPT). But acquiring land for DFC has been difficult at Panvel where several other projects are also converging like proposed CST-Panvel fast corridor, upcoming airport at Navi Mumbai, suburban sections on the Virar- Vasai-Diva-Panvel line and finally, construction of the Panvel Coaching complex.

- **Management change:** Frequent management changes and availability of adequate resources at the mid level have been a bane for DFC till date. "The company continues to suffer lack of institutional strength as a result of non-availability of adequate resources at the middle level.
- **Not enough bidders:** Given the conditions set by the Japanese government (which is giving soft loans) and which stipulates involvement of a Japanese partner, the total number of bidders has been low for the Western corridor.
- **Cancelled Tenders:** Cancellation of a tender and iterating the process again have a ripple effect on the overall advancement of the project.

6. Examine the issue of mismatch between potential and actual utilisation of waterways in India. Give an account of the government initiatives in the recent years aimed at removing this anomaly.

Approach:

- Provide key statistics showing the mismatch between potential and realization.
- Highlight the causes responsible for this mismatch.
- Discuss steps taken by the government in this regard.

Answer:

In India, 14,500 km. of river channels are navigable, of which 3,700 km. are usable by mechanised boats. But, only 2000 km. are used. Of the total canal length of 4,300 km, 900 km. is navigable, but only 330 km. is used. While countries such as China, and Korea channelize over 40% of their passenger and freight traffic, in India the proportion is only 3.5%.

The major reasons of the mismatch between the potential and actual utilization are:

- Large parts of Indian waterways have inadequate depth for commercial movement of cargo.
- Indian rivers (especially in the northern plains) face severe problems of siltation round the year. The river bed rises, impeding movement of cargo during non-monsoon months.
- Fluctuating depth due to seasonal rainfall.
- Inadequate Air draft. Multiple bridges with low vertical clearance obstruct passage of bigger inland vessels.
- Shortage of Inland water Vessels because vessel buildings is highly capital intensive. The private sector is reluctant to invest in barges unless long term cargo commitments for onward/return trips are made from user industries.
- Lack of terminals including those with inter-modal connectivity inhibits connectivity to end user.
- Lack of Night navigation facilities such as DGPS and River Information System (RIS).
- Severe shortage of MRO (Maintenance, Repair and overhaul) facilities for inland water transport vessels.
- Lack of potential multimodal corridors and detailed mapping of waterways and industrial clusters, multimodal transport hubs in inland water transport corridor.

- While inland water transport is cost competitive in general with other transport modes such as rail and road, the situation is sometimes, distorted by preferential treatment offered to other modes.

Government initiatives:

- Inland waterway projects will be developed with PPP and infusion of FDI.
- The Union government is working on a strategy to increase the movement of goods and passengers through waterways by nearly five-fold from a mere 3.5% now to 15% by 2019.
- To encourage transportation of goods by coastal shipping, service tax has been brought on par with road and rail transport.
- RIS has been launched to facilitate safe, accurate navigation.
- The National Waterways Act 2016 identifies 101 waterways as national waterways, in addition to the five existing.
- Pradhan Mantri Jal Marg Yojna launched to provide dry ports and satellite port to landlocked states and convert rivers into waterways.
- The 'Jal Marg Vikas' project will develop a fairway with 3 meters depth to enable bigger commercial navigation vessels.
- Sagar Mala to connect ports to inland through rail, road and inland waterways.

7. Even though the construction sector has significant multiplier effect on the economy, in recent years, it has been showing signs of stress. What are the causes for such a state of affairs? In this context, also highlight the steps taken by the government.

Approach:

- Begin with the importance of the construction sector for the economy of the country.
- Write about the 'stresses' being faced by the sector briefly before enumerating the reasons behind them.
- End with policy measures taken by the government to remove these impediments.

Answer:

- The construction industry is a major contributor towards India's GDP, both directly and indirectly. It employs 33 million people, and any improvements in the construction sector affect a number of associated industries such as cement, steel, technology, skill-enhancement, etc.
- It has major forward and backward linkages, and therefore a high multiplier effect on economic growth (almost two times).
- But, this sector is under stress, indicated by:
  - Increasing levels of debt which affect financial stability
  - A large number of stalled projects
  - A slowdown in construction sector leading to stretched liquidity and limited resources
  - The construction sector is reeling under a severe shortage of skilled workforce, and in many areas of the country, shortage of construction sand, raw materials, and political disturbances are also acting as growth deterrents.
  - Pending claims from government bodies causing huge debt of construction companies. Over 85% claims raised are still pending
  - The prolonged real estate market slowdown has resulted in a lot of unsold housing projects across India.

- The government has been striving to revive the sector through steps like:
  - Increased impetus to the creation of affordable housing mission (Housing for All by 2022), along with quicker approvals and other supportive policy changes will soon result in an increase in construction activity.
  - Granted infrastructure status to affordable housing that will provide a boost in volume of construction activity. Norms for FDI in 15 sectors including real estate and construction development have now been eased, and this has very positive implications for these sectors and the larger economy.
  - The introduction of GST will ease tax-related complexities in the construction sector and bring with it a major spurt in activity and growth.
- Dispute Settlement:
  - PSUs/Departments may seek the consent of the contractors/ concessionaires to transfer the arbitration cases initiated under the pre-amended Arbitration Act to the amended Arbitration Act, wherever possible.
  - In those cases where the award is challenged, the government agencies would pay 75% of the arbitral award amount to an escrow account against margin free bank guarantee. This will help in recovery of loans by banks and increase the speed of projects. This will allow the companies to bid for new projects, thus resulting in competition.
  - PSUs/Departments may adopt the Model EPC contracts for construction works.
  - Department of Financial Services, in consultation with Reserve Bank of India, may evolve a suitable one-time scheme for addressing stressed bank loans in the construction sector.

8. India's rail infrastructure has failed to keep pace with the rate at which both passenger and freight traffic has increased substantially over the years. Comment. In light of the Kakodar committee recommendations, enumerate the measures that can be taken in this regard.

Approach:

- Introduce with the existing situation of Indian railways.
- Comment upon how India's rail infrastructure has not been developed as per increasing requirement and problems caused by it.
- Discuss the recommendations of Anil Kakodar committee to improve railways infrastructure in this regard.

Answer:

According to the Ministry of Railways, in the last 64 years, the freight loading has increased by 13 times and passenger kilometers by 16 times, but the route kilometers have grown by only 23%.

Effects:

- Over utilization of existing infrastructure, which causes faster wear and tear.
- Frequent rail accidents mostly caused by derailment and at level crossings leading to death of innocent persons.
- Cross subsidization: Passenger fares are not revised while freight charges are increased to recover cost. This has resulted in shifting of the traffic to other transportation system.
- High operating cost: It means that railways have to spend more to earn less.

- Increase environmental pollution as Railways are less polluting than road transport in terms of per capita goods/passengers.
- Anil Kakodkar committee was appointed in 2011 for reviewing the rail safety issues and recommend improvements. Committee observed key issues: poor financial condition, inadequate performance and lack of autonomy at functional level.

Way forward

- **National Rail Safety Fund:** Rs 1.31 lakh crore have been allocated by the recent budget for rail safety to be spent over a period of next five years.
- **Capital expenditure** has been allocated by the budget to overhaul railway infrastructure, ranging from old tracks to erratic signalling systems.
- Need for an **Independent Railway Safety Authority** with chairman and expert from outside the government. It will do away high degree of vertical integration in the present situation.
- **Elimination of both manned and unmanned crossing** within next five years. For this **Setu Bharatam project** is being implemented under which bridges are being constructed to eliminate railway crossing from National Highways.
- **Improve signalling system by adopting the** Communication Based Train Control System (CBTC) to improve efficiency of track utilization and reduce accidents; adoption of an **Advanced Signalling System** (akin to the European Train Control System) for the entire trunk route length of 19,000 km within 5 years.
- Rationalise tariffs to generate resources, which is being done gradually with the recent budget.
- Restructuring of Research Design and Standards Organization (RDSO) for greater empowerment. Moreover Railway Research and Development Council (RRDC) be set up directly under the government.

Rail infrastructure need to be enhanced to meet increasing demand from both passengers and freight. The focus should be on increasing revenue from freight traffic and increasing investment in rail infrastructure to provide sustainable, safe and efficient transport system.

9. Despite the government claiming excess electricity production, the power situation for households continues to remain bleak in many parts of the country. Explain the reasons behind this. How can the UDAY scheme help in improving the current situation?

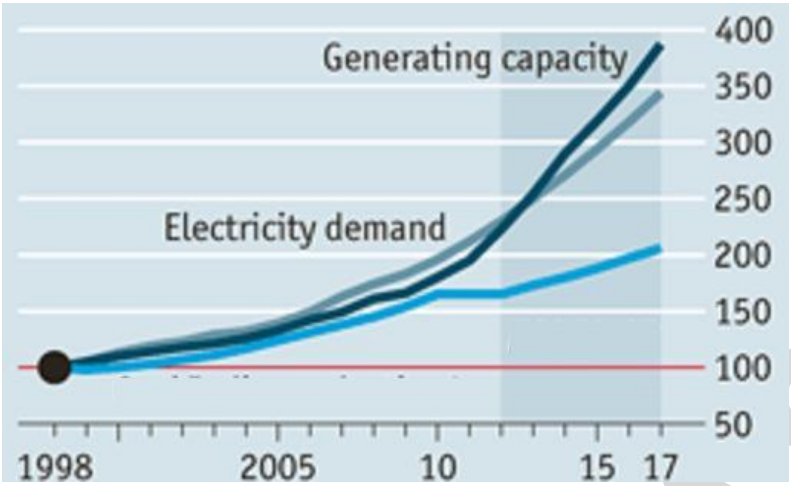
Approach:

- Start with some statistics, like the installed power capacity, and households deprived of constant power supply.
- Discuss the reasons for mismatch between excess power generation and lack of access to power at household level. The most important reason is deficient power off-take by discoms due to poor financial health for buying power.
- Discuss how UDAY scheme would help in this situation.
- Suggest some other measures to ameliorate the situation.

Answer:

India has an installed power generation capacity of 310 GW as of December 2016. With this, India has become world's 3rd largest producer and 4th largest consumer of electricity. However, during 2014-15, per capita electricity generation in India was 1,010 kWh with consumption rate at 746 kWh per capita. It shows that India has surplus

power generation. But, ironically, more than a third of the country's population still lives without power. It is shown below.



Reasons for this paradox:

- **Poor financial health of state distribution companies (Discoms):** Therefore, they are not buying power. Because of this, plants are running at only 60% of their capacity. This is the biggest reason for supply-demand mismatch.
- **Reasons for this state of affairs:** Irrational tariffs i.e. tariffs are lower than production cost; populist measures by states, like waver of electricity bills; free powers to some sections; non-payment of subsidy by states to Discoms; high AT&C losses etc.
- **Underutilized renewable energy:** It is because of technical difficulties in power from renewable plants (solar) on conventional grids and high tariffs..
- **Irrational Tariffs:** There is huge disparity in power tariffs across states, resulting in subdued demand in some states. Further, there are multiple commercial tariffs for different industries making it complex for Discoms to recover the price, while on the other hand, big consumers go for captive power generation.

So it is misleading to say that India has excess power. Statistics show the extent to which power supply falls short of demand by only those connected to the grid. With about 1/3rd of total households still not having electricity connection, the numbers underestimate the extent. Also, it does not capture the quality of power supplied. There are no metrics to estimate the potential power requirement according to standards of living.

UDAY scheme: A way out?

- Debt restructuring of Discoms: It mandates states to take over 75% Discoms debt outstanding as of September 2015.
- Reduction of AT&C losses to 15% by 2018-19 from more than 30% now.
- Rationalize tariffs to reduce the gap between average cost of supply and average revenue realized by 2018-19.
- States shall take over future losses of Discoms in a phased manner and enforce financial discipline.

In this way, UDAY scheme seeks to improve the financial health of Discoms thereby enabling them to buy surplus power to meet the demand.

Further reforms:

- Implement Open Access (OA) Policy: This policy, contained in Electricity Act 2003, provides for unified national power market. Under this policy, large consumers can directly buy power from power plants, rather than through Discoms. This would bypass the disabilities of Discoms, while filling the gap between demand-supply. Indian Railways is going for this policy.
- Effective implementation of schemes: Such as Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) for providing round the clock power to the rural areas; and Power for All to ensure adequate power to all by 2019.

10. The recently launched UDAN scheme to develop the regional aviation market will not only ensure affordability and connectivity but also growth and development of the civil aviation market. Elaborate.

Approach:

- Briefly discuss UDAN scheme and elaborate how this scheme will ensure affordability and connectivity
- Discuss the challenges it may face in the course of implementation

Answer:

UDAN is an innovative scheme of Ministry of Civil Aviation which aims to develop the regional aviation market. It is a market-based mechanism in which airlines bid for seat subsidies. This first-of-its-kind scheme globally will create affordable yet economically viable and profitable flights on regional routes so that flying becomes affordable to the common man even in small towns. It also lends a fillip to India's aim of emerging as the third largest aviation market by 2020.

Ensuring affordability and connectivity

- The passengers would be benefited through additional connectivity on regional routes at prices which are at or below the airfare caps making flying affordable for common man.

The operators could seek a **Viability Gap Funding (VGF)** apart from getting various concessions like free of cost fire, water, electricity etc. to start operations on hitherto unserved routes.

- For reducing operating costs for regional operators the scheme brings down the operating cost for an airline by reducing taxes on aviation turbine fuel (ATF) and airport and other charges to maintain balance between commercial and consumer interests
- Improving liquidity in the small plane leasing market will make it easy for entrepreneurs and airlines to start these unserved or underserved routes. For example – spicejet recently unveiled its plan to lease as many as 10 planes for this scheme.
- The government also plans to upgrade 50 unserved and underserved airports in the country which would further boost air connectivity pan India.

Development of domestic aviation market

- To stimulate further growth and development of the sector, amount collected as Regional Connectivity Fund (RCF) will be used to provide financial support to

airlines in the form of Viability Gap Funding (VGF) for operations under the Scheme. The RCF levy per departure will be applied to certain domestic flights.

The partner State Governments (other than North Eastern States and Union Territories where contribution will be 10 %) would contribute a **20% share to this fund** which will be used for the development of aviation market

- Creation of regional air connectivity / services that would have spin-off benefits within the sector in terms of passengers taking other flights (not under RCS) and using airports / airport services that are not at concessional rates under RCS. The amount collected under the levy will be ploughed back into the sector.
- Amount expected to be collected under this levy in context of other businesses which create connectivity and benefit from the network effect, for example, telecom and railways
- Step to use civil aviation to boost tourism, jobs and balanced regional growth across the country.
- Exclusive rights will be given to the regional airlines on a route for the 1st three years to ensure commercial viability of these regional routes and aiding the growth of aviation market.

Challenges

- **Technical infrastructure** like equipments, technical manpower etc. Mostly, these are day airports without night training facility. If this is included, the costs would be very high and runways have to be improved as well. Air traffic control services and air safety also need to be ramped up.
- **Participation of mainstream airlines** is unlikely as they are already dealing with heavy traffic flow. Also, the overhead cost for a small aircraft is almost same as that of bigger aircrafts. Therefore, low cost operations might not ensure much profit for big airlines. Investments have to be attracted here from new and local investors.
- **Increased fiscal burden –** because viability-gap funding, subsidized ATF and concessions have to be ensured. States need to provide free land and operational infra to bring down costs.
- **Overburdening of Air India** - Lack of interest of private players, may overburden Air India.

11. An effective multi-modal logistics and transport sector will make the Indian economy more competitive. Analyse.

Approach:

- Begin by briefly discussing the problems facing logistics and transport sector in India.
- Proceed to suggest the need for an effective multi-modal logistics and transport sector to make Indian economy more competitive.
- Conclude by mentioning steps taken by the government in this regard.

Answer:

Logistics and transportation sector is considered as backbone of the economy because it provides flow of goods efficiently on which success of other commercial sectors depend. Therefore, the logistics infrastructure has gained a lot of attention both from business industry as well as policy makers.

India's logistics and transport sector is fraught with several issues and challenges. It has largely developed in silos resulting in overly complex regulation and administrative

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procedures. In addition, there are missing modal links and the modal mix is inefficient. For instance, transport by rail and inland waterways is far more cost and time efficient than transport by roads and should account for high proportions of the freight flow. However, while road freight accounts for 54% and railways 33%, just 6% of freight transported in India is carried by coastal shipping and inland waterways.

Consequently, India needs to build a new and robust logistics network to allow inputs, components and finished goods to move across the country seamlessly. An effective multi-modal logistics and transport sector will make our economy more competitive due to the following reasons:

- **Reduces cost:** Efficient transportation and logistics reduce transport time and costs. Moreover, they reduce cost of production by minimizing the need for large inventories. This means less capital required for warehouses, insurance and the like.
- **Creates markets for other goods:** The conventional view of demand in the logistics sector states that it is derived demand. However, growth in transport and logistics enterprises can create markets for other goods.
- **Enhances Inter-state trade:** Reducing friction via improved logistics could boost inter-state trade flows in India that already stand at a healthy 54% of GDP.
- **Keeps pace with demand for transport:** The demand for transport has accelerated manifold since the 1990's. It is important to keep pace with it. Otherwise, it could thwart the manufacturing push and attempts to boost farmer earnings to the benefits of urban agglomeration economies.
- **Complements GST:** A robust multi modal logistics network will allow companies to restructure their supply chains once the domestic market is truly integrated. This would complement GST implementation.
- Lastly, efficient logistics networks can **reduce divergence in regional growth.**

Realising its importance, the government has put forth its plans to draw up and implement a specific programme for development of multi-modal logistics parks, together with multi-modal transport facilities. This programme aims to switch to a hub-and-spoke model from India's current point-to-point logistics model. It entails setting up 35 multi-modal logistics parks at a cost of Rs 50,000 crore, developing 50 economic corridors and inviting investment from the states and private sector. Most importantly, it envisages an integrated approach that will utilize railways, highways, inland waterways and airports to create a transportation grid that covers the country.

13. Previous Years UPSC Mains Questions

1. Explain how private public partnership agreements, in longer gestation infrastructure projects, can transfer unsuitable liabilities to the future. What arrangements need to be put in place to ensure that successive generations' capacities are not compromised?
2. Adaptation of PPP model for infrastructure development of the country has not been free from criticism. Critically discuss the pros and cons of the model.
3. Write a note on India's green energy corridor to alleviate the problems of conventional energy.
4. National urban transport policy emphasizes on moving people instead of moving vehicles. Discuss critically the success of various strategies of the government in this regard.
5. There is a clear acknowledgement that Special Economic Zones (SEZs) are a tool of industrial development, manufacturing and exports. Recognizing this potential, the whole instrumentality of SEZs requires augmentation. Discuss the issues plaguing the success of SEZs with respect to taxation, governing laws and administration.

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6. What are 'Smart Cities? Examine their relevance for urban development in India. Will it increase rural-urban differences? Give arguments for Smart Villages' in the light of PURA and RURBAN Mission.
7. Examine the developments of Airports in India through Joint Ventures under Public-Private Partnership (PPP) model. What are the challenges faced by the authorities in this regard.
8. Give an account of the current status and the targets to be achieved pertaining to renewable energy sources in the country. Discuss in brief the importance of National Programme on Light Emitting Diodes (LEDs).

INVESTMENT MODELS

Contents

1. Models Used in the Planning Process

Growth in GDP is not the only determinant of economic development, which in order to be measured effectively must account for human welfare determinants such as life expectancy, literacy rates, child mortality rates, distribution of income, and so on. However, it has been shown throughout history that economic growth, or the increase in real output and income, correlates directly with improvements in development factors like those above. And to achieve fast paced economic growth we need appropriate growth models, some of which are discussed below:

1.1. Harrod – Domar Growth Model

Harrod and Domar analyzed the dynamic nature of investment and demand and showed how variations in capital and in demand were responsible for instability in economic growth. Therefore, this model suggests that the economy's growth rate depends on two factors:

- Level of savings; and
- Productivity of investment i.e. Capital to Output ratio.

Hence the rate of economic growth in a country depends on the rate of investment and capital-output ratio. Harrod and Domar arrived at the following relation:

Growth Rate = Investment * (1/Capital-Output Ratio)

Incremental Capital-Output Ratio
The incremental capital output ratio (ICOR) is a metric that assesses the marginal amount of investment capital necessary for an entity to generate the next unit of production. For example, suppose that Country X has an incremental capital output ratio (ICOR) of 10. This implies that $10 worth of capital investment is necessary to generate $1 of extra production.

1.1.1. Relevance of Harrod-Domar Model for Developing Countries

Harrod-Domar model was formulated primarily to protect the developed countries from chronic unemployment and they were not meant to provide guidelines to the developing economies in their economic development. Since they were formulated primarily for the developed countries they were based on high propensity to save and a correct estimate of the capital-output ratio, which should remain fixed over time. On the other hand, the main problems of the under-developed countries is to raise their propensity to save because it is generally low in these countries. Nor is it possible to assume a fixed value of the capital-output ratio. This ratio happens to be very high in these countries. Thus the two important bases of the Harrod-Domar model are non-existent in the case of developing economies.

Thus the peculiar conditions prevailing in the developing countries e.g. disguised unemployment, low propensity to save and low productive capacity makes the Harrod-Domar model inapplicable to them. Also, this model assumes no government intervention, fixed prices and no institutional changes. All these assumptions too make it inappropriate.

However, we should not reject this model wholesale and emphasize their inapplicability to developing economies. With slight modifications and reinterpretation they can be made to furnish suitable guidelines even for the developing economies. In some cases, it is only a question of changing the emphasis. For instance, Domar's model recognizes the capacity creating role of investment. But it is intended to increase effective demand in developed countries, while in developing countries, the capacity creating role of investment is to be seen as a means of overcoming the problem of unemployment. Hence, to make the model applicable to the developing countries, it has to be suitably reinterpreted.

1.2. Mahalanobis Strategy of Economic Growth

There has been a lot of controversy in our country on the appropriate strategy to be adopted for planned economic development. There was no clear strategy in the First Five-Year Plan. But when the second plan was being formulated Prof. P.C Mahalanobis prepared a growth model in which he showed that to achieve a self-sustained growth quickly in the country, it would be essential to devote a major part of the development outlay to building basic heavy industry, e.g. of capital goods industry like steel and the engineering industry for making different types of machines, the multipurpose river valley projects for irrigation and power.

According to Prof. Mahalanobis, the rate of real capital formation in a country like India did not depend merely on savings in the form of money but it depends on the capacity for making capital goods. He argued that even if the rate of savings was substantially raised and it was desired to accelerate economic growth and capital formation by investing it in the consumer goods industries, it would be futile. The reason is that the capital goods required for the consumer goods industries are not produced in the country in sufficient quantities.

Thus, Prof. Mahalanobis was of the view that if large investment is not made in the heavy basic and capital goods industry, the country will forever remain dependent on foreign countries for the imports of steel and capital goods like machinery for economic development and real capital formation. Since it is not possible for India to earn sufficient foreign exchange for the purpose by increasing exports, the capital goods cannot be imported in sufficient owing to foreign exchange constraints. The result will be that the rate of economic growth and the rate of real capital formation in the country will be slow indeed. Thus according to him, to achieve rapid economic growth and self-reliance, it would be necessary to give a high priority to basic and capital goods industries in the development strategy of a plan.

1.3. Planning Model Adopted in India

The second five year plan was based on the Nehru-Mahalanobis strategy of development, which guided the planning practice for more than three decades until the end of the Seventh Five Year Plan. The draft outline of this plan was based on the Mahalanobis Model which was viewed as a variant of the Soviet Planning model. The basic elements of this strategy can be summed up as:

- Raising the rate of investment since the rate of development is dependent on the rate of investment. It involved stepping up domestic and foreign savings also
- Rapid growth of the productive capacity of the economy by directing public investment toward development of industries. Simultaneously, promotion of labor-intensive, small and cottage industries
- Import substitution for self-reliance
- An elaborate system of controls and industrial licensing
- Predominance of public sector in capital goods industries

2. Infrastructure Investment Models

2.1. Financing of Infrastructure: Need, Issue and Challenges

The relationship between infrastructure development and economic growth is well established in the literature. While infrastructure development facilitates economic growth; economic growth increases demand for more infrastructure. Thus, development of adequate and quality infrastructure is a necessary if not sufficient condition to maintain growth momentum in any economy. However, infrastructure development is an arduous job for any country as it involves huge investments, long gestation periods, procedural delays and returns spread over a long

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period of time. These unique features of infrastructure development raise some issues which are specific to the financing of infrastructure.

To revert back to the high economic growth rate (8-9%), the rate of investment has to increase substantially (We need 1 Trillion Dollars of investment in infrastructure in next two to three years- National Investment and Infrastructure Fund). This is evidenced by the decline of growth rate and investment rate in last couple of years. Let us look at the broad pattern of financing of infrastructure in our country before highlighting some of the issues involved in it.

2.2. Issues in Infrastructure Financing

- **Funding Gap** - Funding Gap is the most important issue that we face on this front. The slowdown in the economy has further aggravated this funding gap in the infrastructure sector.
- **Fiscal Burden** - Almost half of the total investment in the infrastructure sector was done by the Government through budget allocations. But the Government funds have competing demands, such as, education, health, employment generation, among others.
- **Asset-Liability Mismatch of Commercial Banks** - After the budgetary support, next in line for financing infrastructure were funds from the commercial banking sector. However, it is a well-known fact that these are institutions that primarily leverage on short-term liabilities and, as such, their ability to extend long-term loans to the infrastructure sector is limited. This is because, by doing so they get into serious asset-liability mismatches.
- **Investment Obligations of Insurance and Pension Funds** - From the point of view of asset-liability mismatches, insurance and pension funds are one of the best suited institutions to invest in the infrastructure sector. This is because, in contrast to the commercial banking sector, these institutions leverage on long-term liabilities. However, they are constrained by their obligation to invest a substantial portion of their funds in Government securities. Of course, in a way, this facilitates the financing of gross fiscal deficit of the Central Government and hence enables the Central Government to make more investments. However, this limits the direct investment of these institutions in the infrastructure sector
- **Need for an Efficient and Vibrant Corporate Bond Market** - An active corporate bond market can facilitate long-term funding for the infrastructure sector. However, despite the various initiatives taken by the Reserve Bank, Securities & Exchange Board of India and Government of India, the corporate bond market is still a long way to go in providing adequate financing to the infrastructure sector in India.
- **Developing Municipal Bond Market for Financing Urban Infrastructure** -For large scale financing urban infrastructure which is assuming critical importance in the context of rapid urbanization, conventional fiscal transfers to the urban local bodies or municipals from governments are no longer considered sufficient.
  As a result, there have been some earnest experimentations by these bodies to tap unconventional methods of financing such as public private partnerships (PPPs), utilizing urban assets more productively, accessing carbon credits, etc. but then these do not address the financing needs. One possible way of addressing the problem is developing a municipal bond market.
- **Insufficiency of User Charges** - It is a well-known fact that a large part of the infrastructure sector in India (especially irrigation, water supply, urban sanitation, and state road transport) is not amenable to commercialization for various reasons, such as, regulatory, political and legal constraints in the real sector. Due to this, Government is not in a position to levy sufficient user charges on these services. The insufficiency of user charges on infrastructure projects negatively affect the servicing of the infrastructure loans. Generally, such loans are taken on a non-recourse basis and are highly dependent on cash flows.

Hence, levy and collection of appropriate user charges becomes essential for financial viability of the projects.

- **Legal and Procedural Issues** - Infrastructure development involves long gestation periods, and also many legal and procedural issues. The problems related to infrastructure development range from those relating to land acquisition for the infrastructure project to environmental clearances for the project. Many a times there are legal issues involved in it and these increase procedural delays.

2.3. Measures Taken by the Government

- **Public-Private Partnership Projects in Infrastructure -** As Government faces a tight budget constraint in the context of a rule based fiscal policy framework, it was important to encourage the private sector to invest more in the infrastructure sector. Resultantly, the Government started encouraging Public-Private Partnership (PPP) projects in the infrastructure sector. PPP mechanism provides built in credit enhancement for improving project viability by way of buyback guarantee, escrow arrangement, substitution rights for the lenders, etc. Government has taken several initiatives, especially to standardize the documents and process for structuring and award of PPP projects. This has improved transparency in relation to the issues involved in setting up PPP projects.
- **Viability Gap Funding** Viability gap funding was introduced in 2006, which provides Central Government grants up to 20 per cent of the total capital cost to PPP projects undertaken by any central ministry, state government, statutory entity, or local body. The scheme aimed at providing upfront capital grant to PPP projects to enable financing of commercially unviable projects. The level of grant is the net present value of the gap between the project cost and estimated revenue generation over the concession period based on a user fee that was to be levied in a pre-determined manner.
- **Foreign Direct Investment and Infrastructure Development -** To facilitate infrastructure financing 100 per cent FDI is allowed under the automatic route in some of the sectors such as mining, power, civil aviation sector, construction and development projects, industrial parks, petroleum and natural gas sector, telecommunications and special economic zones. Further, FDI is also allowed through the Government approval route in some sectors such as civil aviation sector, Petroleum and Natural Gas sector – refining PSU companies; Telecommunications etc.
- **Setting up of India Infrastructure Finance Company Limited (IIFCL) -** Another major development was the setting up of IIFCL by the Central Government for providing long-term loans to the infrastructure projects. IIFCL is involved both in direct lending to project companies and refinancing of banks and other financial institutions. IIFCL can provide funds to the infrastructure project up to 20 per cent of the total project cost as long-term debt
- **Setting up of Infrastructure Debt Funds -** Reserve Bank of India and the Securities and Exchange Board of India (SEBI) notified detailed guidelines for setting up of IDFs which can either be a mutual fund (trusts) (IDF-MF) or an NBFC (companies) (IDF-NBFC). The Scheduled commercial banks are allowed to act as sponsors to IDF-MFs and IDF-NBFCs with prior approval from RBI subject to certain terms and conditions.
- **Tapping the retail investor base through Infrastructure Bonds -** To provide further impetus to infrastructure financing, Government of India has permitted IFCI, IDFC, LIC and infrastructure finance firms to issue long-term infrastructure bonds providing for tax benefit.
- **Use of Foreign Exchange Reserves for Infrastructure Development -** Although use of reserves for such purposes does not meet the criterion of reserve management objectives, a special and limited window has been created. Accordingly, IIFC (UK) Ltd. was incorporated in London and was set up in April 2008. Under this scheme, RBI invests, in tranches, up to

Student Notes:

an aggregate amount of USD 5 billion in fully government guaranteed foreign currency denominated bonds issued by this overseas Special Purpose Vehicles (SPV) of the IIFCL. The funds, thus raised, are to be utilized by the company for on-lending to the Indian companies implementing infrastructure projects in India and/or to co-finance the ECBs of such projects for capital expenditure outside India without creating any monetary impact.

- **Introduction of Credit Default Swaps -** Further, the introduction of Credit Default Swaps (CDS) would help banks to manage exposures while increasing credit penetration, and lending to infrastructure and large firms without being constrained by the extant regulatory prescriptions in respect of single borrower gross exposure limits.
- **Liberalization & Rationalization of ECB policies -** The ECB limit for infrastructure has been raised to promote investment in this sector.
- **Establishing National Investment and Infrastructure Fund (NIIF)**- It is India's **first sovereign wealth fund** that seeks to create long-term value for domestic and international investors seeking investment in energy, transportation, housing, water, waste management etc. in greenfield, brownfield and stalled projects. It has been set up as fund of funds and is registered with Securities and Exchange Board of India (SEBI). The **corpus of the fund** is proposed to be around Rs. 40, 000 crore, with the government investing 49% and the rest to be raised from third-party investors such as sovereign wealth funds, insurance and pension funds.

2.4. Public-Private Partnership (PPP) in Infrastructure

The partners in a PPP, usually through a legally binding contract or some other mechanism, agree to share responsibilities related to implementation and/or operation and management of an infrastructure project. This collaboration or partnership is built on the expertise of each partner that meets clearly defined public needs through the appropriate allocation of:

- Resources
- Risks
- Responsibilities, and
- Rewards

2.4.1. What advantages PPPs may provide?

Governments worldwide have increasingly turned to the private sector to provide infrastructure services in energy and power, communication, transport and water sectors that were once delivered by the public sector. There are several reasons for the growing collaboration with the private sector in developing and providing infrastructure services, which include:

- Increased efficiency in project delivery, and operation and management;
- Availability of additional resources to meet the growing needs of investment in the sector; and
- Access to advanced technology (both hardware and software).

2.4.2. How a PPP project is different from a conventional project?

There are significant differences between a conventional construction procurement project and a PPP project that need to be clearly understood. The main differences include:

- PPP projects are different from conventional construction projects in terms of project development, implementation, and management. The administrative and approval processes in the case of PPP projects are also different.
- A PPP project is viable essentially when a robust business model can be developed.
- The risk allocation between the partners is at the heart of any PPP contract design and is more complex than that of a conventional construction project. Both partners should

clearly understand the various risks involved and agree to an allocation of risks between them.
- A PPP contract generally has a much longer tenure than a construction contract. Managing the relationship between the private company and the implementing agency over the contract tenure is vital for the success of a PPP project.

2.4.3. Are there any limitations of PPPs?

There are many important economic, social, political, legal, and administrative aspects, which need to be carefully assessed before approvals of PPPs are considered by the government. PPPs have various limitations which should also be taken into account while they are being considered. The major limitations include:

- Not all projects are feasible (for various reasons: political, legal, commercial viability, etc.).
- The private sector may not take interest in a project due to perceived high risks or may lack technical, financial or managerial capacity to implement the project.
- A PPP project may be more costly unless additional costs (due to higher transaction and financing costs) can be off-set through efficiency gains.
- Change in operation and management control of an infrastructure asset, as has been the traditional BOT model.
- PPP may not be sufficient to improve its economic performance unless other necessary conditions are met. These conditions may include appropriate sector and market reform, and change in operational and management practices of infrastructure operation.
- Often, the success of PPPs depends on regulatory efficiency.

2.4.4. Models of PPP

A wide spectrum of PPP models has emerged. These models vary mainly by:

- Ownership of capital assets;
- Responsibility for investment;
- Assumption of risks; and
- Duration of contract.

The PPP models can be classified into following broad categories in order of generally (but not always) increased involvement and assumption of risks by the private sector. These categories are:

- Supply and management contracts
- Turnkey contracts
- Affermage/Lease
- Concessions
- Private Finance Initiative (PFI) and Private ownership.

A categorization of the PPP models together with their main characteristics is shown in table 1. While the spectrum of models shown in the table are possible as individual options, combinations are also possible such as, a lease or (partial) privatization contract for existing facilities which incorporates provisions for expansion through Build-Operate- Transfer.

Figure 1. Basic features of PPP models

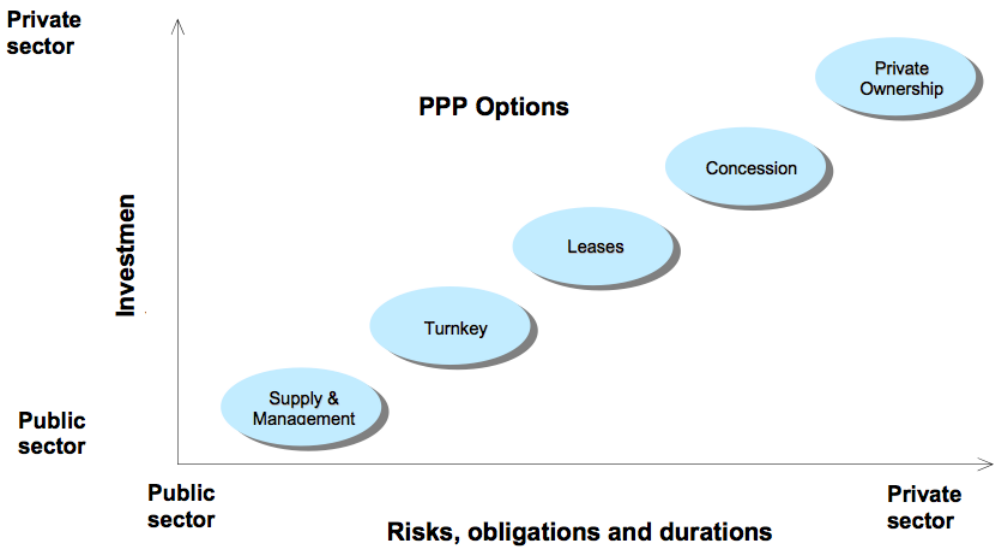


Table 1. Classification of PPP models

Broad category	Main variants	Ownership of capital assets	Responsibility of investment	Assumption of risk	Duration of contract (years)
Supply and management contract	Outsourcing	Public	Public	Public	1-3
	Maintenance management	Public	Public/Private	Private/Public	3-5
	Operational management	Public	Public	Public	3-5
Turnkey		Public	Public	Private/Public	1-3
Affermage/Lease	Affermage	Public	Public	Private/Public	5-20
	Lease*	Public	Public	Private/Public	5-20
Concessions	Franchise	Public/Private	Private/Public	Private/Public	3-10
	BOT**	Public/Public	Private/Public	Private/Public	15-30
Private ownership of assets and PFI type	BOO/DBFO	Private	Private	Private	Indefinite
	PFI***	Private/Public	Private	Private/Public	10-20
	Divestiture	Private	Private	Private	Indefinite

*Build-Lease-Transfer (BLT) is a variant.

**Build-Operate-Transfer (BOT) has many other variants such as Build-Transfer-Operate (BTO), Build-Own- Operate-Transfer (BOOT) and Build-Rehabilitate-Operate-Transfer (BROT).

***The Private Finance Initiative (PFI) model has many other names. In some cases, asset ownership may be transferred to, or retained by the public sector.

The main features of each of the broad categories of the PPP models are discussed next.

Supply and Management Contracts

A management contract is a contractual arrangement for the management of a part or whole of a public enterprise (for example, a specialized port terminal for container handling at a port or a utility) by the private sector. Management contracts allow private sector skills to be brought

into service design and delivery, operational control, labour management and equipment procurement. However, the public sector retains the ownership of facility and equipment. The private sector is assigned specified responsibilities concerning a service and is generally not asked to assume commercial risk.

The private contractor is paid a fee to manage and operate services. Normally, the payment of such fees is performance-based. Usually, the contract period is short, typically three to five years. But the period may be longer for large and complex operational facilities such as a port or an airport.

Pros:

- Can be implemented in a short time.
- Least complex of all PPP models.
- In some countries, politically and socially more acceptable for certain projects (such as water projects and strategic projects like ports and airports).

Cons:

- Efficiency gains may be limited and little incentive for the private sector to invest.
- Almost all risks are borne by the public sector.
- Applicable mainly to existing infrastructure assets.

Turnkey

Turnkey is a traditional public sector procurement model for infrastructure facilities. Generally, a private contractor is selected through a bidding process. The private contractor designs and builds a facility for a fixed fee, rate or total cost, which is one of the key criteria in selecting the winning bid. The contractor assumes risks involved in the design and construction phases. The scale of investment by the private sector is generally low and for a short-term. Typically, in this type of arrangement, there is no strong incentive for early completion of the project. This type of private sector participation is also known as Design-Build.

Pros:

- Well understood traditional model.
- Contract agreement is not complex.
- Generally, contract enforcement is not a major issue.

Cons:

- The private sector has no strong incentive for early completion.
- All risks except those in the construction and installation phases are borne by the public sector.
- Low private investment for a limited period.
- Only limited innovation may be possible.

Affermage/Lease

In this category of arrangement, the operator (the leaseholder) is responsible for operating and maintaining the infrastructure facility (that already exists) and services, but generally the operator is not required to make any large investment. However, often this model is applied in combination with other models such as build- rehabilitate-operate-transfer. In such a case, the contract period is generally much longer and the private sector is required to make significant investment.

The arrangements in an affermage and a lease are very similar. The difference between them is technical. Under a lease, the operator retains revenue collected from customers/users of the

facility and makes a specified lease fee payment to the contracting authority. Under an affermage, the operator and the contracting authority share revenue from customers/users.

In the affermage/lease types of arrangements, the operator takes lease of both infrastructure and equipment from the government for an agreed period of time. Generally, the government undertakes the responsibility for investment and thus bears investment risks. The operational risks are transferred to the operator. However, as part of the lease, some assets also may be transferred on a permanent basis for a period which extends over the economic life of assets. Fixed facilities and land are leased out for a longer period than for mobile assets. Land to be developed by the leaseholder is usually transferred for a period of 15-30 years.

Pros:

- Can be implemented in a short time.
- Significant private investment possible under longer term agreements.
- In some countries, legally and politically more acceptable for strategic projects like ports and airports.

Cons:

- Has little incentive for the private sector to invest, particularly if the lease period is short.
- Almost all risks are borne by the public sector.
- Generally used for existing infrastructure assets.
- Considerable regulatory oversight may be required.

Concessions: BOT/BTO/BROT/BLT

In this form of PPP, the government defines and grants specific rights to an entity (usually a private company) to build and operate a facility for a fixed period of time. The government may retain the ultimate ownership of the facility and/or right to supply the services. In concessions, payments can take place both ways: concessionaire pays to government for the concession rights and the government may pay the concessionaire, which it provides under the agreement to meet certain specific conditions. Usually, such payments by the government may be necessary to make projects commercially viable and/or reduce the level of commercial risk taken by the private sector, particularly in a developing or untested PPP market. Typical concession periods range between 5 to 50 years.

Pros:

- Private sector bears a significant share of the risks.
- High level of private investment.
- Potential for efficiency gains in all phases of project development and implementation and technological innovation is high.

Cons:

- Highly complex to implement and administer.
- Difficult to implement in an untested PPP market.
- May have underlying fiscal costs to the government.
- Negotiation between parties and finally making a project deal may require long time.
- May require close regulatory oversight.
- Contingent liabilities on government in the medium and long term

BOT Model

In a ***Build-Operate-Transfer or BOT*** type of concession (and its other variants namely, ***Build-Transfer-Operate (BTO)***, ***Build-Rehabilitate-Operate-Transfer (BROT), Build-Lease-Transfer***

(BLT) type of arrangement), the concessionaire makes investments and operates the facility for a fixed period of time after which the ownership reverts back to the public sector. In a BOT model, operational and investment risks can be substantially transferred to the concessionaire. In a BOT model, the government has, however, explicit and implicit contingent liabilities that may arise due to loan guarantees and sub-ordinate loans provided, and default of a sub-sovereign government and public or private entity on non- guaranteed loans.

By retaining ultimate ownership, the government controls the policy and can allocate risks to parties that are best suited to assume or remove them. BOT projects may also require direct government support to make them commercially viable. The concessionaire's revenue in a BOT project comes from managing and marketing of the user facilities (for example, toll revenue in a toll road project) and renting of commercial space where possible. Concessions for BOT projects can be structured on either maximum revenue share for a fixed concession period or minimum concession period for a fixed revenue share, a combination of both, or only minimum concession period.

The problem of this model include the appropriate sharing of risks. In general, a project is financially viable for the private entity if the revenues generated by the project cover its cost and provide sufficient return on investment. The private entity is expected to bring the expertise and efficiency as well as the risk transfer. These are some types of the most common risks involved:

- Political risk: especially in the developing countries because of the possibility of dramatic overnight political change.
- Technical risk: construction difficulties, for example unforeseen soil conditions, breakdown of equipment
- Financing risk: foreign exchange rate risk and interest rate fluctuation, market risk (change in the price of raw materials), income risk (over-optimistic cash-flow forecasts), cost overrun risk.

BOOT (build–own–operate–transfer)

A BOOT structure differs from BOT in that the private entity owns the works. During the concession period the private company owns and operates the facility with the prime goal to recover the costs of investment and maintenance while trying to achieve higher margin on project. The specific characteristics of BOOT make it suitable for infrastructure projects like highways, roads mass transit, railway transport and power generation and as such they have political importance for the social welfare but are not attractive for other types of private investments. BOOT & BOT are methods which find very extensive application in countries which desire ownership transfer and operations including. Some advantages of BOOT projects are:

- Encourage private investment
- Inject new foreign capital to the country
- Transfer of technology and know-how
- Completing project within time frame and planned budget
- Providing additional financial source for other priority projects
- Releasing the burden on public budget for infrastructure development

BOO (build–own–operate)

In a BOO project ownership of the project remains usually with the project company for example a mobile phone network. Therefore, the private company gets the benefits of any residual value of the project. This framework is used when the physical life of the project coincides with the concession period. A BOO scheme involves large amounts of finance and long payback period. Some examples of BOO projects come from the water treatment plants.

Student Notes:

This facilities run by private companies process raw water, provided by the public sector entity, into filtered water, which is after returned to the public sector utility to deliver to the customers.

BLT (build–lease–transfer)

Under BLT a private entity builds a complete project and leases it to the government. On this way the control over the project is transferred from the project owner to a lessee. In other words, the ownership remains by the shareholders but operation purposes are leased. After the expiry of the leasing the ownership of the asset and the operational responsibility are transferred to the government at a previously agreed price. For foreign investors taking into account the country risk BLT provides good conditions because the project company maintains the property rights while avoiding operational risk.

Private Finance Initiative (PFI) Model

- In the private finance initiative model, the private sector remains responsible for the design, construction and operation of an infrastructure facility. In some cases, the public sector may relinquish the right of ownership of assets to the private sector.
- In this model, the public sector purchases infrastructure services from the private sector through a long-term agreement. PFI projects, therefore, bear direct financial obligations to the government in any event. In addition, explicit and implicit contingent liabilities may also arise due to loan guarantees provided to the lenders and default of a public or private entity on non-guaranteed loans. A PFI project can be structured on minimum payment by the government over a fixed contract tenure, or minimum contract tenure for a fixed annual payment, or a combination of both payment and tenure.
- In the PFI model, asset ownership at the end of the contract period is generally transferred to the public sector. Setting up of a Special Purpose Vehicle (SPV) may not be always necessary. A PFI contract may be awarded to an existing company. For the purpose of financing, the lenders may, however, require the establishment of an SPV. The PFI model also has many variants.
- In a PFI project, as the same entity builds and operates the services, and is paid for the successful supply of services at a pre-defined standard, the SPV / private company has no incentive to reduce the quality or quantity of services. This form of contractual agreement reduces the risks of cost overruns during the design and construction phases or of choosing an inefficient technology, since the operator’s future earnings depend on controlling the costs. The public sector’s main advantages lie in the relief from bearing the costs of design and construction, the transfer of certain risks to the private sector and the promise of better project design, construction and operation.

Pros:

- Private sector may bear a significant share of the risks.
- High level of private investment.
- Potential for efficiency gains and innovation is high.
- Attractive to private investors in an untested or developing PPP market.
- Most suitable for social sector infrastructure projects (schools, dormitories, hospitals, community facilities, etc.).

Cons:

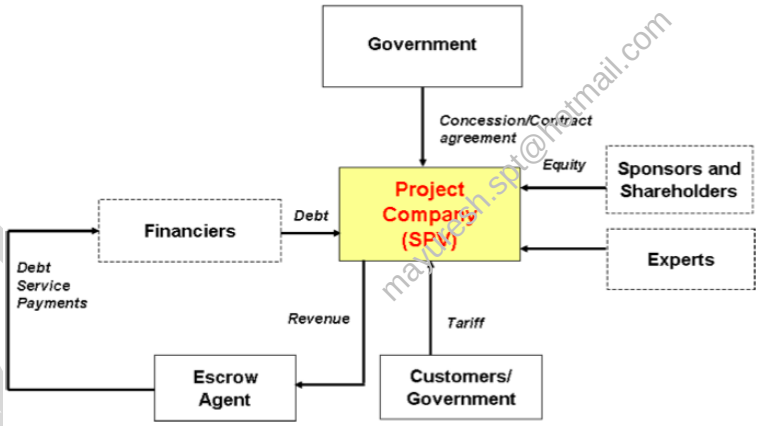
- Complex to implement and manage the contractual regimes.
- Government has direct financial liability.
- Negotiation between parties may require long time.
- Regulatory efficiency is very important.
- Contingent liabilities on the government in the medium and long term.

Understanding the basic structure of a PPP arrangement

A typical PPP structure can be quite complex involving contractual arrangements between a number of parties, including the government, project sponsor, project operator, financiers, suppliers, contractors, engineers, third parties (such as an escrow agents), and customers. The creation of a separate commercial venture called a Special Purpose/Project Vehicle (SPV) is a key feature of most PPPs. The SPV is a legal entity that undertakes a project and negotiates contract agreements with other parties including the government. An SPV is also the preferred mode of PPP project implementation in limited or non-recourse situations, where the lenders rely on the project's cash flow and security over its assets as the only means to repay debts

- The actual structure of a PPP, however, depends on the type of partnership model and can be quite complex involving contractual arrangements between a number of parties including the government, project sponsor, project operator, financiers, suppliers, contractors, engineers, third parties (for example, an escrow agent), and customers.
- An SPV is usually set up by the private concessionaire/sponsor(s), who in exchange for shares representing ownership in the SPV contribute the long-term equity capital, and agree to lead the project. The SPV may not always be directly owned by the sponsors. They may use a holding company for this purpose.
- An important characteristic of an SPV as a company is that it cannot undertake any business that is not part of the project. An SPV as a separate legal entity protects the interests of both the lenders and the investors. The formation of an SPV has also many other advantages. A project may be too large and complicated to be undertaken by one single investor considering its investment size, management and operational skills required and risks involved. In such a case, the SPV mechanism allows joining hands with other investors who could invest, bring in technical and management capacity and share risks, as necessary.

Figure 2. Typical structure of a PPP project[7]



- The government may also contribute to the long-term equity capital of the SPV in exchange of shares. In such a case, the SPV is established as a joint venture company between the public and private sectors and the government acquires equal rights and equivalent interests to the assets within the SPV as other private sector shareholders.
- Sometimes, governments want to ensure a continued interest (with or without controlling authority) in the management and operations of infrastructure assets such as a port or an airport particularly those which have strategic importance, or in assets that require significant financial contribution from the government. In such a case, a joint venture may be established. A joint venture is an operating company owned by a government entity and a private company (or multiple companies including foreign companies if permitted by law), or a consortium of private companies.

- Often, an SPV is formed as a joint venture between an experienced construction company and a service operations company capable of operating and maintaining the project.
- Other than its strategic, financial and economic interest, the government may also like to directly participate in a PPP project. The main reasons for such direct involvement may include:
  - To hold interest in strategic assets;
  - To address political sensitivity and fulfil social obligations;
  - To ensure commercial viability of the project;
  - To provide greater confidence to lenders; and
  - To have better insight to protect public interest.

Direct government involvement in a PPP project is usually guided by the legal and regulatory regime of the country and the government policy on PPPs. For example, the government may hold certain defined percentage of the stake in a strategic project such as an airport or a port.

PPP Initiatives in India

The Government of India is promoting PPPs as an effective tool for bringing private-sector efficiencies in creation of economic and social infrastructure assets and for delivery of quality public services. India in recent years has emerged as one of the leading PPP markets in the world, because of several policy and institutional initiatives taken by the central government. By end December 2012 there were over 900 PPP projects in the infrastructure sector. These projects are at different stages of implementation, i.e. bidding, construction, and operational.

2.4.5. Problems Faced by Private Builders Under PPP Leading to Inefficient Implementation

- Delay in land acquisition and institutional clearances like forest clearance, defense land handovers hampered pace of construction.
- Under PPP, capital completely or partly was to be raised by private player through issuing private equity bonds and borrowing from banks.
- But, due to delayed implementation, private players weren't able to pay back loan in time adding to NPA in banks, eventually instigating many banks to stop lending loans
- Delayed implementation also affected fund raising through private equities as they couldn't find investors for new ventures
- Another area where private players faced difficulty was in assessing the traffic on roads and subsequent designing of roads.

Above major problems over stretched the balance sheets of builders and led them exiting projects.

Global experience indicates that PPPs work well when they combine the efficiency and risk assessment of the private sector with the public purpose of the government sector. They work poorly when they rely on the efficiency and risk assessment of the government sector and the public purpose of the private sector.

India should be careful not to undertake PPPs that do not apportion risks and responsibilities sensibly. Moreover flexibility needs to be built into arrangements so that the contract can be withdrawn and put up for rebid when the private party underperforms. The government needs to study the PPP experience and build some central capacity to help ministries, authorities, and states structure contracts and renegotiate troubled ones.

2.5. EPC MODEL

Highway sector in India is responsible for job creation for millions of people and has a multiplier effect on the economy. Hence government took immediate measures to boost the sector by adopting EPC Model and the acronym stands for **Engineering, Procurement and Construction.**

Engineering procurement and construction is the new system of private sector participation aimed at overcoming the shortcomings of PPP model. Under EPC model the contractor is legally responsible to complete the project under some fixed predetermined timeline and may also involve scope for penalty in case of time overrun. But the entire cost is borne by the government. In EPC all the clearances, land acquisition and regulatory norms have to be completed by the government itself and the private players do not have to get itself involved in these time taking procedures.

Specifically, in EPC model, 90% land is to be acquired and fund is transferred to the player before the starting of the project. Another set of distinctions are that it is to be completed in a predefined time frame, the risk of the project lies more on the contractors (turnkey project) and unlike PPP, the profit margin is fixed in this case.

In PPP mode of project, operator was liable to build, operate and transfer the project to the government after completion while profit is to be acquired by either annuity paid or by levying toll.

2.5.1. How is EPC different and better than PPP?

- Here the government bears the entire financial burden and funds the project. Capital is either raised by issuing bonds like NHAI bonds or by taking steps to secure road toll receivables post construction. Note that the fund here is **not raised through banks, thereby saving banks from the risk of NPAs**. Secondly, it relieves funds for the off take by other players in economy.
- Government now takes care of clearances, acquiring land and estimating the traffic a very huge exercise that had to be done by private parties earlier. This reduces the risk for private player, thereby encouraging them to take up more projects.
- With decreased risk on private builders and increased incentives for early completion, it creates comfortable base to lure investors to carry on the EPC work i.e. the contractor now designs the installation, procures the necessary materials and builds the project, either directly or by subcontracting part of the work.
- Timeline required to construct reduces remarkably and there may even the clause of penalizing the private player for overshooting the timeline.
- Here the government takes responsibility of raising capital, procuring clearances before the onset of the project.
- EPC model is better than PPP model as the company gets the whole responsibility to complete the project and it is also easy for the government to hold the company accountable for the project. In PPP model various companies are involved in a single project. This creates the opportunity to start blame game if anything goes wrong after completion.

The decision of the Government of India to develop, operate and maintain the wayside amenities alongside National highways across India through EPC model is an example for an EPC project.

2.5.2. Some issues with EPC model

Under this system the entire project is funded by the government rather than shared by the private player as well. Sometimes it becomes problematic as under:

- Financial burden on the government: In contrast to PPP where the private player shares the cost of project, thereby enabling the government to save its resources for other socio-economic projects, in EPC the entire cost is borne by the government. Therefore, this model can't be used always, especially when the government is facing budget deficits.
- Lack of incentive to private players to reduce cost of project: It is because, here the nature of project is outsourcing by the government to private entity, which does not have incentive

to reduce cost, as it doesn't share the risks involved. In EPC the private entity is entitled to get pre-decided fixed amount akin to service charge, while the government takes all the risk. Therefore, this model is used only when the private players lack adequate financial resources, or investment sentiments are bleak, where the government has to intervene.

This model was used recently when projects under PPP were stuck at different stages of completion and new investment was not coming. For example, due to reduced private sector participation, Govt. has increasingly resorted to EPC in 2013-14 and 2014-15. But in view of the high fiscal deficit this model is unsustainable. As a result, efforts are being made to adopt a hybrid model, which borrows the advantages of both the PPP Model and EPC Model, called **Hybrid Annuity Model (HAM)**, which is discussed later in this document.

2.6. Swiss Challenge Model

A Swiss challenge is a form of public procurement which requires a public authority which has received an unsolicited bid for a public project, to publish the bid and invite third parties to match or exceed it. Some Swiss challenges also allow the entity which submitted the unsolicited bid itself then to match or better the best bid which comes out of the Swiss challenge process. The technique was used for the development of Mega Film City Venture by the Jaipur Development Authority (JDA). In 2017 Indian Railways also adopted Swiss challenge for inviting tenders for renovation of its 23 railway station.

2.6.1. Advantages

- ***Competition:*** It allows the project to be put for competitive bidding and counter-bidding so to realize the optimum cost.
- ***Transparency:*** Since the bidding and counter-bidding are open to challenge in this model, it promotes transparency and thereby helps in fixing the accountability.
- ***Creativity:*** Since this model allows the prospective bidders to analyses the design submitted by their competitors and come out with better design, it promotes creative designing and project execution.

2.6.2. Problems with this Model

Concerns are raised that unsolicited proposals (or the Swiss Challenge) may be actively discouraged as they bring information asymmetries in the procurement process and result in lack of transparency and in the fair and equal treatment of potential bidders. It is because the opponent bidder may unnecessarily submit the counter proposal merely to create confusion.

Governments need to have a strong legal and regulatory framework to award projects under the Swiss Challenge method. It can potentially foster crony capitalism, and allow companies space to employ dubious means to bag projects. Given that governments sometimes lack an understanding of risks involved in a project, direct negotiations with private players can be fraught with downsides.

In general, competitive bidding is the best method to get the most value on public-private partnership projects. The government might also end up granting significant concessions in the nature of viability gap funding, commercial exploitation of real estate, etc., without necessarily deriving durable and long-term social or economic benefits.

2.6.3. Suitability of Model to Indian situation

As there is no strong legal framework in India, it is suggested that this method may not be adopted for large scale projects where such projects are challenged in case of a lack of transparency or poor disclosures. Smaller projects can be awarded through this method. This method is more suitable to the projects where creativity and design and innovation are key determinants to project success.

2.7. Hybrid Annuity Model

The new hybrid model is a mix of the EPC (engineering, procurement and construction) and the BOT models. In the annuity mode, the concessionaire gets a fixed and more importantly assured payment from the government.

2.7.1. Salient Features

- **Assured return**: This assured return frees the concessionaire's dependency on the toll collected on the highway. The government shoulders the responsibility of revenue collection.
- Further, the government will pay **40 per cent of the project cost** to the concessionaire during the construction phase in five equal installments of 8 per cent each.
- **Land**: The government will provide 90 per cent of land and the related environment and forest clearance (earlier 80 per cent).
- **Operation and Maintenance**: The balance of 60 per cent needs to come from the concessionaire. Operation and maintenance of the toll road also rests with the concessionaire.

2.7.2. Advantages of this Model

- According to industry experts, hybrid model is viable and companies see value in bidding for such projects.
- In the hybrid annuity model, one need not bring 100 per cent of finance upfront and since 40 per cent is available during the construction period, only 60 per cent is required to be arranged for the long term.
- Moreover, there is no risk of tolling as well as traffic uncertainty.
- The National Highways Authority of India (NHAI) will collect toll and refund the amount in installments over a period of 15-20 years, cutting down on upfront investment required to be made by the government.
- Developers will start participating in this type of projects, otherwise, the enterprise and lenders have practically no appetite for BOT projects and it should also give impetus to active private sector participation.
- Further, 40 per cent grant in form of capital support would substantially reduce the debt portion and interest thereof. The lenders will have a great comfort in financing the project.
- Land Acquisition and Environmental clearances: are major sources of delay and stalling of many projects. In HAM model, the obligation to acquire land and environmental clearances lies with the government.
- Projects speeded up: Losses due to time overruns are prevented. As government is itself a stakeholder, it now acts as a real 'partner'.
- Sensible risk and reward sharing
- Investment burden shared: Since corporate bank balance sheets are weak, private players cannot bear full capital investment burden. (HAM has 40% investment from govt.)
- Higher revenue certainty and reduced risk of developer: In the BOT model, private partner bears the construction and maintenance risks. As Government is going to collect Highway toll tax in HAM, government also bears the risk.
- Monitoring mechanism: as government will invest money in five equal installments based on the targeted completion of the road project.
- Cost overruns: tackled due to provisions for inflation adjusted project costs.

2.7.3. Need of this Model

Under the existing public private partnership model called build-operate-transfer, the developer absorbs most of the risks—financial, operations and maintenance and revenue. Developers

have shied away from the BOT (build operate and transfer) model due to the slowdown in the economy, which not only hampered fund-raising, but also hit toll collection, due to lower traffic flow. The poor cash flows burdened existing projects' ability to service debt.

With this new model, the idea is to provide a transparent, time-bound mechanism to fast-track decision making and anticipating solutions to issues that could arise through a built-in approach.

2.7.4. Challenges in this Model

- HAM is still a new model. So government should test it, improve it and refine it, before it goes big. (There are 28 projects approved under HAM, worth more than 36,000 cr.)
- Participation has to be increased more to start the positive feedback loop, where old contractors return. Then more participation and competition will increase the confidence.

Notwithstanding these issues this model presents a healthy mix of the existing models, taking their positives. Currently, this seems to be the solution for fast track execution of projects amidst the pessimistic business sentiments.

3. Models of Foreign Investment

3.1. Why the Need for Foreign investment?

- In most developing countries like ours, domestic capital is inadequate to meet the purpose of economic growth.
- The inflow of foreign capital helps in removing the balance of payment over time.
- By taxing the profits of foreign enterprise, the developing countries mobilize funds for development projects.
- Foreign capital contributes to the generation of employment.
- Foreign investment fills the gaps in management, entrepreneurship, technology and skill.

3.2. Forms of Foreign Investment

- It includes foreign direct investment (FDI) and foreign portfolio investment (FPI)
- Foreign direct investment is the investment in physical assets by foreign individuals, companies or financial institutions.
- Foreign portfolio investment in the investment made in financial assets. It includes investments made by foreign institutional investors.

3.3. Foreign Direct Investment

- Investment in the businesses by foreign citizens usually involving majority stock ownership of the enterprise
- Joint ventures between the foreign and domestic companies

3.3.1. Forms of FDI

There are two types of FDI

- **Greenfield Investment:** It is the direct investment in new facilities or the expansion of existing facilities. It is the principal mode of investing in developing countries.
- **Mergers and Acquisition:** It occurs when a transfer of existing assets from local firms takes place.

3.3.2. Why FDI preferred?

- It is of non-debt creating nature.

- It is also less prone to quick reversals. South-east Asian crisis emanated due to the reversals of short-term capital inflows.

3.3.3. Forbidden Territories

FDI is not permitted in the following industrial sectors:

- Arms and ammunition
- Atomic Energy
- Railway Transport
- Manufacturing of cigars, cheroots, cigarillos and cigarettes, of tobacco or of tobacco substitutes
- Gambling & BettingLottery
- Chit Funds
- Nidhi Companies

3.4. Foreign Institutional Investors

- Foreign Institutional Investors (FII s) means an entity established or incorporated outside India which proposes to make investment in India. Positive tidings about the Indian economy combined with a fast-growing market have made India an attractive destination for FIIs.
- FII inflows are called 'hot money' because they can be taken out any time.

According to recently changed guidelines, the investment of up to 10% of the project cost is categorized as FPI and above that limit comes under the category of FDI.

3.5. Recent Initiatives to promote Foreign Investment

3.5.1. Expansion of Qualified Foreign Investors (QFIs) Scheme

- In Budget 2011-12, the government, for the first time, permitted Qualified Foreign Investors (QFIs), who meet the know-your-customer (KYC) norms, to invest directly in Indian MFs.
- In June 2012, the definition of QFI was expanded to include residents of the member countries of the Gulf Cooperation Council (GCC) and European Commission (EC) as the GCC and EC are the members of the Financial Action Task Force (FATF).

3.5.2. Categorization of NRI investment as domestic investment

There is proposal to categorize the NRI investment as domestic investment, by giving same benefits as are entitled by the domestic investor. This has the effect of extending the room for foreign investors in Indian economy, as a major part of it would be counted as domestic investment.

3.5.3. What More Needs to be Done to Promote Investment and Increase Efficiency of Investment?

- **Making the Infrastructure Project Commercially Viable -** This is the first and foremost thing we should do for financing infrastructure in a sustainable manner. As mentioned earlier infrastructure projects involve huge financing requirements, most of which are met by banks and other financial institutions directly and indirectly. Thus, it is very important to make the project commercially viable to ensure regular servicing of the loan. This will lead to sustainable development of infrastructure without jeopardizing the soundness of the financial sector. Project appraisal and follow-up capabilities of many banks, particularly public sector banks, also need focused attention and upgradation so that project viability can be properly evaluated and risk mitigants provided where needed.

- **Greater Participation of State Governments -** In a federal country like India, participation and support of the State governments is essential for developing high quality infrastructure. The State governments' support in maintenance of law and order, land acquisition, rehabilitation and settlement of displaced persons, shifting of utilities, and obtaining environmental clearances are necessary for the projects undertaken by the Central Government or the private sector. It is satisfying to know that many State governments have also initiated several PPP projects for improving infrastructure.
- **Improving efficiency of the Corporate Bond Market -** Vibrant corporate bond market will reduce the dependence on the banking sector for funds. Further, coordinated regulatory initiatives could be considered in the areas involving standardization of stamp duties on corporate bonds across the states, encouraging public issuance and bringing in institutional investors in a big way. It is also important to broad base the investor base by bringing in new classes of institutional investors (like insurance companies, pension funds, provident funds, etc.) apart from banks into this market.
- **Credit Enhancement -** One of the major obstacles in attracting foreign debt capital for infrastructure is the sovereign credit rating ceiling. Domestic investors are also inhibited due to high level of credit risk perception, particularly in the absence of sound bankruptcy framework. A credit enhancement mechanism can possibly bridge the rating cap between the investment norms, risk perceptions and actual ratings
- **Simplification of Procedures – Enabling Single Window Clearance -** It is well recognized that while funding is the major problem for infrastructure financing, there are other issues which aggravate the problems of raising funds. These include legal disputes regarding land acquisition, delay in getting other clearances (leading to time and cost overruns) and linkages (e.g. coal, power, water, etc.) among others. It is felt that in respect of mega-projects, beyond certain cut-off point, single window clearance approach could cut down the implementation period.

4. Previous Years Vision IAS GS Mains Questions

1. What is National Investment Fund? Discuss its salient features and changes incorporated in its recent restructuring.

Approach:

Straightforward question. Mention what is NIF. Then discuss its features and why it is was constituted. Finally, list out the recent changes introduced in NIF.

Answer:

In 2005, the Government of India constituted a 'National Investment Fund' (NIF) into which the realization from sale of shareholding of the Government in Central Public Sector Enterprises (CPSEs) would be channelized. In other words, realizations from disinvestments were to be maintained in NIF (which was kept outside of the Consolidated Fund of India).

Salient features:

- 75% of the annual income of the Fund was to be used to finance selected social sector schemes, which promote education, health and employment. The residual 25% of the annual income of the Fund was used to meet the capital investment requirements of profitable and revivable CPSEs that yield adequate returns, in order to enlarge their capital base to finance expansion/ diversification
- The Fund was professionally managed by three public sector mutual funds – SBI, LIC and UTI mutual funds to provide sustainable returns to the Government, without depleting the corpus.

- In 2009 the government had decided to put a 'pause' on putting disinvestment money in NIF.

Restructuring:

Following changes have been incorporated recently in NIF:

- The disinvestment proceeds with effect from the fiscal year 2013-14 will be credited to the public account under the head National Investment Fund (NIF), and they would remain there until withdrawn/invested for the approved purposes.
- The fund will be used to subscribe to shares issued by the Central Public Sector Enterprise (CPSEs), including public sector banks and public sector insurance companies, and for preferential allotment of shares of the CPSE to promoters so that government holding does not go down below 51 per cent, in all the cases where the CPSE is going to raise fresh equity
- The fund managers presently managing the NIF will stand discharged of their responsibility and NIF will be operated through an empowered group of ministers (eGoM) headed by the finance minister and it will work on the advice of an inter-ministerial group (IMG) working under the chairmanship of disinvestment secretary.

2. Highlight the problems in the BOT mode for road transport. How will switching to the EPC mode solve these problems?

Approach:

In the answer, we need to highlight the problems in BOT model along with a brief mention of its history in India. Also the basic features of EPC should be mentioned and how it has the potential to fill the voids in BOT model.

Answer:

As a new initiative for promoting highway development, the mode of Engineering Procurement and Construction (EPC) contracts is being brought in for funding in cases where there are no takers under BOT (toll) mode.

In the BOT model, the enterprise customer provides the financing for the new infrastructure. The service provider does not own the infrastructure but is a concessionaire entitled to manage it for a fee that covers its operating expenses. The BOT model may be advantageous with reference to time and money saving but it has certain limitations. The BOT projects involve high transaction costs (5 – 10% of total costs) and are not suitable for smaller projects. Their success depends upon successful raising finance and the projects are successful only when substantial revenues are generated during the operation phase. Besides, *Additional costs* are incurred to pay a profit to the service provider for the value of its know-how and time in assembling the service delivery infrastructure. *Tie-in effects* arise, since the enterprise customer commits to work with the particular service provider (as in any class outsourcing model) and cannot escape for low switching costs until the service provider's investment is amortized or recaptured.

Under the EPC model, the engineering and construction contractor will carry out the detailed engineering design of the project, procure all the equipment and materials necessary, and then construct to deliver a functioning facility or asset to their clients. The government spends the entire money required to build roads so as to attract builders who are shying away from highways projects for want of funds. It reduces the

stress for the owner. Besides, the cost is known at the start point of the project. The owner is also protected against the changing prices for material, labour etc. Besides, an EPC project has a single point of responsibility. The contractor is responsible for all design, engineering, procurement, construction, commissioning and testing activities. Therefore, if any problems occur the project company need only look to one party – the contractor – to both fix the problem and provide compensation. Also, the projects have a fixed completion date. EPC contracts include a guaranteed completion date that is either a fixed date or a fixed period after the commencement of the EPC contract. If this date is not met the contractor is liable for delay liquidated damages (DLDs).

3. India has emerged as the world's largest PPP market with more than 900 projects in various stages of development yet challenges galore. Explain. How far would the '3P India' Initiative be able to address these challenges?

Approach:

The first part of the answer should list a few challenges faced by the PPPs in India, ranging from financing to project clearances etc. The next part should focus on how 3P India, tries to resolve these challenges through an institutional mechanism.

Answer:

- PPPs have delivered some of the iconic infrastructure like airports, ports and highways, which are seen as models for development globally.
- But we have also seen the weaknesses of the PPP framework. There has been a chain of problems and allegations in the implementation of such projects, or in terms of the concessions offered to promoters in the private sector or to foreign investors.
- More often than not, land acquisition and compensation payable for it emerge as the biggest problems, invariably leading to public agitations or protest.
- The other side of the problem relates to user charges. These projects are based on certain user projections. When the numbers do not add up on the ground, the investor becomes frustrated because the projected return on investment may not materialize.

How can 3P India address these challenges?

- Finance Minister Arun Jaitley announced the decision to set up an institution named 3P India with a corpus of Rs.500 crore, to provide support to mainstreaming PPPs.
- It is likely to be a non-profit company on the lines of the National Skill Development Council (NSDC)
- 3P India will address issues related to regulation, management of contracts, bidding process, dispute resolution mechanism and stressed Public-Private Partnership projects in the country.
- 3P India will be staffed by highly skilled professionals, who have deep knowledge of PPP projects, which would mean that now, we would have an institutional arrangement with professionals, someone who understands PPPs
- Once 3P India is formed, targets will be set on a weekly basis and not monthly.
- As per experts, the whole bundle of tasks taken together by 3P India will revive the PPP ecosystem in the country
- Critics of 3P India alleged that the new body can do little to revive PPPs and will be just another body of officials.

4. Explaining the Hybrid Annuity Model, discuss how far it can help to revive private participation in large infrastructure projects.

Approach:

The answer can be written in 3 parts:

- First, discuss the Hybrid Annuity Model (HAM).
- Secondly, explain how is it an improvement over other investment models (BOT, EPC) and how it can help in reviving private participation in large infrastructure projects.
- Finally conclude what more needs to be required to revive private participation in large infra projects.

Answer:

- The hybrid annuity model was proposed by the Government in 2014 to reduce risks in public private partnership format is likely to provide impetus for the next wave of PPP road projects.
- The model is a mix of EPC and BOT formats, with the government and the private enterprise sharing the total project cost in the ratio of 40:60, respectively.
- A Hybrid annuity contract gives flexibility to allocate funds to both fixed and variable (which are risky, but can give higher returns) annuity components.

How Hybrid Annuity Model will revive private participation in large infrastructure projects:

- National Highways Authority of India (NHAI) had recently laid down the guidelines for the hybrid annuity model (HAM) in which the government funding to the extent of 40 per cent of the project cost will come in five equal instalments during the construction period, thus reducing the financial burden on concessionaire during the project implementation phase.
- When compared with EPC projects, shift to HAM would ease the cash flow pressure on NHAI. Moreover, spends can be recovered to an extent through tolling of these stretches by NHAI itself. Therefore, NHAI´s own upfront funding requirement will be lower in case of hybrid annuity compared with EPC model.
- Also, in the BOT annuity model, the government bears the commercial risk of toll collection. The government pays the private operator the project cost along with interest in the form of a half- yearly annuity.
- However, the hybrid annuity will involve the government paying a part of the capital cost at the commencement of the construction work, thus giving the private company a revenue stream even before the actual commercial operations begin.
- Thus, a Hybrid annuity contract gives flexibility to allocate funds to both fixed and variable (which are risky, but can give higher returns) annuity components.

Thus, the HAM model may succeed as government has mitigated lot of risks for private sector. More vigorous private sector involvement in PPP models can happen when the Government addresses some other issues related with PPP MODEL like- timely regulatory clearances, timely land acquisition and compensation, dispute resolution mechanism which is non - existent; The more sustainable and long term solution to funding of infra projects with long gestation period lies in developing insurance and pension markets in India as only their business is long enough to fund projects of long duration whereas banking sector finds it difficult to fund projects beyond 5-7 years.

5. Explain the key issues in infrastructure financing in India. What steps have been taken by the government to address these issues?

Approach:

- Discuss the issues related to infrastructure financing in detail.
- Discuss the steps taken by the government to address these issues.
- Suggest some measures in conclusion.

Answer:

Infrastructure development is an arduous job as it involves huge investments, long gestation periods, procedural delays and returns spread over a long period of time. These unique features of infrastructure development raise some issues which are specific to the financing of infrastructure.

Issues in Infrastructure Financing

- Fiscal Burden - almost half of the total investment in the infrastructure sector is done by the Government through budget allocations. But Government funds have competing demands, such as, education, health, employment generation, among others.
- Asset-Liability Mismatch of Commercial Banks - commercial banking sector's ability to extend long-term loans to the infrastructure sector is limited.
- Investment Obligations of Insurance and Pension Funds - insurance and pension funds are constrained by their obligation to invest a substantial portion of their funds in Government securities.
- Need for an Efficient and Vibrant Corporate Bond Market - the corporate bond market is still a long way to go in providing adequate financing to the infrastructure sector in India.
- Insufficiency of User Charges - a large part of the infrastructure sector in India especially irrigation, water supply, urban sanitation, and state road transportis not amenable to commercialization for various reasons. Due to this, the Government is not in a position to levy sufficient user charges on these services.
- Legal and Procedural Issues – issues relating to land acquisition and environmental clearances add uncertainty which affects the risk appetite of investors as well as banks.

Steps taken by the Government

- Public-Private Partnership Projects in Infrastructure
- Viability Gap Funding
- Foreign Direct Investment and Infrastructure Development - 100 per cent FDI is allowed under the automatic route in some of the sectors such as mining, power etc. Further, FDI is also allowed through the approval route in some sectors such as civil aviation sector etc.
- Setting up of India Infrastructure Finance Company Limited (IIFCL)
- Setting up of Infrastructure Debt Funds
- Tapping the retail investor base through Infrastructure Bonds
- Introduction of Credit Default Swaps
- Liberalisation & Rationalization of ECB policies

Greater Participation of State Governments must be ensured and steps must be taken to simplify the procedures and to improve efficiency of the Corporate Bond Market.

Student Notes:

5. Previous Years UPSC Mains Questions

1. Examine the developments of Airports in India through Joint Ventures under Public-Private Partnership (PPP) model. What are the challenges faced by the authorities in this regard.
2. Justify the need for FDI for the development of the Indian economy. Why there is gap between MOUs signed and actual FDIs? Suggest remedial steps to be taken for increasing actual FDIs in India.
3. Explain how private public partnership agreements, in longer gestation infrastructure projects, can transfer unsuitable liabilities to the future. What arrangements need to be put in place to ensure that successive generations' capacities are not compromised?
4. Adaptation of PPP model for infrastructure development of the country has not been free from criticism. Critically discuss the pros and cons of the model.

AGRICULTURAL SUBSIDIES AND MINIMUM SUPPORT PRICE

Contents

1. Introduction

The Indian Government plays a vital role in agriculture sector development. The government's role is diverse and varied including, but not limited to, self-sufficiency, employment creation, support to small-scale producers for adopting modern technologies and inputs, reduction of price instability and improvement of the income of farm households.

This vital role can take a number of forms such as import-export policies and domestic policies like price support programmes, direct payments, and input subsidies to influence the cost and availability of farm inputs like credit, fertilizers, seeds, irrigation water, etc. Of all the domestic support instruments in agriculture, input subsidies and product price support are the most common.

Derived from the Latin word 'subsidium', a subsidy literally implies coming to assistance from behind. A subsidy, often viewed as the converse of a tax, is an instrument of fiscal policy.

The subsidies may be direct or indirect, cash or kind, general or particular, budgetary or non budgetary, etc. But their impact is practically visible on both the production and distribution. The **economic rationale** of subsidies lies in incentivising the producers to invest in productive activities and increase production leading to high growth in national income and obtaining desirable structure of production. The social justification of subsidies lies in reducing inter-personal income inequalities and inter- regional development imbalances. The justification gets strengthened if the subsidies promote agricultural development besides equitable distribution of income.

2. Agriculture Subsidies

An agriculture subsidy is a governmental financial support paid to farmers and agribusinesses to supplement their income, manage the supply of agricultural commodities, and influence the cost and supply of such commodities.

Agriculture subsidies act as an incentive to promote agricultural development and as an instrument of stimulating agricultural production and attaining self-sufficiency. In order to attain the goal of self-sufficiency in food, government adopts short term policies such as support prices of products and input subsidy to stimulate the products to increase the food production. It is expected that subsidies contribute to better cropping pattern, employment and income of the beneficiaries.

But in most development programmes, subsidies are one among the many developmental inputs being provided. Thus the observable changes in cropping pattern, employment level and overall incomes are because of the joint effect of all the efforts going on. Therefore, these changes cannot be attributed solely to subsidies.

2.1. Types of Agriculture Subsidies in India

2.1.1. Explicit Input Subsidies

Explicit input subsidies are payments made to the farmers to meet a part of the cost of an input. These are in the nature of explicit payments made to the farmer. For example, subsidy on improved or high yielding variety seeds, plant protection chemicals and equipments, improved agricultural implements and supply of mini-kits containing seeds, fertilizers and plant protection chemicals for certain crops are the explicit subsidies. These are usually made available to small and marginal farmers and those belonging to scheduled castes and tribes. The objective of such subsidies is to induce the farmers to adopt yield increasing inputs so that they are able to realize the benefits of new technology. The coverage of these subsidies in terms of crops,

inputs, regions and target groups has been changing from time to time. Explicit subsidies have formed only a small fraction of the development expenditure of Central/ State Governments

2.1.2. Implicit Input Subsidies

While there is transparency in explicit input subsidies, implicit input subsidies are hidden in nature. The latter arise on account of the mechanics of pricing of inputs. If inputs whose prices are administratively determined are priced low as compared to their economic cost, it becomes a case of implicit subsidization. As far as the farmer is concerned, he does not receive any direct payment but somebody in the economy accounts for the difference.

2.1.3. Output Subsidies

Subsidization of agricultural sector through output pricing means that by a restrictive trade policy, the product prices in the domestic market are maintained at levels higher than those that would have prevailed in the absence of restrictions on trade. On the other hand, if the trade policies have resulted in keeping the domestic prices lower than the corresponding border reference price, the policies have taxed the agricultural sector. The border reference price is the free on board prices in the case of exportables and cost, insurance and freight price in the case of importables.

2.1.4. Food Subsidies

There is an important subsidy linked to the agricultural sector and that is the food subsidy. The twin policy of providing market support to the foodgrains producers and supplying atleast a part of the requirement to consumers at reasonable prices, along with the policy of maintaining a buffer- stock of required quantity for national food security, involves cost in the form of meeting the differences between the economic cost and issue prices of foodgrains. This is what is called the food subsidy and appears explicitly in the Union Budget.

2.2. Agriculture Subsidies on the basis of Mode of Payment

2.2.1. Direct Subsidies

Direct subsidies are money transfers by the government that reach the ultimate beneficiary through a formal predetermined route. In the agriculture and allied sectors, subsidies are given for crop husbandry, agricultural implements, minor irrigation, soil conservation, horticulture, animal husbandry, pisciculture, sericulture and also for loss in agriculture during natural calamities like droughts or floods. The various subsidy schemes in agriculture and allied sectors are routed through the departments of Agriculture, Horticulture, Animal Husbandry and Fisheries.

Assessment of Direct Subsidies

Merits

- Direct benefit transfer has been successful in many schemes such as PAHAL in LPG and MGNREGA.
- There would be no problem of identification, pilferage and corruption etc. as through JAM trinity or Aadhaar, payments can be made directly to the beneficiaries.
- This would increase efficiency, as well as promote regional balance, and crop diversification. People can decide for themselves which crop they would want to grow, according to the profits and their local requirements. They can also use the amount in value addition, mixed farming and other beneficial activities for their farms/lands.
- It is likely to control Inflation and decrease prices of fertiliser, and other agricultural produce as well.
- Behavioural change, as farmers will stop using excessive water or fertiliser in their fields.

- Better Nutrition as cereal centric food policy (Calorie based intervention) ignores micro-nutrients requirement of human body.

Demerits

- India is a poor country facing hunger, diseases, malnutrition etc. There is a huge chance that the cash may get used in some non-priority activities or for some non-productive works e.g. on marriage of girls, alcohol, etc. rather than being used for the right purposes.
- The country may not be able to reach its desired goals such as food grain production may not be enough to support the huge population and create the problem of food security instead.
- This will also open the country to volatility of market mechanisms.
- Widespread illiteracy and lack of awareness may also hamper the prospect of Agriculture in the country.

2.2.2. Indirect Subsidies

Indirect subsidies are provided through price reduction, welfare and other ways but do not include a direct cash payment. They reach the farmers along with the use of inputs. Therefore, these are highly correlated with the amount of use of inputs by farmers. Generally, those farmers who use more inputs would naturally enjoy higher subsidies. Example cheaper credit, farm loan waivers, reduced tariffs for electricity and irrigation etc.

Assessment of Indirect Subsidies

Merits

- In developing economies such subsidies help development of priority area.
- These subsidies were introduced in India to provide incentives to the farmers to grow food grains. Hence, generally the indirect subsidies are meant to fulfill some targets fixed by the Government or to guide people to move towards required goal set by the government.
- Training support and technological assistance helps in enhancing the farmers' knowledge.

Demerits

- It takes away incentives from other areas, such as Indian agriculture has become cereal centric, regionally biased, and input intensive. Indirect subsidies are one of the main reason towards such a state.
- Farmers do not feel the incentive to save resources such as over exploitation of ground water, indiscriminate use of fertilizers, etc. are resulting due to it.
- Indirect subsidies are not successful in reaching the target beneficiaries because of several lacunas in identification, corruption, lobbying by rich farmers etc.
- It is liable for misuse for gaining political mileage especially during time of elections.

2.3. Issues related to Agriculture Subsidies and their Possible Resolution

1. **Heavy Fiscal Burden:** The total outgo on fertilizer subsidy alone in 2017-18 was Rs. 70,000 crore.
   - **Possible Resolution**: A better targeting of subsidies with the usage of JAM (JanDhan – AADHAAR- Mobile Number) trinity can reduce the fiscal burden.
2. **Excessive use of Ground water:** The power subsidy has led to overuse of ground water which has further resulted into dramatic fall in ground water levels. In several villages, wells have gone dry. Water extracted from deep inside earth has shown contamination of Arsenic and other heavy metals.
   - **Possible Resolution**: Separate agriculture feeder network (under Deen Dayal Upadhayay Gram Jyoti Yojna). This separate agriculture feeder will supply electricity

only for a few hours a day. The process has shown positive results in arresting decline of ground water levels in Gujarat.

3. **Environmental Effects and decline in Soil Fertility:** Indiscriminate use of fertilizers (recommended ratio of NPK fertilizer is 4:2:1 while actual usage is 8:3:1. Similarly, urea consumption has increased to 60% in 2017 from 55% in 2010-11) harm the soil fertility, biodiversity, and also leads to eutrophication (increased nutrients in water bodies, eventually leading to decreased oxygen concentration in them) and bio-accumulation/bio-magnification (increasing concentration of toxic material in tissues of living organisms at successively higher levels in a food chain).
   - **Possible Resolution**: Creating awareness among farmers, increasing penetration of soil health card scheme, promoting organic farming and innovative products like neem-coated urea will go a long way to check the issue.
4. **No benefits to the targeted groups:** Fertilizer subsidies are generally cornered by the manufacturers and the rich farmers of Punjab, Haryana and Western UP.
   - **Possible Resolution:** Nutrient based subsidy and Neem-Coated Urea has been introduced by Government. There should be Direct Benefit Transfer of fertiliser subsidy through Aadhaar authentication, organic farming should be encouraged and there should be phased increase in the price of urea.
5. **Cereal Centric, Regionally Biased, and Input Intensive:** Price subsidies has affected Indian agriculture negatively. This has made Indian agriculture cereal centric, and neglectful towards pulses, oil seeds and coarse cereals. This has led to import of these crops and food insecurity in lower strata which depend upon coarse cereals. Also, most of the subsidies go to the rich farmers, and the rich states which are able to grow marketable surplus and have well developed infrastructure.
   - **Possible Resolution:** Crop diversification by including more crops under MSP, Mission on Integrated Development of Horticulture, Organic and Cooperative farming, food processing, mixed farming, Direct Benefit Transfer.

2.4. Agriculture Subsidies and WTO

2.4.1. Historical Background

A. Uruguay Round, 1995

a) It led to the formation of WTO. One of the main objectives of Uruguay round was to reduce agricultural subsidies. The **Agreement on Agriculture (AoA)** was signed by the WTO members.

b) The agreed long-term objective of the reform process initiated by the Uruguay Round reform programme is **to establish a fair and market-oriented agricultural trading system**.

c) The reform programme comprises specific commitments **to reduce support and protection** in the areas of domestic support, export subsidies and market access.

d) The Agreement also takes into account non-trade concerns, including food security and the need to protect the environment, and **provides special and differential treatment for developing countries,** including an improvement in the opportunities and terms of access for agricultural products of particular export interest to these members.

e) The implementation period for the country-specific commitments is the six-year period commencing in 1995. However, **developing countries have the flexibility to implement their reduction and other specific commitments over a period of up to 10 years.**

f) **Special Agricultural Safeguard (SSG)** was provided to developing economies under which they can **impose an additional duty** in case of import surge (volume) or fall of import price below a specified reference price.

g) Uruguay Round created two categories of domestic support

Student Notes:

1. Support with no, or minimal, distortive effect on trade on the one hand (often referred to as "Green Box" measures). For example, government funded agricultural research or training.
2. Trade-distorting support on the other hand (often referred to as "Amber Box" measures). For example, government buying-in at a guaranteed price ("market price support") falls into the Amber Box.
   - **Green Box:** These measures are exempt from reduction commitments and, indeed, can even be increased without any financial limitation under the WTO. The Green Box applies to both developed and developing country members but in the case of developing countries special treatment is provided in respect of governmental stockholding programmes for food security purposes and subsidized food prices for urban and rural poor. But, they must not involve transfers from consumers and must not have the effect of providing price support to producers (India's PDS does not come under Green Box). Following programs come under Green Box:
     - **Government service programs** such as Research Programs, Pest and Disease Control, training, infrastructure etc.
     - **Direct Payment to producers** but it must not influence type or volume of production, also called *Decoupled Payments*.
   - **Blue Box:** These are basically Amber Box subsidies but they tend to limit the production. . Any support that would normally be in the amber box, is placed in the blue box if the support also requires farmers to limit their production. These measures are also exempt from reduction commitments. It includes **direct payments under production limiting programs**, made on fixed areas and yield or a fixed number of livestock. Such payments also fit into this category if they are made on 85 per cent or less of production in a defined base period. While the Green Box covers decoupled payments, in the case of the Blue Box measures, production is still required in order to receive the payments, but the actual payments do not relate directly to the current quantity of that production.

De Minimis: Minimal amounts of domestic support that are allowed even though they distort trade. Under the de minimis provisions of the agreement there is no requirement to reduce trade-distorting domestic support in any year in which the aggregate value of the product-specific support does not exceed 5 per cent of the total value of production of the agricultural product in question. In addition, non-product specific support which is less than 5 per cent of the value of total agricultural production is also exempt from reduction. **The 5 per cent threshold applies to developed countries whereas in the case of developing countries the de minimis ceiling is 10 per cent.** However, the quantum of subsidy is computed after taking into consideration prices that prevailed two decades ago. India is well below and within the de minimis level (10 per cent) for all its major crops.

Peace Clause : holds that domestic support measures and export subsidies of a WTO Member that are legal under the provisions of Article 13 of the Agreement on Agriculture cannot be challenged by other WTO Members on grounds of being illegal under the provisions of another WTO agreement. The Peace Clause has expired on January 1, 2004. Another temporary peace clause was made at the WTO Bali conference in December 201 for four years until 2017. It stipulated that no country would be legally barred from food security programs for its own people even if the subsidy breached the limits specified in the WTO Agreement on Agriculture.

B. **Doha Round**

Doha round or Doha Development Agenda is the trade negotiation round of WTO which started in 2001. For agricultural negotiations, Bali Ministerial Conference (2013) and Nairobi Ministerial Conference (2015) has been important.

a) **2013 Bali Ministerial Conference:**

- An agreement to negotiate a permanent solution to **Public Stockholding for food security purposes** and to refrain from challenging breaches of domestic support commitments resulting from developing countries' public stockholding programmes for food security provided certain conditions are met.
- A declaration to reduce all forms of export subsidies and to enhance transparency and monitoring.
- **A temporary peace clause** was added in Bali. It stated that no country would be legally barred from food security programmes even if the subsidy breached the limits specified in the WTO agreement on agriculture. This clause will remain in force for four years until 2017, by which time the members will find a permanent solution to the problem. However, the permanent solution is still elusive after the 11th Ministerial Conference.

b) **2015 Nairobi Package:**

- WTO members adopted a historic decision to **eliminate agricultural export subsidies**. Developed countries to eliminate immediately, except for a handful of agriculture products, while developing countries to end it by 2018. This step has been taken to fulfill the key target of **Sustainable Development Goal on Zero Hunger by 2030**.
- WTO members **agreed to engage constructively** in finding a permanent solution to developing countries' use of public stockholding programmes for food security purposes.
- Ministers also agreed to continue negotiations on a **special safeguard mechanism (SSM)** that would allow developing countries to temporarily raise tariffs on agriculture products in cases of import surges or price falls.

2.4.2. Indian Agriculture Subsidies and WTO

India had signed Agreement on Agriculture of WTO expecting that it would:

- reduce the domestic support given by OECD countries to their respective agricultural sectors
- increase the prices of agricultural products in international markets
- improve export prospects for India.

But, to its surprise, the agricultural prices went down, putting agricultural countries like India at disadvantage.

The agreement is heavily loaded in favour of developed countries due to following reasons:

- Developed countries have put their agricultural subsidies under Green Box. Highest green box support to agriculture is provided by USA which spends more than third of its GDP from agriculture on this support, while India provides support of only 2.34% of its GDP from agriculture in 1995. Investment in agriculture has been between 8% to 12% of agri-GDP.
- The developed countries are not ready to admit that there exists variation in capacity and structural composition of the economies of developed and developing countries. A developed country might need only 1-2% of its GDP to subsidise 50% of its agriculture. Hence, **distortions arising out of Green Box subsidies are significant but are inadequately addressed.**

- Developed countries were required to reduce their volume of subsidised export by 21% and budgetary allocation for export subsidies by 36%. But, it favoured the developed countries only, as they were already providing such huge subsidies over their exports that even this much reduction are not likely to make any impact.
- Post Uruguay (1994-98), the export of agricultural products from Asia actually declined steeply to 0.5% from 8.2% in 1990-94. **For India, the share in 1990-91 was 18.5%, it fell to 2.2% in 2015-16**. Also, because of the high subsidies given by developed countries, the agricultural products sell below the cost of production in international market, and also results in export dumping of products.
- The developed countries also make use of **Agreement on Sanitary and Phytosanitary Measure (SPS) and Agreement on Technical Barriers to Trade (TBT)** to selectively ward off imports from developing countries by imposing higher standards than those imposed by international bodies.
    - **Agreement on Sanitary and Phytosanitary (SPS) Measures:** 1995, Uruguay Round. It sets out the basic rules for food safety and animal and plant health standards. It **allows countries to set their own standards**. But it also says regulations must be based on science. They should be applied only to the extent necessary to protect human, animal or plant life or health. And they should not arbitrarily or unjustifiably discriminate between countries where identical or similar conditions prevail.
    - **Agreement on Technical Barriers to Trade:** 1995, Uruguay Round. It aims to ensure that technical regulations, standards, and conformity assessment procedures are non-discriminatory and do not create unnecessary obstacles to trade. At the same time, it recognises WTO members' right to implement measures to achieve legitimate policy objectives, such as the protection of human health and safety, or protection of the environment. The TBT Agreement strongly encourages members to base their measures on international standards as a means to facilitate trade. Through its transparency provisions, it also aims to create a predictable trading environment.

3. Agriculture Pricing Policies

The agricultural pricing policies and allied institutional mechanisms evolved in India in the context of shortages in the availability and excess demand for food grains during 1960s. A system of procurement and distribution of major food grains was introduced and statutory minimum prices were set, though not strictly enforced. India's agricultural price policy includes three main types of administered prices: **support, procurement,** and **issue price**.

The support price is generally announced at sowing time, and the government agrees to buy all grain offered for sale at this price. These prices guarantee to the farmer that, in the event of excessive production leading to oversupply in the market, prices of his produce will not fall below the support price. Support prices generally affect farmers' decisions indirectly, regarding land allocation to crops. The areas to be sown, however, depend upon the actual prices farmers realized from the previous crop and their expectations for the coming season.

The quantity to be procured is determined by the government's needs for disbursements under the public distribution system. In recent years, however, the actual quantities procured have depended upon the grain offered for sale by farmers at prices fixed by the government. These prices are generally higher than the support prices but lower than the free market prices in normal years. In a good crop year, in surplus states, free market prices would have been lower but for government purchases; after the surplus is mopped up, market prices tend to run higher than procurement prices. The government recognizes the importance of assuring reasonable prices to farmers to motivate them to adopt improved technology and to promote investment by them in farm enterprises for increasing agricultural production.

Minimum Support Prices	These provide a long term guarantee to the producers, that in case of glut, prices will not fall below these announced minimum prices. The Government started large scale procurement of food grains at the MSP to ensure its intent.
Procurement Prices	These are higher than MSP and are meant essentially for the purchase of quantities needed by the Government to maintain its PDS and for building up the Buffer Stock.
Issue Prices	These indicate prices at which the Government supplies food grains through Fair Price shops and ration depots.

The basic objective of agricultural pricing policy in India is to evolve a balanced and stable price structure to meet the overall needs of the economy while protecting, in particular, the interests of the producers' and the consumers'. The policy is aimed towards facilitating the desirable path of attaining the objectives of growth and equity in the process of economic development.

Incentive prices in the form of minimum support prices are essential for the success of agricultural production programs based on high-yielding-varieties technology. At the same time, undue reliance cannot be placed on high prices alone as an incentive for increasing production of food grains. Effective implementation of price support policies requires adequate institutional arrangements for the purchase of quantities offered for sale at that price.

3.1. Minimum Support Price

It was recognized, even prior to mid sixties, that for the acceleration of agricultural growth, farmers need to be motivated to adopt better technology and to invest more in their farm enterprises. This evidently was difficult without assuring reasonable prices to the farmers. The Government constituted a committee in 1964-65 to suggest price policy for food grains and to suggest the terms of references for an organization which would be set up to advice the government on price policy on a long term basis.

The recommendations of the committee led to the establishment of the Agricultural Price Commission in 1965 which was later renamed as *Commission for Agricultural Costs and Prices (CACP)* in March 1985. Simultaneously, the development strategy for agricultural sector was also remodeled. Remodeling of strategy included application of modern inputs like high yielding varieties of seed (HYV), chemical fertilizers and mechanization of certain agricultural operations. Thus, main emphasis in this development was on finding methods of increasing land productivity through the use of modern input and improved methods of production in the potential regions of the country. This development strategy in turn required that price policy should encourage farmers to make greater investments in farm operations so as to enable them to shift on to higher production possibility curves. Thus the minimum support price was aimed at:

- Assuring remunerative and relatively stable price environment for the farmers by inducing them to increase production and thereby augment the availability of food grains.
- Improving economic access of food to people.
- Evolving a production pattern which is in line with overall needs of the economy.

Therefore, the provision of Minimum Support Prices (MSP) was initiated during the mid-1960s to create a favorable environment for the producers of major food crops, which were seen to possess vast potential for raising grain production.

Commission for Agricultural Costs and Prices (CACP)

The Commission for Agricultural Costs & Prices (CACP) is an attached office of the Ministry of Agriculture and Farmers Welfare, Government of India. It came into existence in January 1965. Currently, the Commission comprises a Chairman, Member Secretary, one Member (Official) and two Members (Non-Official). The non-official members are representatives of the farming community and usually have an active association with the farming community.

It is mandated to *recommend* minimum support prices (MSPs) to incentivize the cultivators to adopt modern technology, and raise productivity and overall grain production in line with the emerging demand patterns in the country

MSP for major agricultural products are fixed by the government, each year, after taking into account the recommendations of the Commission.

As of now, CACP recommends MSPs of 23 commodities, which comprise

- 7 cereals (paddy, wheat, maize, sorghum, pearl millet, barley and ragi)
- 5 pulses (gram, tur, moong, urad, lentil)
- 7 oilseeds (groundnut, rapeseed-mustard, soyabean, seasmum, sunflower, safflower, nigerseed)
- 4 commercial crops (copra, sugarcane, cotton and raw jute).

CACP submits its recommendations to the government in the form of Price Policy Reports every year, separately for five groups of commodities namely Kharif crops, Rabi crops, Sugarcane, Raw Jute and Copra.

3.1.1. Need of MSP Policy

Rapid and violent fluctuations in agricultural prices can have negative consequences on the economy of a country, such as:

a) In case, the price of a particular crop declines steeply: growers will be left with little income and no incentive to grow the same crop next year. If this happens to a staple food item, the reduced supply next year will force the government to import that food item to fulfill the demand of people. This will create a fiscal burden over economy.
b) In case, there is steep rise in price of a commodity: consumers will suffer. If this happens to a necessary item of consumption, consumers will not have enough income left to spend on some of the other items. This will have a disastrous effect on other sectors of the economy.

So, there should be an agricultural price policy which can safeguard the interests of both producers and consumers.

How MSP is Calculated

- MSPs of 23 crops is recommended by Commission for Agricultural Costs and Prices (CACP).
- It adopts several cost concepts like A2, FL and C2
  - Cost A2 – Includes the actual costs paid by farmer for purchase of various inputs like seeds, fertilisers, pesticides, hired labour, rent of land & machinery, if hired.
  - Cost A2 +FL – FL refers to Family Labour. If the hitherto unaccounted family labour cost is accounted and added to cost A2, it becomes A2+FL.
  - Cost C2 – C2 stands for Comprehensive Cost. It includes notional costs of family labour, notional rent of owned land and notional interest on owned capital.
- M.S Swaminathan headed National Commission on Farmers recommended a 50 per cent margin over C2, which is also being the demand of the farmers.

- For rabi crop the government is using 50 per cent margin of Cost A2 or cost A2+FL. But even then the MSPs given by the government is less than cost C2.

Stand of the Government

- In 2014 the union government has promised to offer 50 per cent margin over cost C2 but this was never implemented in letter and spirit.
- Recently, Finance ministry has announced that the MSP will be in lines with its earlier announcement on Rabi crops.
- In budget 2018-2019, Finance Ministry has announced a hike in MSP for Kharif crops.
- Farmers are not satisfied with the announcement as the MSP formula used by the government is blurred.

Constraints in hiking MSP

- Some of the government officials are of the opinion that it is impractical to give 50 per cent margin over cost C2 in all crops.
    - The estimated cost of C2 components is about 35-40 per cent higher than cost A2+FL. This would require a significant rise in MSPs. For example paddy MSP might go up by 46 per cent.
    - Calculating the MSPs based on cost of input components ignores the demand side of crops which might compromise the demand-supply principle for determining the cost.

3.1.2. Critical Evaluation of Minimum Support Price

a) **Injects an element of certainty and confidence:** The advance announcement of MSP and procurement prices by CACP (Commission for Agricultural Costs and Prices) provides an assurance to the farmers and they can confidently invest in the crops.
b) **Contributes to inflationary trend:** There has been continuous hike in MSP and Procurement prices due to the rich farmers' lobby and it has pushed up the carrying cost of buffer stocks of FCI considerably. This has pushed up the food subsidy bill to a very high level.
c) **Bias in favour of surplus states:** Almost all states produce wheat, but 95% procurement is from Punjab, Haryana and Western UP. Similarly, around 20 states produce rice, while 90% is procured from Punjab, Andhra Pradesh, Haryana, UP and Tamil Nadu. Other states do not get much benefit from it.
d) **Adverse impact on investment:** Due to extra expenditure in food procurement, the other sectors looses out on new investments. It has been observed that a 10% increase in MSP of wheat and rice leads to a decline in investment by 1.9% and in overall GDP by 0.33%.
e) **Distortion in cropping pattern:** MSP of wheat and rice has generally been higher than the cost of production and that of cereals and pulses has been less than the cost of production. So farmers get incentivised for growing profitable crops and hence cropping pattern gets distorted.
f) **Faulty criterion being used for calculating MSP:** Since cost of production is the major criterion to decide MSP by CACP, inefficiency gets built up, land unsuitable for cultivation of particular crop is being used e.g. rice cultivation is being done in semi-arid regions of Punjab & Haryana which is creating environment and natural resources problem.
g) **Bias in favour of large farmers**: It has been estimated that in each state, the average income transfer to large farmers is approximately ten or more times greater than those received by marginal farmers.
h) **Deterrent to crop diversification:** With the price support policy favoring food grains, there is very little incentive for the farmer to move away from the food grains to the production of other crop. The price support policy has been a major deterrent to crop diversification. In determining minimum support prices, the CACP has taken into account cost of production as well as domestic and global market conditions. MSP is determined by the principle of full

cost of production that includes the rental value of land, an imputed value of family labor and returns to management.

i) **Flaws in PDS:** It is restricted mainly to wheat and rice only, while inferior grains which are main food of the poor have been neglected, PDS coverage in rural areas have been lesser than that in urban areas, high cost of running, and benefits not reaching the targeted beneficiary are the major flaws in PDS.

j) **Impact on rural poor:** Rise in price of cereals (due to higher MSP) leads to significant burden of high cost for the buyers.

k) **Price incentives and fiscal squeeze:** Because of the price incentives, there is an agricultural price rise. Since wages are linked to the agricultural price, it will end up in raising wage cost in non-agriculture sector and hence fall in private profits. This will lead to less tax collection by Government. Also, fall in purchasing power of people due to price rise will compress effective demand and hence will affect the economy negatively.

The pricing policy has proved to be helpful in several ways. From a situation of massive shortages, India has emerged as a grain surplus country with self reliance in food grains, and this inherent process of self sufficiency subsumed the inbuilt proposition of attaining food security at the national level. A strong base has been created for grain production and for meeting grain demand in the medium term. The policy has had a favorable impact on farm income and has led to an economic transformation in the well-endowed, mainly irrigated regions.

However, the adverse effects can also be recognized as the food policy has been highly asymmetric and skewed mainly towards the production of rice and wheat at the cost of cultivation of pulses, oilseeds and other crops. This has created serious imbalances in demand and supply of principal crops in the country. Similarly, the country has been facing large shortages of pulses and edible oils and now has to meet about one-tenth of its demand for pulses and close to half of the demand for edible oil through imports. These imports are in turn having an adverse impact on producers in the unfavorable dry-land areas. These changes necessitate a fresh look at the role and relevance of the Minimum Support Price system in the country.

Announcing procurement prices has become one of the primary tools of intervention in agriculture while other crucial issues like fall in capital formation, developing irrigation facilities, need of changing land holding pattern etc. have been ignored.

4. Vision IAS GS Mains Test Series Questions

1. The imbalance between subsidy expenditure and expenditure on public investment in agriculture call for a long-term strategic re-orientation. Analyse.

Approach:

- Discuss the scale and nature of expenditure on agriculture sector.
- Point out the imbalance in public expenditure and subsidies
- Stress the significance of public expenditure.
- Provide comprehensive picture of future public investment.
- Discuss need to rationalize subsidies along with mechanism.

Answer:

The government spending in agriculture sector is around 20%-25% of the GDP, one of the highest in South and South-East Asian region. Yet it does not result in desired output from agriculture.

- The nature and manner in which expenditure is poured into agriculture is responsible for precarious situation. Almost 80% of the public expenditure going to

agriculture is in the form of input subsidies (fertilizers, power, irrigation) and only 20% as investments in agriculture.

- In the post-reform period investment has been an overlooked aspect in Indian agriculture. The role of government must evolve so that those activities which it still does are performed with the greatest effectiveness, in terms of meeting the needs of the agricultural sector.
- In past the large investment made by the government in irrigation works, agricultural inputs and technology played crucial role in the success of the Green Revolution.
- Public investment has a leading role to play, in the form of infrastructure as well as necessary research and development in farm technologies. Spread of infrastructure in power, transport, communication, storage and processing sectors are important.
- By investment irrigation systems can be developed, which in medium and long term will change the face of Indian agriculture from being rain-fed to irrigated.
- Similarly investment in research and development can help to produce high productivity crops which can be resilient in face of climate change.
- Along with this rural infrastructure and e-infrastructure creation can open new avenues for farmers. This investment may also create favourable environment for allied activities and agro-based industries.
- Rationalisation of subsidies and better targeting of beneficiaries through direct transfers would generate part of the resources for the public investment that is essential in research, education, extension, irrigation, water-management, soil testing, warehousing and cold-storage, whether research, education, and extension.
- Distortions emerging from various policies, including, exempting user charges for electricity and water need to be reduced through better targeting and eliminating leakages.

Hence we can see that for a vibrant agriculture sector preferred approach should be investment instead of providing subsidies. Although necessity of some subsidies cannot be written off but they need to be rationalized so that money thus saved can further be invested for making Indian agriculture an attractive and profitable profession. Proper balance between investment and subsidies can make agriculture engine of Indian economy.

2. Highlight the strengths and weaknesses of the current MSP regime. What are the changes required to strengthen it and help it achieve its stated policy objectives?

Approach:

- Mention what is MSP and why it is needed
- Bring out the positives of MSP
- Then write down the negative effects of MSP
- Conclude with suggestions for reforms

Answer:

Minimum Support Price refers to the price at which government purchases crops from the farmers, whatever may be the quantum of the crops.

The Commission for Agricultural Costs and Prices (CACP) recommends MSP based on cost of cultivation, the overall shortage of grains as reflected by the trend in wholesale prices, and the need to keep in check the rate of inflation in the consumer's interest.

The major objectives are to support the farmers from distress sales and to procure food grains for public distribution. Further, such minimum support prices are fixed at incentive level, so as to induce the farmers to make capital investment for the improvement of their farm and to motivate them to adopt improved crop production technologies to step up their production and thereby their net income. In the absence of such a guaranteed price, there is a concern that farmers may shift to other crops causing shortage in these commodities. The policy of MSP has also other beneficial consequences like income security to farmer bringing investment into agriculture, building up buffers, a large network of FP shops, stabilizing price line and consumer welfare.

Fixing of MSP to cover the full costs of cultivation imposes a heavy burden on the government's finances. Although the MSP is supposedly based on cost plus formula, the actual price offered in practice is higher and influenced by high expectations of rich farmers represented by politically strong farm lobbies. Moreover, the income transfers accrued disproportionately to large farmers confined mainly to surplus states.

The MSP regime has not only created price distortions in the output market but also a shift from the production of cereal crops to that of MSP administered crops. Further, it also led to accumulation of buffer stocks of grains and the credit blocked in these stocks put pressure on interest rates and crowded out more productive investment. Owing to above weakness, following reforms are suggested to revamp the MSP regime in India

- MSP policy should extend to all regions
- MSP should be national level floor price, rather than remaining confined to certain regions
- The MSP should be reduced to levels of average capital costs(that is all costs including imputed costs of family labour, owned capital, and rental on land)
- Procurement should be at market prices
- The MSP should be supplemented with variable import and export tariff for effective price stabilization
- When market prices is greater than MSP, government imports or make open market purchases
- There should be stable and predictable policy regarding open market sales
- Private trade should be encouraged.

3. With reference to Bali decision clearly stating that Peace clause under Agreement on Agriculture (AoA) would remain in force, until permanent solution is found, can we say that India was at least partially successful in placing 'Food Security Box' and 'Development Box' alongside 'Green Box'? Analyze. Also, suggest some remedies to counter the adverse effects of huge Green Box subsidies offered by developed nations to their farmers.

Approach:

- Briefly write about the Agreement on agriculture and the need for food security box and developmental box alongside Green box.
- Then explain about the Bali decision to include peace clause until permanent solution is found and its significance for India.
- Write briefly about the adverse effects of huge Green Box subsidies offered by developed nations to their farmers and suggest some remedies to counter them.

Answer:

There has been a demand for 'Development Box' and 'Food Security Box' along with 'Green Box' in agreement on agriculture (AoA) in order to cater to the needs of food security, rural development, and poverty reduction in developing countries. The basic aim is to ensure that developing countries have the policy flexibility to support domestic agricultural production and ensure the food security of their population.

With the recent rise in global food prices, many countries have begun giving higher subsidies to farmers to promote agriculture, putting them in danger of breaching the 10 per cent cap under the deminimus levels.

During the 9th ministerial conference held in Bali a 'peace clause' was agreed between developed and developing countries. The 'peace clause' said that no country would be legally barred from food security programmes even if the subsidy breached the limits specified in the WTO agreement on agriculture. This 'peace clause' is expected to be in force for four years until 2017, by which time a permanent solution to the problem will be found.

With reference to this outcome, one can correlate to the provisions of Green Box subsidies allowed under AoA which includes items like decoupled income support, research expenditures, pest control measures, training & extension expenses and promotion expenses and infrastructure expenses. However some of the direct payments are also listed in this category. There is ambiguity in head and expense classification, which makes this subsidy highly contentious as many developed nations misuse the loopholes under this category to support their farmers, USA being at the top with 1/3rd of GDP support.

So we can definitely say that with the Bali statement regarding peace clause, India was at least partially successful in placing the 'Food Security Box' and 'Development Box' alongside the 'Green Box'. However India and other developing countries should be cautious of following issues.

- Accepting a temporary peace clause should not be amounted to admitting that the subsidy programmes in India and other developing nations violate global trade norms.
- If the clause expires before a permanent solution is in place, food security programmes and policies to protect farmers, such as Minimum Support Prices, would come under siege.
- The peace clause requires full disclosure of MSPs and annual procurement for food security programmes, which might leave India open to questioning by other countries on domestic matters.

Hence there is a need for permanent solution in this regard to ensure food security programme in developing countries.

The WTO agreement with its complex structure provides enough room for maneuvering subsidies to provide protection to domestic produce under the Green Box subsidies. Level of subsidies is so high in developed countries that level playing filed in agriculture trade is a far cry. To counter adverse effect of such support and subsidies following suggestions are made:

- Developing countries should seek clubbing of all kinds of support to agriculture in one category and seek some parity among developed and developing countries.
- Other member countries should have the freedom to impose protective tariff linked to differences in domestic support.

- In order to counter the adverse impact of GBS in other countries on domestic produce, we need to pay serious attention to infrastructure development, which has been deteriorating for quite some time.

4. Agricultural subsidies are hotly contested at the WTO negotiations. What are the concerns of developing countries, especially India, vis-a-vis the attitude of developed countries on the issue? What is Special Safeguard Mechanism (SSM)? In this context, what are the reasons underlying India's keenness on a permanent solution on public stockholding for food security?

Approach:

- Describe the reservations of developing countries in respect of agricultural subsidies at WTO negotiations. It should be a comparative outlook vis-a-vis developed countries.
- Define Special Safeguard Mechanism, and mention its ad-hoc nature.
- Finally, mention why India is keen on a permanent solution on public stockholding.

Answer:

Agriculture occupies crucial space at the WTO negotiations and the issue of subsidies therein is a bone of contention between the developing countries such as India and developed countries such as the United States and those from Europe. The Agreement on Agriculture has been criticised for reducing tariff protections for small farmers in developing countries while simultaneously allowing rich countries to continue subsidizing agriculture at home.

The concern of developing countries regarding the attitude of the developed countries can be summed up thus:

- Whereas the developed countries want subsidies to be removed, the developing countries view agricultural subsidies as crucial for their farm livelihood and food security.
- The box-shifting practices and use of green box as well as amber box subsidies by rich countries such as US cause concern in developing countries. For example under a 2006 ministerial agreement, agriculture subsidies in rich countries were to be eliminated by 2013 to spur export competition in global agriculture, but this did not happen. In fact, new policies, such as the US Farm Bill of 2014 have ensured that there will be no cut in their export subsidies.
- The insistence of countries such as US for Countries like India to limit Amber box subsides to 1986 production (not adjusted to inflation) is a major bone of contention.
- While developed countries including the US, Australia, the EU oppose public stock-holding of food crops, it is crucial for India's food security programme.
- The developing countries are concerned about the issue of import surges and tariffs to be imposed in case of livelihood threatening. This is perhaps most visible in the differences over the structure of the Special Safeguard Mechanism (SSM).

Special Safeguard Mechanism (SSM) is a trade remedy that allows developing countries to impose additional safeguard duties in the event of an abnormal surge in imports or the entry of unusually cheap imports.

India argued for higher level of tariff and lower import surge for making the SSM. On the other hand, the US and allies argued for lower tariffs and higher imports. India and

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the G33 insist that the SSM mechanism can come into play if imports rise by about 10%, while developed countries want it as 40%.

For a permanent solution, India had proposed either amending the formula to calculate the food subsidy cap of 10 per cent, which is based on the reference price of 1986-88, or allowing such schemes outside the purview of subsidy caps of the AOA. This would enable India to continue with its policy of public stockholding for food security without violating any of the extant provisions.

5. Excess subsidies are doubly detrimental to Indian agriculture; on one side they cause market distortion and a burden on national exchequer; on the other, they lead to environmental degradation. It is also true that Indian agriculture can't sustain without the subsidies. Subsidies are a kind of imbroglio. Analyze.

Approach:

- Give a brief introduction of subsidy provisions in agriculture and first explain why subsidies are needed for the framers.
- Then relate the subsidies with three keywords in the question– "market distortion", "environmental degradation" and "burden on national exchequer".
- Give your conclusion that instead of subsidies we should invest the money in agriculture research.

Answer:

There are major agriculture subsidies in India, - for fertilizer, electricity and irrigation. The subsidies are given on the basis of criteria like merit, income-level, social group etc. In all, subsidies accounts for roughly 2.5 per cent of India's GDP. The govt. has taken a decision to limit the subsides to around 1.2 per cent of GDP by the final year of the 12th Plan.

Reasons in favour of the subsidies in agriculture

- Fertilizer subsidy is a development subsidy, which accelerate the fertilizer use and promotes agricultural production. Subsidies in fertilizer were reduced in the year 2003 and agricultural production gradually decreased as a result of that.
- The farmers are not able to purchase fertilizer on the higher price as production cost increases due to removal of agricultural subsidy. Thus, removal of subsidy would affect the agricultural sector and economy.
- Subsidies offer employment to unskilled workforce and contribute the human capital for agricultural needs. Government offers Minimum Support Prices (MSP) and provides facilities for proper warehousing and packaging facilities under agriculture subsidies.
- Seeds are distributed for subsidized rates and subsidies are also provided for farm mechanization to boost the agriculture productivity.
- Subsidies support seeds distribution, marketing facilities, farming techniques, new technology implementation and training methods, credit assurance, machinery, plant protecting, disaster management assured yearly crops to feed the every growing population.

Reasons against the subsidies in agriculture

- The biggest of all these input subsidies is the fertilizer subsidy. The subsidy policy in fertilizers has led to an imbalanced use of N, P and K in states like Punjab and

Haryana which in turn contributes to deterioration of soil conditions. Subsidies induce excess use of fertilizers and pesticides in farm production.

- Agriculture subsidies draw marginal agricultural land into for agriculture production that might be used for forests, wetlands or other environmental conservation purposes.
- Subsidies given to the farmers for electricity, has resulted in drawing of ground water in huge excess. This has resulted in lowering of water table in many areas.
- In areas where there is a lack of sufficient electricity for agriculture, it encourages the private investment in diesel generating sets for agriculture and other purposes which is an underlying reason of huge petroleum imports. Thus, the fiscal deficit multiplies.
- Subsidies are paid from the public money. Corrupted politicians, bureaucrats, middlemen make the most of subsidies to their own benefit. Agricultural economy is marked with fodder scams, fertilizer scams, and diversion of funds.
- Agriculture subsidies induce excess production in some particular crops eg those having higher MSP, while some other crops are not produced in enough quantity to meet the demand and hence it causes food price inflation.
- The way subsidies in agriculture are being administered, food inflation will continue to be a concern for a long time and for the simple reason that the supply of non-cereal, protein-rich food items is not keeping pace with their increased demand. Subsidies also cause less insufficient attention to innovative agricultural practices such as mixed cropping, animal husbandry and cost control.
- The excess subsidies come at a cost of public investment in agriculture research, irrigation, rural roads and power. Lesser public investment in such areas due to more emphasis on subsidies further deteriorates the quality of essential services for rural areas like uninterrupted power supply.

There are research studies which show that the marginal returns evident in terms of poverty alleviation or accelerating agricultural growth are much lower than the input subsidies for agriculture development. There is trade-off between allocating money through subsidies for agriculture or increasing investments for agriculture development such as irrigation, backward infrastructure etc. The investment option is much better than subsidies for sustaining long-term growth in agricultural production and also to reduce burden on national exchequer.

5. Past Year UPSC Questions

1. What are the different types of agriculture subsidies given to farmers at the national and at state levels? Critically analyse the agricultural subsidy regime with reference to the distortions created by it.
2. How do subsidies affect the cropping pattern, crop diversity and economy of farmers? What is the significance of crop insurance, minimum support price and food processing for small and marginal farmers?

Student Notes:

PUBLIC DISTRIBUTION SYSTEM, BUFFER STOCKS AND FOOD SECURITY

Contents

1. Public Distribution System in India

Public distribution system is a government-sponsored chain of shops entrusted with the work of distributing basic food and non-food commodities to the needy sections of the society at very cheap prices.

1.1. Objectives

- to provide **essential consumer goods** at cheap and subsidized prices to the consumers.
- to insulate them from the **impact of rising prices** of these commodities.
- to maintain the **minimum nutritional status** of our population.
- to put an **indirect check on the open market prices** of various items.

It is **supplemental in nature** and is not intended to make available the entire requirement of any of the commodities distributed under it to a household or section of the society. Yet, it **acts as a safety net** and attempts socialization in matter of distribution of essential commodities.

1.2. Evolution and Functioning of PDS

In India PDS is **working since 1960s**. It was initially a general entitlement scheme for all consumers without any target.

- **In 1992, a Revamped PDS (RPDS)** was launched in 1775 blocks throughout the country to strengthen and streamline the PDS as well as to **improve its reach to poor families** especially in the far-flung, hilly, remote and inaccessible areas. RPDS covered areas **where special programmes were under operation** such as Drought Prone Area Program (DPAP), Integrated tribal development program (ITDP), Desert Development Program (DDP), and certain Designated Hill Areas (DHA)**.**
- **In 1997, Targeted PDS (TPDS)** was launched with focus on the poor families. It aimed to benefit 6 crore poor families for whom 7.2 MT foodgrains was earmarked annually. Over and above the TPDS allocation, **'additional allocation'** was also given periodically to the states. This transitory allocation was **to benefit APL population**. But, this allocation was issued at higher prices than the ones at BPL quota.
- **In December 2000, Antyodaya Anna Yojana (AAY)** was introduced for poorest of the poor people (the hungry) and 25kg/month per household (increased to **35kg in 2002**) was provided at the highly subsidised rate of Rs 2/kg of wheat and Rs 3/kg of rice. **The scheme aimed to reach one crore Antyodaya households**. Since then, **AAY has undergone three phases of expansion and now covers 2.5 crore poorest of the poor people.** In between 2003-2006, 3 expansions took place which included 1.5 crore people (38% of BPL) belonging to terminally ill, widows, senior citizens with no societal support, landless and marginal farmers, rickshaw pullers, rag pickers, primitive tribal groups, etc have been added to AAY.
- **In 2013, National Food Security Act (NFSA)** was enacted. It introduced individual entitlement of 5 kg per person per month foodgrains to around 82 crore of population.

The PDS seeks to provide to the beneficiaries two cereals, rice and wheat and four essential commodities viz. sugar, edible oil, soft coke and kerosene oil. However, state governments, which actually manage the system at the ground level, are exhorted to add other essential commodities like pulses, salt, candles, matchboxes, ordinary clothes, school text books/copies and the like. Supply of additional items through PDS is especially relevant in interior areas, which are away from markets and where one or two traditional shopkeepers, who also double up for money-lenders, have the market monopoly. A number of state governments have set up Civil Supplies or Essential Commodities Corporations to buy such additional items directly from the manufacturers and use the existing structure of PDS to arrange for the sale at lower than

market rates. Making available the six essential commodities (rice, wheat, sugar, edible oil, soft coke and kerosene oil) to the state government is the responsibility of the central government.

The PDS distributed commodities worth more than 98,000 crore in 2014-15 through 5.21 Lakh Fair Price Shops. Rice, wheat, sugar and kerosene have been the four major items of distribution under PDS. Other than them, edible oils, coal and cloth have also been distributed through it. Coarse grains (jowar, bajra, maize, etc) virtually remained absent from it as their combined sales have amounted to less than 1% of the total PDS sales. Pulses, which are an important source of protein for poor, constitute only about 0.2% in total PDS sales.

1.3. Limitations of PDS In India

1. **Limited benefits to poor from PDS:** Rural poor have not benefited much from PDS and their dependence on the open market has been much higher than on PDS. Urban poor face the similar scenario. Since, there is residential requirements for ration cards, a large number of homeless people, migrants etc. are automatically left out of the food security.
2. **Urban Bias:** For quite a longer period of time, PDS remained limited mostly to urban areas. Although things have changed now and there has been expansion of PDS in rural areas but its effectiveness in terms of timely and adequate availability remains meager. Also, their meaningfulness in remote, inaccessible, backward areas remains under question.
3. **The burden of food subsidy:** After inclusion of NFSA-2013, the burden of food subsidy has become huge. Also, APL have no incentive to buy from PDS, so there has been increasing stock with FCI. Other than that the procurement prices have been rising continuously due to rich farmers' lobby and issue prices are getting lower due to populist policies. All of this together are making the PDS unsustainable.
4. **Inefficiencies in the operations of FCI**: The economic cost of FCI food grains operation has been rising on account of increase in procurement prices and other costs (distribution cost, carrying cost, etc.) and also due to inefficiencies caused by highly centralised and bureaucratic mode of operations.
5. **PDS results in Price increases:** Due to large procurement of food grains every year by Government, the net quantities available in open market reduces. This leads to increase in Price. This dual market system i.e. PDS and Open market operates to the disadvantages of poor, especially those who are excluded from the food security system.
6. **Leakages from PDS**: The major part of leakage is due to diversion of food grains to the open markets because of widespread prevalence of corruption. Transport and diversion losses also takes place. There is problem of ghost beneficiaries as well.

1.4. Targeted Public Distribution System

This system has been adopted by Government of India since 1997, **to provide foodgrains to people Below Poverty Line at highly subsidized rate from the PDS and foodgrains to people above poverty line at much higher prices**. The identification of the poor under the scheme was done by the States. TPDS maintains universal character of PDS but has special focus on BPL. Total number of families covered under BPL and AAY is 6.52 crores. The allocated amount is 35 kg per month per household to BPL and AAY, while for APL, it will be between 15 kg to 35 kg/month/household.

1.4.1. Key Features of TPDS

1. **Targeting:** Those earning a maximum of Rs. 15,000 per annum are kept within BPL. Initially 10 kg of food grains were provided per household per month, but in 2002 the limit was revised to 35 kg/household/month.
2. **Dual Prices**: In 2000, the Central Issue Prices for the PDS to state governments was set at 50% of the economic cost of FCI for BPL families and at 100% of the economic cost for APL

families. In 2001, a third price was also issued for beneficiaries of ANTYODAYA ANNA YOJANA (Rs 2/kg of wheat and Rs. 3/kg of rice per family under AAY).

3. **Central-State Control:** PDS is designed and managed by State Governments, while the Central Government allocates the foodgrains to the states. Under TPDS, the size of the BPL population and the entitlement for them is decided by the Central Government.

1.4.2. Issues related with TPDS

1. **Targeting:** It has both conceptual and operational issues. Conceptual issues include the problems related with **definition of eligibility for BPL status based on income poverty line** does not cover a large number of vulnerable population. Under operational issues, **Identification has been considered as the biggest challenge.** Exclusion errors are so high that 63% of the poor household were not covered by the system (NSS-2007). A high Inclusion Error is also reported as APL were having unacceptably large amount of subsidised grains. NCAER reports about **'ghost' card holders**. The Gram Panchayats and the Gram Sabhas are given responsibility of identification, but in states where these bodies are not functional, PDS dealers are seen performing the task and benefitting from it.
2. **Leakages and diversion:** Planning commission estimated that in 2004-05, more than half (54%) of the grain taken off for TPDS disappeared before they reached buyers in the fair price shop. NSSO 68th round reports that diversion of grains from PDS amounts to 46.7% in 2011-12.
3. **Late and irregular arrival of grains in fair price shop:** because of lack of awareness among poor households about the exact arrival of grains creates the problem of physical and economic access.
4. **No variation in purchase across expenditure groups:** A successful targeting is said when there is continuous decrease in quantity purchased from PDS with increase in expenditure class. Other than Kerala, Andhra Pradesh and Karnataka, no state has shown this trend.
5. **TPDS has failed in transferring cereals from surplus to deficit regions:** The policy of targeting and allocation of grain on the basis of income poverty line has worked against the earlier objective of price stabilisation through grain movements across the country. In pre-TPDS time, the areas where PDS offtake was high, were not only deficient in terms of cereal production but also tended to be the area of low cereal consumption.
6. **Burden of subsidy has increased:** Because of introduction of AAY and low prices for BPL, and exclusion of APL as they are not getting any incentive to buy from fair price shops (hence increasing the stock with FCI), the burden of subsidy has pushed the burden of subsidy further.

1.5. Recent PDS Reforms

1. **Digitization** of almost all of 23 crore ration cards.
2. 56% of the digitised cards have been seeded with unique identification number **Aadhaar.**
3. Installation of **ePOS (electronic point of sale) devices** by many states at the fair price shops to track the sale of foodgrains to actual cardholders on a real time basis.
4. Three UTs-Chandigarh, Puducherry and Dadra and Nagar Haveli have implemented DBT on a pilot basis.

1.6. Revamping of PDS

Suggested Reforms

Procurement Side

- States which have gained sufficient experience (Andhra Pradesh, Chhattisgarh, Punjab, Haryana and MP) should be encouraged to procure for PDS directly from the farmers.

- FCI should focus on states which suffer from distress sale at prices much below MSP, and which are dominated by small holdings, like Eastern Uttar Pradesh, Bihar, West Bengal, Assam etc.
- Private sector should be encouraged to shoulder the responsibility of procuring, storage and distribution of PDS commodities.
- Negotiable warehouse receipt system (NWRs) should be taken up on priority and scaled up quickly.
- GoI should widen its procurement basket so as to incorporate adequate nutrient mix. It will prevent skewed incentive to wheat and rice only and promote crop diversification.
- A transparent liquidation policy is the need of hour, which should automatically kick-in when FCI is faced with surplus stocks than buffer norms.

Supply Side

- End to end computerization: Mapping of FPS and the registered customers at each FPS will help to identify exact requirements at each FPS. Timely and adequate allotment of goods at Fair Price Shops (FPS) in adequate quantities.
- Monthly declaration of sales by FPS to prevent piling up of excess inventories.
- Truck dispatch information & stock availability at FPS through SMS to registered users.
- GPS based tracking of trucks carrying PDS goods.
- FPS should be operated through Gram Panchayats, Cooperatives, Self Help Groups etc.

Consumer Side

- Proper identification of beneficiaries and creating a web database with allotted quantity of each goods as per entitlement.
- Computerized entry via AADHAAR authentication at Point of Sale (POS).
- Pilot testing of cash transfers in PDS, starting with large cities with more than 1 million population; extending it to grain surplus states, and then giving option to deficit states to opt for cash or physical grain distribution.
- Toll Free Number for complaint registration.

1.7. Alternatives to PDS

1. The high level committee chaired by **Shanta Kumar in 2015** had recommended gradual introduction of **cash transfers in PDS**, starting with large cities with more than 1 million population; extending it to grain surplus states, and then giving option to deficit states to opt for cash or physical grain distribution. DBT in the name of lady of the house, and routed it through PM Jan Dhan Yojana, and dovetailing it with the UIDAI has also been suggested. This will help in better targeting, and plugging leakages.
2. **Food coupons** can be provided to the beneficiaries through which they can buy food grains from store, and the dealer could be reimbursed on production of these coupons at the Government treasury. This will remove the problems of procurements, diversion and black marketing of food grains.
3. A Universal Basic Income to all.
4. Entitlement of a fixed basket of food or its monetary equivalent can be provided to all, but the richest individuals. This will remove exclusion error, as it is easier to identify rich, than to identify a poor person.

1.8. Universal vs. Targeted Debate

1. A universal scheme will create an **unnecessary burden over the exchequer**, as this will have huge inclusion error because those who do not need the security, such as rich people, will get automatically included in it. But, at the same time a universal PDS will remove the

exclusion error seen in targeted schemes due to misidentification of beneficiaries, rampant corruption, leakages and diversion in the PDS, etc. Some critics are of view that **a more inclusion error, but less or no exclusion error is more favourable condition** for the success of PDS. Also, rich people can be persuaded to give up their subsidy, as successfully done in LPG.

2. A high procurement of food grain will have to be done for a Universal PDS. This will **increase the price** of wheat and rice in open markets. In case of drought, or inefficient rainfall, will the government be able to import such quantities of highly subsidized food grains?
3. A targeted PDS approach can **limit the operations of both market forces and the bureaucracy**.
4. India is home to a **large number of migrants, non-citizens etc.** A targeted PDS excludes these people as they do not have required documents for ration card. A universal PDS will bring them under the fold of food security. But both budget and grains are limited. Universal schemes implemented in North Africa suggests that it involves unnecessary high costs and no significant benefits to the poor.
5. Universal programs **lack the element of 'affirmative action'.**

1.9. Food Corporation of India (FCI)

FCI is a statutory organisation set up in 1965 under Food Corporation Act 1964. It is the main agency providing foodgrains to the PDS. Its primary duty is to undertake the **purchase, storage, movement, transport, distribution and sale of food grains and other foodstuffs**. FCI is mandated with three basic objectives:

1. to provide effective price support to the farmers, also, it ensures that the farmers are getting the announced remunerative prices and the consumers are getting food grains at the uniform price fixed by the Government.
2. to procure and supply grains to PDS for distributing subsidized staples to economically vulnerable sections of society.
3. keep a strategic reserve to stabilize market (for basic food grains).

1.9.1. Recommendations of High Level Committee on Restructuring of FCI

The Committee was set up in 2014, with **Shanta Kumar as Chairman**. It submitted its report in 2015.

1. **On Procurement Related Issues:**
   - FCI should hand over procurement to those States which have gained sufficient experience (Andhra Pradesh, Chhattisgarh, Punjab, Haryana and MP). It should focus on states which suffer from distress sale at prices much below MSP, and which are dominated by small holdings, like Eastern Uttar Pradesh, Bihar, West Bengal, Assam etc.
   - Negotiable warehouse receipt system (NWRs) should be taken up on priority and scaled up quickly.
   - GoI needs to revisit its MSP policy which gives skewed incentive to wheat and rice only and neglects crop diversification.
   - MSP policy should work in coordination with trade policy so that the landed costs of imported crops are not below their MSP.
2. **On PDS And NFSA Related Issues:**
   - GoI should defer implementation of NFSA in states that have not done end to end computerization; have not put the list of beneficiaries online for anyone to verify, and have not set up vigilance committees to check pilferage from PDS.
   - The current coverage of 67% Population under NFSA is a huge fiscal burden. It should be brought down to 40%.

- Gradual introduction of cash transfers in PDS, starting with large cities with more than 1 million population; extending it to grain surplus states, and then giving option to deficit states to opt for cash or physical grain distribution.
    - Cash transfers can be indexed with overall price level to protect the amount of real income transfers.
    - Cash can be given in the name of lady of the house.
    - Cash can be routed through Prime Minister's Jan-Dhan Yojana (PMJDY) and dovetailing Aadhaar and Unique Identification (UID) number.

3. **On stocking and movement related issues:** FCI should outsource its stocking operations to the private sector.
4. **On Buffer Stocking Operations and Liquidation Policy:** the current system is extremely ad-hoc, slow and costs the nation heavily. A transparent liquidation policy is the need of hour, which should automatically kick-in when FCI is faced with surplus stocks than buffer norms.
5. **On Labour Related Issues:**
    - Increase mechanisation to reduce the number of manual labour requirements and offices.
    - At top level, hire executives from private sector
    - daily wage contractual labour or outsourcing should be done wherever possible
6. **On direct subsidy to farmers:** Farmers be given direct cash subsidy (of about Rs 7000/ha) and fertilizer sector can then be deregulated.
    - This will plug diversion of urea to non-agricultural uses, as well as to neihbouring countries.
    - This will also help raise the efficiency of fertilizer use.
    - This may also help those who take loans from money lenders at exorbitant interest rates to buy fertilizers or other inputs, thus relieving some distress in the agrarian sector.

The new face of FCI as envisioned by Shanta Kumar committee:

- The FCI will become an agency for innovations in Food Management System
- Its primary focus would be to create competition in every segment of foodgrain supply chain-from procurement to stocking to movement and finally distribution in TPDS.
- It will reduce the overall costs of the system substantially, plug leakages, and will serve larger number of farmers and consumers.
- It will make itself much leaner and nimble (with scaled down/abolished zonal offices)
- It will focus on eastern states for procurement
- It will upgrade the entire grain supply chain towards bulk handling and end to end computerization by bringing in investments, and technical and managerial expertise from the private sector.
- It will be more business oriented with a pro-active liquidation policy to liquidate stocks in OMSS/export markets, whenever actual buffer stocks exceed the norms.

This would be challenging, but HLC hopes that FCI can rise to this challenge and once again play its commendable role as it did during late 1960s and early 1970s.

2. Buffer Stocks

2.1. Introduction

A *buffer stock* is a system or scheme which buys and stores stocks at times of good harvests to prevent prices falling below a target range (or price level), and releases stocks during bad harvests to prevent prices rising above a target range (or price level). So, it neutralizes the fluctuation in production of a given crop, so that the prices may remain stable.

In times of surplus production, government procures the crops from farmers through MSP so that the farmers do not suffer negatively for producing more. In times of deficit, government releases the buffer stocks in a phased manner so that interests of the consumers do not suffer, and they are able to meet their nutritional requirements at reasonable prices.

2.2. Buffer Stock Policy of India

The concept was introduced in the **fourth five year plan (1969-74)**, and a buffer stock of food grain was to be maintained by FCI on behalf of the Government of India to meet the monthly release of food grains **for supply through PDS** (Targeted Public Distribution System, TPDS and Other Welfare Schemes (OWS) **to meet emergency situations** arising out of unexpected calamities such as crop failure, natural disasters, etc. and **for market intervention** to augment supply in case of deficit production of food grains, so that, the open market prices get moderated.

Buffer norms are fixed by CCEA (Cabinet committee on Economic Affairs chaired by PM) on quarterly basis as on 1st April, 1st July, 1st October, and 1st January of every financial year. The buffer norms have been revised in January 2015.

Operational stock = Stocks earmarked for TPDS + OWS and Food security stocks/reserves.

In addition to the buffer norms, **a strategic reserve** of 30 lakh tonnes of wheat and 20 lakh tonnes of rice is also maintained. This stock is termed as **Food Grain Stocking Norms.**

Food grain stocking norms refers to the level of stock in the central pool that is sufficient to meet the operational requirements of food grains i.e. for distribution under Targeted Public Distribution System TPDS, Other Welfare Schemes (OWS) and exigencies at any point of time. Earlier this concept was termed as **Buffer Norms and Strategic Reserves**. The Buffer norms of food grains in the central pool have been revised in 2015 and Cabinet Committee on Economic Affairs, CCEA has approved that in case the stock of food grains is more than the revised buffer norm, the Department of Food and Public Distribution will **offload excess stock in the domestic market through open sale or through exports.**

From 2015, Government has decided to create a buffer stock of 1.5 lakh tonnes of pulses to control fluctuation in their prices. NAFED, SFAC and FCI will procure pulses for buffer stock.

Food stock above the minimum buffer norms are treated as 'Excess Stock', and government can liquidate them through export, open market sales or additional allocation to states.

2.3. Critical Evaluation of Buffer Stocks in India

There are several problems in operating and designing a sustainable food intervention system. From procurement of grains, to storing the grains to releasing them, the system is handled mainly by the government (although more recently some part of the logistics have been handed over to private contractors, based on tender-auctions) and is plagued with inefficiencies. Some of the inefficiencies are given below:

1. **Open-ended procurement:** The Government procures for TPDS, OWS and for maintaining buffer/strategic stocks. FCI has to procure a large amount of grain from market due to increasing commitment of government, and has become a buyer of last resort. In 2016-17, Government ended up procuring more than 30% of the marketable surplus of wheat**.**
2. **Procurement Prices have become Support Prices:** Procurement prices which were kept for maintaining the buffer stock has virtually become the prices for purchasing whatever amount the farmer offers for sale. The quantity purchased exceeds the storing capacity of FCI and leads to excessive damage of procured grains.

3. **One tool serving many objectives:** The buffer stocking policy of food grains has become the one tool with the government to fulfill the interlinked objectives of supporting food producers and food consumers, and of ensuring food availability at the national level. Buffer stocking is used to simultaneously tackle the problem of volatility in the price of food grains, provide food security and incentivize high production. Using the same instrument to achieve the objectives of ensuring remunerative price to farmers and providing the procured food grains to the poor at highly subsidized prices creates conflicts. By implication, this entails a huge gap between the purchase price and issue price, and consequently a larger subsidy bill.
4. **Inefficient Inventory management:** In the absence of clear targets for the stock level, the whole inventory management system of the FCI becomes inefficient and thus costly.
    a. First, the **FCI's inventory management policy has a counter-cyclical character**. The government should procure grain in times of abundant supplies in the market, and release it in times of scarcity. However, the need to meet the needs of the TPDS and the other food- based welfare schemes, the government not only withholds stocks during a bad crop year, because it expects off-take to be higher than normal, it also steps up its procurement, pushing up prices in an already supply-constrained market.
    b. **Inefficient Inventory management:** Even after allocating to the mandated schemes and maintaining reserves, an excess of millions of tons of grain remains in the FCI godowns. There is no pro-active, pre-defined, sustainable policy practiced for this residual grain. As a policy, such residual grain, which is of good quality, can be released through two channels.
        i. It could be released in the domestic market under the open market sale scheme (OMSS)
        ii. Grain can be released in the global markets through exports (depending on the prevailing export policy)

    Grain of inferior quality or destroyed grain is disposed of as feed, generally at a pre-determined reserve price.

    The policy towards international grain trade has been of an ad-hoc nature, with the domestic grain supply and price situation determining the export/import policy every year. Also, there have been frequent bans on grain export. While, OMSS-Domestic remains a failure because the issue prices are always kept higher and poor quality of released grains. Both, the methods have proved inadequate for disposing off the residual grain.
5. **Rising cost of Operation:** Under grain management, FCI's main heads of costs are acquisition costs, which include the pooled cost of grain and procurement incidentals, and distribution costs (these are costs involved in the allocation and distribution of grains to various states/UTs under various food- based welfare schemes). To maintain strategic stocks, FCI incurs buffer-carrying costs, which include the cost of warehousing, stock maintenance etc. and this cost of FCI is called "annual rate of buffer carrying cost". This cost has more than doubled since 2001-02. There has been rise in all the above mentioned costs due to:
    a. **Higher acquisition cost:** MSPs and Bonuses are continuously increasing. Mandi charges, milling charges, administrative charges are increasing as well. The economic costs of FCI for acquiring, storing and distributing food grains is about 40 per cent more than the procurement price.
    b. **Higher storage costs and losses due to inadequate capacity:** FCI's average annual rate of increase in storage capacity has been a meager 4.5 percent while the growth rate of rice and wheat stocks in the central pool has been more than 18 per cent. Data for the year 2011-12 show that FCI's storage and transit losses have increased by close to 147 per cent in nominal terms between 2006-2007 and 2011-2012, much of which is accounted for by a 164% increase in storage costs in the period.

6. **De-facto nationalization of the grain market:** With **more than 75 per cent of the marketable surplus procured by the government**, very little grain is available for the open market. This lower market supply exerts an upward pressure on prices in the open market, neutralizing much of the consumer benefits that the subsidy provides. Also, the Essential Commodities Act, APMC Act and state government interferences adversely affect the price competitiveness of Indian grain in the international market.
7. **Increasing gap between per capita production and per capita availability:** Although rice and wheat production rose by 29 per cent between 2000 and 2012, **per capita net availability of grains went down by close to 1 per cent**. When rising stock levels with the government reduces grain availability for consumption, it counters the whole objective of buffer stocking. The idea was to procure grain and distribute it to the needy to improve the access to and availability of grain. However, if the grain is procured, stored, and not distributed/released when needed, then it could, contrary to the objectives of the system, increase food insecurity.
8. **Inefficiencies in the targeted public distribution system:** Along with high amount of pilferage, inclusion and exclusion errors, the economic cost of operation has also increased more than 100% in last decade, while the issue price has remained constant. The huge amount of financial implication can be observed by following facts (2014)
    a. India's food subsidy bill has grown more than 25 times (in nominal terms) during the last two decades
    b. it is more than one per cent of annual gross domestic product (GDP) and five per cent of the agricultural GDP
    c. and is nearly one-third of all subsidies given by the central government.

3. Food Security

3.1. Introduction

The definition of food security has evolved over a period of time. As a concept, food security originated in the mid-1970s, in the wake of global food crisis. The initial focus of attention was assuring the availability and to some degree the price stability of basic foodstuffs at the international and national level. This was then broadened to incorporate the demand side of food security in early eighties. During the nineties issues such food safety, nutrition, dietary needs and food preferences were also considered important ingredients of food security.

In FAO report on 'The State of Food Insecurity, 2001' , food security is defined as a " --- situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life".

World Summit on Food Security stated that the "four pillars of food security" are availability, access, utilization, and stability i.e. food security over time.

To accomplish all the above criteria, requires not only an **adequate supply of food** but also **enough purchasing power capacity** with the individual or household to demand adequate level of food.

Food Security vis-a-vis Constitution of India

In the Indian context, the underpinnings for food security of the people can be found in the Constitution, though there is no explicit provision on right to food.

The fundamental right to life enshrined in Article 21 of the Constitution has been interpreted by the Supreme Court and National Human Rights Commission to include right to live with human dignity, which includes the right to food and other basic necessities.

Under Directive Principles of State Policy, it is provided under Article 47 that that the State shall regard raising the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties.

Providing food security has been focus of the Government of India's planning and policy. Attainment of self-sufficiency in foodgrains production at the national level has been one of the major achievements of the country. In order to address the issue of food security at the household level, Government is implementing the Targeted Public Distribution System under which subsidized foodgrains is provided to eligible households. To further strengthen the efforts to address the food security of the people, the Government has enacted the National Food Security Act, 2013.

3.2. Qualitative and Quantitative Dimensions of Food Security

The adequate supply of food involves two dimensions:

- Quantitative Dimension or overall food availability in the economy.
- Qualitative Dimension pertaining to the fulfillment of nutritional requirements.

3.2.1. Quantitative Dimension of Food Security in India

India gained self-sufficiency in the food grains in 1970s mainly because of green revolution and has sustained it since then.

Foodgrain output in 2016-17 was 275.11 million tonnes. It is forecasted to increase by 0.9% to 277.49 million tonnes in the crop year ending June 2018 after a normal monsoon and wider planting in winter. Thus, in terms of per capita food requirements, India is self-sufficient in the production of major food crops like wheat and rice.

Trends in Per Capita Net Availability of Food Grain

It has fluctuated since last five years. While in 2014, it was 489 g/day, it went down to 465.1 g/day in 2015. As per provisional data, it went up again to 518.1 g/day.

3.2.2. Qualitative Dimension of Food Security in India

While the per capita food availability is sufficient, food is not equally distributed. Due to anomalies in the distribution channels and disproportionate purchasing power capacity of people, the nutritional requirements of vulnerable sections are not adequately addressed.

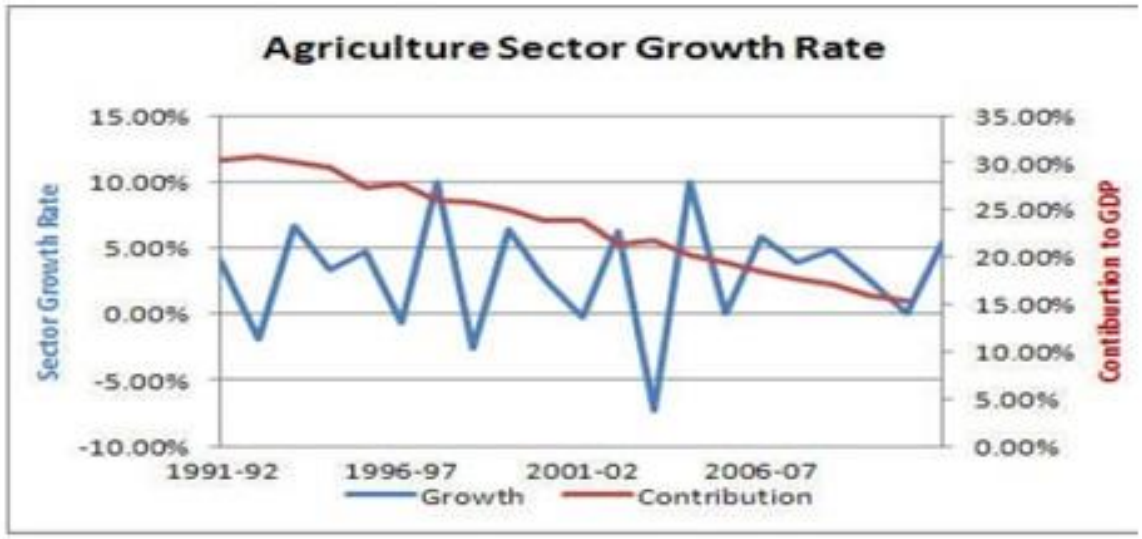
This can be gauged from the following facts:

- According to **State Of Food Security and Nutrition in The World 2017 Report of FAO**, proportion of undernourished population of India was 14.5% during 2014-16; 21% of children under the age of five are wasted (too thin for their height) and 38.4% of children under the age of five are stunted (too short for their age) and 51.4% of women (15-49 years of age) were anaemic in 2016.
- Recently released NFHS-4 report also shows similar facts i.e. 53% women (15-49 years of age) and 58.4% of children (6-59 months) are anaemic and 35.7% of children (under 5) are underweight.
- According to **Global Hunger Index 2017 (published by International Food Policy Research Institute)**, India ranks 100 out of 119 countries.
- India's Hunger Index score for 2017 is 31.4, which indicates that India is at the high end of the 'serious' category.

3.3. Why Securing Food is a Challenge?

Over the coming decades, a changing climate, growing global population, rising food prices, poor agricultural growth rate (trends shown below) and environmental stress factors will have significant yet highly uncertain impacts on food security.

Moreover, a significant proportion of population is economically backward to be able to afford adequate food for fulfilling their dietary requirements. Despite the availability of government support programs, there have been numerous question at international foras like WTO over government public procurement and distribution of food grains to the needy people.



To tackle the quantitative and qualitative aspect of food security problem, India provides **three food-based safety nets**

- Public Distribution System (PDS)
- Integrated Child Development Scheme (ICDS)
- Mid-Day Meals Program (MDM)

3.3.1. Integrated Child Development Scheme (ICDS)

A **centrally sponsored scheme** launched in 1975, it is a one of the largest child intervention programs in the world with a holistic package of **6 basic services for children up to 6 years of age**, and for pregnant and lactating mothers. These services are:

- Supplementary feedings (Child-500 calories, 12-15gm protein for 300 days, Pregnant mothers-600 calories, and 18-20 gm protein)
- Immunization
- Health Checkups
- Referral services
- Health and nutrition education to adult women
- Non-formal pre school education to 3-6 years old.

3.3.2. Mid-Day Meal (MDM) Scheme

National Program of **nutritional support to primary education**, also called MDM scheme was launched in 1995. It is a nationwide **central scheme** intended to improve the enrolment and regular attendance and to reduce the dropouts in schools. It is also intended to improve nutritional status of primary school children. From 2008-09, Children from upper primary level i.e. till Class VIII were also included in the scheme. MDM is the world's largest school feeding program reaching out to about 11 crore children in Schools and Education Guarantee centres

(EGS) across the country. **For primary students-300 calories and 8-12 gm protein and for upper primary students-700 calories and 20 gm protein has been kept as norm**.

3.3.3. Critical Appraisal of ICDS and MDM

India's one of the biggest flagship programs, the Rs 8,000 crore-a-year Supplementary Nutrition Program (SNP) to fight child malnourishment under ICDS suffers from gross violations and misuse of rules and has failed in meeting its ends.

1. Due to **meager allocation of resources and faulty policy designs,** the overall impact of ICDS and MDM over malnutrition has remained very limited.
2. The states with high degree of malnutrition, have **low coverage** of both the schemes.
3. Poor quality of **nutrient deficient meal** is being served at most of the schools.
4. ICDS has limited itself with just one function of Supplementary Nutritional Program (SNP) and is not concerned about other functions. Also, it focuses on children 3-6 years of age, so, 0-3 years (when maximum nutrition is required) old suffer neglect.
5. Since food is nutrition deficient in ICDS as well, children are facing the problem of **hidden hunger** i.e. prevalence of Iodine, calcium, iron or Vitamin A deficiency.
6. Child Immunization and pre-school education is neglected under ICDS, except in Tamil Nadu (FOCUS report).
7. ICDS is poorly implemented. Also, several posts such as of CDPO and supervisors remain vacant in many states.
8. FOCUS reports (Focus on Children Under Six Report by Right To Food Campaign NGO) show that c**orruption is the main reason for failure** of ICDS and MDM in removing malnutrition. It was found that 'panjiri' (ready-to-eat energy mix) meant for children is being used illegally to feed the cattle of rich and influential in Uttar Pradesh. **Rampant corruption, fudged records and bland panjiri has become the reality of ICDS.**
9. MDM is **falling prey to private contractors**. Also, political leaders and influential business people have formed SHGs and mahila mandals to gain such contracts.

3.4. National Food Security Act, 2013

It marks a paradigm shift in approach to food security – from a welfare to rights based approach. The Act legally entitles up to 75% of the rural population and 50% of the urban population to receive subsidized foodgrains under Targeted Public Distribution System. About two thirds of the population therefore is covered under the Act to receive highly subsidized foodgrains. There is a special focus in the Act on nutritional support to pregnant women and lactating mothers and children up to 14 years of age by entitling them to nutritious meals. Pregnant women will also be entitled to receive cash maternity benefit of Rs. 6,000 in order to partly compensate her for the wage loss during the period of pregnancy and also to supplement nutrition. Keeping in view the important role that women play in ensuring food security of the family, the Act contains an important provision for women empowerment by giving status of head of the household to the eldest woman of the household, for the purpose of issuing of ration cards.

Further, the Act seeks to provide food and nutritional security in human life cycle approach, by **ensuring access to adequate quantity of quality food at affordable prices to people to live a life with dignity** and for matter connected therewith or incidental to it. The Act brings the **Right to Food** within the framework of legally mandated entitlements.

3.4.1. Key Features of the Act

1. It entitles 75% of the rural population and 50% of the urban population (**67% of the population i.e. 80 crore people**) for subsidized grain under TPDS.

2. The act provides **'individual entitlement'** and each **individual will be provided 5 kg** of wheat, rice or coarse cereals a month at the rate of Rs 3, Rs 2, and Re 1 per kg respectively. These Prices may be changed by the Central Government from time to time, but after 3 years of the act only and not above the MSP.
3. 2.43 crore people under **AAY will get 35 kg food grain** per household per month, like earlier.
4. State Governments have been given responsibilities to identify the households within 365 days of the passage of the act.
5. For children below 6 months, **exclusive breast feeding** is to be promoted. For children between 6 month to 6 years, **age-appropriate free meals** will be provided by the Aanganwadi Centres. For children between 6-14 years of age (unto Class VIII) will be given **Mid Day Meal** at public schools.
6. Every pregnant and lactating mother will get free meal at local aanganwadi (till 6 months of delivery) and a **maternity benefit of Rs 6000** in instalments.
7. A **State Food Commission** will be set with a chairperson, five members and 1 secretary (including at least 2 women, and 1 member each from the SC and ST community)
8. If concerned state government is not able to provide the food grain, then **equivalent food security allowance** has to be provided.
9. Act includes three schedules:
   a. **Schedule 1** prescribes issue prices for the PDS.
   b. **Schedule 2** prescribes nutritional standards for MDM, take home rations and related entitlements.
   c. **Schedule 3** lists various provisions to advance food security under 3 broad headings:
      - revitalisation of agriculture (land reform, R&D, etc.)
      - procurement, storage and movement of food grains, and
      - other provisions (safe drinking water, sanitation, healthcare, adequate pensions for vulnerable, etc.)

3.4.2. Critical Evaluation of NFSA

1. **Cost Of Implementation:** It will take around Rs 1.3 lakh crore (1.3% Of GDP at current market prices) to provide annual food subsidy under NFSA. Critics believe that other entitlements, maternity benefits, transportation, grievance redressal and other associated costs will make a huge cost burden of around 6.8 lakh crore over the 3 year period 2013-14 to 2015-16.
2. **Risk of Leakages:** NSSO data shows a huge leakage of 37% from PDS in 2011-12. Although it is unacceptably high but is declining as compared to 44% in 2007-08 and 54% in 2004-05.
3. **Identification Of Beneficiaries:** Identification is an inherent problem in targeted schemes. It amounts to a huge exclusion error in India, mainly because of prevalent illiteracy and corruption. However a Socio Economic Caste Census (SECC, 2011) has been done and its reports are in public domain now. Criteria can be find out to select beneficiaries, or to keep out a section of people who do not need such subsidies.
4. **Problems In Procurement** CACP argues that production has to go up by an extra 25 MT to meet the requirements of NFSA. But, analysts say that since our production and procurement of cereals has been increasing continuously since 2000-01, procurement shall not be a problem. Also, CACP has included just wheat and rice in its estimation, coarse cereal has not been included.

3.5. WTO and Food Security

[WTO rounds related to Agriculture and Public Stockholding has been dealt in detail in the Farm Subsidies Section]

According to WTO, people are considered **food secure** when they have **access to sufficient, safe, nutritious food to maintain a healthy and active life**. For food security reasons several countries adopt Public Stockholding Programmes through which the government purchases, stockpiles and distribute food to people in need. WTO considers it a legitimate policy objective, but when this involves purchases at "supported" or "administered" prices by the government, then it is considered as trade distorting.

- **At 2013 Bali Ministerial Conference**, ministers agreed that on an interim basis, public stockholding programmes would not be challenged legally even if a country's agreed limits for trade-distorting domestic support were breached, subject to certain safeguards. They also agreed to negotiate a permanent solution to this issue by the end of 2017 (**Peace Clause)**.
- At present such subsidies are classified as trade distorting and **capped at 10% of production value** (for developing countries).
- The safeguards include several tough conditions such as these subsidies must not affect the food security of other countries and world prices, information has to be shared, etc.
- At **2015 Nairobi Ministerial Conference**, the resolution was reaffirmed that the members must take all concerted efforts to agree on a permanent solution.

3.5.1. Recent debates in WTO meets over Food Security

Demands of India in WTO

- to find out a permanent solution for its public stockholding programmes for food security.
- special safeguard mechanism for millions of farmers from unforeseen surges in agricultural imports.
- an agreement for removing bottlenecks for facilitating trade in services.

The G-33 Coalition of developing countries led by Indonesia in 2014 and 2015 had offered several options to reach a permanent solution, such as to:

- include these 'support programmes' for food security under Green Box which is exempted from any subsidy reduction commitments.
- modify the rules to address the historical inequities in the existing WTO's Agreement on Agriculture.
- G-33 countries also want that **"traditional staple food crop"** term used in Bali decision be replaced by **"foodstuffs"** to cover all food crops.

The above two proposals (inclusion in Green Box, and addressing historical inequalities) have been **defied by US, EU, Canada, Australia, Brazil, Thailand, Pakistan,** etc. They argue that inclusion in green box:

- will amount to a **carte blanche** i.e. unrestricted power to act on one's own discretion,
- would lead to unsustainable production; and
- the permanent solution must be based on the Bali agreement, which affirms that such programmes lead to distortion.

WTO 11th Ministerial Conference at Buenos Aires in December, 2017 ended in a stalemate with no permanent solution.

4. Vision IAS GS Mains Test Series Questions

1. With overflowing godowns and the presence of one of the largest population of hungry in the world, there seems to be a paradox in the Indian system. Comment and provide suggestions to rectify it.

Approach:

- First explain that this paradox occurs using some basic facts and then we can explain "why" this paradox occurs
- Then give some suggestion at institutional level and policy level to address this paradox.

Answer:

More than 45 years after Green Revolution began; India provides a unique spectre of overflowing godowns and rotting grains on the one hand while millions go to bed hungry. Having the largest population of hungry in the world, India ranks 66 among 105 countries in the 2012 Global Hunger Index. That too at a time when there is no shortage of food within the country. Recent record on the food grain stock in the country shows that the government of India is pilling up one of the world's largest stockpiles of food grains amounting to around 667 lakh tonnes, as of January 2013. This is much higher than the government's rule of stocking up buffer stock of 250 lakh tonnes which must be maintained in a year.

To ensure that no starvation death takes place and people are saved from malnutrition as far as possible, the Supreme Court directed the centre to release five million tons of food grains immediately for distribution in 150 most poverty-stricken districts or other poorer segments in the country. The entire food production and distribution system therefore needs an urgent overhaul. If only the government was to focus on agricultural production, procurement and distribution in a decentralized manner, much of the agrarian crisis would disappear. There is a need is to take the following steps to address this paradox -

Institutional Set up

- Set up a wide network of *mandis* and temporary purchase centers across Bihar, eastern Uttar Pradesh, West Bengal, Odisha, Assam and the other northeastern states. Extending the Green Revolution to northeast has already increases rice production, but farmers are resorting to distress sale getting about 20 to 30 per cent less because of the absence of procurement centers. Thus mandis will cater to their problems where they will get optimum price for their produce.
- Invest in setting up a network of grain silos, warehouses and godowns across 50 places spread throughout the country. The public-private partnership model to improve storage facilities is a promising solution
- Thrust on food processing industries thereby setting food processing centres across the country.

Policies and legislations

- **Strengthening PDS**- The public distribution system should be strengthened and should be designed to reach the unreached.
- **Bringing food security bill based on right based approach** - effective bill on food and nutrition security, address the issue of rotting food grains -- a criminal waste when people still die of starvation-- and rely on bottom-up methods that complement the top-down administrative structure to identify the poor and reduce both exclusion and inclusion errors in targeting

- Removing barrier to interstate trade
- Longer term policies of restoring purchasing power need to be started on an urgent basis, and the stepping up of food-for-work programmes to cover every state whether drought affected or not, is the obvious answer.
- Decentralised procurement and decentralised storage will help to minimise transport and transaction costs.. The storage can be done through a national grid of Community Food Banks (CFBs) managed by self-help groups

A universal and user-sensitive Public Distribution System, Food Guarantee Scheme, Community Food Banks and various other food entitlement projects need to be implemented in an integrated manner, so that the goal of hunger-free India can be achieved.

2. Starvation in the midst of plenty; this reflects the sorry state of affairs associated with the issue of food security today. In light of this statement, what role does buffer stock play in promoting food security? Comment on the Institutional Setup for the management of buffer stocks and bring forward challenges as well as solutions associated with the same.

Approach:

Explain the concept of Buffer Stock and why it is required to maintain. Further, Elaborate on the institutional setup for the management of stocks, analysing the current shortcomings and suggestions for revamping the system.

Answer:

The Buffer norms are the minimum food grains the Centre should have in the Central pool at the beginning of each quarter to meet requirement of public distribution system and other welfare measures. Buffer stock constitutes an important parameter for ensuring food security in the country. It is well known that a modicum of self-sufficiency in food is desirable which immediately means that the state will have the responsibility of maintaining a certain amount of food stocks. Further, it is argued that in a big country like ours, it is politically risky to rely entirely on private traders and international trade to iron out excessive price fluctuation and international experiences in the past have shown that relying entirely on international market comes with its own strategic costs.

Maintaining buffer stocks helps in achieving multiple objectives i.e. they are required to feed TPDS and other welfare schemes; ensure food security during the periods when production is short of normal demand during bad agricultural years and stabilize prices during period of production shortfall through open market sales.

The Food Corporation of India, is the nodal agency for procurement, storage and release of food grains in India. It was setup under the Food Corporation Act 1964. The objectives of FCI are:

- Effective price support operations for safeguarding the interests of the farmers
- Distribution of food grains throughout the country for public distribution system
- Maintaining satisfactory level of operational and buffer stocks of food grains to ensure National Food Security.

Buffer stocks have been under frequent attacks in recent times. The level of stocks is said to be too high in relation to the buffer stock norms which is causing huge cost in terms of storage, interest on value of produce, and wastage, tying up huge resources

that could have been put to better use. It is argued that price stabilization can be better achieved through trade rather than stocks and the former is found to be much cheaper than latter. Further, it is also argued that buffer stocks for absorbing shocks due to production fluctuation were justified when India did not have enough foreign exchange reserve to maintain excessive stocks held by public agencies.

What needs to be done is to vary our procurement, taking in more when the weather is good, supply plentiful and with low prices, when the weather is bad and prices are high. Further, the efficacy of the policy of offloading of grains is enormously dependent on the size of packages to be offloaded in the open market.

Inspired by the sight of food grain going waste, it is often made out to be that our central problem is that of poor food grain storage. Though there is no doubt regarding improving our storage facilities, it is important to be clear that this will not lower the price of food. To achieve that we need to redesign the mechanics of how we acquire and release food on the market.

3. Huge increase in food production in recent times has neither resulted in a more equitable distribution of food nor has it led to a moderation in food inflation. In this context, discuss the systemic and operational inefficiencies in the grain management system in the country.

Approach:

Elaborate upon the current situation where increase in food production has not had the desired commensurate effects on Indian economy and food security scenario. Major part of the answer should focus on inadequacies in India's grain management system.

Answer:

While the Indian agriculture on a whole grew at a rate of 4.1 percent for 11th FYP, there was no commensurate increase in per capita food grain availability. A lot of this gap between production and availability to end user can be attributed to various lacunae in the way we manage food grain as it moves from the producer to the consumer.

A majority of our population is dependent on PDS, managed by FCI making government the largest procurer of food grains in the country. This structure faces is plagued by a myriad of inefficiencies like:

- FCI was set up in 1965 with the twin objective of procuring food grains for the government's food policies and to offer some support to farmers who can sell their produce at the government-mandated minimum support price (MSP). However over the years with increase in MSP and inability of FCI to move grains out of its storage quickly, has resulted in making FCI one of the largest hoarders of food grain in the country. It currently holds more than four times the required buffer stocks. This stock can be safely off loaded in the open market to increase the net food availability.
- Lack of adequate capacity with FCI to store the procured grains leading to wastage, rotting of food grains etc.
- The centralized procurement and storage of food grains makes the cost of taking food to go-downs and to consumers cost more than the food procurement at MSP. There is a need to encourage local procurement and storage model. This will further increase the local food grain availability.
- Lack of accountability is the central issue. FCI is neither a PSU- company nor a government department as it is formed under the Food Corporation of India Act of

1964.The FCI Act itself says all its expenses will be borne by the centre. So there is no accountability inherent in the structure. It's neither a government department which is accountable to parliament nor is it a PSU which is accountable to shareholders.

- There is a need to change storage technology. Following tradition, FCI stores grain mainly in jute sacks; but this causes problems as the gunny sacks are easily damaged by rodents. This has lead to huge food grain losses over the years. Instead we need to move towards grain silo which is a concrete or metal structure where grain is stored loose and not in bags.
- Cost is the biggest problem at FCI. FCI's biggest cost is its labor.- it has a staff strength of over 36,000 employees and 18,000 loaders. Rationalization of operational costs can make it possible to invest more on increasing storage capacity and improving it distribution system.

In future we will continue to focus on increasing agricultural production because of its benefits to rural economy. This coupled with the need to feed our increasing population makes it imperative that FCI to resolve the above lacunae in a time bound manner.

4. Food and nutritional security, increasing farm income, poverty alleviation and minimizing crop production risks on account of climate change are the priority challenges faced by Indian agriculture. Comment. Also, suggest measures to address these challenges on priority basis.

Approach:

- Discuss the challenges facing agriculture sector under various themes listed in the question.
- Discuss the remedial measures to address the challenges identified in the first part.

Answer:

India is an agrarian nation where half of population is still dependent on agriculture and allied sectors for livelihood. But its GDP contribution is around 19% (2014-15). Also there is a huge disparity in land distribution with average landholding size of 0.2 ha, majority of whom are small and marginal farmers. However, since the merger of global economies many new issues are arising while many old ones are getting more concerning which is evident from the logjam in Doha round of WTO negotiations. Some of the priority challenges and their possible solutions are discussed as follows:

- **Food and nutritional security:** Though government has given statutory status to food security covering around 67% of population, our main focus has been on making available staple food comprising of cereals – wheat and paddy. Also, there are many issues regarding access to these food items. On account of nutritional security, we have launched few missions focusing on increasing production of oilseeds and pulses – like Integrated Scheme for Oilseeds, Pulses, Oilpalm and Maize (ISOPOM) and the latest push has been given through launch of Protein mission in annual budget 2014-15, but tangible benefits are yet to be achieved as we are still importing them. Also, there are major problems in extension program regarding the transfer of the technology from research institutions to the farmers' field.
- **Increasing Farm Income**: Focus must be diverted from just increasing crop production to farm income, which includes income from livestock, poultry and other related agricultural enterprises. However, this has not been encouraging on

account of institutional drawbacks, lack of access to modern technology, market information which needs to be corrected.

- **Poverty Alleviation**: India resides in villages – main source of income agriculture – lack of synergy between Policy initiatives, technology extension and welfare program results in persistent poverty among rural population.
- **Minimizing the crop production risks on account of climate change:** Climate change is the reality and since India is an agrarian economy, we have lot of reasons to be concerned…lack of awareness among the farmers, slow pace of R&D in development of Good Farming Practices – climate resilient agriculture.

Some remedial measures to tackle above mentioned challenges on priority basis:

- Increasing agricultural productivity - focusing on the technology development and its effective dissemination; focus on access to inputs in timely manner along with attention to output sector.
- Attention to rainfed regions of India – can constitute Rainfed Authority of India – focus on crop diversification, availability of modern technology.
- Linking farmers with markets with least possible intermediaries.
- Increasing investment in agriculture, especially in new potential areas like North east, collaboration with private sector with proper legal reforms creating conducive environment.
- The introduction of climate-smart agriculture to adapt the sector to changing environment and climate characteristics.
- All the above measures should inter alia include the sustainable development approach – tackling climate change challenges.

5. Despite being amongst the top agricultural producers, there exists a huge gap between production and availability of food grains and vegetables in India. Analyse the reasons for the same with special focus on post-harvest losses. Also enumerate the steps taken by the government to address the problem.

Approach:

- Introduce the given statement by substantiating some key facts.
- Discuss the reasons including supply chain problems which cause wastage.
- Mention the steps of the government in this regard.

Answer:

India's is the world's largest producer of milk, many fruits and vegetables, and some staples. In recent years India has achieved a record production in food grains. It is favoured by a vast geographical area supported by varied climatic conditions.

Even though India has enough food it is home to about 25 percent of the world's hungry poor. The per capita availability of food grains, fruits and vegetables, vis-a-vis production, is quite low.

Table 4: Per capita Availability and Deficit of other than food grains

Food Items	Per capita availability	ICMR recommendations for Indians	Per capita deficit
Milk	246 grams/day	250 grams/day	06 grams/day
Egg	42 eggs/annum	180 eggs/annum	138 eggs/annum
Vegetables	179 grams per day	300 grams per day	121 grams per day
Fruits	58 grams per day	92 grams per day	34 grams per day

The Per capita amount of food available is typically calculated as production plus imports minus exports divided by the population.

Reasons for the low per capita availability

- **Poverty**: India is a hugely demand-constrained economy due to poor purchasing power reflecting poor access to nutritious food despite high production.
- **Exports**: When demand is low, an increase in local production need not translate into increased availability as a larger portion of the produce may be exported.
- **Government stocks**: Huge public stocks have been built up, foregoing consumption. The food in these stocks is deteriorating because of poor management, reducing availability.
- Huge leakages in **Public Distribution System**
- **Post-Harvest losses:** Around 25-30% of the production is wasted which means the inefficient utilisation of production and lowering of its availability.
- **Absence of a unified Agricultural market** which creates wide differentials in prices for the same commodity in different regions**.** It also leads to sharp seasonal variation of prices.

These higher levels of post-harvest losses are caused by the following:

- **Inefficient supply chain** for the distribution of the fruits and vegetables because of several problems:
  - Numerous stake holders working in isolation
  - Absence of demand forecasting
  - Absence of application of technology improvements
  - Lack of system integration
  - Presence of large number of unorganized retailers
- **Improper bagging** without crating,
- Lack of **temperature controlled vehicles** and **cold chain facilities**. According to research, approximately only 10% of the fruits and vegetables produced in India use cold storage
- Unavailability of enough **processing facilities** for the agricultural produce
- Lack of **vertical integration** of production with processing.

The government has adopted multi-pronged strategy to improve food availability in India:

- **Increase production** through various programmes such as Rashtriya Krishi Vikas Yojana, ISOPOM etc.
- **Increasing purchasing power** through welfare measures such as MGNREGA, NSAP etc.
- **Reducing leakages** by improving PDS through Aadhaar and Direct Benefit Transfer.
- **Rationalising buffer stocks**
- **E-NAM-** pan-India electronic trading portal which networks the existing APMC mandis to create a unified national market for Agriculture.
- **Model APMC act** and exclusion of fruits and vegetables from the purview of State APMC act by certain states.

Several steps have also been taken to reduce post-harvest losses:

- Scheme for Development of Infrastructure for Food Processing having components of Mega Food Parks, Integrated Cold Chain, Value Addition and Preservation Infrastructure and Modernization of Abattoirs

Student Notes:

- Scheme for Quality Assurance, Codex Standards, Research & Development and Other Promotional Activities.
- Central Sector Scheme of Cold Chain, Value Addition and Preservation Infrastructure.
- Various departments and ministries are providing assistance for setting up cold storages under different schemes.

6. *"Food Security Act shouldn't be seen as just another subsidy. If implemented well, it has the potential to give a huge boost to the sagging economy." Comment.*

Approach:

- Explain the FSA – describe that it leads to substantial increase in subsidy
- Then explain that it's not just another subsidy – if implemented in spirit, it would boost economy by
  - Construction boom due to stepping up of construction of procurement, storage, transport facilities
  - boosting rural demand
  - Building productive human resource
- Finally conclude hence although it is costly – but the attempt is worth the cost. It's not only morally appropriate but makes economic sense as well.

Answer:

- The Food Security Act envisages the distribution of wheat, rice and coarse grains to over 2/3rd of its population. The new bill will expands that coverage at a cost of about 1.35% of the GDP which is going to increase as our population increases. It will worsen the fiscal deficit situation and may even lead to high CAD in years of bad monsoons when government has to import food to meet its legal obligations. Hence financial analysts are raising predictable concerns about its affordability. These concerns, however, are misplaced.
- A large part of the food subsidy today is also wasted on the transport and storage of monumental food stocks. With a well-functioning PDS, it will be much easier to coordinate procurement and distribution, so that excess stocks don't accumulate. The availability of excess stocks also means that the short-run economic cost (as opposed to the financial cost) of the Act is virtually nil.
- With clear legal obligations, the governments will be forced to step up their procurement infrastructures, create more storage houses, cold storage, etc. which may give rise to construction boom in the economy.
- Further to make up for the increased demand, the ministry of agriculture may have to take steps to improve farm productivity substantially. This will raise farmer's income, effectively giving rise to higher aggregate demand. This will boost the sagging economy as well.
- Finally the Act is a form of investment in human capital. It will bring some security in people's lives and make it easier for them to meet their basic needs, protect their health, educate their children, and take risks. This will make better, healthier and more productive work force, which will benefit the economy as a whole. In short, the Food Security Act is sound economics.

7. Indian agriculture has become cereal-centric and as a result, regionally biased and input-intensive. Discuss. What steps have been taken by the government to rectify this issue?

Approach:

- Discuss the regional bias and input intensive character of Indian agriculture due to its cereal-centric nature.
- Mention various schemes and programs being implemented by the government to bring about crop diversification, remove regional bias and reduce input intensity.

Answer:

The current scenario in Indian agriculture is that wheat and rice, the two main cereals, are grown on the most fertile and irrigated areas of the country. Green revolution was focused around these cereals which made the country self-sufficient in food production. However this also meant diversion of land from crops like pulses and coarse grains to water guzzling crops like paddy. It also led to growing regional disparities between the original Green Revolution States (Punjab, Haryana and Western Uttar Pradesh) as compared to the eastern states of the country.

The successive monoculture has also led to increased dependence on fertilizers for maintaining soil fertility and sustained outputs. Input intensive agriculture has brought down the profit margins for farmers, especially the marginal ones.

Not only these cereals highly input intensive, they also use a large part of the resources that the government channels to agriculture, be it water, fertilizer, power, credit or procurement under the MSP program. It has created a vicious cycle, where increasing input costs lead to further demand of increase in MSP and increases of MSP has led to these crops being grown in unsuitable regions leading to rise in input costs.While the government announces MSP for 23 crops, effective MSP-linked procurement occurs mainly for wheat, rice and cotton. The MSP policy needs to encourage other crops, like pulses, through a Rainbow Revolution on the lines of the Green Revolution.

The government of India has taken several initiatives to promote diversification of agriculture, remove regional bias and reduce input intensity. These include:

- Promotion of cultivation of pulses and coarse cereals under National Food Security Mission (NFSM) and oilseeds under National Mission on Oilseeds and Oil Palm (NMOOP)
- **Crop Diversification Programme** in Original Green Revolution States as a sub scheme of Rashtriya Krishi Vikas Yojana (RKVY) since 2013-14 to divert the area of water guzzling paddy to alternate crops like pulses, oilseeds, maize, cotton and agro forestry system. The programme has been extended to tobacco growing states to encourage tobacco growing farmers to shift to alternate crops/cropping system
- **Technology Mission for the Integrated Development of Horticulture in the Northeastern Region**. This will ameliorate the regional bias.
- **National Agriculture Insurance Scheme**. The scheme will cover food crops and oilseeds and annual commercial and horticulture crops, and thus promote other crops.
- **Initiative for Nutritional Security through Intensive Millet Promotion (INSIMP), National Horticulture Mission (NHM) and Technology Mission on Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM)**
- **Promoting water conservation techniques** like Direct Seeded Rice (DSR), System of Rice Intensification (SRI), alternate wetting & drying method, laser land levelling,

adoption of short duration and drought tolerant varieties, etc. (NFSM) through programs like Bringing Green Revolution to Eastern India (BGREI), National Food Security Mission (NFSM), etc.

- **Promoting organic farming** through various schemes/programmes like National Mission for Sustainable Agriculture (NMSA)/ Paramparagat Krishi Vikas Yojana (PKVY), Rashtriya Krishi Vikas Yojana (RKVY) etc.
- Indian Council of Agricultural Research, Pusa has developed new pulse variety (PUSA Arhar – 16) with extra early maturing period.

8. Financial support to farmers through various instruments has been a crucial aspect of agricultural policy of the government. Examine whether the proposal of moving towards direct transfer of benefits and universal crop insurance would alleviate the existing concerns in the current scenario.

Approach:

- In the introduction, explain the current financial support to the farmers, as highlighted by the given statement.
- Discuss the issues with current instruments of financial support and measures needed to address them.
- Provide a solution oriented conclusion.

Answer:

To address the financial problem of farmers government came up with schemes like Interest Subvention Scheme, loan waiver, MSP and subsidies in different sectors (fertilizer, electricity etc.). However, there are certain issues with respect to economy and efficiency of such approaches For example, it is seen that at least 30 to 40 per cent of crop loans under the interest subvention scheme is getting diverted to non-agricultural uses. Under these circumstances the need for moving towards direct transfer of benefits and Universal crop insurance has been felt.

Direct Transfer

Benefits

- Reduce leakages, which currently hover around 30 to 40 per cent.
- Will promote equity as a subsidy package can be designed on a per-hectare basis, with smaller landholders getting a higher per-hectare rate.
- Convergence: Directly transferred money to farmers' accounts linked to Aadhaar for all input subsidies like fertilizers, seeds, farm machinery and credit, will give them freedom to choose the right mix of inputs at market prices.
- Address market distortions: Transferring input subsidies to farmers' accounts will let the markets for inputs be freed.
- Post-harvest losses will also be covered and Time Bound Payment of Losses will prevent delays and further worsening of Farmers' Distress.

Challenges

- Issue of upfront payment: not all farmers can pay market prices for say, fertilisers and wait for the subsidy to be credited to their bank accounts.
- Exclusion of sharecroppers by virtue of their not 'owning' land.
- Inadequate penetration of banking services.

Crop Insurance Scheme

Currently crop insurance scheme has limited penetration due multiple conditionalities, in terms of season, crop etc. Moreover, due to significantly high premium rate, insurance coverage is very less. Therefore, it is argued that Universal Crop Insurance Scheme should be launched.

Benefits

- Increased penetration: It would increase the coverage of insurance scheme.
- Financial security: This would ensure financial security to distressed farmers, reducing farmer suicide.
- Formalise agriculture: With increased penetration of insurance in farming sector, a beginning can be made towards the formalization and taxation of agriculture.

Challenges

- Universal crop insurance scheme would need huge financial resources.
- Universal crop insurance without matching extension services might encourage farmers to take unsustainable risks, thereby making insurance unviable.

Way forward

Steps such as PM Fasal Bima Yojana, changes in land leasing laws (which allow formal recognition of non-landowning cultivators) are the moves in good direction and could offer solution. Thus, both direct transfer of benefits and Universal Crop Insurance, if applied creatively and equitably, have the potential to alleviate the current concerns and leakages.

5. Previous Year UPSC Questions

1. Food Security Bill is expected to eliminate hunger and malnutrition in India. Critically discuss various apprehensions in its effective implementation along with the concerns it has generated in WTO.

ECONOMICS FOR ANIMAL REARING

Contents

1. Introduction

Ever since the beginning of civilization, humans have depended on animals for many requirements, such as that of food (milk, meat and egg), clothing (hide or wool), labour (pulling, carrying load) and security etc. The development of desirable qualities in all such animal species, through creating better breeds, has been an important human achievement. For this, humans have consistently tried to improve the breeds of domesticated animals to make them more useful for them.

The branch of science, which deals with the study of various breeds of domesticated animals and their management for obtaining better products and services from them is known as Animal Husbandry. The term husbandry derives from the word "husband", which means 'one who takes care'. When it incorporates the study of proper utilization of economically important domestic animals, it is called Livestock Management.

2. Different Categories of Animals

- Wild: Those that breed better where they are free than they do when they are captivated. They have no common use for humans. Example Lion, Tiger, Rhinoceres, Deer etc.
- Tamed: Those, which are caught from the wild and trained to be useful to humans in some way. Elephant, Chimpanzee, Gorilla, Yak etc.
- Domesticated: Those that are of use at home and are easily bred and looked after by humans. Common domesticated animals are dog, horse, cow, sheep, buffalo, fowl etc.

3. Role of Livestock in Indian Economy

- **Output functions** such as source of edible (milk, meat, egg) and non-edible (wool, leather, hides) products.
- **Input functions** such as providing draught power (bulls/oxen), dung, urine etc. in crop production.
- **Economic functions** by providing steady income - being the source of milk, meat and eggs almost round the year.
- **Risk Coverage** in case of crop failures or other disasters and are considered as 'Banks on hooves'.
- More equitably distributed compared to land, thus has more potential for increasing farmers' income. Rapid growth of the livestock sector can be even more egalitarian and inclusive than growth of the crop sector because those engaged in it are mainly small holders and the landless.

4. Present Status of Animal Rearing in India

- According to NSSO 68th round survey, 16.44 million people are engaged in the activities of farming of animals, mixed farming, fishing and aquaculture.
- It contributes around 4% of GDP and 25% of Agricultural GDP.
- India has one of the largest cattle population in the world.
- Value of milk alone in 2014-15 was Rs 4.92 Lakh crore which was more than the value of wheat and rice combined i.e. 3.6 Lakh crore.

Production Figures

- **Milk Production:** India is the largest producer of milk in the world with 165.4 million tonnes in 2016-17, and per capita availability of 355 g/day.
- **Egg Production:** 88.1 billion, with per capita availability of 66 eggs/annum in 2016-17
- **Wool Production:** 43.5 million kg in 2017-18

- **Meat Production:** 7 million tonnes in 2015-16
- **Fisheries Production:** India is the second largest producer of Fish (marine + fresh water) and also, the second largest producer of Fresh Water Fish. About 108 lakh tonnes of Marine and 17 lakh tonnes of inland fisheries produced in 2016-17. Due its large coastline, India has high potential for fisheries.
- India is first in total buffalo population (56.7%) in the world, second in cattle population, second in fish production, second in goat and third in sheep population in the world.

5. Challenges faced by Animal Husbandry Sector

- **Lack of access to organized markets and meager profits** distract farmers from investing into improved technologies and quality inputs. Informal market intermediaries often exploit the producers.
- **Shrinking and degrading pastures coupled with limitations of fodder, lack of sufficient veterinary care and apathy to assisted reproductive technologies** have been the major constraints in reaching the full potential of animal husbandry e.g. potential of raising Pashmina goats' viz. Changthangi in Ladakh and Chegu in Himachal Pradesh remains under exploited due to above reasons.
- **Livestock extension services are almost absent**. The extension format, methodology and set-up established for agriculture has failed to cater to the needs of the livestock sector. Consequently, only 5.1% of the farm households were able to access any information on animal husbandry against 40.4% for crop farming. The only centrally sponsored scheme on "Livestock extension and delivery services" with a budgetary outlay of Rs. 15.00 crore remained non-operational.
- **Sufficient facility / setup for disease diagnosis, reporting, epidemiology, surveillance and forecasting are not on board**. Several diagnostic kits required for disease surveillance and monitoring are imported at a huge cost. The limited diagnostics available in the country are produced by few laboratories and are not of desired quality.
- Testing of milk for **safety and quality parameters at the collection centers is almost non-existent**. Lack of proper anaerobic waste treatment and dairy by-product utilization are the other concerns. Due to quality concerns of milk, value addition and export potential has not been fully exploited.
- India has huge diversity of animals, which are adaptable to harsh climate, limited nutrition, and resistance to diseases and stress. Populations of most of these breeds have alarmingly gone down due to **comparative preferences for highly productive exotic breeds**. This calls for an immediate action for systematic conservation, genetic improvement and sustainable utilization of indigenous livestock breeds.
- There is also a huge demand of Indian ethnic meat products in the international market. However, **lack of international processing standards** is the hindrance. Unfortunately, schemes on modernization of slaughterhouses and by-product utilization have not been effectively implemented.
- Bulk of the **investment** for livestock development comes from the state governments. The central government contributes about 10% to the total investment. There is hardly any private sector investment in animal husbandry
- **Microbial contamination, antibiotic residues and adulteration in milk, meat and animal feed is rampant**. Quality control for veterinary drugs and vaccines is almost non-existent. There is a need to establish food testing laboratories duly accredited by the Food Safety and Standards Authority of India (FSSAI) to check adulteration.

6. Government Initiatives to Overcome the Challenges

1. National Livestock Mission (NLM)
2. Livestock Health and Disease Control Schemes
3. National Dairy Plan
4. National Program for Bovine Breeding and Dairy Development
5. Establishment of National Fisheries Development Board
6. In Budget speech 2015-16, government came up with schemes for **Indigenous Breed** and **Blue Revolution**
7. In 2017-18 budget speech, government has introduced **Dairy Processing and Infrastructure Development Fund**
8. In 2017-18 budget speech, government has extended the facility of Kisan Credit Card to farmers engaged in fisheries, aquaculture and animal husbandry. A dedicated fund of Rs. 10,000 crore was allocated to develop the animal husbandry sector.

6.1. National Action Plan (Through NLM) 2017-18 to 2019-20

- Double the productivity of goat and sheep for milk, meat and wool by selective breeding**.**
- Transform Backyard poultry to commercial economic model. The aim is to bring landless, small and marginal farmers into mainstream of economic activity.
- Fodder development in the country by improving Gauchar lands (grazing pastures).
- Animal insurance of poor farmers as per availability of budget.

6.2. National Livestock Mission

- The National Livestock Mission (NLM) has commenced from 2014-15.
- The Mission is designed to cover all the activities required to ensure quantitative and qualitative improvement in livestock production systems and capacity building of all stakeholders.
- The Mission covers everything germane to improvement of livestock productivity and support projects and initiatives required for that purpose subject.
- It is formulated with the objective of sustainable development of livestock sector, focusing on improving availability of quality feed and fodder.
- NLM has four sub-missions as follows:
    - **The Sub-Mission on Fodder and Feed Development** will address the problems of scarcity of animal feed resources, in order to give a push to the livestock sector making it a competitive enterprise for India, and also to harness its export potential. The major objective is to reduce the deficit to nil.
    - **Under Sub-Mission on Livestock Development**, there are provisions for productivity enhancement, entrepreneurship development and employment generation (bankable projects), strengthening of infrastructure of state farms with respect to modernization, automation and biosecurity, conservation of threatened breeds, minor livestock development, rural slaughter houses, fallen animals and livestock insurance.
    - **Sub-Mission on Pig Development in North-Eastern Region**: There has been persistent demand from the North Eastern States seeking support for all round development of piggery in the region. For the first time, under NLM a Sub-Mission on Pig Development in North-Eastern Region is provided wherein Government of India would support the State Piggery Farms, and importation of germplasm so that eventually the masses get the benefit as it is linked to livelihood and contributes in providing protein-rich food in 8 States of the NER.
    - **Sub-Mission on Skill Development, Technology Transfer and Extension**: The extension machinery at field level for livestock activities is very weak. As a result, farmers are not

able to adopt the technologies developed by research institutions. The emergence of new technologies and practices require linkages between stakeholders and this sub-mission will enable a wider outreach to the farmers. All the States, including NER States may avail the benefits of the multiple components and the flexibility of choosing them under NLM for a sustainable livestock development.

6.3. National Mission on Bovine Productivity (NMBP)

- The mission has been initiated in November 2016 with an allocation of Rs. 825 crore (575.80 crore as Central Share and 249.20 crore as State Share) over a period of three years and implementation of spill over activities of the project beyond the project period.
- It will be implemented as a part of **Rashtriya Gokul Mission under umbrella scheme White Revolution-Rashtriya Pashudhan Vikas Yojna.**
- The objective is to enhance milk production and productivity of bovine population, increase trade of livestock and its products, e-market for bovine germplasm and to double farmers' income by 2022.
- It has 4 components:
  - **Pashu Sanjivni:** an animal wellness program with provision of **Nakul Swasthya Patra** (animal health card) along with unique ID to animals and uploading data on National Data Depository.
  - **Advanced breeding technology:** IVF/MOET (In-Vitro fertilisation/Multiple-ovulation embryo transplant) and sex sorted semen technique to improve availability of disease free high genetic merit female bovines.
  - **e-Pashuhaat:** a website portal launched on birthday of V. Kurien on 26 Nov 2016 to connect the breeders and farmers for sale and purchase of germplasm.
  - National Bovine Genomic Centre for indigenous breeds **(NBGC-IB)**

6.4. National Program for Bovine Breeding and Dairy Development (NPBB&DD)

- The program has been initiated in February 2014 by **merging four ongoing schemes** of the Department of Animal Husbandry, Dairying and Fisheries in the dairy sector:
  - National Project for Cattle and Buffalo Breeding (NPCBB)
  - Intensive Dairy Development Programme (IDDP)
  - Strengthening Infrastructure for Quality & Clean Milk Production (SIQ & CMP); and
  - Assistance to Cooperatives (A to C)
- The aim is to integrate milk production and dairying activities in a scientific and holistic manner, so as to attain higher levels of milk production and productivity, to meet the increasing demand for milk in the country.
- The Scheme has two components
  - National Programme for Bovine Breeding (NPBB)
  - National Programme for Dairy Development (NPDD)
- **NPBB focuses on** to ensure quality Artificial Insemination services at farmers doorstep through **MAITRI** (Multipurpose AI Technician in Rural India) and to conserve, develop and proliferate selected indigenous bovine breeds of high socio-economic importance. **Rashtriya Gokul Mission** comes within it.
- **NPDD will focus on** creating infrastructure related to production, procurement, processing and marketing by milk unions/federations and also extension activities including training of farmers.
- Under this scheme, there is provision for rehabilitation assistance to improve the condition of sick milk cooperatives by providing a central grant up to 50 % of the cost of the rehabilitation project with a maximum financial ceiling of Rs.5 crore.

6.4.1. Rashtriya Gokul Mission

- Rashtriya Gokul Mission has been initiated under **National Programme for Bovine Breeding (NPBB)** in December 2014.
- It is being implemented with the objectives of:
  - development and conservation of indigenous breed
  - breed improvement programme or indigenous cattle breeds to improve their genetic makeup and increase the stock
  - enhancement of milk production and productivity
  - upgradation of nondescript cattle using elite indigenous breeds like Gir, Sahiwal, Rathi, Deoni, Red Sindhi
  - distribution of disease free high genetic merit bulls for natural service.
- The mission includes establishment of
  - **Gokul Gram** (Integrated Indigenous Cattle Centres)
  - **Gopalan Sangh** (Breeder's Societies)
  - distribution of disease free high genetic merit bulls for natural service
  - provides incentive to farmers maintaining elite animals of indigenous breed
  - heifer rearing programme
  - award to Farmers (**Gopal Ratna**) and Breeders' Societies (**Kamadhenu**).
  - **National Kamdhenu Breeding Centres** for development, conservation and preservation of indigenous breeds are being established one in north and one in south India, as a Centre of Excellence, to develop and conserve Indigenous Breeds. **Besides being a repository of indigenous germplasm, it will also be a source of certified germplasm in the Country.**

6.5. Dairy Entrepreneurship Development Scheme

- The scheme was started in September, 2010 with the objective **to generate self employment opportunities in dairy sector** in the country.
- It is being implemented through NABARD which provides **financial assistance to commercially bankable projects** with loans from Commercial, Cooperative, Urban and Rural banks with a back ended capital subsidy of 25% of the project cost to the beneficiaries of general category and 33.33% of the project cost to SC & ST beneficiaries.
- The activities include establishment of small dairy unit from 2 to 10 milch animals, rearing of heifers (up to 20 calves), vermicompost, purchase of milking machines, etc.
- An individual entrepreneur, farmer, group of farmers, self help groups, Dairy Cooperative Societies, district milk unions and panchayati raj institutions are eligible under the scheme.

6.6. National Dairy Plan

- NDP (Phase I) is a **central sector scheme** being implemented by National Dairy Development Board (NDDB) through the network of End Implementing Agencies (EIAs) for the period 2011-12 to 2018-19.
- It is a scientifically planned **multi-state initiative to increase productivity of milch animals** and thereby increase milk production to meet the rapidly growing demand for milk through scientific breeding and feeding and to provide rural milk producers with greater access to the organised milk processing sector.
- NDP-I is being implemented in the 18 major milk producing States.
- Pattern of funding under the scheme is 100 per cent grant-in-aid for nutrition and breeding activities and in the case of village milk procurement systems, 50 per cent of the cost of capital items is being contributed by the End Implementing Agencies.
- Under NDP I, 364 sub projects of 158 EIAs from 18 States have been approved till November 2016.

6.7. National Mission on Protein Supplement

- It is one of the six components of Rashtriya Krishi Vikas Yojana.
- It was launched in 2011-12 to take up activities to promote animal based protein production through livestock development, dairy farming, piggery, goat rearing, and fisheries in selected blocks.

7. Pink Revolution

Pink Revolution is a term used to denote the technological revolutions in the meat and poultry processing sector.

- In 2014, India surpassed Brazil and Australia to become the **largest bovine meat exporting country in the world.**
- Bovine meat became India's top agricultural export item ($4781m), ahead of Basmati Rice in 2014-15.
- The largest importer of Indian meat are primarily the countries in the Middle-East and South East Asia.
- The broiler sector (poultry meat) has also shown more than 8% growth.
- India is home to the largest population of cattle and buffalo in the world (58% of world's buffalo population).
- About 10% of the rural labour force is involved in livestock rearing occupation, which constitutes 26% of the total agricultural value added. UP, Andhra Pradesh and Maharashtra are the major states supplying buffalo meat (carabeef).
- **Cost of production of meat is much lower in India. Also, India is geographically well placed in terms of export to the consuming nations**
- With a shift towards protein rich diet India can gain from its meat industries.

Challenges faced by Indian Meat Sector

- Largely Unorganized (90% unorganized)
- Lack of adequate meat hygiene
- Inadequate infrastructure like outdated abattoirs (slaughter houses), poor cold storage facilities etc.
- Animals are not specifically bred for meat.
- Poor quality of meat because spent animals (old age farm animals) are generally used for meat production.
- Lower domestic demand, low per capita meat consumption in India (5.2 Kg/year vs 39.8 kg global average)
- Lack of awareness about food safety norms and packaging standards.

7.1. Poultry Sector

- Poultry is one of the fastest growing sub sectors of animal husbandry.
- Policies for poultry development has been included in the National Livestock Mission.
- NLM includes modernisation and development of breeding infrastructure, which includes training and feed analysis as well.
- It has also been aligned with National skill development framework.
- Technological interventions in the areas of biosecurity, automation and modernisation of Infrastructure is envisioned in the Central/State Government poultry farms.
- NLM includes Rural Backyard Poultry Development as a component to provide supplementary income and nutritional support to the BPL families.

8. Fisheries

Fisheries is a sunrise sector with varied resources and potential, engaging over 14.50 million people at the primary level and many more along the value chain. Transformation of the fisheries sector from traditional to commercial scale has led to an increase in fish production from 7.5 lakh tonnes in 1950-51 to 107.95 lakh tonnes during 2015-16, while the export earnings from the sector registered at around 33,441 crore in 2014-15 (US$ 5.51 billion). Constituting about 6.30% of the global fish production and 5% of global trade, India has attained the second largest fish producing and second largest aquaculture nation in the world.

Besides being a source of protein, income and livelihood to poor fishermen, the fishery sector is also responsible for engaging rural population in ancillary activities like marketing, retailing, transportation etc.

While one of the most significant characteristic of Indian fishery is its small-scale nature, Inland fishery (with respect to marine), and through aquaculture (with respect to capture fisheries) has become the major norm of Indian Fishery sector.

8.1. Challenges Faced by the Fisheries Sector

- Inland fish production has declined due to proliferation of water control structure, loss of habitat and indiscriminate fishing.
- Marine fishing has declined due to depleting resources, energy crisis and resultant high cost of fishing.
- Low investment in the sector coupled with limited capabilities of fishermen and fish farmers.
- Inadequate supply of seed, feed and genetic resources.
- Slow development and adoption of new and improved farming technologies.
- India is yet to realise the potential of deep-sea fishing.
- Inadequate cold chain, market, trade and safety.
- Environmental integrity and a vicious circle of low productivity.
- The sector is also experiencing loss of biodiversity on account of adverse climate change
- Security of fishermen especially along the maritime boundaries with Sri Lanka and Pakistan remains a concern.
- Lack of a reliable database relating to aquatic and fisheries resources.
- Water pollution; unscientific management of aquaculture and contamination of indigenous germplasm resources.

8.2. Blue Revolution– Neel Kranti Mission

The government of India restructured the central plan scheme under an umbrella of **Blue Revolution: Integrated Development and Management of Fisheries** (Central Sector Scheme)**.**

Blue Revolution, the Neel Kranti Mission has the vision to achieve economic prosperity of the country and the fishers and fish farmers as well as contribute towards food and nutritional security through full potential utilization of water resources for fisheries development in a sustainable manner, keeping in view the bio-security and environmental concerns. It will have multi-dimensional approach to all activities concerned with development of the fisheries sector as modern world class industry in India. It will focus on tapping the full production potential and enhance productivity substantially from aquaculture and fisheries resources, both inland and marine. Substantially increasing the share of Indian fisheries in the export area would be a key goal. It will ensure doubling the income of the fishers and fish farmers with inclusive participation of the socio-economically weaker sections and ensure sustainability with environment and biosecurity.

8.2.1. Vision

"Creating an enabling environment for integrated development of the full potential of fisheries of the country, alongwith substantially improvement in the income status of fishers and fish farmers keeping in view the sustainability, bio-security and environmental concerns."

8.2.2. Mission

- Formulation of a Neel Kranti Mission Plan (Blue Revolution Mission Plan) for tapping the full potential of the inland and marine culture fisheries of the country by developing it as a professional modern world class industry.
- Ensure doubling of income of fishers and fish farmers of the country.
- Ensure sustainability of, bio-security and address environmental concerns for enabling sustainability of the fishing industry.

8.2.3. Objectives

- To fully tap the total fish potential of the country both in the inland and the marine sector and triple the production by 2020.
- To transform the fisheries sector as a modern industry with special focus on new technologies and processes.
- To double the income of the fishers and fish farmers with special focus on increasing productivity and better marketing postharvest infrastructure including e-commerce and other technologies and global best innovations.
- To ensure inclusive participation of the fishers and fish farmers in the income enhancement.
- To triple the export earnings by 2020 with focus on benefits flow to the fishers and fish farmers including through institutional mechanisms in the cooperative, producer companies and other structures.
- To enhance food and nutritional security of the country.

8.2.4. Strategy – Central Sector Assistance Schemes

The Ministry of Agriculture and Farmers Welfare, Department of Animal Husbandry, Dairying & Fisheries has accordingly restructured the scheme by merging all the ongoing schemes under an umbrella of Blue Revolution. The restructured scheme provides focused development and management of fisheries, covering inland fisheries, aquaculture, marine fisheries including deep sea fishing, mariculture and all activities undertaken by the National Fisheries Development Board (NFDB).

The restructured Plan Scheme on Blue Revolution: Integrated Development and Management of Fisheries" has been approved at a total central outlay of Rs. 3000 crore for implementation during a period of five years (2015-16 to 2019-20) with the following components:

- **National Fisheries Development Board** and its activities: increasing fish production, enhance its exports, apply modern tools and techniques, creation of employment etc.
- **Development of Inland Fisheries and Aqua Culture**: Construction and renovation of ponds, establishing fish hatcheries, stocking of fingerlings, training and skill development etc
- **Development of marine fisheries, infrastructure and post-harvest operations**: Motorisation of traditional craft, promotion of mariculture in the form of sea cages, see weed cultivation, bi-valve cultivation and pearl culture, infrastructure like ice plants, cold storages development etc.
- **Institutional arrangements for fisheries sector**

- **Strengthening of data base and Geographical Information System of the fisheries sector**: assistance to state governments for collection and supply of fisheries data, development of GIS, mapping of water bodies etc.
- **Monitoring, control and surveillance (MCS) and other need based interventions:**
  - Biometric ID card to marine fishers
  - registration of their vessels
  - upgradation of the registration centres into Fisheries Monitoring Control and Surveillance centres (FMCS)
- **National scheme of welfare of fishers:** Housing for fishermen, basic amenities, group accident insurance for active fisherman, Grant in aid to the National Federation of Fishers Cooperative ltd **(FISHCOPFED**).

An Integrated **National Fisheries Action Plan 2020** has been developed to achieve the concept of Blue Revolution.

8.3. National Policy on Marine Fishery, 2017

National Policy on Marine Fisheries provides guidance for promoting 'Blue Growth Initiative' which focus on ushering 'Blue Revolution' (NeeliKranti) by sustainable utilization of fisheries wealth from the marine and other aquatic resources of the country for improving the lives and livelihoods of fishermen and their families.

- The policy intends to guide the coordination and management of marine fisheries in the country during the next 10 years.
- It envisions to create a healthy and active marine fishery sector which can fulfill the necessities of present and future generations.
- The policy states that "**private investments will be promoted in deep sea fishing and processing** to fully harness the potential of marine fishery for inclusive development. Sustainable utilisation of the deep sea fisheries resources necessitates an optimum fleet size of modern fishing vessels capable of undertaking extended voyages, and wherever required, **support of overseas technology** will also be considered for development of the sector".
- Legislations will be brought to economically empower the producer cooperatives and the right of first sale option to be given to the fisherman.

9. Operation Flood

It is the world's biggest dairy development program, launched in 1970 by National Dairy Development Board (NDDB). It transformed India from a milk-deficient nation into the world's largest milk producer. India surpassed USA in 1998, with about 17 percent of global output in 2010–11. In 30 years it doubled milk available per person, and made dairy farming India's one of the largest self-sustainable rural employment generator.

- It helped dairy farmers direct their own development, placing control of the resources they create in their own hands.
- A National Milk Grid links milk producers throughout India with consumers in over 700 towns and cities, reducing seasonal and regional price variations while ensuring that the producer gets fair market prices in a transparent manner on a regular basis.
- The bedrock of Operation Flood has been village milk producers' cooperatives, which procure milk and provide inputs and services, making modern management and technology available to members. Operation Flood's objectives included:
  - Increase milk production ("a flood of milk")
  - Augment rural income
  - Reasonable prices for consumers

Success

- In 1955 India's butter imports were 500 tons per year, today India's cooperatives alone produce more than 12,000 tons of butter.
- India imported 3000 tons of baby food in 1955, today cooperatives alone produce 38,000 tons of baby food.
- By 1975 all imports of milk and milk products stopped.
- In 1998 the World Bank published a report on the impact of dairy development in India and looked at its own contribution to this. The audit revealed that of the Rs 200 crore the World Bank invested in Operation Flood, the net return on India's rural economy was a massive Rs 24,000 crore each year over a period of 10 years, which no other dairy programme has ever matched.
- India has retained its leadership as the world's largest milk producer for the last 15 years. This has been made possible by Operation Flood — which ushered in the White Revolution in India.

Criticism

- Operation Flood failed to replicate the success of Amul (Anand Milk Union Limited) in states other than Gujarat.
- Analysts cited reasons for this failure:
  - political interference
  - bureaucratic apathy
  - lack of a professional approach
  - lack of knowledge among the co-operative board and committee members of how to run co-operatives

10. Need of a Second White Revolution to Overcome Supply Side & Demand Side Challenges

Supply-Side Challenges:

Eighty per cent of Indian cattle is owned by farmers with a herd size of up to four animals. But a number of factors impact the sustenance of these traditional small farms, such as:

- the subsidiary nature of dairying as an activity
- stagnant yields
- rising feed/fodder costs and
- a shift in rural areas towards other vocations

Demand-Side Challenges:

- India is slated to witness a boom in dairy **demand of over 6 per cent annually**, due to increasing population and increase in income.

However, the average annual growth in supply is only about 4%. The demand-supply interplay effect is evident in steadily rising milk prices in the recent past. We clearly need a Second White Revolution.

Way Forward

- **Large scale dairy farms:** Large scale cooperatives and corporates can **establish integrated dairy farms**, with automated milking, feeding, processing, integrated feed production and in-house breed improvement. They can sell their produce to other dairy plants or can do further value addition.

- **Hub and Spoke Model:** The main farm (hub), owned by an anchor has all the integrated facilities for milking, feed production and milk processing with a cattle count of over 500 cows. The connected/satellite farms (spokes), with 50 to 200 cattle each, have basic infrastructure for milking and cattle management and are owned by progressive dairy farmers in close proximity to the main farm. **The anchor provides technical support (veterinary care, feed management, and training) to the satellite farms. This model will be socially inclusive.**
- **Progressive dairy farmer:** This model envisages investment in farm infrastructure by an anchor. **Cow stalls are leased out on nominal charges to farmers, who are responsible for housing of cows and managing them under guidance of the anchor**. The automation level of the farms can depend on the farm size. The milk would be purchased under a buy-back arrangement by the anchor. This model enables the smallest dairy farmers to avail the benefits of technology, scale and systems. This model **includes the concept of building hostels for cows** and to establish mid-sized dairy farms with 200-300 cattle.
- **Community Model: Community ownership and management of common infrastructure** for housing, breeding, feeding and milking under a cooperative/producer company model shall be applicable here. A number of such farms within a restricted geographical periphery can avail of technical support services on a pooling basis. Farmers are not restricted to sell their milk to a specific entity. Milking machines, equipment, bulk coolers and milk storage facilities are owned by the community.

11. Previous Year Vision IAS GS Mains Test Series Questions

1. Animal rearing is a key livelihood and risk mitigation strategy for tribals and small and marginal farmers, particularly across the rainfed regions of India. Substantiate. Also, discuss some strategies to realize the potential of this sector.

Approach:

- Briefly discuss the scope of the sector.
- Bring out its significance for tribals and small and marginal farmers.
- Discuss steps that need to be taken to realize the potential of the sector.

Answer:

Livestock have been an integral component of India's agricultural and rural economy. Livestock contribute over 1/4th to the agricultural GDP and about 5% of the country's GDP and engage about 9% of the agricultural labor force. The livestock sector has been growing faster than crop sector.

Its growth has special significance for small and marginal farmers, landless laborers and tribals and farmers in rain-fed areas as they are more dependent on livestock for supplementing incomes and generating gainful employment. To elaborate:

- In India, livestock wealth is much more equitably distributed than wealth associated with land.
  About 70 per cent of the livestock market in India is owned by 67 per cent of the small and marginal farmers and by the landless. Thus, growth of the livestock sector would reduce poverty more than growth of the crops sector.
- Distribution patterns of income and employment show that rural poverty is less in states where livestock accounts for a sizeable share of agricultural income as well as employment.

- The small ruminants and poultry livestock provide livelihood support to the poor underprivileged landless, and marginal farm households as there upkeep cost is low and are source of milk, eggs and meat.
- Rain-fed regions face uncertain and erratic weather conditions which negatively impact crop productivity and wage labor in the agriculture sector. Animals are natural capital, which can be easily reproduced to act as a living bank with offspring as interest, and an insurance against income shocks of crop failure, natural calamities and climate change.
- Tribals have community controlled lands which provide them large pastures for their animals. Moreover tribals are still engaged in subsistence agriculture. Thus, livestock is a good source of income and support to them.

In the light of immense potential of the sector in providing inclusive economic growth to the rural folks, government has come up with several projects. Yet, the sector has shown a decline in recent years. Following steps can be taken to improve the potential of the sector:

- Livestock producers, including traditional pastoralists and smallholders, are both victims of natural resource degradation and contributors to it. Corrective action related to environmental protection, ecosystem services, community led interventions and through incentives for private investment should be taken.
- Improving livestock-related technologies for livestock feed, breeding, processing, technical manpower and infrastructure.
- Frequent outbreak of diseases and poor productivity should be tackled with improved focus on animal health and outreach of veterinary services.
- Development of a better paying markets for livestock and commercialization of livestock.

Livestock sector did not receive the policy and financial attention commensurate to its contribution. Systematic implementation of loans and insurance schemes particularly in remote areas is needed.

2. In spite of having the world's largest livestock population in India, the potential of animal rearing remains underutilized. In this context, discuss the challenges faced by the meat and poultry sector and suggest measures for accelerated and sustained growth for this sector.

Approach:

- Give the current status of the livestock population in India.
- List the challenges faced by the meat and poultry sector.
- Then give an account of measures that can be taken for accelerated and sustained growth in the sector.

Answer:

With only 2.29% of the land area of the world, India is maintaining about 10.71% of the world's livestock. A large manpower is also involved in livestock related activities like manufacture of animal food products and beverages, manufacture of textiles, tanning & dressing of leather, farming of animals etc. Despite that, the potential of animal rearing remains underutilised due to various challenges such as:

- **Lack of poultry feed:** Maize is the single most important ingredient of poultry feed, its' availability at a reasonable cost is the major problem of poultry sector.
- Diseases: Pathogenic and emerging diseases often cause heavy losses both in domestic market and international trade.

- Lack of trained Human Resource: This results in less than optimal output.
- Low productivity: Dead weight of carcass is low, indicating low biomass. For bovine and cattle, milk production is also lesser than international varieties.
- Poor hygiene and upkeep: Poultry unfit to meet industry and export norms.

The challenges faced by the meat sector include:

- Lack of modernised abattoir: it results in poor efficiency and issues of sanitation which hampers export.
- Cultural issues: In some states meat industry has been facing resistance due to religious sentiments.
- Low productivity of livestock: In terms of meat output.
- Low level of processing and value addition in animal products.

Both these sectors suffer from ineffective marketing strategy to project these products.

Way Forward

- Long-term sustainable production measures should be looked into increase the production & quality of maize.
- Active surveillance, monitoring and control in case of any outbreaks in rapid manner. Implementation of livestock insurance insurance schemes is also important.
- Network for a realistic national and global poultry database and marketing intelligence may be developed. Also, the genetic resource of Indian livestock should be conserved through programmes like Gokul Mission.
- Sufficient trained manpower should be developed in the existing institutions.
- The by-products from mechanized abattoirs should be utilized for production of value added products, like Meat-cum-Bone Meal (MBM), Tallow, Bone Chips, Pet Foods and methane, which can be used as a source of energy for value addition in most of the modern plants.
- There is a need to support pig rearing in order to improve sow productivity, growth rate of piglets and feed conversion efficiency.
- Proper utilization of by-products of livestock slaughter for higher income of livestock owners.
- The environmental pollution and spread of livestock diseases should be prevented.

With growing urbanization and increasing quality consciousness, the market for scientifically produced meat products is growing for ready-to-eat and semi-processed meat products. With proper utilisation of livestock resources India needs to be ready for changing socio-economic scenario.

3. "Compared to animal husbandry's contribution to the Indian economy, the sector has received much less resources and institutional support." Analyse the above statement in the light of challenges faced by livestock sector in India.

Approach:

Comment on the challenges faced by the animal husbandry sector, referring to its various components, bringing out the shortcomings and suggesting measure that needs to be taken to improve the situation of animal husbandry in India.

Answer:

[The answer deals with every section of the livestock sector separately detailing each section's challenges and suggestions making this answer quite long. This has been done to provide sufficient details with respect to livestock sector so that students can confidently tackle any section specific question in the examination]

The animal production system in India is predominantly part of a mixed crop-livestock farming system vital for the security and survival of large numbers of poor people. In such systems, livestock generate income; provide employment, draught power and manure. Also it is a major source of milk, meat, eggs, wool and hides. Thus, animal husbandry plays an important role in the rural economy.

India's livestock sector is one of the largest in the world. In 2010-11 livestock generated outputs worth Rs 2075 billion (at 2004-05 prices) which comprised 4% of the GDP and 26% of the agricultural GDP. The total output worth was higher than the value of food grains. Therefore, though animal husbandry has got special attention through various schemes and programmes of the GOI to remove the bottlenecks hindering this sector much still needs to be done.

There are number of socio-economic, environmental, technological and other challenges that need to be overcome through appropriate policies, technologies and strategies in order to harness the pro-poor potential of animal husbandry. Various sub sector specific challenges along with their solutions are as follows:-

Dairy Sector:

India continues to be the largest producer of milk in the world. Production is estimated to be around 121.8 million tonnes during 2010-11 as compared to 53.9 million tonnes in1990-91. Per capita availability of milk at national level has increased from 176 grams per day in 1990-91 to 281 grams per day in 2010-11.

The challenges faced by the dairy sector are:

- Small herd size and poor productivity
- Inadequate budgetary allocation over the years
- Lack of equity with crop production
- Inadequate availability of credit
- Poor access to organized markets deprive farmers of proper milk price
- Shortage of manpower and funds
- Limited availability of quality breeding bulls
- Disease outbreaks: mortality & morbidity
- Deficiency of vaccines and vaccination set-up
- Induction of crossbred animals in areas poor in feed resources
- Majority of grazing lands are either degraded or encroached
- Diversion of feed & fodder ingredients for industrial use

Way Forward:

- Continuous support to the States is essential for further genetic up gradation programmes to meet the fast increasing demand for milk in the country.
- There is further need to consolidate and improve the breeding infrastructure created under NPCBB, scientific programmes like Embryo Transfer Technology (ETT), Multi Ovulation Embryo Transfer Technology (MOET)
- Incentivizing investment in this sector
- Increasing public investment.

Meat and Poultry Sector:

In terms of population, India ranks second in the world in goats and third in sheep. The growth in poultry production is mainly attributed to the efforts of the organized private sector, which controls over 80% of the total production in the country.

The challenges faced by the sector are:

- **Maize availability and cost**: maize is the single most important ingredient of poultry feed, it's availability at a reasonable cost is the major problem of poultry sector.
- **Diseases**: Pathogenic and emerging diseases namely AI often causes heavy losses both in domestic market and international trade.
- **Lack of Marketing Intelligence:** There is a dire need for realistic national marketing intelligence to bridge the gap between supply and demand of poultry & poultry products.
- **Human Resource Development**: To meet the growing demand of sustainable and safe production there is a huge demand for trained and skilled manpower in poultry sector.
- Low level of processing and value addition in animal products.

The Way Forward:

The following measures are suggested to strengthen the meat and poultry sector for accelerated and sustainable growth:

- Long-term sustainable production measures have to be looked into to increase the production & quality of maize.
- Active surveillance, monitoring and control in case of any outbreaks in rapid manner.
- Network for a realistic national and global poultry database and marketing intelligence may be developed. Sufficient trained manpower should be developed in the existing institutions.
- With growing urbanization and increasing quality consciousness, the market for scientifically produced meat products is expected to grow rapidly. The market is growing for ready-to-eat and semi-processed meat products because of a changing socio-economic scenario and an increase in exports to neighbouring countries, especially the Middle East.
- The mechanized slaughter houses produce huge quantities of offal and digests from the slaughtered animals which could be profitably utilized for production of value added products, like Meat-cum-Bone Meal (MBM), Tallow, Bone Chips, Pet Foods and methane as a source of energy for value addition in most of the modern plants.
- There is a need to support pig rearing in order to improve sow productivity, growth rate of piglets and feed conversion efficiency.
- It is important to encourage proper utilization of by-products of livestock slaughter for higher income of livestock owners. The environmental pollution and spread of livestock diseases has to be prevented.

Nutrition: Fodder and Feed

With only 2.29% of the land area of the world, India is maintaining about 10.71% of the world's livestock. The nutritive value of feed and fodder has a significant bearing on productivity of livestock. The gap between the demand and supply of fodder is fast increasing.

Challenges:

The main challenges in providing adequate and quality fodder and feed include:

- While numbers of livestock are growing, but the grazing lands are gradually diminishing. The area under fodder cultivation is also limited.
- A majority of the grazing lands have either been degraded or encroached upon restricting their availability for livestock grazing.
- Due to increasing pressure on land for growing food grains, oil seeds, and pulses, adequate attention has not been given to the production of fodder crops.
- Diversified use of agriculture residues like paper industry, packaging, etc. widening the gap between the supply and demand for fodder.
- There is lack of authentic data on availability of fodder, crop residues, agro industrial by- products and feed grains (coarse cereal grains). This is required to build an actual database, on feed and fodder, to be used for more effective and realistic planning of livestock sector development.
- A substantial amount of crop residues is burnt by the farmers after harvesting of main crop like wheat and paddy.
- In most of the states there are inadequate staffs to address the problems related to fodder.

The Way Forward:

The measures which can contribute to improved fodder and feed situation include the following:

- A reliable data-base is required for assisting in realistic planning.
- Supply of quality fodder and feed should be encouraged on a priority basis.
- The forest department can play a major role in augmenting fodder production in the country. The degraded forest areas, mostly under the Joint Forest Management Committees (JFMCs), can be used for assisting growth of indigenous fodder varieties of grasses, legumes, and trees under area-specific silvi-pastoral systems.
- There is a need for undertaking an effective Extension campaign in major states for efficient utilization of crop residues, growing fodder crops, Azolla production, etc.
- Production of seeds of high yielding fodder varieties needs to be increased in the organized/cooperative sector.
- Production of condensed fodder blocks needs to be encouraged by creating an assured market, coupled with providing a transport subsidy for supply to distant areas.

Livestock Health:

High prevalence of various animal diseases like Foot & Mouth Disease (FMD), Brucellosis, Classical Swine Fever and Avian Influenza is a serious impediment to growth in the livestock sector. There is a dire need to strengthen veterinary hospital facilities for timely diagnosis and treatment of animal diseases. Emphasis also needs to be given to strengthen art mobile veterinary services to ensure door-step veterinary support.

Challenges:

The main challenges confronting the animal health sector include:

- Veterinary hospitals, dispensaries and technical manpower are inadequate.
- The disease reporting is neither timely nor complete which delays proper interventions.
- Inadequate availability of vaccines and lack of cold storage.

The Way Forward:

The following measures will strengthen the animal health sector:

- Adequate veterinary disease diagnosis, epidemiology, hospital infrastructure and manpower need to be developed.
- A strong programme for supply of sufficient veterinary vaccines is necessary.

Fisheries Sector:

India is the second largest producer of fish in the world, contributing 5.54 percent of global production. Allocations made for the development of fisheries sector through the Centrally Sponsored Schemes and Central Sector Schemes are utilized for implementation of both development and welfare oriented schemes through the respective states and UTs.

In addition to the allocations made through CSS and CS, assistance is provided through other flagship programmes like Rashtriya Krishi Vikas Yojana (RKVY) and the recently launched National Mission for Protein Supplements (NMPS) as well as other programmes like Marine Fisheries Development Scheme, Inland Fishery Development Scheme, Fishermen Welfare Scheme.

Challenges:

The main challenges facing the fisheries sector include:

- Shortage of quality and healthy fish seeds and other critical inputs.
- Lack of resource-specific fishing vessels and reliable resource and updated data.
- Inadequate awareness about nutritional and economic benefits of fish.
- Inadequate extension staff for fisheries and training for fishers and fisheries personnel.
- Absence of standardization and branding of fish products.

The Way Forward:

The following measures will help to further strengthen the fisheries sector:

- Schemes of integrated approach for enhancing inland fish production and productivity with forward and backward linkages right from production chain and input requirements like quality fish seeds and fish feeds and creation of required infrastructure for harvesting, hygienic handling, value addition and marketing of fish.
- Existing Fish Farmers Development Authority (FFDAs) would be revamped and cooperative sectors, SHGs and youths would be actively involved in intensive aquaculture activities.
- Large scale adoption of culture-based capture fisheries and cage culture in reservoirs and larger water bodies are to be taken up.
- Sustainable exploitation of marine fishery resources especially deep sea resources and enhancement of marine fish production through sea farming, Mari-culture, resource replenishment programme like setting up of artificial reefs.

Therefore, the extent to which the pro-poor potential of livestock can be harnessed would depend on how technology, institutions, policies and financial support address the constraints of the sector. The number-driven growth in livestock production may not sustain in the long run due to its increasing stress on the limited natural resources. The future growth has to come from improvements in technology and service delivery systems leading to accelerated productivity, processing and marketing.

4. In India, livestock sector promotes more equitable sharing of resources and gender equity. Examine.

Approach:

Firstly, along with facts, give an introduction about livestock sector in India. Then, explain the role played by it in India's socio-economic setting and then argue how it brings more equitable sharing of resources and gender equity.

Answer:

India's livestock sector is one of the largest in the world. In 2010-11 livestock generated outputs worth Rs 2075 billion (at 2004-05 prices) which comprised 4% of the GDP and 26% of the agricultural GDP. The total output worth was higher than the value of food grains.

Animal husbandry is an integral component of Indian agriculture supporting livelihood of more than two-thirds of the rural population. Animals provide nutrient-rich food products, draught power, dung as organic manure and domestic fuel, hides & skin, and are a regular source of cash income for rural households. They are a natural capital, which can be easily reproduced to act as a living bank with offspring as interest, and an insurance against income shocks of crop failure and natural calamities. However, driven by the structural changes in agriculture and food consumption patterns, the utility of livestock has been undergoing a steady transformation.

In India distribution of livestock is more equitable than that of land. It is evident from the data that in 2003 marginal farm households (≤1.0h hectare of land) who comprised 48% of the rural house- holds controlled more than half of country's cattle and buffalo and two-thirds of small animals and poultry as against 24% of land. Livestock has been an important source of livelihood for small farmers. They contributed about 16% to their income.

Similarly, animal husbandry promotes gender equity as more than 3/4th of the labour demand in livestock production is met by women across the India. The share of women employment in livestock sector is around 90% in Punjab and Haryana as well as other states where dairying is a prominent activity and animals are stall-fed.

Thus, the distribution patterns of income and employment show that small farm households hold more opportunities in livestock production. The growth in livestock sector is demand-driven, inclusive, pro-poor and pro -women empowerment. Incidence of rural poverty is less in states like Punjab, Haryana, Jammu & Kashmir, Himachal Pradesh, Kerala, Gujarat, and Rajasthan where livestock accounts for a sizeable share of agricultural income as well as employment. Therefore, empirical evidence from India as well as from many other developing countries suggests that livestock development has been an important route for the poor households to escape poverty and to enhance gender equity in labour force participation in livestock production.

5. The success of "Operation Flood" proves that thoughtful intervention in the livestock sector has the potential of acting as a growth engine for the agriculture sector and rural economy. In light of this, examine the potential of the livestock sector and the challenges it faces. Also enumerate the steps taken by the government in recent years to leverage the potential of this sector.

Approach:

- Briefly write the benefits of Operation Flood and a short introduction of livestock in India.

- Write how livestock can be instrumental in tackling the problems of rural economy.
- Write challenges with respect to the competition, new diseases, pollution etc.
- Various government schemes with respect to insurance, modernisation, quantitative and qualitative development of livestock.

Answer:

It was the organised use of cattle (livestock) that made the Operation Flood a huge success and converted India from a net importer of dairy products to a net exporter and positioned India on top of the list of milk production. Livestock being the internal component of the rural Indian society has huge potential of acting as a growth engine for agriculture and rural economy.

Mechanization in Agriculture has been to the tune of 20% only, whereas 80% of the agriculture/farm operations are done by bullock drawn implements. Livestock (Bulls) provides draught power and manure to the crop enterprise and this in turn provides feed and fodder.

Fortunately, India is blessed with a tremendous livestock wealth. It has the largest population of cattle and buffalo in the world and its breeds are admired for heat tolerance and inherent resistance to diseases and ability to thrive under different climatic condition. This sector has huge employment potential both for farmers and landless labourers. The rural population can directly form collaboration with big investors or through cooperative society and can leverage the benefit from this sector.

But there are many challenges which are as follows:

- Lack of direct market which hampers the commercialisation of livestock sector.
- Lack of policies, financial and institutional support.
- Stringent food safety and quality norms.
- Frequent outbreaks of diseases continue to affect livestock health and productivity.
- Deteriorating common grazing land which is a major source of food to livestock.
- Large influx of foreign breed has the potential to negatively affect the indigenous breed.

Steps taken by government to leverage the potential of this sector are:

- National Livestock Mission (NLM) launched in FY 2014-15 to ensure quantitative and qualitative improvement in livestock production systems and capacity building of all stakeholders.
- Livestock insurance scheme aims to provide protection mechanism to farmers and cattle rearers against any eventual loss of their animals and to bring qualitative improvement in livestock and their products.
- National Project for Cattle and Buffalo Breeding (NPCBB) aims for genetic up-gradation of cattle and buffaloes by artificial insemination as well as acquisition of proven indigenous animals.
- Strengthening of Database and Information Networking of livestock to target the schemes effectively.
- Ensuring the modernisation of this sector to attract foreign investor.
- There are many disease control programs of government to ensure healthy and productive livestock.

Student Notes:

TECHNOLOGY MISSIONS

Contents

1. Introduction

Technology Missions are mission-mode projects aiming towards rejuvenating agriculture sector & its sub-sectors via technological enhancements. Techniques adopted for such purposes are generally scientific and mechanized, and support is provided by the Government to procure such advancements by ways of subsidy, promotion, credit-linked subsidy, soft loans, etc.

2. Mission for Integrated Development of Horticulture (MIDH)

- The mission was approved in 2013
- It was targeted to achieve a growth rate of 7.2% in the horticulture in Twelfth Plan.
- MIDH is a **Centrally Sponsored Scheme** for the holistic growth of the horticulture sector covering fruits, vegetables, root & tuber crops, mushrooms, spices, flowers, aromatic plants, coconut, cashew, cocoa and bamboo.
- While Government of India **(GOI) contributes 85% of total outlay** for developmental programmes in all the states except the states in North East and Himalayas, 15% share is contributed by state governments. In the case of North Eastern States and Himalayan States, GoI contribution is 100%.
- Similarly, for development of bamboo and programmes of National Horticulture Board (NHB), Coconut Development Board (CDB), Central Institute for Horticulture (CIH), Nagaland and the National Level Agencies (NLA), GoI contribution is 100%.

The strategy of the MIDH will be on production of **quality seeds** and planting material, **production enhancement** through productivity improvement measures along with support for creation of infrastructure to **reduce post harvest losses and improved marketing** of produce with active participation of all stake holders, particularly farmer groups and farmer producer organisations. The interventions under MIDH will have a blend of technological adaptation supported with fiscal incentives for attracting farmers as well as entrepreneurs involved in the horticulture sector. It has subsumed 6 ongoing schemes:

1. **National Horticulture Mission (NHM):** applied in all states and UTs except NE and Himalayan Region. It targets small and marginal farmer.
2. **Horticulture Mission in NE and Himalayan Region (HMNEH):** Targets small and marginal farmers of NE and other Himalayan states.
3. **National Bamboo Mission:** applied in all states and UTs to address developmental issues of Bamboo. It mainly emphasized on propagation and cultivation of bamboo, with limited efforts on processing, product development and value addition. There was weak linkage between the producers (farmers) and the industry.
    - **Restructured National Bamboo Mission:** The Cabinet Committee on Economic Affairs (chaired by the Prime Minister) approved Centrally Sponsored Scheme of National Bamboo Mission (NBM) under National Mission for Sustainable Agriculture (NMSA) for remaining period of Fourteenth Finance Commission (2018-19 & 2019-20).
    - An outlay of Rs. 1290 crore (with Rs. 950 crore as Central share) is provisioned for implementation of the Mission.

    The restructured NBM strives:

    - To increase the area under bamboo plantation in non-forest Government and private lands to supplement farm income and contribute towards resilience to climate change.
    - To improve post-harvest management through establishment of innovative primary processing units, treatment and seasoning plants, primary treatment and seasoning plants, preservation technologies and market infrastructure.

- To promote product development at micro, small and medium levels and feed bigger industry.
- To rejuvenate the under developed bamboo industry in India.
- To promote skill development, capacity building, awareness generation for development of bamboo sector.

4. **National Horticulture Board (NHB) schemes:** will address developmental issues on commercial horticulture through entrepreneurs involving institutional financing. Applied in all States and UTs
5. **Coconut Development Board (CDB) schemes:** applied in States and UTs producing Coconut
6. **Central Institute of Horticulture (CIH), Nagaland schemes:** in NE states, focusing on HRD and capacity building

MIDH works closely with **National Mission on Sustainable Agriculture (NMSA)** and also provides technical advice and administrative support to the **Saffron Mission,** and other horticulture related activities like **Vegetable Initiative for Urban Clusters (VIUC)** funded by RKVY/NMSA. It encourages aggregation of farmers into farmer groups like FIGs/FPOs (Farmer Interest Groups/Farmer Producer Organisations) and FPCs (Farmer Producer Companies) to bring economy of scale and scope. The overall objective of the scheme is to strengthen nutritional security through enhanced horticulture production and augmenting farmers' income.

3. National Mission on Agriculture Extension and Technology (NMAET)

The mission was approved in 2014 to be implemented during Twelfth Plan Period. It includes four Sub Missions:

1. **Sub Mission on Agriculture Extension (SMAE)**:
   - It focuses on Awareness Creation and enhanced use of appropriate technologies in agriculture & allied sectors.
   - Personnel are trained under **ACABC** (Agri-clinic and Agri-Business Centres schemes) and **DAESI** (Diploma in Agriculture Extension Services for input dealers).
   - Convergence in the schemes is brought by **ATMA** (Agriculture technology management agency) and **BTTs** (Block Technology teams).
2. **Sub Mission on Seed and Planting Material (SMSP):**
   - development of quality seeds
   - protection of rights of farmers and plant breeders and
   - to encourage development of new varieties of plants.
3. **Sub Mission on Agricultural Mechanisation (SMAM)**: it will mainly cater the needs of small and marginal farmers through institutional arrangements such as Custom hiring, mechanisation of selected villages, subsidy for procurement of machines and equipments, etc.
4. **Sub Mission on Plant Protection and Plant Quarantine (SMPP):** keeping the crops disease free using scientific and environment friendly techniques through promotion of Integrated Pest management.

Farmers' skill trainings and field extension as contained in all 4 sub missions will be converged with similar farmer related activities going on through ATMA (Agriculture technology management agency).

4. National Mission on Oilseeds and Oil Palm (NMOOP)

The mission was approved in 2014 and has been revised in 2017. Contribution of Centre and State is 75:25. The strategy involves

- increasing seed replacement ratio
- irrigation coverage and
- use of wastelands and watersheds.

The mission includes three mini missions:

- **Mini Mission I:** to increase production and productivity of oilseeds
- **Mini Mission II**: bringing an additional area of 1.25 Lakh hectare under Oil Palm cultivation by the end of 2016-17 and production of Fresh fruit bunches.
- **Mini Mission III:** aims at enhancing seed collection of Tree Born Oil

Earlier, only 25 hectare area was provided assistance, but **in April, 2017 the restriction has been relaxed to attract corporate bodies** towards oil palm and derive maximum benefits of 100% FDI.

5. National Saffron Mission

The mission was approved in 2010 to bring **economic revival of saffron** in Jammu and Kashmir.

- Its objective is:
  - to increase overall production of saffron
  - enhancing quality of saffron
  - research and extension capability enhancement and
  - to develop appropriate system for organised marketing.
- The scheme also extends support for creation of irrigation facilities through tube wells and sprinklers.
- A Quality control lab and a Saffron Park is established at Pampore, Pulwama under this mission with involvement of NHB.
- **Saffron Mission comes under the umbrella of Rashtriya Krishi Vikas Yojana (RKVY) now.**

6. Technology Mission on Citrus

The mission was announced in 2006 for Vidarbha region.

- It was later extended to Marathwada and Chhindwara as well.
- The objective of the mission is:
  - Production of disease free planting material of citrus
  - Human Resource Development through training of horticulture officers on campus and training of citrus growers at their villages
  - Demonstration of NRCC (National Research Centre for Citrus, Nagpur) technologies on citrus grower's orchard for quality fruit production through scientific method of management
  - Rejuvenation of declining citrus orchards

7. Technology Mission on Coconut

This mission was launched in 2001. It has 4 major components i.e.

- Development and adoption of technologies for management of pests and diseases affecting coconut gardens.
- Development and adoption of technologies for processing and product diversification
- Market research and Promotion.

- Technical support, external evaluation and Emergent requirements.

Financial assistance is provided in development, demonstration and adoption of technologies, as well as for market research and promotion upto 100% depending upon the cost of project and beneficiary.

8. Technology Mission on Oilseeds, Pulses and Maize (TMOP)

- The technology mission on oilseeds was launched in 1986, and later pulses and maize were added to it.
- The schemes included under TMOP are
  - Oilseeds Production Program (OPP)
  - National Pulses Development Program (NPDP)
  - Accelerated Maize Development Program (AMDP)
  - Post Harvest Technology (PHT)
  - Oilpalm Development Program (OPDP)
  - National Oilseeds and Vegetable Oils Development Board (NOVOD).
- In 2004, during 10th Plan period, OPP, OPDP, AMDP and NPDP were merged into Centrally Sponsored **Integrated Schemes of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM)**
- The special feature of this program is that flexibility has been provided to states in terms of fund utilisation and plan formulation, keeping regional diversity in mind.
  - States can introduce innovative measures as well to the extent of 10% of financial allocation
  - Private sector has also been involved
  - Fund diversion of up to 20% has been allowed from seed to non-seed component.

9. Jute Technology Mission

- This mission was launched in **Eleventh Plan period** (2006-07 to 2011-12, later extended to 2012-13) as a major initiative for overall development of Jute industry.
- The mission involves **4 mini missions**.
  - Mini Mission I to improve **yield and quality** by agricultural research and development in Jute sector. It is under Ministry of Agriculture.
  - Mini Mission II to transfer improved technology and practices in **production and post harvesting** phase. It is under Ministry of Agriculture.
  - Mini Mission III for providing **market linkage** of raw jute in all jute growing states. It is under Ministry of Textiles.
  - Mini Missions IV to **modernise jute industry, up gradation of skills and market promotion.** It is under Ministry of Textiles.

Minimum Support price of raw jute is fixed every year, and Jute Corporation of India is the nodal agency which procures jute. **West Bengal, Bihar and Assam** are the three major jute producing states in India.

10. Technology Mission on Cotton (TMC)

The mission was launched in 2000 with the objectives of improving the yield and quality of cotton through development of better cotton varieties and improved seeds, integrated water, nutrient and pest management technologies

- to increase the income of cotton growers by reducing cost of cultivation and increasing yield per hectare through transfer of technology, and
- to improve the quality of processing cotton by improving infrastructure and by modernising the factories and setting up new units.

TMC had four mini missions under it.

- Mini Mission I deals with **cotton research and technology development**
- Mini Mission II deals with **transfer of technology and development**. This mission has been **subsumed under National Food Security Mission-Commercial Crops (NFSM-CC)** from 2014-15 in major cotton growing states.
- Mini Mission III and IV deal with development of market infrastructure and modernisation/setting up of new ginning and pressing factories respectively.
- Mini missions III and IV stand terminated from December 2010.

11. Sugar Technology Mission

- This mission was launched in 1994 with an objective to improve and upgrade the technology for Indian sugar Industry. It is a joint initiative of Directorate of Sugar & Edible Oils (Ministry of Consumer Affairs, Food & Public Distribution) and Department of Science & Technology.
- The purpose is to use latest environment friendly, cost effective technologies for achieving efficient sugar production through improvement in plant efficiencies, energy saving and reduced inputs.
- The mission has provided financial support to a number of new technologies and has successfully commercialised and replicated them to yield benefits in sugar recovery, improvement in quality etc. such as Ethanol from secondary juices, low pressure extraction, planetary gear box etc.

12. National Mission on Bio Diesel

- This mission was approved in 2009 with Department of Land Resource, Ministry of Rural Development as nodal agency.
- The mission was to be implemented in 2 phases i.e. Phase I as Demonstration Project and Phase II as Self Sustaining Expansion of Bio diesel program.
    - The Demonstration Phase (2006-07) has been taken under Mission Mode as a **Centrally Sponsored Scheme, implemented by State Governments**. 3lakh hectare plantations of bio diesel producing non edible oilseeds species (Jatropha or Ratanjot and Pongamia or Karanji) on degraded forest land and waste land was to be assessed by TERI and then only the mission was to be finally approved.
- The ultimate aim of the mission was supplementation of petroleum by bio diesel fuel to the extent of 20% by the end of phase II program (2011-12).
- The target was not achieved due to lack of sufficient Jatropha seeds to produce bio diesel.
- **The target of 20% bio fuel blending has been set to be achieved by 2017 which is yet to be achieved.**

13. National Mission on Food Processing

- This mission was launched in 2012 as a Centrally Sponsored Scheme to cater different aspects of this industry viz. modernisation of food processing industries, establishing of mega food parks, integrated cold chains and preservation and modernisation of abattoirs.
- Flexibility was allowed to State/UTs in implementing the scheme based on local needs.
- **This scheme was delinked from Central Government support in 2015 after 14th Finance Commission devolved more funds to States.**
- In 2017 Central Government has come up with **a new Central Sector Scheme Kisan Sampada Yojana for the period 2016-20** with Mega food Parks, integrated cold chain, agro-processing clusters etc. as components.

14. National Food Security Mission

The mission was launched in 2007 as a **Centrally Sponsored Scheme (**Ministry of Agriculture & Farmers Welfare) with a target to improve Rice production by 10 million tonnes, Wheat by 8 MT and Pulses by 2 MT.

- During Twelfth Five year plan the mission was continued with a new target of additional production of 25 million tonnes of food grains comprising 10 MT Rice, 8 MT wheat, 4 MT pulses, and 3 MT of coarse cereals.
- NFSM during this period had 5 components i.e.
  - NFSM-Rice
  - NFSM-Wheat
  - NFSM-Pulses
  - NFSM-Coarse Cereals
  - NFSM-Commercial crops (Sugarcane, Jute, Cotton)
- **In NFSM during 2016-17, new initiatives to enhance production and productivity has been adopted such as free of cost distribution of seed mini kits of newer varieties of pulses, creation of seed hubs, bio fertilisers and bio agent labs, technological demonstration by KVKs etc.**
- The commercial crops component focuses on Cropping System Approach for transfer of technology in approved states.
- Training of farmers (4 sessions- before and during each seasons i.e. Kharif and Rabi) is also provided.

15. National Mission on Medicinal Plants

- The mission is implemented by National Medicinal Plant Board (*Ministry* of AYUSH) from 2008-09 and was later continued in Twelfth Five year Plan.
- This **Centrally Sponsored Scheme** is primarily aimed at supporting cultivation of medicinal plants on Private land with backward linkages, for establishment of nurseries for supply of quality planting material etc. and forward linkages for postharvest management, marketing infrastructure, certification, etc.
- From Year 2015-16, the National Mission on Medicinal Plants has been **merged with National AYUSH Mission as a component viz. "Medicinal Plants"** and is continuing with the same activities.

16. National Mission on Micro-Irrigation

- It was a Centrally sponsored scheme in which 40% cost of the MI system was borne by Central Government, 10% by State Government and remaining by the beneficiary herself.
- An additional 10% cost was borne by Central Government in respect of small and marginal farmers.
- Also, the assistance was limited to a maximum area of 5 hectare per beneficiary.
- This scheme was subsumed under National Mission on Sustainable Agriculture (NMSA) and implemented as "On Farm Water Management" during 2014-15.
- **The same is now implemented as "Per Drop More Crop" component under PMKSY from 2015-16 onwards.**

17. National Mission for Sustainable Agriculture (NMSA)

- This is one of the eight mission under NAPCC (National Action Plan for Climate Change).
- NMSA as a programmatic intervention is operational from 2014-15. It aims at making agriculture more productive, sustainable, and remunerative and climate resilient by

- promoting location specific integrated farming system
- soil and moisture conservation measures
- comprehensive soil health management
- efficient water management practices and
- mainstreaming rainfed technologies.

- Rain-fed Area Development and Soil Health Management are its two components.

18. Green Revolution – Krishonnati Yojana

It is an umbrella agricultural programme encompassing 11 schemes under it. It was launched during 12th Five Year Plan.

Cabinet Committee on Economic Affairs recently approved the continuation of this Umbrella Scheme from 2017-18 to 2019-20.

It aims to bring together 11 agricultural schemes besides their effective monitoring.

The schemes are:

- Mission for Integrated Development of Horticulture (MIDH)
- National Food Security Mission (NFSM)
- National Mission for Sustainable Agriculture (NMSA)
- Sub-Mission on Agricultural Mechanisation (SMAM)
- Integrated Scheme on Agricultural Marketing (ISAM).
- Submission on Agriculture Extension (SMAE)
- Sub Mission on Seeds and Planting Material (SMSP)
- Sub Mission on Plant Protection and Plant Quarantine (SMPPQ)
- Integrated Scheme on Agriculture Census, Economics and Statistics (ISACES)
- Integrated Scheme on Agricultural Cooperation (ISAC)
- National e-Governance Plan – Agriculture (NeGP-A).

These schemes look to develop the agriculture and allied sector in a holistic and scientific manner to increase the income of farmers by enhancing production, productivity and better returns on produce.

These schemes are aimed at creating and strengthening of infrastructure for production, reducing production cost and marketing of agriculture and allied products.

19. Previous Year Vision IAS GS Mains Test Series Questions

1. Enumerate some of the technology missions launched by Government of India and assess their impact on Indian Agriculture. What are the aims and objectives of National Mission on Agricultural Extension and Technology (NMAET)?2014-426

Answer:

As India is agriculture based economy with huge diversity in agro-climatic zones, the major objective behind launching various technology missions is to reduce the yield gap in laboratory and on field. So through these missions farmers are demonstrated new input methods along with credit incentives to encourage them to adopt new crops and technologies.

Some of the major missions are as follows:

1. The **National Food Security Mission (2007)** aims to bridge the yield gap in respect of paddy, wheat, pulses, millet and fodder. The Mission is being continued during

12th Five Year Plan with new targets of additional production of food grains of 25 million tons of food grains comprising of 10 million tons rice, 8 million tons of wheat, 4 million tons of pulses and 3 million tons of coarse cereals. The ongoing Integrated Development of Pulses Villages, Promotion of Nutri-cereals and Accelerated Fodder Development Programme were also merged in this Mission.

2. **National Mission on Sustainable Agriculture (2013)** including Micro Irrigation is being taken up as a part of the National Action Plan on climate change. The *Rainfed Area Development Programme* is merged in this Mission. Mission seeks to transform Indian agriculture into a climate resilient production system through suitable adaptation and mitigation measures in domains of both crops and animal husbandry.
3. **The National Mission on Oilseeds and Oil Palm (2013)** was aimed at increasing production and productivity of oilseeds and oil palm. This would help in enhancing production of oilseeds by 6.58 million tonnes.
4. **The National Horticulture Mission (2005-06)** is a Centrally Sponsored Scheme (Centre – 85% & State- 15%) with a view to promote holistic growth of the horticulture sector through an area based regionally differentiated strategies, which include research, technology promotion, extension, post-harvest management, processing and marketing, in consonance with comparative advantage of each State/region and its diverse agro-climatic feature. In addition, mission is expected to promote horticulture diversification including an *initiative on saffron.*
5. The food processing sector has been growing at an average rate of over 8 per cent over the past 5 years. In order to have a better outreach and to provide more flexibility to suit local needs, a new centrally sponsored scheme **"National Mission on Food Processing"** was launched in cooperation with the State Governments in 2012-13.

Aims and Objectives of NMAET

The mission – approved in April, 2014 – under Agricultural Technology Management Agency (ATMA) aims,

- To restructure & strengthen agricultural extension to enable delivery of appropriate technology and improved agronomic practices to the farmers through interactive methods of information dissemination, use of ICT, capacity building & institution strengthening;
- To improve reach of farm mechanization to small and marginal farmers by various means including promotion of custom hiring centers;
- To make available quality seeds and increase Seed Replacement Ratio and
- To promote Integrated Pest Management and plant protection measures.

Uniquely, *Public-Private-Partnership* is encouraged in the Extension and Training components of the Mission.

The main objective of the mission is *to focus on adoption of appropriate technologies by farmers for improving productivity and efficiency in farm operations.*

2. Explain the role of agricultural extension in boosting agricultural productivity. Also, discuss in brief the importance of National Mission on Agricultural Extension & Technology.

Approach:

- Introduce by defining Agriculture extension.
- In brief explain its different types.

- Discuss Agriculture Extension can boost agricultural productivity.
- Highlight the importance of National Mission on Agricultural Extension & Technology.

Answer:

Agricultural extension can be defined as the "delivery of information inputs to farmers to increase agricultural productivity". It is the application of scientific research and knowledge to agricultural practices through farmer education.

Agriculture Extension services are of 3 types:

Technology transfer – the traditional model of the transfer of advice, knowledge and information.

Advisory – the use by farmers of experts as a source of advice in relation to specific problems faced by them.

Facilitation – the aim is to help farmers to define their own problems and develop their own solutions.

Thus, different types of extension services help increase the agricultural productivity:

- By replacing traditional farming mechanisms by modern and advantageous systems
- By enabling pooling of resources to achieve economy of scale
- Changing attitude of farmers towards new and productive farming approaches
- Efficient utilisation of resources such as water, soil, pesticides, weedicides etc.

Even the UN High-Level Panel of Experts (HLPE) on food security and nutrition argues that the extension systems need full attention and investments from governments and the donor community.

Keeping in mind the benefits of agricultural extension services, the government launched National Mission on Agricultural Extension & Technology. To ensure easy availability of seeds, pesticide and machinery at reasonable prices, there are subject specific three Sub-Missions as well.

This mission also focuses on:

- Sustainable farm agriculture especially in rainfed areas, through integrated farming systems approach which incorporates natural resource management, minimizing external cost and maximizing return through value addition in crops, horticulture, livestock, fisheries etc.
- Capacity building of farmers, extension functionaries, institutions and other stakeholders is provided through knowledge centres.
- Partnering with knowledge generators public - private, formal and informal to collect and disseminate the knowledge through all channels.
- Development of difficult areas and disadvantage group of farmers need high priority as low yield in these areas results in low macro yield.
- The power of ICT has been fully leveraged for linking the mission from national to field level through farmers portal, Kisan call centres etc.
- Employment generation for youths on and off farm services through various interventions and programs. "Jai Kisan"- mobilization for farmers' empowerment.
- Agrarian distress and conflicts, farmers' agitations, indebtedness and other concerns also looked through action research project and linkages with other institutions.

3. Discuss the potential of Information and Communication Technology (ICT) to improve the livelihood of farmers in India. What are the initiatives taken by the government under 'National e-Governance Plan in Agriculture (NeGP-A)' in this regard?

Approach:

- The introduction should include link between ICT and agriculture or farmers.
- Then potential role should be enumerated in ICT in various areas associated with agriculture which in turn would improve livelihood of farmers.
- Finally, initiatives under NEGP-A should be enumerated.

Answer:

Agriculture is an information intensive sector where farmers should be well versed in the latest farming technologies and business techniques. ICT plays an important role in addressing the challenges faced in management of natural resources & production of commodities.

The potential role of ICT in agriculture

- **Information dissemination throughout crop-cycle** - through technologies (like Satellite Communication, Geographic Information System (GIS), computer network, video and mobile phones) regarding weather conditions, input requirements like soil health, fertilizers etc. Example – DD kisan.
- **Increasing productivity** – by precision farming, popular in developed countries, which extensively uses IT to make direct contribution to agricultural productivity.
- **Agriculture marketing** - Awareness of up-to date information on prices for commodities, inputs and consumer trends help improve farmer's livelihood. For example National agriculture market is possible only due to ICT
- **Collectivization of producers** – to facilitate appropriate alliances and overcoming the barrier of small landholdings and achieving economies of scale. Example – farmer producer organizations.
- **New employment opportunities** - in rural sector- eg: information kiosks .This will reduce the disguised unemployment.
- **Effective monitoring and analysis** – of agricultural performance through ICT to reduce losses at various levels of supply chain.
- **Countering adverse effect of globalization** – by reducing the information asymmetry among farmers of different countries
- **Increasing effectiveness of government service delivery** – in quick estimation and timely compensation to farmers in wake of disaster. It ensures sowing area is not reduced in the next season.
- **Insurance:** PMKSY aims to assess the damage to crops for insurance purposes through satellite and Drone imagery. This will improve accuracy and compensation.

Started during 11th FYP, NeGP-A aims to achieve rapid development of agriculture in India through ICT enabled multiple delivery channels such as Internet, Government Offices, Touch Screen Kiosks, Krishi Vigyan Kendras , Kisan Call Centres, Agri-Clinics, Common Service Centers, Mobile Phones (Broadcast, IVRS, interactive messaging using unstructured Supplementary Service Data and Voice Recognition for ensuring timely access to agriculture related information for the farmers of the country.

Considering the potential of ICT in this sector government has taken many initiatives under NeGP-A. Some of which are as follows:-

- **Agricultural services** like Pesticide registration, Display on the Web of Seed Testing Results, Prices and arrival details, District level Agro-met advisories, Information on fertilizers/seeds/pesticides etc.
- **Mobile applications** for increasing awareness by providing information – Example: Kisan Suvidha, Pusha Krishi, India weather etc.
- **Development of web portals -** Farmers' Portal where a farmer can get information on a range of topics, mKisan Portal where officials and scientists can send targeted advisories to farmers, Crop Insurance Portal for complete information related to Crop Insurance scheme
- **e-Mandi**: has been launched to make procurement of agricultural products smoother and provide competitive remuneration, especially for small and marginal farmers.
- **Modernisation of land records** - Many States have computerized their land records and are providing computerized copies of Records of Rights on demand. These states have also placed their land records data in public domain

Thus, ICT can play a major role in facilitating the process of transformation of rural India provided the existing bottlenecks are addressed soon.

4. Write short note on National Horticulture Mission.

National Horticulture Mission is a Centrally Sponsored Scheme to promote holistic growth of the horticulture sector through an area based regionally differentiated strategy. Presently, India is the 2nd largest producer of fruits & vegetables in the world. It aims to further enhance horticulture production, improve nutritional security and income support to farm households. Its objectives also includes promotion, development and dissemination of technologies, through a seamless blend of traditional wisdom and modern scientific knowledge and to create opportunities for employment generation for skilled and unskilled persons, especially unemployed youth.

Student Notes:

MAJOR CROPS & CROPPING PATTERN

Contents

1. Cropping Pattern

Cropping pattern refers to the proportion of area under different crops at any given point of time in a unit area.

It indicates the temporal and/or spatial arrangement of crops in a particular area. There are different types of cropping patterns depending on the availability of various factors/resources (as discussed further).

Temporal Arrangements (time) refers to the yearly sequence of growing different crops on a piece of land. For example, if only one crop is grown on a particular land **year after year** (like rice in various floodplains) it is called Mono cropping.

Spatial Arrangements (space/land) refers to the arrangement of crop/s on a piece of land in various patterns. For example, if two crops are grown on a land in alternative rows it is called Row inter-cropping.

1.1. Cropping Systems

A cropping system is a **broader term** than cropping pattern and includes the sum total of all crops and the practices used to grow those crops on a field or farm. It comprises of all components, such as water, soil, technology etc. required for the production of a particular crop and the interrelationships between them and the surrounding environment.

For example, in a **Simple Cropping System** only one variety of crop is grown each year in the same field with regular fertilizer application to replenish the soil nutrients. While in a **Complex Cropping System** multiple crops like fruits, vegetables, tree crops, grain, fodder crops and livestock are all grown on a farm during a year with multiple harvests along with managed recycling of nutrients within the system.

While talking about cropping systems we tend to apply systems approach to crops.

Difference between Cropping Pattern and Cropping System

Cropping Pattern	Cropping System
Includes crop rotation practiced by a majority of farmers in a **given area or locality**.	Includes cropping pattern and its management to derive benefits from a **given resource base** under **specific environmental conditions**.
Type and **management of crops** in time and space.	The cropping patterns used on a farm and **their interaction with farm resources**, other farm enterprises and available technology which determine their make-up.
Yearly sequence and spatial arrangement of crops or crops and fallow on a given area. The **proportion of area** under various crops at a point of time in a unit area	Pattern of crops taken up for a given piece of land, or **order in which crops are cultivated** on a piece of land over a fixed period, **associated with** soil, management practices such as tillage manuring and irrigation
The two concepts are, however, overlapping, in various ways.	

1.2. Significance of Cropping System

All around the world, different variations are adopted in agriculture. Each variation/ combination has some unique associated benefits which will be discussed later. However, these variations have some **common associated benefits,** like:

- **Maintain and enhance soil fertility**: Growing of different crops such as nitrogen fixing leguminous crops enhance the nitrogen content of soil. Growing of perennial forages and millets help to enhance soil organic content.

- **Minimize spread of diseases**: It encourages biodiversity by providing a habitat for a variety of insects and soil organisms. Some of them may act as predator for the certain diseases, thus limiting the outbreaks of diseases.
- **Inhibit pest and insect growth**: It reduces the homogeneity of farm. This heterogeneity increases the barriers against biological dispersal of pests in the field.
- **Control weed**: It reduces the likelihood that specific weed species will become adapted to the system and become problematic. For example *rotation of crops is the most effective means yet devised for keeping land free of weeds.*
- **Use resources more effectively**: Multiple activities, if scientifically planned, lead to better usage of resources, For example, fodder crops can be used for livestock feed, animal dung can be used as organic manure and dairy products helps to enhance farmers income.
- **Reduce risk for crop failure**: Different crops have different response to the climate vagaries and varied degree of susceptibility to disease attack. Due to such heterogeneity, the risk of total crop failure is reduced.
- **Improved food and financial security**: By reducing the risk of crop failure & diversifying the income opportunities for the famers, scientifically designed cropping system improves food and financial security.

1.3. Factors Affecting the Cropping Pattern

Crop diversification refers to the addition of new crops or cropping systems to agricultural production on a particular farm taking into account the different returns from value-added crops with complementary marketing opportunities

The cropping pattern and crop diversification in a particular geographical area depends on different categories of factors. All the factors vary in their impact on the crops under different circumstances and times. These factors have been differently classified by different researchers/ institutions. For example, World Bank (1990) has put forward a detailed list of factors under the broad categories of agronomic, economic and policy factors in this regard as determinants of cropping system strategies as mentioned in the table below.

All these factors are interrelated and their relative importance changes over time.

Agronomic, Economic and Policy Factors

Agronomic/Technical	Economic	Government Policy
Climate and soil type (irrigation, topography, fertility, drainage etc.) Availability of required inputs (fertilizer, chemical, credit, tractors etc.) Plant/seed of high genetic quality ★Management techniques and quality managers ★Abundance of labour of appropriate mechanical technologies	Flow of market signals and communication and information systems Venture capital and entrepreneurship Transparency of input and output prices Information on export standards, market demand and relative profitability Efficient marketing systems	★Non-distortionary policy that discriminate among crops ★Efficient research and extension programmes, without any bias for major crops or against high value crops. ★Contract-farming opportunities ★Rural credit ★Off-farm employment opportunities ★Marketing systems including quality standards ★Involvement of the private sector

(Source: World Bank (1990)

1.4. Types of Cropping Systems

1.4.1. Mono-Cropping

Mono-cropping or monoculture refers to growing of only one crop on a piece of land year after year.

- It may be due to **climatic and socio-economic conditions** or due to **specialisation of a farmer** in growing a particular crop. For example, groundnut or cotton or sorghum are grown year after year due to limitation of rainfall, while in canal irrigated areas, under a waterlogged condition, rice crop is grown as it is not possible to grow any other crop.

Crop rotation: Crops are changed in the field from year to year according to a planned sequence rather than the same crop being grown in the same field again and again.

1.4.2. Multiple Cropping

It is the practice of growing two or more crops in the same field within a given year.

- It is the intensification of cropping in time and space dimensions, i.e., **more number of crops** within year and more number of crops on same piece of land in any given period.
- Double-cropping is a case where the land is occupied by two crops, which are grown in a year in sequence. It includes **mixed-cropping, inter-cropping and sequence cropping**.

Cropping Intensity

It refers to **number of crops cultivated** in a piece of land per annum. In Punjab and Tamil Nadu, the cropping intensity is more than 100% (i.e. around 140-150%). In Rajasthan, the cropping intensity is less.

Need for intensive cropping

- The increase in population has put pressure on land to increase productivity per unit area, unit time and for unit resource used.
- Moreover, for efficient use of available natural resources, the cropping system has to evolve with change in climate, soil and water availability.
- Thus, cropping system should provide enough food for the family, fodder for cattle and generate sufficient cash income for domestic and cultivation expenses.

A. Mixed Cropping: Two or more crops grown in the same field within a given **year without a definite row arrangement**. It is a common practice in most of dry land tracts of India. Seeds of different crops are mixed in certain proportion and are sown.

- The objective is to meet the family requirement of cereals, pulses and vegetables. Ex: sorghum, pearl millet and cowpea are mixed and broadcasted in rain-fed conditions.

B. Inter-cropping: It includes growing two or more crops simultaneously **with definite row arrangement** on the same field with an objective of higher productivity per unit area in addition to stability in production.

- It was earlier practiced as an insurance against crop failure under poor rainfall conditions. If done unscientifically, it might lead to intercrop competition for available resources.

  Requirements for successful Inter-cropping:
  - The timing of peak nutrient demands of component crops should not overlap.
  - Competition for light should be minimum among the component crops.
  - The difference in maturity of component crops should be at least 30 days.

Types of Intercropping: Combinations of various crops can vary in terms of spatial or temporal arrangement. On the basis of these variations, following types of intercropping have been identified.

1. **Row intercropping:** Growing two or more crops **simultaneously** where one or more crops are planted in rows. It is a **variation in space dimension**. For example, maize + greengram (1:1), maize + blackgram (1:1), groundnut + redgram (6:1)

- Variations include alley cropping, where crops are grown in between rows of trees, and strip cropping, where multiple rows, or a strip, of one crop are alternated with multiple rows of another crop.

2. **Strip-intercropping**: Two or more crops are planted in the same field in **alternate strips**.
   - Strips are wide enough to permit independent cultivation but narrow enough for the crops to interact. Ex. groundnut + redgram (6:4) strip.

Advantages of intercropping

- It leads to **better use** of growth resources including light, nutrients and water.
- Intercropping of compatible plants also **encourages biodiversity** by providing a habitat for a variety of insects and soil organisms that would not be present in a single-crop environment. This in turn can help **limit outbreaks of crop pests** by increasing predator biodiversity.
- Along with **suppression of weeds** it causes **yield stability** - even if one crop fails due to unforeseen situations, another crop will yield and gives income.
- Successful intercropping gives **higher equivalent yields** (yield of base crop + yield of intercrop), higher cropping intensity.
- It reduces pest and disease incidences and improves soil health and agro-ecological system.
- Reducing the homogeneity of the crop increases the barriers **against biological dispersal of pest** organisms through the crop.

Mixed Cropping vs Intercropping	
Mixed Cropping	**Intercropping**
Aimed to minimize the risk of crop failure	Aimed to increase productivity from unit area
Seeds of different crops are mixed together before sowing	Seeds are not mixed
All the crops are sown at the same time.	Crops can be sown at the same or different time.
Crop sowing is random.	Different crops are grouped in different rows or columns.
Pest control is relatively difficult.	Pest control is relatively easier.
Equal emphasis is given to all the crops.	More emphasis is given to main crops.
Same fertilizer and pesticide is applied to all crops.	Specific fertilizer and pesticide is applied to each crops.

C. Sequence Cropping or Sequential Cropping or Crop Rotation:

- It can be defined as growing of two or more **crops in a sequence on same piece** of land in a farming year. The succeeding crop is planted after the preceding crop has been harvested.
- Crop variation is done **with respect only to time**. There is **no intercrop competition**. Its various types are:
  - **Double Cropping:** Growing two crops on the same land in a year in sequence. Ex. rice→cotton
  - **Triple Cropping:** Growing three on the same land in a year in sequence. Ex. Triple cropping: rice→rice→pulses
  - **Quadruple:** Growing four crops on the same land in a year in sequence. Ex. tomato→ridge gourd→amaranthus greens→baby corn.

(NOTE: The various terms defined above bring out essentially two underlying principles of growing crops simultaneously in mixture, i.e., intercropping; and of growing individual crops in sequence, i.e., sequential cropping. The cropping system for a region or farm may comprise either or both of these two principles).

D. Other Types of Multiple Cropping

Alley cropping: It is planting rows of trees at wide spacing with a companion crop grown in the alleyways between the rows.

- It diversifies the sources of farm income, improves crop production and provide protection and conservation benefits to crops.
- Common examples of alley cropping plantings include wheat, corn, soybeans or hay planted in between rows of black walnut or pecan (a type of walnut) trees.

Relay Cropping: Growing two or more crops simultaneously during the part of the life cycle of each.

- The second crop is planted after the first crop has reached its reproductive stage of growth, but, before it is ready for harvest. Ex: rice fallow pulses i.e pulses gown on land where rice is nearing its harvest season.
- This allows farmers to grow two crops in one season in places where the growing season is not long enough to accommodate two crops.

Ratoon cropping: Ratooning is a method of harvesting a crop which leaves the roots and the lower parts of the plant uncut to give the ratoon or the stubble crop. Crop regrows out of roots or stalks after harvest of crops.

- The main benefit of ratooning is that the crop matures earlier in the season. Ratooning can also decrease the cost of preparing the field and planting.
- However, this method cannot be used endlessly as the yield of the ratoon crop decreases after each cycle.
- Ratooning is most often used with crops which are known to give a steady yield for three years under most conditions eg sugarcane, banana, pineapple.

2. Major Crops in India

Crop	Characteristics	Climatic Condition	Remarks/Distribution
Rice	Staple food crop of India. Kharif Crop Aus, Aman and Boro are varieties of rice in Kharif, Rabi and Zaid seasons.	High temperature (above 25° C) High Humidity with average rainfall above 100 cm	Plains of North and North-Eastern India, coastal areas and the deltaic regions Punjab, Haryana, West UP and Parts of Rajasthan (with help of irrigation)
Wheat	Second most important crop Main food crop in north and north-western India Rabi Crop	Requires a cool growing season and a bright sunshine at the time of ripening. Winter temperature from 10°-15° C and summer temperature from 21°-26° C 50-75 cm of annual rainfall evenly distributed over the growing seasons	The Ganga-Satluj plains in the northwest and black soil region of the Deccan. The major wheat-producing states are Punjab, Haryana, Uttar Pradesh, Bihar, Rajasthan and parts of Madhya Pradesh.
Millets	Jowar, bajra and ragi are important millets in India. Have high nutritional value	Jowar is a rain-fed crop mostly grown in the moist areas which hardly needs irrigation. (Kharif- 26°-33° C; Rabi- above 16°C) Bajra grows well on sandy soils and shallow black soil.	Major Jowar producing States were Maharashtra, Karnataka, Andhra Pradesh and Madhya Pradesh. Major Bajra producing States were: Rajasthan, Uttar Pradesh, Maharashtra, Gujarat and Haryana. Major ragi producing states are:

		(Temperature- 25°-30° C, rainfall- 40-50 cm) Ragi is a crop of dry regions and grows well on red, black, sandy, loamy and shallow black soils. (Temperature- 20°-30° C; rainfall- 50-100 cm)	Karnataka, Tamil Nadu, Himachal Pradesh, Uttarakhand, Sikkim, Jharkhand and Arunachal Pradesh.
Maize	Is used both as food and fodder. Kharif Crop. In some states like Bihar- Rabi crop also.	Temperature between 21°C to 27°C and grows well in old alluvial soil. 50-100 cm rainfall Requires four and a half frost free months in a year	Major maize-producing states are Karnataka, Uttar Pradesh, Bihar, Andhra Pradesh, Telangana and Madhya Pradesh
Pulses	Major source of protein in a vegetarian diet. Tur (arhar), urad, moong, masur, peas and gram are major pulses in India.	less moisture and survive even in dry conditions. Gram prefers 20°-25° temperature and 40-50 cm rainfall	Major pulse producing states in India are Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra and Karnataka. Being leguminous crops, all these crops except arhar help in restoring soil fertility by fixing nitrogen from the air.
Sugarcane	Tropical as well as subtropical crop. Main source of sugar, gur (jaggary), khandsari and molasses.	Hot and humid climate with a temperature of 21°C to 27°C and an annual rainfall between 75cm and 100cm Can be grown on a variety of soils and needs manual labour from sowing to harvesting	The major sugarcane-producing states are Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Bihar, Punjab and Haryana.
Tea	Plantation Crop	Grows well in tropical and sub-tropical climates endowed with deep and fertile well-drained soil, rich in humus and organic matter. Ideal temperature- 20°-30° C Requires warm and moist frost-free climate all through the year. Frequent showers (150-300 cm) evenly distributed over the year ensure continuous growth of tender leaves	Tea is a labour-intensive industry. It requires abundant, cheap and skilled labour. Major tea-producing states are Assam, hills of Darjeeling and Jalpaiguri districts, West Bengal, Tamil Nadu and Kerala. Himachal Pradesh, Uttarakhand, Meghalaya, Andhra Pradesh and Tripura are also tea-producing states in the country.
Coffee	The Arabica variety initially brought from Yemen is produced in the country.	Requires hot and humid climate with temperature varying between 15°-28° C and rainfall from 150-250 cm	Intially its cultivation was introduced on the Baba Budan Hills and even today its cultivation is confined to the Nilgiri in Karnataka, Kerala and Tamil Nadu.
Rubber	Equatorial Crop, but under special conditions Also grown in tropical and sub-tropical areas.	Moist and humid climate with rainfall of more than 200 cm. and temperature above 25°C.	Mainly grown in Kerala, Tamil Nadu, Karnataka and Andaman and Nicobar islands and Garo hills of Meghalaya.

Cotton	Fibre Crop Kharif Crop and requires 6 to 8 months to mature. Cotton grows well in drier parts of the black cotton soil of the Deccan Plateau.	It requires high temperature (21° -30° C), light rainfall (50-100 cm) or irrigation, 210 frost-free days and bright sun-shine for its growth.	Major cotton-producing states are– Maharashtra, Gujarat, Madhya Pradesh, Karnataka, Andhra Pradesh, Telangana, Tamil Nadu, Punjab, Haryana and Uttar Pradesh.
Jute	Known as Golden fibre	Grows well on well-drained fertile soils in the flood plains where soils are renewed every year. High temperature is required during the time of growth	Major jute producing states are West Bengal, Bihar, Assam, Odisha and Meghalaya.

3. Cropping System in India

3.1. Evolution

The cropping system of a region is a **cumulative result** of long term agricultural practices, social customs and traditions, physical conditions, Government policies, monetary considerations and historical factors. In India, over last 50 years, the trend in the land use pattern and cropping pattern has shown increasing use of land for the purpose of cultivation with slight variations.

The change in land use pattern and cropping pattern is vastly affected by irrigation expansion, infrastructure development, penetration of rural markets, development and spread of short duration and drought resistant crop technologies, rapid urbanization. The higher cultivable area has been achieved by bringing large acreage of uncultivable land into cultivation.

Some of the **observable trends/issues in Indian agriculture system** can be seen as under:

- **Dominance of food crops over non-food crops**

  At the time of Independence, more than 75 per cent of the total area sown in the country was devoted to the production of food crops. Now, relative share of area under food crops has declined from 76.7% during 1950-51 to 65.8% during 1999-2000.

  Reason: Gradually with commercialization of agriculture, farmers in India have started shifting area to non-food crops mainly due to relatively better price realization.

- **Variety of Crops**

  Almost every kind of crops are grown in India as it is endowed with a variety of soils. Cash crops have gradually cached up with the production of food crops and more and more farmers are moving from subsistence to commercial farming.

  Horticulture crop production (305.4 MT in 2017-18) has recently overtaken the total foodgrain (279.5 MT in 2017-18) production in India. Besides, **medicinal plants, fruits, flowers and vegetables** are gradually getting special attention due to their demand in food processing and export potential.

  Plantation crops are highly profitable but require huge capital and large tracts of land. Thus it is confined to limited parts of country. Emphasis is placed now on **production of oilseeds** through various initiatives like Integrated Scheme of Oilseeds, Pulses, Maize and Oilpalm (ISOPOM).

  Reason: After ensuring the food security, now the policy emphasis is on increasing farmers income, boost exports, save foreign exchange spent on import of edible oils.

- **Dominance of cereals among food crops**

  Within broad group of food crops, cereals like wheat and rice dominate. About 82 per cent of the area under food crops has been put to cultivation of cereals.

  Reason: This is due to better prices, less risk in production and the availability of better seeds.

- **Decline in coarse cereals**

  Jowar, Bajra, Maize, Millets, Barley etc. are called coarse or inferior cereals. The area under these crops to the total area under cereal crops has declined significantly from 48 per cent in 1950-51 to about 25 per cent in 2016.

  Reason: This is due to spread of irrigation facilities, improved inputs and a shift in consumption patterns of the people.

- **Declining importance of Kharif crops**

  The share of Kharif has declined from 71 per cent in the 1970's to 49 percent in 2015-16. The share of Rabi foodgrain production in total foodgrain production of the country has increased from 36.4% in 1970-71 to 50.83% in 2015-16.

  Reason: The Kharif crops are not reliable because they are mostly **dependent on monsoon rainfall** which in itself is unreliable. Contrary to this, mostly Rabi crops in India are raised on irrigation which offers a degree of reliability.

Related Information

- There are mainly three cropping seasons in India (i) Kharif (ii) Rabi (iii) Zaid. The Kharif season corresponds to the rainy season, while Rabi season with the winter. The short period in between the harvest of the Rabi crops and the sowing of the Kharif crops is called the Zaid season.
- The area under Rabi crops is 22.4% less than under Kharif.

3.2. Categories of Crops in India

Crops can be categorized differently based on end usage and on the growing season.

3.2.1. Based on End Usage

Food Crops	Cash Crops	Plantation Crops	Horticulture crops
These are the crops which are **grown as food for the producer's family** or for the producer's own livestock. Example wheat, rice, jowar etc. The scale of operations is quite small so as to fulfil the basic needs of a family.	Cash Crops are crops that are especially **used for profit** rather than consumption by a family. They can be consumed directly or processed into other products, such as sugar and biofuel. They consist of foods like tobacco, tea, coffee, cardamom, fruits and vegetables, grains, etc. They are sold, but **some are not edible**. Cotton and tobacco	A plantation is a **large-scale farm** that specializes in cash crops. The term Plantation crops refers to those crops which are usually cultivated as a **single crop on an extensive scale** in a large contiguous area, owned and managed by an Individual or a company. These plantation crops are **high value commercial crops** of greater economic	Horticulture is the science and art of **growing and caring for plants**, especially flowers, fruits, and vegetables. The word horticulture comes from Latin and means "garden cultivation." Whereas agronomy (a branch of agriculture) refers to the growing of field crops, horticulture refers

	are examples of non-edible cash crops.	importance The crops include tea, coffee, rubber, cocoa, coconut, arecanut, oil palm, cashew, cinchona etc.	to **small-scale gardening**.
***All food crops can be cash crops but not all cash crops can be food crops. Food crops can be eaten by someone somewhere and so have a cash value. Food crops can be sold, which would make them cash crops as well.			

3.2.2. Based on Seasons

There are three distinct crop seasons namely Kharif, Rabi, and Zaid.

- **Kharif season** largely coincides with Southwest Monsoon
- **Rabi season** begins with the onset of winter in October-November and ends in March-April. The low temperature conditions during this season facilitate the cultivation of temperate and subtropical crops such as wheat, gram and mustard.
- **Zaid** is a short duration summer cropping season beginning after harvesting of rabi crops, the cultivation of watermelons, cucumbers, vegetables and fodder crops during this season is done on irrigated lands.

Cropping season	**Major crops cultivated**	
	Northern States	**Southern States**
Kharif June-September	Rice, Cotton, Bajra, Maize, Jowar, Tur	Rice, Maize, Ragi, Jowar, Groundnut
Rabi October-March	Wheat, Gram, Rapeseeds and Mustard, Barley	Rice, Maize, Ragi Groundnut, Jowar
Zaid April-June	Vegetables, Fruits, Fodder	Rice, Vegetables, Fodder

However, this type of distinction in the cropping season **does not exist in southern parts** of the country. Here, the temperature is high enough to grow tropical crops during any period in the year provided the soil moisture is available. Therefore, in this region same crops can be grown thrice in an agricultural year provided there is sufficient soil moisture.

3.3. Cropping Patterns in India

Different parts in India follow different cropping patterns during a year. It is largely due to variations in physical factors, size of land holdings, market facilities, government policies, infrastructure facilities etc. These factors are discussed below.

Crop diversification and intensification depends on various factors related to:

- **Soil and climatic parameters:** It determines overall agro-ecological setting
- **Resource:** It covers irrigation, rainfall and soil fertility
- **Technology:** Varieties of seeds, cultural requirements, mechanization, plant protection, and access to information etc.
- **Infrastructure facilities:** Irrigation, transport, storage, trade and marketing, post-harvest handling and processing etc.
- **Condition of Household**: Food and fodder self-sufficiency requirement as well as investment capacity.
- **Socio-economic conditions:** Financial resource base, land ownership, size and type of land holding, household needs of food, fodder, fuel, fibre and finance, labour availability etc.

- **Pricing Structure:** It includes output and input prices as well as trade policies and other economic policies that affect these prices either directly or indirectly.
- **Institutions:** It covers farm size and tenancy arrangements, research, extension and marketing systems and government regulatory policies.

Apart from this the **factors determining the choice of crops by a farmer** may depend largely on:

- **Size of the Land Holding:** In India marginal and small farmers represent the majority of farming community. So the mono crop paddy has become predominant as it fulfils the household needs and perpetuates the subsistence agriculture with little scope for commercial Cop husbandry.
- **Literacy:** Majority of the farmers are ignorant of the scientific methods involved in mixed-cropping, mono cropping and other technological knowhow for practicing better
- **Disease and pest:** The cropping pattern also depends on the possibility of disease and pest infections.
- **Ecological Suitability:** The cropping pattern of a particular region is highly dependent on the ecological condition (temperature, rainfall, humidity, etc.).
- **Moisture Availability:** The source of irrigation greatly determines the type of the cropping pattern to be practiced. For example, in low rainfall area, dry land farming is best possible way to profit maximisation.
- **Financial Stability:** The economic condition of the farmers also affects the cropping pattern. As the cash crops (for example, cotton) involve high capital investments, these are practised only in estate farming. The marginal section of the farms community adopts low cost crops.

Examples of Cropping Patterns Followed in India

Major categories of cropping pattern followed in India are-

Kharif (monsoon crops)		**Rabi** (post-monsoon crops)	
Rice based	**Non-Rice-Based**	**Wheat and Gram Based**	**Rabi-Jowar Based**
Relay Cropping - seed of succeeding crops like lentil, gram, pea, lathyrus, berseem, linseed etc. is sown through broadcasting in maturing rice crop. It is done in both upland and lowland rice culture*. **Mixed varietal cropping of rice** - Mixing the seeds of early rice (ahu) with late maturing deep water rice (bao). It is mainly practiced in West Bengal.	Maize-based Bajra-based Cotton-based	These two crops are grown under identical climate and can often be substituted for each other.	Along with Jowar, bajra, pulses, oilseeds and tobacco are grown as alternative crops.

3.4. Major Agricultural Regions or Zones of India

On the basis of some homogeneity and commonness, major crop regions in India may be divided as follows:

- Rice Region
- Wheat Region
- Jowar-Bajra Region
- Cotton Region
- Millet and Maize Region
- Fruit and Spice Region

> ***Upland rice*** is grown in rainfed, naturally well-drained soils with bunded or unbunded fields without surface water accumulation.
>
> ***Lowland rice*** is grown on land that is flooded or irrigated.

Rice region

Rice is considered as the major crop in the vast region stretching from lower Gangetic plain to Brahmaputra valley in the east and the circum-coastal alluvial tracts of the peninsula region. Though rice displays overall dominance, considering the secondary importance of other crops, this region may be subdivided into following zones:

- Rice-Jute-Tea: This association of crops occurs in far east, near Assam Valley, north-west Bengal and lower Gangetic plains.
- Rice-Pulses-Millets-: This association occurs in the western section of the former zone, covering central Bihar, eastern Madhya Pradesh and eastern Uttar Pradesh.
- Rice-Millets: This zone comprises the entire Andhra Pradesh, southern Orissa and some parts of Tamil Nadu.
- Rice-Coffee-Spices: This zone is found in the southern extremity of Kerala and Tamil Nadu.

Wheat region

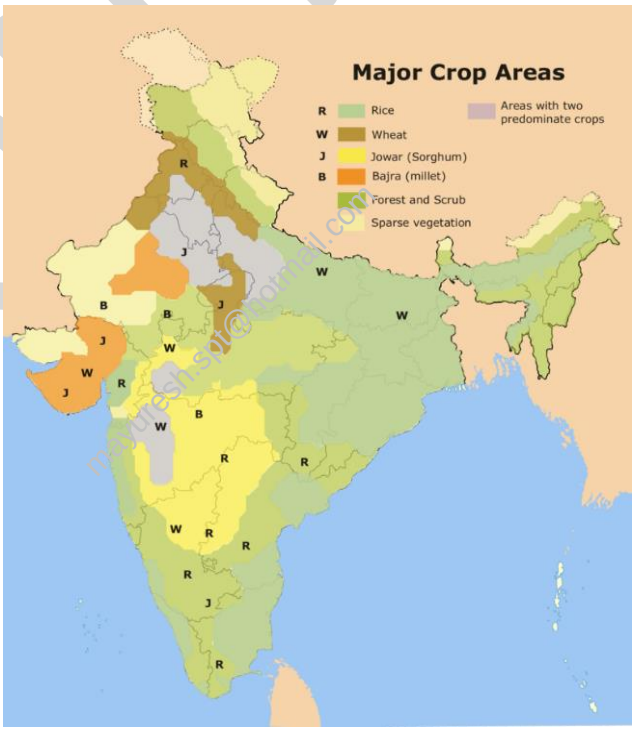
This region covers the entire north-western India including the state of Punjab, Haryana, Uttar Pradesh and Rajasthan. The major sub-regions are:

Other wheat based systems:
- Wheat –chickpea
- Wheat-rice-wheat
- Wheat-green manure-wheat
- Wheat-fallow-wheat

- Wheat-Maize-Sugarcane: This region comprises a great part of wheat regions, covering West Uttar Pradesh, Himachal Pradesh and Jammu.
- Wheat-Jowar-Bajra in Indus Plain covering Punjab and Haryana.
- Wheat-Jowar-Bajra in Vindhyan scarp land and Malwa Bundelkhand plateau.

Jowar-Bajra Region

This crop combination is practised in drought prone region (rainfall 50-100 cm).



- Jowar-Cotton in Maharashtra.
- Jowar-Cotton-Oilseeds-Millets in Karnataka and Maharashtra.
- Jowar-Wheat in entire Rajasthan, Haryana and some parts of Uttar Pradesh.
- Bajra-Jowar-Pulses in Rajasthan desert and semi-desert areas.

Cotton Region

Cotton cultivation predominates in the black cotton soil (regur) region in the North West India. It covers the Deccan trap region and Gujarat plain. The Narmada, Tapti, Purna, Sabarmati River Valleys are basically heartlands of cotton cultivation. As a cash-crop, cotton cultivation is always associated with one food grain cultivation, preferably Jowar, Bajra or oil seeds. The different sub-regions are:

- Cotton-Jowar-Bajra grows in close association with one another in the Maharashtra and Western Madhya Pradesh.
- Cotton-Oilseeds combination developed in Gujarat.
- Cotton-Pulses-Rice region developed in Narmada banks and Eastern Gujarat.

Millet-Maize Region

The cultivation of millet, maize and ragi are found in close association with other major cereals like bajra, wheat, rice etc. Maize cultivation dominates in Rajasthan, Gujarat, and Madhya Pradesh. In Himachal Pradesh, Maize-Barley-wheat combination has developed, particularly in the foothills of the Himalayas. Some parts of the Aravalli have the peculiar crop combination of Maize-Cotton-Oilseeds-Millets-Wheat. Ragi cultivation predominates in South of Karnataka.

Maize based cropping systems

- Maize has wide adaptability and compatibility under diverse soil and climatic conditions.
- It is cultivated in sequence with different crops under various agro-ecologies of the country
- Among different maize based cropping systems
  - Maize-wheat ranks 1st having 1.8 m ha area mainly concentrated in rainfed ecologies.
  - Maize-wheat is the 3rd most important cropping systems (after rice-wheat and rice-rice that contributes about 3 % in the national food basket.)

Rice-maize has emerged a potential maize-based cropping system in peninsular and eastern India. Compared to existing cropping systems like rice-wheat and rice-rice, maize based cropping systems are better user of available resources and the water use efficiency of maize based cropping systems is about 100 to 200 % higher at different locations.

Fruit & Spice Region

This is the **smallest region** among the different crop regions. High-altitude hilly areas come under the territory of this region. The 'Duns' and valleys in Himalayas, foothills of Nilgiri, Annamalai, Palni and Cardamom hills in Tamil Nadu and Kerala may be classified as fruit and spice region. Here, the dominant agricultural activity is fruit orchards and plantations.

Related Information

Agro-ecological/climatic zoning (AEZ)

It defines zones on the basis of **combinations of soil, landform and climatic** characteristics. The particular parameters used in the definition focus attention on the climatic and edaphic requirements of crops and on the management systems under which the crops are grown. Each zone has a similar combination of constraints and potentials for land use and serves as a focus for the targeting of recommendations designed to improve the existing land-use situation, either through increasing production or by limiting land degradation.

With the 329 million hectares of the geographical area the country presents a large number of complex agro-climatic situations. Several attempts have been made to delineate major **agro-ecological regions in India** for macro-level planning on a more scientific basis. They are as follows.

- Agro-climatic regions by the Planning Commission
- Agro-climatic zones under National Agricultural Research Project (NARP)
- Agro-ecological regions by the National Bureau of Soil Survey & Land Use Planning (NBSS & LUP)

Plantation and Other Commercial Crops

Crops under this category include sugarcane, tobacco, potato, jute, tea, coffee, coconut, rubber and other crops, such as spices and condiments. Some of them are seasonal, some annual and some perennial. Most of them require specific environmental conditions and from the point of view of cropping patterns, they are concentrated in some particular regions. Besides, certain horticultural crops, such as apple, mango and citrus, are important.

In the case of plantation-crops, intercropping with pulses and fodder crops is common. Spices and condiments are generally grown on fertile soils. Chillies are rotated with jowar, whereas onion, coriander, turmeric and ginger are grown as mixed crops with other seasonal crops.

4. Previous Years Vision IAS GS Mains Questions

1. India has seen significant progress towards increasing production, yield levels and crop diversification in last three decades. Still, the agricultural productivity in India is among the lowest in the world. In this context, analyse the reasons for low productivity and suggest some measures to improve the same.

Approach:

- Identify causes of low productivity in India in spite of the factors mentioned
- Suggest improvement measures

Answer:

Causes of low productivity

- **Overcrowding in agriculture:** Disguised unemployment and low marginal productivity because too many people are directly dependent on farming. Increased population led to sub-division and fragmentation of holdings thus there was a decline in the area of land available for cultivation per capita.
- **Discouraging rural atmosphere:** Very few farmers are quick in following modern technology exposed to them; but vast majority of farmers are not motivated to learn and try new ways. However, this has steadily changed in recent years.
- **Inadequate Farm Credits:** Farm Credits have been inadequate despite the efforts of the government and RBI to increase it.
- **Small Size of Holdings:** The average size of holdings in India is very low and they are fragmented and small. Since they are small, scientific cultivation techniques cannot be adopted. Small sized holdings lead to great waste of time, labour and cattle power, difficulty in proper utilization of irrigation facilities and consequent litigation among farmers etc.
- **Inadequate irrigation facilities:** Indian agriculture is mostly dependent on rainfall and very few farmers avail the facility of artificial irrigation. Though over the time, more area was brought under irrigation, still there is a great scope for improving the irrigation facilities

Improvement measures

- There should be necessary programmes which demonstrate the technology and show the importance of crop rotation, multi-cropping etc. to the farmers.
- An Agricultural Mechanization Corporation can be established which can help an average farmer who cannot manage with hired labour.
- Greatest importance should be given to the promotion of transport, marketing facilities and consolidation of holdings.

- Improvement in storage facilities, providing tenant security, implementing the recommended projects in rural areas for improving the irrigation facilities for supplementing better quality seeds and for increasing awareness among the people about hybrids, varieties, disease resistant varieties, drought resistant varieties, etc. are the other major aspects to be concentrated upon.
- There is little scope for increasing the area of cultivation in future but through multiple cropping, relying on irrigation facilities, high yielding varieties, etc. we can raise the agricultural productivity.

2. Food grain constitutes 64 percent of the gross cropped area (GCA), although it accounts for less than 25 percent of the total value of output of agriculture and allied activities. Give reasons for this existing imbalance in the current cropping pattern of food grains in India and steps needed to correct such an imbalance.

Approach:

- Highlight factors incentivising food grain production
- Also focus on factors creating disincentive for non-food grain products like horticultural products etc.
- Mention some steps taken by government to correct such imbalance
- Suggest some more steps required

Answer:

In India, there is an existing imbalance in the cropping pattern of the food grains. The food grains occupied an area of 97.32 million hectare (mha) in 1950-51 has increased to 126.74 mha in 2011-12. In these years, the area under cereals such as rice and wheat has grown but the same under coarse cereals and millets has decreased.

Reasons of imbalance in Crop Pattern:

- Prices of food grains have been rising quite fast and the farmers have started growing food crops in the similar way they grow commercial crops like cotton, oil seed crops sugarcane etc.
- Cultivation of food grains has become highly remunerative and productive under the influence of new technology.
- Traditionally, the **Minimum Support Prices** for wheat and rice have been maintained reasonably high (in comparison to millets such as Jowar and Bajra). This has helped the farmers to increase their production.
- There has been a change in the consumption pattern and people have moved from coarse cereals to wheat and rice for their main dietary grain. This is because of the increase in the income of the people and coarse cereals being the inferior goods.
- The strategic objectives of agricultural development in India have been changing over time.
    - In 1960s, it was to maintain the prices of food grains at low level. The government significantly supported the growth of wheat and rice cultivation via its policy intervention, procurement and technology.
    - In 1960s to 1980s, it was to maximize food production.
    - In 1980s to 1990s, it was to go for a demand driven production pattern.
    - Since 1990s, it was to reduce inputs of agricultural commodities.
- Lack of market and storage facilities for horticultural products
- Absence of stable price regime for horticultural products

Student Notes:

Various steps taken by government

- Government through National food security mission focussed on increasing production of pulses, which India has been importing
- Oil seed production has also been emphasized under National mission on oilseed and oil palm
- National horticultural mission for promoting horticultural products.

Some other steps like rationalisation of MSP for products other than cereals is necessary**.**

3. ***"Multiplicity of cropping systems has been one of main features of Indian agriculture and it is attributed to rainfed agriculture and prevailing socio-economic situations of farming community." Comment.***

Approach:

The answer should highlight the reason for origin and development of various cropping patterns in India. Besides, a brief mention of the various factors which guide these patterns should be made. Answer should be supported by examples of some of these patterns.

Answer:

Multiplicity of cropping systems has been one of the main features of Indian agriculture. This may be attributed to following two major factors:

- Rainfed agriculture still accounts for over 92.8 million hectare or 65 per cent of cropped area. A large diversity of cropping systems exists under rainfed and dryland areas with an overriding practice of intercropping, due to greater risks involved in cultivating larger area under a particular crop.
- Due to prevailing socio-economic situations such as dependency of large population on agriculture, small land-holding size, very high population pressure on land resource etc., improving household food security has been an issue of supreme importance to many million farmers of India, who constitute 56.15 million marginal (<1.0 hectare), 17.92 million small (1.0-2.0 hectare) and 13.25 million semi-medium (2.0-4.0 hectare) farm holdings, making together 90 per cent of 97.15 million operational holdings. An important consequence of this has been that crop production in India remained to be considered, by and large, a subsistence rather than commercial activity. One of the typical characteristics of subsistence farming is that most of the farmers resort to grow a number of crops on their farm holdings, primarily to fulfil their household needs and follow the practice of rotating a particular crop combination over a period of 3-4 years interchangeably on different farm fields.

Depending upon the natural water resources, each region has certain area under irrigated agriculture. But, broadly considering, two distinct irrigated ecosystems emerge. One is Indo-Gangetic Plain region comprising the states of Punjab, Haryana, plains of Uttar Pradesh, Bihar and plains of Jammu & Kashmir. The other ecosystem may be carved out of coastal areas of Andhra Pradesh and Tamil Nadu.

Under influence of all above factors, cropping systems remain dynamic in time and space, making it difficult to precisely determine their spread using conventional methods, over a large territory. Based on rationale of spread of crops in each district in the country, 30 important cropping systems have been identified. Some of them are rice-wheat, rice-rice, rice-gram, rice-mustard, rice- groundnut, rice-sorghum, pearl millet-gram, pearl millet-mustard, pearl millet-sorghum, and cotton-wheat.

4. Despite favourable demand and supply factors as well as high rate of return, diversification towards horticulture crops has been slow. Examine. What steps are required to achieve the potential of this sector?

Approach:

- In introduction delineate the meaning and significance of horticulture insofar as higher rate of returns is concerned.
- Delineate the favourable demand and supply factors for this sector.
- Explain why diversification towards this sector has been slow.
- Suggest measures to achieve the potential of this sector.

Answer:

Horticulture is the branch of agriculture that deals with art and science of fruits, vegetables, flowers and ornamental plants. It offers high rate of returns as:

- Fruits and vegetables give 4-10 times the return from other crop groups namely cereals, pulses and oilseeds.
- A one per cent shift in area from non-horticultural crops to horticultural crops adds 0.46 percentage points to growth rate of agriculture sector.

The higher rate of returns from horticulture is also backed by favourable demand and supply factors. For example -

- **Changes in taste and preferences** - Due to changes in taste, preferences and food habits, the consumption pattern in India has been shifting towards fruits and vegetables.
- **Increasing incomes** - 1 per cent increase in per capita expenditure results in 1.9% and 1.02% increase in demand for fruits and vegetables respectively. Thus, per capita intake of fruits and vegetables in the country will keep rising in coming years.
- **Increasing imports** - There is large deficiency of these items in Indian diet. India's import of fruits is rising by 20 per cent per year. All these indicators suggest that demand side prospects for fruits and vegetables are very bright.
- **Technological developments** in horticultural crops have facilitated some diversification. Varieties of horticultural crops have been developed for cultivation in off season, under diverse climatic conditions and with various attributes to attract consumers.

Despite these factors the area under horticulture crops in the country has remained below 10 per cent. The major constraints for the growth in horticultural crops are:

- **System of Marketing -** Horticultural crops, particularly vegetables, are more popular with smaller size land holdings as they have advantage in terms of family labour required for labour intensive production. However, such farmers are severally constrained by scale factor in marketing of produce.
- **Inadequate processing facilities** - In most cases a horticultural crop does not come to maturity at the same time and harvestable produce is distributed over a span of a few weeks. Being perishable, these crops cannot be stored at home to make a economical lot for taking to market. And if not sold, it results in big post harvest loss
- **Other constraints** include very high growth in horticultural imports, large price spread between producers and end users, frequent and often violent price fluctuations, low level of processing, and very low post harvest value addition.

Various steps that are required in order to achieve the potential of this sector are as follows:

- **Institutionalize cooperatives** – It will help small growers to trade their produce in the market as combined harvest will be sufficient to trade in markets.
- **Provide favorable market conditions** - It is needed to give complete freedom to producers and buyers for sale/purchase throughout the country and take horticulture produce out of the purview of APMC act so that they do not need to sell compulsorily in the local mandis and can sell even its small produce directly in the market or can pool with other producers for marketing.
- **Development of modern value chain** - This has not been happening due to legal hurdles and restrictions on free and direct marketing. If the sector is deregulated then many innovative vegetable and fruit sellers in urban areas will be attracted to develop back-end linkage to get direct supply from the producers.
- **Free marketing –** It will also attract large investments from private sector as happened in the case of milk production

These require action both by the states and the Central government. The onus for freeing market for horticultural produce rests with the states while support of Central government is crucial for promoting producers' organizations and fruits and vegetable processing.

5. What do you understand by cropping pattern? What are the factors that influence the cropping pattern in India? Is there a need to change the cropping pattern in the country keeping the agro-ecological concerns in mind?

Approach:

- Define cropping pattern.
- Enumerate factors of cropping pattern.
- Discuss the problems with present cropping pattern.

Answer:

Cropping pattern is the proportion of area under different crops at a point of time. A change in cropping pattern implies change in proportion of area under different crops.

The factors affecting cropping pattern in India are:

- **Physical factors**: Cropping pattern of any region depends upon geographical features as soil, climate, rainfall, etc. Apart from this, it depends on the nature and availability of irrigation facilities. Example Cotton in deccan plateau because of black soil.
- **Economic Factors**:
  - **Price and Income maximization:** Price influences the acreage. Inter crop price parity leads to shift in acreage between the crops. Fixed procurement price of wheat and rice has helped in increasing its acreage.
  - **Farm Size:** There is a direct relationship between farm size and cropping pattern. Farmers with small size farm prefer subsistence agriculture. They go for cash crops only after meeting their food requirement.
  - **Insurance against the risk:** The need to minimize risk leads to crop diversification.
  - **Availability of Inputs:** Crop pattern is dependent on inputs like seeds, fertilizer, water, etc. The availability of seeds of groundnut induced farmers in Madhya Pradesh to increase its acreage.
  - **Tenure**: Under the crop sharing system, the landlord has dominant voice in the choice of the cropping pattern and this helps in the adoption of income maximizing crop adjustments.

Problems with current cropping pattern:

- In India, there is an existing imbalance in the cropping pattern of the food grains because a large proportion of the area under food grains is occupied by rice and wheat.
- Further, there is a gradual shift from non-food grains to food grains. Reasons of imbalance in Crop Pattern Prices of food grains have been rising quite fast and the farmers have started growing food crops in the similar way they grow commercial crops like cotton, oil seed crops sugarcane etc. Cultivation of food grains has become highly remunerative and productive under the influence of new technology and reasonably high Minimum Support Prices for wheat and rice.
- There has been a change in the consumption pattern and people have moved from coarse cereals to wheat and rice for their main dietary grain. This is because of the increase in the income of the people and coarse cereals being the inferior goods.
- Constant increase in the production of rice and wheat with little emphasis on other cereals. This is the result of government's procurement at MSP, example being Punjab
- Cultivation of water intensive crops despite low ground water levels.
- Use of excess quantities of fertilizers without considering the existing soil quality
- Indiscriminate use of pesticides and insecticides resulting in water pollution and reduction in soil fertility
- Use of HYV which require high cost inputs

All the above cropping patterns are inefficient not sustainable and there is need to move away from the present rice wheat dominant cropping pattern.

6. Not only does the yield (measured in tonnes/ha.) of a crop but a number of other factors determine the choice of crops that a farmer cultivates. Elaborate with special focus on cropping pattern in India.

Approach:

- Briefly define the concept of cropping pattern.
- Discuss various factors which influence the cropping pattern- such as geo-climatic, socio-cultural, economic, historical and political factors.
- Also briefly highlight some discrepancies in the existing cropping pattern along with concrete suggestions.

Answer:

Cropping pattern is yearly sequence and spatial arrangement of crops or of crops and fallow on a given area it means the proportion of area under various crops at a point of time. Cropping pattern is, however, a dynamic concept as it changes over space and time.

Some of the dominant factors which influence cropping pattern are-

1. **Physical factors**
   a. Physiographic, climate and water imposes limits on growth and distribution of plants and animals.
   b. Depending on terrain, topography, slope, temperature, amount and reliability of rainfall, soils and availability of water for irrigation, the cropping patterns vary.
   c. For example, in rainfall deficient areas of Rajasthan, farmers grow bajra, while in Brahmaputra valley of Assam rice is the dominant crop.

2. **Soil type**
   a. For example cotton is grown in regur (black earth) soil of Maharashtra and Gujarat, while the loamy soils of western Uttar Pradesh, Haryana and Punjab are ideally suited for wheat, rice and sugarcane.
3. **Irrigation facilities**
   a. Where ever water is available, not only can a different crop be grown but even double or triple cropping will be possible. When new irrigation facilities are provided, the whole method of cultivation may change.
4. **Availability of Inputs**
   a. Seeds, fertilizers, water storage, marketing, transport etc. also affect the cropping pattern.
5. **Government Policies**
   a. The legislative and administrative policies of the government may also affect the cropping pattern. Food Crops Acts, Land Use Acts, intensive schemes for paddy, for cotton and oilseeds, subsidies affect the cropping pattern.
6. **Economic and behavioral motivation**
   a. MSPs for some crops such as wheat and rice have remained high in comparison to millets. As a result, intercrop price disparities lead to shifts in acreage between the crops.
7. **Institutional factors**
   a. Such as land tenancy, ownership of land, size of holdings and size of fields also impose restrictions on the cropping patterns of a region.
      i. In areas of small holdings, farmers tend to be subsistent despite innovation diffusion.
      ii. Contrary to this, farmers with large holdings have more risk bearing capacity and they have relatively high degree of commercialization.
8. **Yield (tonnes/ha.) of a crop**
   a. Higher the yield per unit area, higher will be returns on investment of time and money. This is a strong factor in determining cropping pattern of paddy.

In India, there is an existing imbalance in cropping pattern of food grains because a large proportion of area under food grains is occupied by cereals. Green Revolution which focused on cereals alone, combined with the MSP regime in favor of cereals has skewed cropping pattern, although, a shift is being witnessed towards other commercial crops and horticulture. Also, there is a strong need to shift towards Integrated Farming Systems combining several enterprises like cropping system, dairying, piggery, poultry, fishery, apiculture, etc. in a harmonious way. It would also give a strong boost in achieving the much cherished vision of doubling the farmer's income in next 5 years.

5. Previous Years UPSC Mains Questions

1. What are the major reasons for declining rice and wheat yield in the cropping system? How crop diversification is helpful to stabilize the yield of the crop in the system?

DIFFERENT TYPES OF IRRIGATION AND IRRIGATION SYSTEM STORAGE

Contents

1. Introduction

Water needs to be applied to crops in the exact amount and on time. In this context, irrigation becomes important in order to reduce risks associated with agriculture.

Irrigation is the artificial supply of water to crops for the purpose of agricultural production. There can be various artificial means for supplying water such as canals, wells, tube-wells, tanks etc. which transport water from different sources such as rivers, ponds or underground water.

2. Need for Irrigation

Agriculture plays a vital role in India's economy. 54.6 per cent of the population is engaged in agriculture and allied activities (census 2011) and it contributes 17 per cent to the country's Gross Value Added (current price 2015-16, 2011-12 series).

- In the next 35 to 45 years, world food production will need to double to meet the demands of increased population.
- Agriculture requires adequate amount of water throughout the lifecycle of a crop. If the rainfall decreases to less than 30 cm, agriculture becomes impossible without irrigation.
- India's rainfall pattern suffers from both - spatial and temporal variations - as well is known for its uncertainty, irregularity, unreliability and erratic nature.
- India, with her 1.2 billion population, has to have to ensure food security for her citizens through increased agricultural productivity and production and cannot remain dependent on others.
- Irrigation increases crop yield, protects from famine and also helps in cultivating superior crops with the water supply as per need of the crops.
- Irrigation maintains moisture in the soil. Moisture is necessary for the germination of seeds.
- Crops like rice, jute, sugarcane, etc. need more water, which can be fulfilled only through irrigation.
- New and high-yielding seeds need additional water through irrigation for higher productivity.
- Agricultural activities provides employment to more than 50 % of the total workforce in India so we need to reduce the risk associated with agriculture and increase its productivity to provide better returns to farmers.

3. Different Types of Irrigation System

- In India, the irrigated area consists of about 36 per cent of the net sown area.
- There are various types of systems of irrigation practices in different parts of India which differ in how the water obtained from the source is distributed within the field.
- In general, the goal is to supply the entire field uniformly with water, so that each plant has the amount of water it needs, neither too much nor too little.

Irrigation by Source in India

Source	Area (000 Hectares)
Canals	16278
Tanks	1842
Tube-wells	31126
Other Wells	11312
Other Sources	7542

Source- Statistical Year Book of India, 2017, MOSPI

3.1. Irrigation System Based on Source

Depending on the way irrigation water is conveyed to the head or upstream point of a field, irrigation system can be categorized as following:

3.1.1. Tank Irrigation

Figure: Tank Irrigation

A tank is a water storage system developed by constru
across a stream. The water impounded by the bund is

The ratio of tank irrigated land to the total irrigated
per cent in the 1960-61 to about 4.6 per cent in 2000
tube well irrigation and partly due to fall in the tank irr

Areas where Tank Irrigation is Prevalent

- In peninsular area, tank irrigation is prevalent in Andhra Pradesh, Telangana, Tamil Nadu, Karnataka plateau, eastern Madya Pradesh, eastern Maharashtra, interirio Orissa and Kerala.
- Outside the Peninsular plateau, West Bengal, Bihar, Bundelkhand area of Uttar Pradesh, Rajasthan and Gujarat have tank irrigation.

Tank irrigation is popular in the peninsular plateau area mainly because of following reasons:

- The undulating relief and hard rock's make it difficult to dig canals and wells.
- There is little percolation of rain water due to hard rock structure and ground water is not available in large quantity.
- Most of the rivers of this region are seasonal and dry up in summer season. Therefore, they cannot supply water to canals throughout the year.
- There are several streams which become torrential during rainy season. The only way to make best use of this water is to impound it by constructing bunds and building tanks. Otherwise this water would go waste to the sea.
- The scattered nature of population and agricultural fields also favours tank irrigation.

Merits of Tank Irrigation

- Most of the tanks are natural and do not involve heavy cost for their construction.
- Tanks are generally constructed on rocky bed and have longer life span.
- In many tanks, fishing is also carried on, thus, supplementing both the food resources and income of the farmer.

Demerits of Tank Irrigation

- Many tanks dry up during the dry season and fail to provide irrigation when it is needed the most.
- Silting of the tank bed is a serious problem and it requires desilting of the tank at regular intervals.
- Much water is evaporated from the large expanse of shallow water and is thus not available for irrigation.
- Lifting of water from tanks and carrying it to the fields is a strenuous and costly exercise which discourages the use of tanks as a source of irrigation.

3.1.2. Wells and Tube Wells

Wells

A well is a hole dug in the ground to obtain the ground water. An ordinary well is about 3-5 metres deep but deeper wells may go up-to 15 metres. This method is being used since time immemorial to lift the ground water for irrigation, drinking, bathing and for other purposes.

Areas of Well Irrigation

- Well irrigation is more popular in those regions where ground water is in plenty and where there are few canals.
- These areas include a large part of the Great Northern Plain, the deltaic regions of the Mahanadi, the Godavari, the Krishna and the Cauvery, parts of the Narmada and the Tapi valleys and the weathered layers of the Deccan Trap and crystalline rocks and the sedimentary zones of the Peninsula.
- However, the greater part of the Penisnular India is not suitable for well irrigation due to rocky structure, uneven surface and lack of underground water.
- Large dry tracts of Rajasthan, the adjoining parts of Punjab, Haryana, and Gujarat and some parts of Uttar Pradesh have brackish ground water which is not fit for irrigation and human consumption and hence unsuitable for well irrigation.

Tube Wells

A tube well is a **deeper well** (generally over 15 metres deep) from which water is lifted with the help of a **pumping set** operated by an electric motor, a diesel engine or solar power.

In several areas, the 'persian wheel' earlier used for lifting water has been replaced by tube wells.

Figure: Tube Well Irrigation

A tube well cannot be constructed everywhere and requires some **geographical conditions** favouring its installation, such as:

- There should be sufficient quantity of ground water because a tube well can generally irrigate 2 hectares per day against 0.2 hectares per day irrigated by an ordinary well.
- The water level should be nearly 15 metres. If the water table is more than 50 metres deep the cost of pumping out water from the tube well becomes uneconomic.
- There should be regular supply of cheap electricity or diesel so that water from the tube well can be taken out at the hour of need.
- The soil in the immediate neighbourhood of the tube well should be fertile so that there is demand for irrigation and the cost involved in the construction and operation of the tube well can be recovered by the increased farm production.

Major Areas under Tube Wells

More than three fourths of India's tube wells are functioning in Tamil Nadu, Maharashtra, Andhra Pradesh, Telangana, Uttar Pradesh, Madhya Pradesh, Karnataka and Punjab.

Merits of Well and Tube Well Irrigation

- Well is simplest and cheapest source of irrigation and the poor Indian farmer can easily afford it.
- Well is an independent source of irrigation and can be used as and when the necessity arises. Canal irrigation, on the other hand, is controlled by other agencies and cannot be used at will.
- Excessive irrigation by canal leads to the problem of reh which is not the case with well irrigation.
- There is a limit to the extent of canal irrigation beyond the tail end of the canal while a well can be dug at any convenient place.

- Several chemicals such as nitrate, chloride, sulphate, etc. are generally found mixed in well water. They add to the fertility of soil when they reach the agricultural field along with well water.
- The farmer has to pay regularly for canal irrigation which is not the case with well irrigation.
- More reliable during periods of drought when surface water dries up.

Demerits of Well and Tube Well Irrigation

- Only limited area can be irrigated. Normally, a well can irrigate 1 to 8 hectares of land.
- The well may dry up and may be rendered useless for irrigation if excessive water is taken out of it.
- In the event of a drought, the ground water level falls and enough water is not available in the well when it is needed the most.
- Tubewells can draw a lot of groundwater from its neighbouring areas and make the ground dry and unfit for agriculture.
- Well and tube well irrigation is not possible in areas of brackish groundwater.
- Lack of electricity, diesel and requirement of capital investment for Tubewell

3.1.3. Canal Irrigation

- Canals used to be the most used source of irrigation up-to 1960s, but in the 1970s they wells and tube wells became most used source of irrigation and now, canals constitute the second most important source of irrigation in India.
- Canals are an effective source of irrigation in areas of low level relief, deep fertile soils, perennial source of water and extensive command area.
- Therefore, the **main concentration** of canal irrigation is in the northern plain of India, especially the areas comprising Uttar Pradesh Haryana and Punjab.
- The digging of canals in rocky and uneven areas is difficult and uneconomic. Thus the canals are practically absent from the Peninsular plateau area.
- However, the coastal and the delta regions in South India do have some canals for irrigation.

Figure: Canal Irrigation

Canals in India are of two types:

- **Inundation canals**, which are taken out from the rivers without any regulating system like weirs etc. at their head. Such canals provide irrigation mainly in the rainy season when the river is in flood and there is excess water. When the rainy season is over, the flood in the river subsides, the level of water falls below the level of the canal head and the canal dries up. Some canals taken off from the Satluj in Punjab were of this type. Since irrigation from this type of canals is uncertain, they have been converted in perennial canals.
- **Perennial Canals** are those which are taken off from perennial rivers by constructing a barrage across the river. Most of the canals in India today are perennial.

Barrage: An artificial obstruction placed in a river or water course to increase the depth of water.

Areas where Canal Irrigation is Prevalent

- The main canal irrigated areas are in the northern plains of India where Uttar Pradesh, Punjab, Haryana, Rajasthan and Bihar account for about 60 per cent of the canal irrigated area of the country.
- In south and central India, Andhra Pradesh, Maharasthra, Karnataka, Madhya Pradesh, Chhattisgarh, Orissa and Tamil Nadu are important states of canal irrigation.

Merits of Canal Irrigation

- Most of the canals provide perennial irrigation and supply water as and when needed. This saves the crops from drought conditions and helps in increasing the farm production.
- Canals carry a lot of sediment brought down by the rivers. This sediment is deposited in the agricultural fields which add to the fertility of soil.
- Some of the canals are parts of multipurpose projects and, therefore, provide cheap source of irrigation.
- Although the initial cost involved in canal irrigation is much higher, it is quite cheap in the long run.

Demerits of Canal Irrigation

- The canal water soaks into the ground and leads to the problem of waterlogging along the canal route.
- Excessive flow of water in the fields raises the ground water level. Capillary action brings alkaline salts to the surface and makes large areas unfit for agriculture. Vast areas in Panjab, Haryana, Uttar Pradesh and Maharashtra suffer from the problem of 'reh' caused by canal irrigation.
- The marshy areas near the canals act as breeding grounds of mosquitoes which result in widespread malaria.
- Many canals overflow during rainy season and flood the surrounding areas.
- Canal irrigation is suitable in plain areas only.

3.2. Different Types of Irrigation Systems Based on Delivery Technique

Irrigation water conveyed to the head or upstream point of a field must be applied efficiently on the whole area such that the crops growing in the either fields gets water more or less uniformly. There are various types of irrigation techniques that differ in how the water is distributed within the field. These are:

3.2.1. Surface Irrigation

One of the most common and oldest methods of irrigation is surface irrigation. This method uses the force of gravity to distribute the water, which then seeps into the soil. It's also known as flood irrigation because it simply allows water to flow into an area. Surface irrigation can be divided into furrow, border strip or basin irrigation. This method is not as efficient as other options because there is a tendency to use too much water in order to saturate the land.

The advantages of surface irrigation include:

- Requires less manual labor than hose spraying or shifting hose sprinklers.
- Better able to cover a large plot of land in a shorter amount of time.
- Not as negatively influenced by winds or sediments as other systems.

Drawbacks to surface irrigation include:

- Potential overwatering and wasteful runoff due to frequent erosions

- If soil lacks proper sloping or doesn't absorb readily, water can't move through the field
- Standing water can harm crops, mainly by reducing the respiration of the roots
- Loss of water occurs due to percolation

3.2.2. Sprinkler Irrigation

Sprinkler irrigation is a method of applying water to the land in a manner that mimics natural rainfall. Water is distributed through a system of pipes, usually by pumping, and is then sprayed into the air through sprinklers that break up the water into small drops that uniformly fall to the ground.

The advantages of sprinkler irrigation include:

- Suitable for varying sizes of land—both large and small plots.
- Better able to direct water flow to specific areas of a property, avoiding water loss.
- Ability to administer fertilizers and chemical treatments through the system for even application.

Micro-Irrigation

Micro-irrigation can be defined as the application of water at low volume and frequent interval under low pressure to plant root zone.

Types of Micro-irrigation:

- Sprinkler Irrigation
- Drip Irrigation
- Subsurface Irrigation
- Central-Pivot Irrigation

Disadvantages:

- The initial cost is rather very high.
- Any cost of power to provide pressure must be added to the irrigation charges.
- Wind interferes with the distribution pattern, reducing spread or increasing application rate near lateral pipe.
- There is often trouble from clogged nozzle or the failure of sprinklers to revolve.
- It requires a dependable constant supply of water free from slit and suspended matter
- It is suitable for high value crops

3.2.3. Drip Irrigation

Drip irrigation, also known as trickle irrigation, functions as its name suggests. Water is delivered at or near the root zone of plants, drop by drop. This method can be the most water-efficient method of irrigation, if managed properly, since evaporation and runoff are minimized. In modern agriculture, drip irrigation is often combined with plastic mulch, further reducing evaporation, and is also a means of delivery of fertilizer. The process is known as fertigation.

The Advantages of Drip Irrigation include:

- Saves time, money, labor and water because the system is so efficient.
- Prevents fungal disease by minimizing water contact with the leaves, stems, and fruit of plants.
- Discourages weed growth because water is only delivered where it's needed
- Increases effectiveness on uneven ground.
- High efficiency in the use of fertilizers and no runoff of fertilizers into ground water

The Disadvantages of Drip Irrigation are:

- Sensitivity to clogging
- Moisture distribution problem
- Salinity hazards
- High cost compared to furrow.
- High skill is required for design, install and operation.

Water Use Efficiency

Definition: the ratio between effective water use and actual water withdrawal. It characterizes, in a specific process, how effective is the use of water.

3.2.4. Subsurface Irrigation

Subsurface irrigation is similar to the drip/trickle method in that it distributes water through tubes and emitters. But in this method, the tubes are buried below the surface of the ground. Developed in the 1960s in Israel, where water tends to be scarce, this system works best for areas that are arid, hot, windy, or have sandy soil types.

The benefits of subsurface irrigation include:

- Saves water by eliminating surface water evaporation in hot and arid conditions.
- Reduces the number of weeds because water is not on the soil surface where most weed seeds germinate.
- Prevents damage from animals or machinery because the system is below ground.
- Prevents soil erosion which happens in surface irrigation

3.2.5. Centre-Pivot Irrigation

Centre-pivot irrigation involves a self-propelled system in which a single pipeline supported by a row of mobile towers is suspended 2 to 4 meters above ground. Water is pumped into the central pipe and as the towers rotate slowly around the pivot point, a large circular area is irrigated. Sprinkler nozzles mounted on or suspended from the pipeline distribute water under pressure as the pipeline rotates. The nozzles are graduated small to large so that the faster moving outer circle receives the same amount of water as the slower moving ones on the inside.

Advantages:

- Uniformity of applied water
- No human labor required
- May operate at lower pressure, thus conserving energy
- Reduces the opportunity for surface runoff or deep percolation
- Provides opportunity for fertigation which allows the targeted application of small quantities of nutrients, with a reasonable uniformity of application and less risk of nutrient losses.

Disadvantages:

- Relatively high capital cost compared to surface irrigation systems
- Require some form of energy source (electric or diesel) to operate
- Operation and maintenance of these systems require different skills than surface irrigation
- Not suitable for irrigation of fields of rectangular or square shape

3.2.6. Manual Irrigation

These systems have low requirements for infrastructure and technical equipment but need high labour inputs. Irrigation using buckets or watering cans is to be found, for example, in most rural areas and periurban agriculture around large cities.

4. Classification of Irrigation Projects/Schemes

Irrigation projects, in Indian context are usually classified as follows:

Major project: This type of project consists of huge surface water, storage reservoirs and flow diversion structures. The area envisaged to be covered under irrigation is of the order over 10000 hectare.

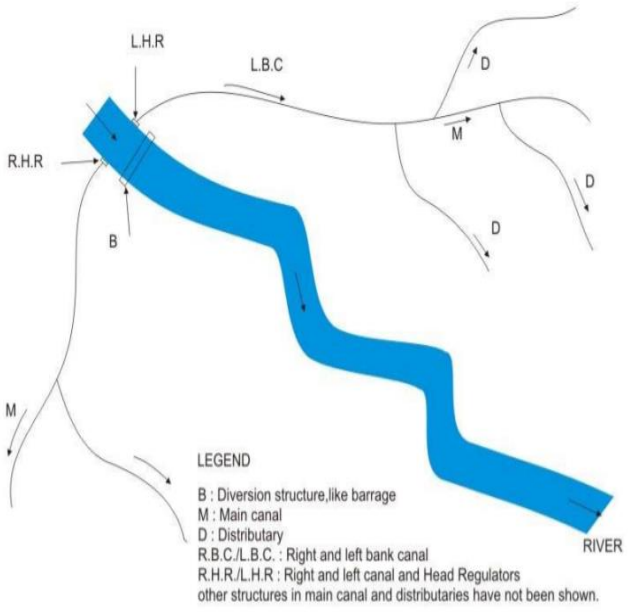
Medium project: These are also surface water projects but with medium size storage and diversion structures with the area under irrigation between 10000 hectare and 2000 hectare.

Student Notes:

Minor project: The area proposed under irrigation for these schemes is below 2000 Ha and the source of water is either ground water or from wells or tube wells or surface water lifted by pumps or by gravity flow from tanks. It could also be irrigated from through water from tanks.

The major and medium irrigation projects are further classified as:

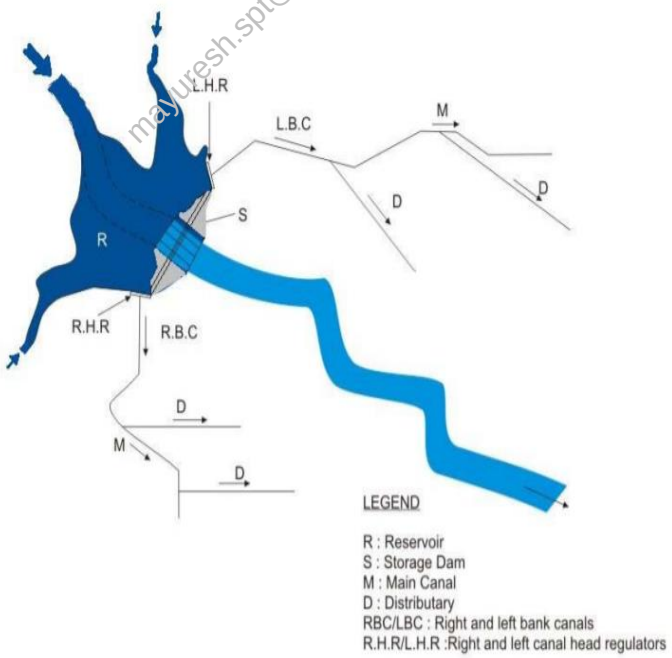
1. **Direct Irrigation method:** In this project water is directly diverted from the river into the canal by constructing a diversion structure like weir or barrage across the river with some pondage to take care of diurnal variations. It also effects in raising the river water level which is then able to flow into the offtaking channel by gravity. The flow in the channel is usually controlled by a gated structure and this in combination with the diversion structure is also sometimes called the headworks.



An Example of Direct Irrigation

   A direct irrigation scheme of irrigation using river water diversion head works typically be laid out as shown in the adjoining figure. An example of this scheme is the DVC irrigation project on the Damodar river with the barrage located at Durgapur.

2. **Storage Irrigation Method**: For this type of irrigation schemes part of the excess water of a river during monsoon which otherwise would have passed down the river as a flood is stored in a reservoir or tank found at the upstream of a dam constructed across a river or stream. This stored water is then used for irrigation. This is adopted when the flow of river or stream is in excess of the requirements of irrigated crops during a certain part of the year but falls below requirements or is not available at all in the river during remaining part of the year. Since the construction site of a storage reservoir is possible in regions of undulating topography, it is usually practiced in non-deltaic areas. A general layout of this irrigation scheme may typically be laid out as shown in the adjoining Figure.



An Example of Storage Irrigation Scheme

In **other type** of scheme the storage head works or the dams has to be equipped with ancillary structure like outlet, sluice, spillway, log chutes, etc. The storage created by the dam behind the reservoir is substantial compared to that behind a barrage and may inundate a large tract of land, depending on the topography. The capacity of the reservoir is generally determined systematically by knowing possible withdrawal demands (in this case for irrigation) over the weeks and months of a year and corresponding expected inflows. An example for this type of scheme is the Indira Sagar project on the Narmada River.

Another type of storage irrigation method envisages the storage of water at some place in the hilly terrain of the river where the construction of the dam is possible. A barrage is constructed at some downstream location, where the terrain is flatter and canals take off as in a usual direct irrigation method. A general layout of such scheme could be represented as shown in Figure below.

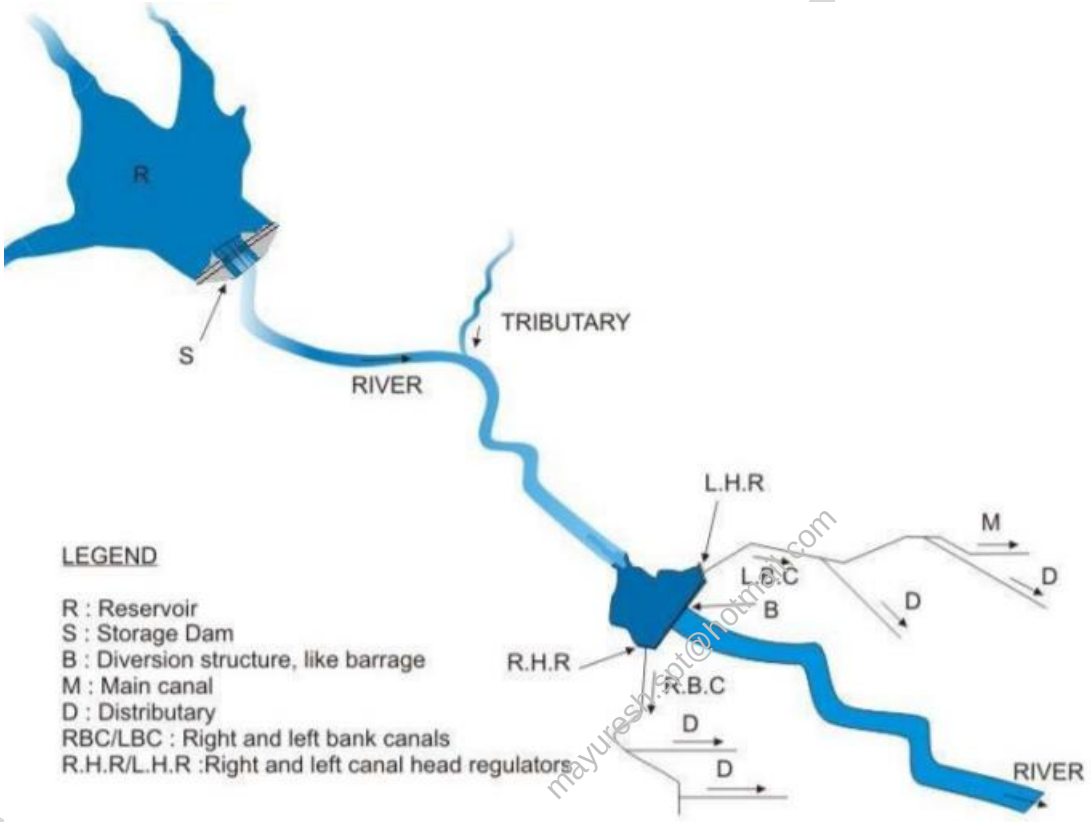


Figure: A Typical Layout of Storage irrigation scheme incorporating a dam with a barrage on its downstream

An example for this type of scheme is the Bhakra-dam Nangal-barrage combination on the river Sutlej.

5. Some Types of Storage Irrigation Systems

1. **Dams**

   A dam is a hydraulic structure constructed across a river to store water on its upstream side. It is an impervious or fairly impervious barrier put across a natural stream so that a reservoir is formed. On the basis of structure, dams can be categorized as:-

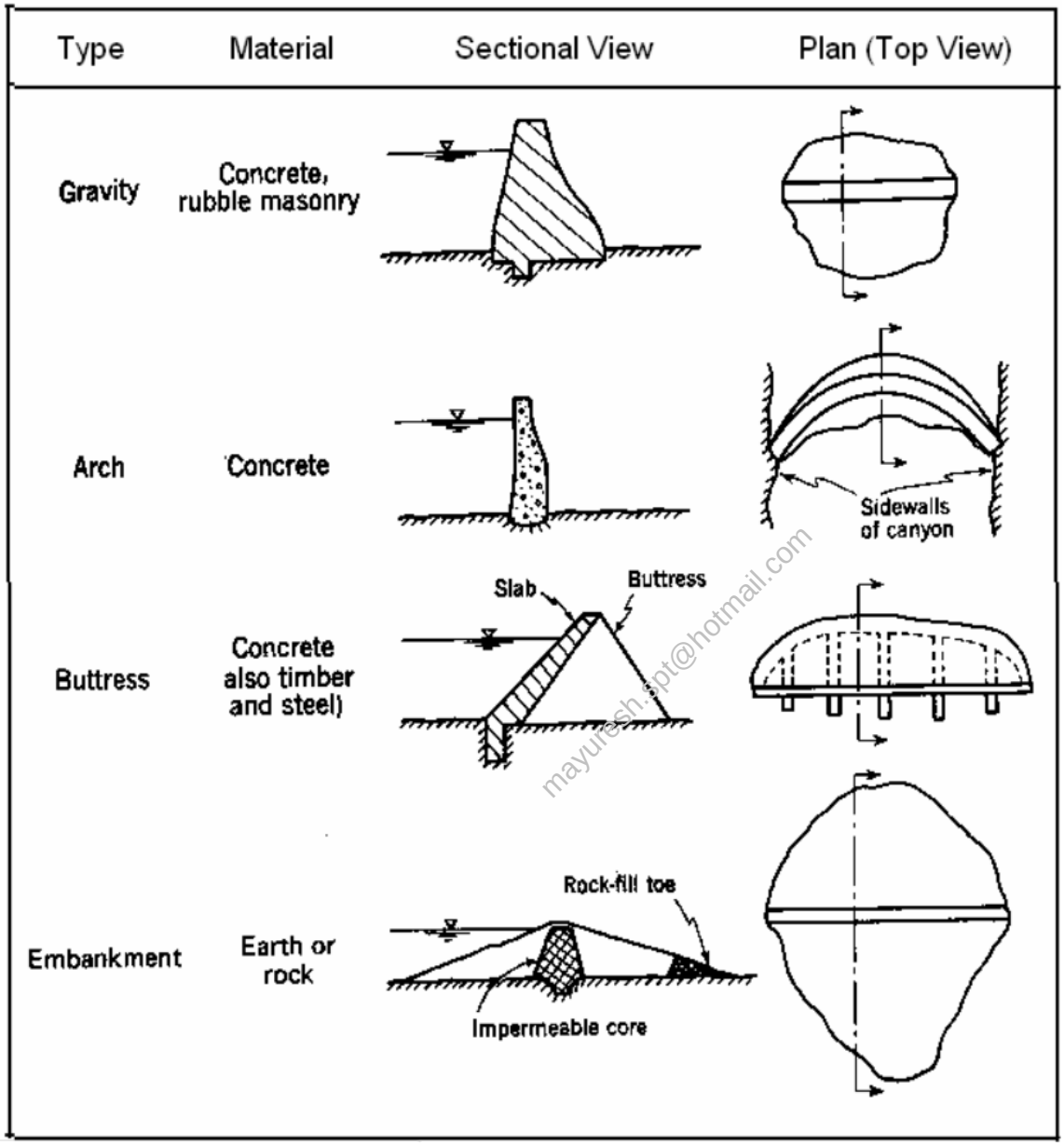
   A. Gravity Dams: These dams are heavy and massive wall-like structures of concrete in which the whole weight acts vertically downwards. These dams resist the horizontal thrust of the water entirely by their own weight.

B. **Buttress Dam:** is a gravity dam reinforced by structural supports. These dams have a solid, water-tight upstream side that is supported at intervals on the downstream side by a series of buttresses or supports.

C. **Earth Dams:** They are trapezoidal in shape. Earth dams are constructed where the foundation or the underlying material or rocks are weak to support the masonry dam or where the suitable competent rocks are at greater depth.

D. **Arch Dams:** These are designed so that the force of the water against it, known as hydrostatic pressure, presses against the arch, compressing and strengthening the structure as it pushes into its foundation or abutments.

Based on structure and design, dams can be classified as follows:



2. Spillways and energy dissipators

Spillway is a channel that carries excess water over or around a dam or other obstruction. An energy dissipator is a device that is used to convert concentrated storm water runoff to sheet flow and is constructed at the end of all storm sewers or channels that outfall into a buffer.

3. **Sluices and outlets**
   A sluice is an artificial channel for conducting water, with a valve or gate to regulate the flow. An outlet is a small structure which admits water from the distributing channel to a water course of field channel. Thus an outlet is a sort of head regulator for the field channel delivering water to the irrigation fields.

6. Some Schemes Related with Irrigation Systems

6.1. Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

Launched in 2015, PMKSY has been formulated **amalgamating ongoing schemes** viz. Accelerated Irrigation Benefit Programme (AIBP); Integrated Watershed Management Programme (IWMP); and On Farm Water Management (OFWM) component of National Mission on Sustainable Agriculture (NMSA).

Objectives:

- To achieve convergence of investments in irrigation at the field level
- Expand cultivable area under assured irrigation (har khet ko pani).
- To enhance recharge of aquifers and introduce sustainable water conservation practices.
- To explore the feasibility of reusing treated municipal waste water for periurban agriculture
- To attract greater private investments in irrigation
- To promote extension activities relating to water harvesting, water management and crop alignment for farmers and grass root level field functionaries

Components of PMKSY

1. Accelerated Irrigation Benefit Program (AIBP)
2. PMKSY (Har Khet ko Pani)
3. PMKSY (Per Drop More Crop)
4. PMKSY (Watershed Development)

Salient Features

- An outlay of Rs. 50,000 crore over a period of five years (2015-16 to 2019-20) to bring **140 lakh hectares of additional area under irrigation**.
- **Decentralized State level planning and execution**' structure, in order to allow States to draw up a **District Irrigation Plan (DIP) and a State Irrigation Plan (SIP)**
- **Administration**: Inter-Ministerial **National Steering Committee (NSC) under PM** with Union Ministers of all concerned Ministries. A National Executive Committee is to be constituted under
  the Chairmanship of the Vice Chairman, NITI Aayog to oversee programme implementation.
- **Long Term Irrigation Fund has been instituted under PMKSY in NABARD** for funding and fast tracking the implementation of incomplete major and medium irrigation projects.

6.2. Kisan Urja Suraksha evam Utthaan Mahaabhiyan (KUSUM)

KUSUM scheme was announced in Budget 2018-19.

About KUSUM

- It aims to incentivise farmers to run solar farm water pumps and use barren land for generating solar power to have extra income.
- The total cost of the capacities under this scheme would be Rs 1.4 lakh crore, out of which, the Centre will provide Rs 48,000 crore financial assistance.

Components of KUSUM

- **Utilisation of barren land** by farmers to generate **10,000 MW** of solar energy and sell it to grid. For this, discoms would be given 50 paise per unit as generation based incentives to buy power from farmers for five years.
- The government will provide **subsidy** to farmers for buying **17.5 lakh off grid solar farm pumps**. The Centre and the states will provide 30% subsidy each on solar pumps. Another 30% will be met through loans while 10% of the cost will be borne by the farmer.
- **Solarisation of grid-connected farm pumps** involving 7,250 MW capacity.
- **Solarisation of government departments' grid connected water pumps**.

Expected Benefits

- It would help in **de-dieseling of the agriculture sector** which currently uses approximately 10 lakh diesel run pumps.
- Help the **financial health of DISCOMs by reducing the subsidy burden** to the agriculture sector.
- Promotion of **decentralised solar power production**
- Provide water security to farmers through provision of assured water sources through solar water pumps – both off-grid and grid connected
- To support States to meet the renewable purchase obligation targets
- To fill the void in solar power production in the intermediate range between roof tops and large parks
- Reduce transmission losses through off-grid systems.

7. Related Terms

Commanded area (CA): is defined as the area that can be irrigated by a canal system, the CA may further be classified as under:

Gross command area (GCA): This is defined as total area that can be irrigated by a canal system on the perception that unlimited quantity of water is available. It is the total area that may theoretically be served by the irrigation system. But this may include inhibited areas, roads, ponds, uncultivable areas etc which would not be irrigated.

Culturable command area (CCA): This is the actually irrigated area within the GCA. However, the entire CCA is never put under cultivation during any crop season due to the following reasons:

- The required quantity of water, fertilizer, etc. may not be available to cultivate the entire CCA at a particular point of time. Thus, this is a physical constraint.
- The land may be kept fallow that is without cultivation for one or more crop seasons to increase the fertility of the soil. This is a cultural decision.
- Due to high water table in some areas of the CCA irrigated water may not be applied as the crops get enough water from the saturation provide to the surface water table. During any crop season, only a part of the CCA is put under cultivation and this area is termed as culturable cultivated area.
- The remaining area which is not cultivated during a crop season is conversely termed as culturable uncultivated area.

Intensity of irrigation is defined as the percentage of the irrigation proposed to be irrigated annually. Usually the areas irrigated during each crop season (Rabi, Kharif, etc) is expressed as a percentage of the CCA which represents the intensity of irrigation for the crop season. By adding the intensities of irrigation for all crop seasons the yearly intensity of irrigation to be obtained.

8. Previous Years Vision IAS GS Mains Questions

1. ***Evaluate the type of irrigation systems in India and related problems due to faulty practices? Suggest a road map to improve the situation.***

Approach:

You have to mention the types of irrigation systems, then you have to discuss the problems associated with each type of irrigation system and give some examples. Then you have to give solutions to that problem.

Answer:

Irrigation is used to assist in the growing crops, maintenance of landscape, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Various Irrigation system in India are as follows:

- **Border Irrigation**: It uses land formed into strips which are located across the narrow dimension, but sloping along the long dimensions.
- **Check Basin Irrigation**: In this irrigation system, water is applied to a completely level or dead level area enclosed by dikes or boarders. This requires perfectly level field which becomes a limitation in many cases at fielded level.
- **Furrow Irrigation**: Furrows are sloping channels formed in the soil. Infiltration occurs laterally and vertically through the wetted perimeter of the furrow and plants get water in its root zone.
- **Sprinkler Irrigation**: In this system of irrigation, water is delivered through a pressurized pipe network to sprinklers nozzle or jets which spray water into the air.
- **Drip Irrigation**: It minimizes the use of water and fertilizer by allowing water to drip slowly to the roots of plants
- **Fertigation** : It is the process of application of water soluble solid fertilizer or liquid fertilizer through drip irrigation system.

The main sources of irrigations that are used in various parts of the country are

- **Wells and tube-wells**

  Wells and tube-wells are method by digging a hole in the ground to get the subsoil water. Well irrigation is popular in the areas where sufficient sweet water is available this includes great northern plains, deltaic regions of mahanadi, krishna , godavari, narmada and tapi valleys.

  Problems associated with wells and tube-wells are as follows: Limited area can be irrigated, normally a well can irrigate 1 to 8 hectares of land. Well may be dried up if excess water drain out of it like the water table decline and dark zones have been recently notified by the government due to overuse of ground water resources. Well and tube-wells is not possible in areas of brackish groundwater.

- **Canals**

  It is the second most important source of irrigation in India. It is more effective in the areas of low relief, deep fertile soil, perennial source of water and extensive command area. They are mainly confined to the northern parts of India in Punjab, Haryana and Uttar Pradesh. The digging of canal in peninsular India is difficult and uneconomic. However deltaic regions of south India have some canals for irrigation.

  Problems associated with canal irrigation are - canal water soaks into soil thus leads to the problem of water logging. Excess level of water flow leads to raising of

ground water level .capillary action brings alkali salts on the surface leads to the process of alkalinity, floods in surrounding areas during rainy season, it is suitable in plain areas only

- **Tanks**

  This is popular in peninsular parts of India.

  Problems associated with tank irrigation are - they dry up during the dry season when it is needed the most, silting, operational cost is high, water evaporation for large expanse, they cover large areas of cultivable land, lifting of water from tanks and carrying it to the fields is a strenuous and costly.

  To improve the irrigation system in India there is an urgent need to improve the mechanism at three levels at the entry level, storage level and at the exit or the use value level. Three pronged strategy to tackle this problem:

  1) To maintain the catchment area by improving the catchment area of any lake, tank, reservoir. Its conservation with maintenance and construction of the physical structures required for the conservation, management and functioning irrigation system.
  2) To maintain the required level of carrying capacity that what has been prescribed for its functioning thus to maintain the potential of water holding capacity by these structures. It is the improvement in the water retention capacity and water storage enhancement through the addition of new structures and proper maintenance of the existing once.
  3) To improve the water use efficiency in the region to manage the irrigation system. This aspect will consider the methods that need to be taken care of such sprinkler irrigation, drip-irrigation, and enhancement in water use efficiency by the application of drought resistance crops and by the development of new ways of crops and plough methods that conserve water.

Specific suggestion to improve the various irrigation system:

Well and tube wells irrigated region: The problem in this region is the water recharge capacity need to be developed by the efficient utilization of funds under the integrated water-shed management programme. There is a need to regulate the number, distribution and use of water in the tube well irrigated regions such as Punjab, Haryana, Rajasthan. Formation of dark zones due to over exploitation water needs to be controlled. There is a need to create the ground water recharge structure such as check dams. Formation of roof top-harvesting, run-off harvesting techniques by making the construction of these structures compulsory to all the owners of the irrigated system. Need to regulate the flat price policy of electricity as followed in Punjab to control the mis-utilization of government subsidies in this sector.

Canal irrigated regions Major problem are related to the over irrigation. The problem of water logging can be solved by the technique of sprinkler irrigation, drip irrigation rather than flood irrigation method. There is a need to manage the cropping pattern in the canal irrigation area such as rice is grown in the semi-arid areas of southern Punjab, southern Haryana etc. De-silting of the canals regularly can maintain the flow of water to the tail ends of the canal. There is a need to enhance the water use efficiency to distribute the water judiciously to various parts of canal irrigation system. The new experiment of Gujarat is the covering of canal by solar penal is helpful in preserving water from evaporation and the supply of solar power to the nearby areas.

Tank irrigated regions- To stop the siltation of tanks there is a need to maintain the plantation of trees, afforestation, restoration of nearby catchment areas by the application of MNREGA fund for the construction of tank areas, with the people participation we can improve the situation of dredging before every monsoon period. We have to develop new varieties of crops that are drought resistance and temperature resistance. Proper timely maintenance and covering of open area tank can also be followed. And last but not the least is the water use efficiency in dry areas has to considered by making regional water policy by proper auditing of water use and its utilization for the future roadmap of irrigation improvement.

There is an urgent need to improve the irrigation techniques according to the agro-climatic regions of India and subject to the topographical features and the potential to use those techniques effectively and efficiently.

2. What are various types of irrigation systems in India? Explain the benefits of micro-irrigation over the conventional irrigation systems. Also discuss the bottlenecks in the adoption of this technology.

Approach:

- Briefly explain the various types of irrigation systems in India.
- Explain the benefits of micro irrigation systems.
- Discuss the bottlenecks in the adoption of micro irrigation.

Answer:

Various types of irrigation techniques differ in how the water is distributed within the field. The various irrigation techniques are as under:

- **Surface Irrigation**: Water moves over and across the land by simple gravity flow. Surface irrigation can be subdivided into **furrow**, **border**, **strip** or **basin** irrigation. It is often called flood irrigation when the irrigation results in flooding or near flooding of the cultivated land.
- **Micro irrigation:** It is application of water at low volume and frequent interval under low pressure to plant root zone. Its types are **drip irrigation, sprinkler irrigation** etc.
- **Sub-irrigation**: it is also called seepage irrigation. It is used in field crops in areas with high water tables. It is a method of artificially raising the water table to allow the soil to be moistened from below the plants' root zone.

Benefits of micro irrigation systems

- **Water savings**: water is saved through different ways such as:
  - By reducing loss of water in conveyance.
  - By reducing loss of water through evaporation, run off, and by deep percolation.
- **Lower consumption of fertilizers**; An efficient drip irrigation system reduces consumption of fertiliser through **fertigation**
- **Cost savings**: There are substantial reductions in irrigation costs and savings on electricity and fertilisers.
- **Higher yields**: the yields are higher than traditional flood irrigation. Yields of crops increase – up to 45 per cent in wheat, 20 per cent in gram and 40 per cent in soybean.

- **Weed and disease reduction**: It helps in inhibiting growth of weeds as it keeps limited wet areas. Under this condition the incidence of disease is also reduced.
- Improved production on marginal land as the fields need not be leveled.
- Overall, improvement in net farm incomes is substantial.

Bottlenecks in adoption

- The adoption of this technology has **high initial costs.**
- Uninterrupted availability of **electric power** is required.
- Micro-irrigation systems normally have **greater maintenance requirements**. Soil particles, algae, or mineral precipitates can clog the emission devices.
- **Potential for damage**. Animals, rodents and insects may cause damage to some components.

However, the increase in yields and reduction in costs of power and fertiliser use can help farmers recover the fixed cost quickly.

Way Forward

Irrigation investments must shift towards adopting technologies like sprinkler and drip irrigation. In order to facilitate this shift:

- The new irrigation technologies need to be accorded "infrastructure lending" status; and
- Both the Centre and states need to increase public spending for micro irrigation.
- Provisions for credit to farmers can incentivise greater adoption of this technology.

9. Previous Years UPSC Mains Questions

1. What is water-use efficiency? Describe the role of micro-irrigation in increasing the water-use efficiency.
2. What is allelopathy? Discuss its role in major cropping systems of irrigated agriculture.

Student Notes:

FOOD PROCESSING AND RELATED INDUSTRIES IN INDIA – SCOPE AND SIGNIFICANCE, LOCATION, UPSTREAM AND DOWNSTREAM REQUIREMENTS, SUPPLY CHAIN MANAGEMENT

Contents

1. Food Processing Industry

What is Processed Food

As defined by the inter-ministerial stakeholder meeting, processed food pertains to the following two processes:

- **Manufactured Processes**: If any raw product of agriculture, animal husbandry or fisheries is transformed through a process (involving employees, power, machines or money) in such a way that its original physical properties undergo a change and if the transformed product is edible and has commercial value, then it comes within the domain of processed food.
- **Other Value-Added Processes:** If there is significant value addition (increased shelf life, shelled and ready for consumption etc.) such produce also comes under processed food, even if it does not undergo manufacturing processes.

Items under the purview of Food Processing Industries in India

Food processing is a large sector that covers activities such as agriculture, horticulture, plantation, animal husbandry and fisheries. It also includes other industries that use agriculture inputs for manufacturing of edible products. Based on International Standard Industrial Classification, it has been assumed that the factories listed in the following groups can be summed up to constitute Food Processing Industries.

S.No	NIC Group	Description
1	151	Production, Processing and Preservation of Meat, Fish, Fruits, Vegetables, Oils and Fats
2	152	Manufacturing of Dairy Products
3	153	Manufacture of Grain Mill Products, Starches and Starch products and prepared animal feeds.
4	154	Manufacture of Other Food Products.
5	155	Manufacture of Beverages.

The above groups also include food products which are under the mandate of Ministries other than Ministry of Food Processing as well

Source: Data Bank on Economic Parameters of the Food Processing Sector

***NIC – National Industries Classification**

2. Evolution of the Food Processing Sector in India

Evolution of India's Agriculture and Food Processing Sector

Before 1960s	1960 - 1990	1991 – to date
Policies were not directed towards Agriculture: More focus on Industry sector (esp. capital goods) though 48% of India's GDP was from agriculture in 1950-51. The need to create a self-reliant and diversified industry sector motivated planners to adopt a import substitution strategy But, in the early 1960s, the GDP growth was only 3.9% against the expected 5%. But population growth was 2.3% against the expected 1.4%. As a result food security of India worsened as India imported cereals worth 28% of its export earnings	Focus on Agriculture: Main objectives were self-sufficiency in food grains, reasonable prices for the farmers and affordable prices for the consumers (especially the poor) Green Revolution: Introduction of high-yielding variety of rice and wheat, Provision of irrigation facilities and fertilizers and Minimum Support Prices for the crops Creation of buffer stock for food and strengthening of the Public Distribution System Green revolution was successful in bringing the imports to 1.9% of the total export earnings Land Ceiling Act -1972: To provide lands to the landless farmers. Ceiling on the land holding by the farmers Restriction on exports: Agricultural goods were restricted from being exported. Also, the prevailing exchange rates did not favour exports	Economic Reforms: Agricultural sector was ignored. Industry-first approach, focusing on removal of industrial licensing, removal of import licensing from all manufactured and capital goods, tariff reductions and relaxation of rules for foreign investment However, post- 2000, government focused on the food processing industry 100% FDI is allowed automatically in food processing sector No industrial license required to start the industry except for a few items like alcohol, beer etc Export Promotion: Food parks and export zones were promoted which provides benefits like duty free imports, profits from export sales are exempt from corporate taxes etc

Food Processing Industry in nascent stage → Growth of Food Processing industry

Key Conclusions from the evolution of Agro Processing Industry in India

Food Crisis and Green Revolution:

- Food crisis in India during 1960s forced the government to adopt Green revolution which helped in self-sufficiency in food.

Focus on improving the poorer sections of the society:

- To improve the livelihood of the poorer sections of the society, land ceiling act was enforced during 1972.
- The primary aim is to provide land to landless farmers. It also limits the area of land held by a farmer (limited to 17 ha – varies in different states)

Focus on Food processing industry after 1991:

- After the economic reforms, government focused on improving the food processing industry in India.
- Allowance of 100% FDI in food processing industry, export promotion incentives and other schemes to attract investments.
- However, investment in this sector has been very low in India. The government has identified food and agro-processing industry as one of the "sunrise" sectors that has high potential for domestic demand and export markets

3. Supply Chain of the Food Processing Sector

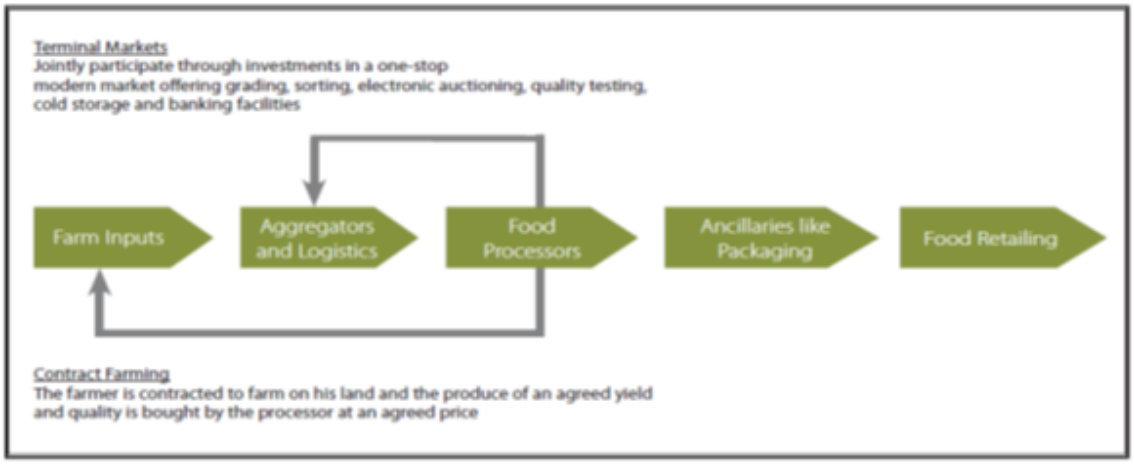
A *supply chain* is a network between suppliers (farmers) of raw material, company (food processor) and distribution network to market the finished products. *Supply chain* represents the steps it takes to get the product or service to the customer.

The different stages of processing of manufactured food products are as follows:

Source: Data Bank on Economic Parameters of the Food Processing Sector

- **Primary Processing**: cleaning, grading, powdering and refining of agricultural produce, e.g., grinding wheat into flour.
- **Secondary Processing**: basic value addition, e.g., tomato-puree, ground coffee, processing of meat products.
- **Tertiary Processing**: high value addition products like jams, sauces, biscuits and other bakery products ready for consumption

The generic value chain of the food processing industry from raw materials to retail to the consumer is shown below in the figure.



3.1. Backward and Forward Linkages

Backward Linkage: It means the connectivity of the FPIs with sources of raw material supply. For example, supply of raw material like tomatoes to a ketchup manufacturer.

Forward Linkage: It means the connectivity of FPIs with the markets through distribution network comprising of physical infra like storages, road and rail network etc.

Significance of Linkages

- It encourages and enables farmers to grow products of appropriate quality.
- It helps the farmers fetch appropriate and remunerative return for their produce especially the marginal and medium farmers.
- It helps to reduce the food wastage especially of perishable products with low shelf life like fruits, vegetables, dairy products etc.
- It ensures timely delivery of food products to the consumer markets.
- High quality products and better infrastructure results in cost saving and enhanced efficiency.
- These links provide a level playing field for all stakeholders and aid in facing competition.
- Helps to improve hygiene and food safety standards leading to greater acceptability of processed food domestically and in international market.

Existing Challenges in Establishing Robust Linkages

- Small and dispersed marketable surplus due to fragmented holdings
- High seasonality of raw material production
- Large number of intermediaries
- Poor infrastructure facilities like cold storage, transport facilities, electricity etc.
- Industry is highly fragmented and is dominated by the unorganized sector
- Substandard levels of processing industries

- Inadequacy of information with farmers and small processors.
- Multiplicity of legislation leads to contradictions in specifications, conflicting approach, lack of co-ordination and administrative delays.
  - For instance, manufacturers of packaged food products such as jams and squashes are obligated to comply with quality standards and label declarations prescribed under multiple legislations, such as The Standards of Weights & Measures (Packaged Commodities) Rules, Prevention of Food Adulteration (PFA) and Fruit Products Order (FPO)
- Anomalies in domestic food laws with international food safety standards
- Under developed food testing network

4. Scope and Significance of the Food Processing Sector in India

Scope of Food Processing sector encompasses the existing scale of operations/size of industry as well as the future potential to grow. The scope can be gauged from the following:

- In 2016, Food Processing industry constituted more than 8% to India's GDP through manufacturing.
- During FY11–16, India's exports of processed food and related products (inclusive of animal products) grew at a CAGR of 11.74 per cent, reaching US$ 16.2 billion.
- The Indian food and grocery market is the world's sixth largest, with retail contributing 70 per cent of the sales.
- It is the fifth largest industry in our country in terms of production, consumption, export and growth.
- The food industry, which is currently valued at US $39.71 billion, is expected to grow at a Compounded Annual Growth Rate (CAGR) of 11 per cent to US$ 65.4 billion by 2018.
- India's organic food market is expected to increase by three times by 2020.
- India is a country with a population of over 1.25 billion. With rising middle class having a considerable disposable income, the domestic market offers significant demand opportunities.
- 100% FDI is allowed in the sector. The Confederation of Indian Industry (CII) estimates that this sector has the potential to attract as much as US $33 billion of investment over the next 10 years and also to generate employment of nine million person-days.
- India ranks no. 1 in the world in the production of milk, ghee, ginger, bananas, guavas, papayas and mangoes. Further, India ranks no. 2 in the world in the production of rice, wheat and several other vegetables & fruits. If the surplus production of cereals, fruits, vegetables, milk, fish, meat and poultry, etc. are processed and marketed both inside and outside the country, there will be greater opportunities for the growth of the sector.

5. Potential of Processed Food Sector in India

Demand: With a population of more than one billion individuals and food constituting a major part of the consumer's budget, this sector has a prominence next to no other businesses in the country.

Resilience: The importance of this sector to India's economy becomes all the more relevant, considering the fact that this sector continued to perform well, despite fall in GDP number and poor performance by many other industries, during recession in 2008-09.

Value Chain: The industry encompasses a gamut of activities involved in reaching the final product to the consumer, starting with farming activity to produce inputs, processing of the inputs to create products and the associated supply chain involved in delivering the products.

Forward-Backward Linkages: It has increasingly come to be seen as a potential source for driving the rural economy as it brings about synergy between the consumer, industry and agriculture. A well-developed food processing industry is expected to increase farm gate prices, reduce wastages, ensure value addition, promote crop diversification, generate employment opportunities as well as export earnings. This sector is also capable of addressing critical issues of food security and providing wholesome, nutritious food to our people.

Scope for development: While the industry is large in terms of size, it is still at a nascent stage in terms of development. Out of the country's total agriculture and food produce, only 2 per cent is processed. However, the contribution of food processing sector to GDP has been growing faster than that of the agriculture sector.

Raw material: Being an agrarian economy, there is sufficient supply of raw material in India.

Employment generation: It has the potential to generate non-farm employment, especially in rural areas. It would reduce disguise unemployment by providing productive employment opportunities.

Investments: There is 100 per cent FDI (foreign direct investment) allowed into the sector through the automatic route. There has been FDI equity inflow of US $6492.19 million in the food processing sector during 2010-11 to 2016-17 (Department of Industrial Policy & Promotion). These investments serves as a catalyst to boost agricultural income and employment.

6. Factors Responsible for Success of Food Processing Sector in India

The Indian food processing industry's growth potential cannot be disputed; however, it requires certain competencies and success factors to fructify this potential. These include addressing the current gaps in the value chain as well as leveraging on the various advantages the country provides. Some of the key success factors are discussed below.

- **Integrated Supply Chain and Scale of Operations**
  While India ranks second in production of fruits & vegetables, nearly 20 to 25 per cent of this production is lost in spoilage in various stages of harvesting. The key issues are poor quality of seeds, planting material and lack of technology in improving yield. Ensuring good quality produce entails investments in technology and ability to sustain a long gestation period for the harvest. Good quality production also results in better quality of processed fruits. Hence there is a need to establish backward linkages with the farmers with the help of arrangements such as contract farming to improve the quality of the produce. Scale is a key factor in the processing industry. Nearly 90 per cent of the food processing units are small in scale and hence are unable to exploit the advantages of economies of scale. This is also true with land holdings.

- **Processing Technology**
  Currently, most of the processing in India is manual. There is limited use of technology like pre-cooling facilities for vegetables, controlled atmospheric storage and irradiation facilities. This technology is important for extended storage of fruits and vegetables in making them conducive for further processing. In the case of meat processing, despite the presence of over 3600 licensed slaughter-houses in India, the level of technology used in most of them is limited, resulting in low exploitation of animal population. Bringing in modern technology is an area that existing as well as new investors in the sector can focus on, this will make a clear difference in both process efficiencies as well as quality of the end product.

- **Increasing Penetration in Domestic Markets**

  Most of the processing units are export oriented and hence their penetration levels in the domestic market are low. For example:
  - Penetration of processed fruits and vegetables overall is at 10 per cent
  - The relative share of branded milk products especially ghee is still low at 2 per cent
  - Penetration of culinary products is still 13.3 per cent and is largely tilted towards metros
  - Consumption of packaged biscuits for Indian consumers is still low at 0.48 per cent while that for Americans is 4 per cent

  However, there is increasing acceptance of these products amongst the urban population. India has a large untapped customer base and even a small footprint in the domestic market would enable the player to gain significant volumes. Acceptance in the domestic market and hence higher penetration is driven by the following factors:

- **Competitive Pricing**

  Consumers of processed foods are extremely price sensitive. Even a small change in pricing can have significant impact on consumption. For instance, the launch of PET bottles, new price points and package sizes in non-carbonated drinks (such as by Coca Cola) increased in-home consumption from 30 per cent to 80 per cent in a year's time. Competitive pricing also enables penetration in the rural markets.

- **Brand Competitiveness**

  Share of branded products in purchases of Indian consumers has also increased substantially. This is especially true for urban consumers. Branded products like Basmati rice and KFC's chicken have been very successful implying that there is a good demand for hygienic branded products at reasonable prices.

- **Product Innovation**

  Certain processed food categories such as snack foods are impulse purchase products where consumers look for novelty and new flavours and hence these categories lack brand loyalties. Visibility through attractive packaging boosts consumption. Increasing time constraints amongst the working middle class has boosted consumption of products like instant soups, noodles and ready-to-make products. Innovation in packaging and product usage is an important success factor for processed foods.

7. India's Strengths in the Food Processing Sector

India's strengths in the food processing sector lies in the following:

- **Favourable-Factor Conditions**

  India has access to several natural resources that provides it a competitive advantage in the food processing sector. Due to its diverse agro-climatic conditions, it has a wide-ranging and large raw material base suitable for food processing industries. Presently a very small percentage of these are processed into value added products. The semi-processed and ready to eat packaged food segment is still evolving.

  India's comparatively cheaper workforce can be effectively utilized to set up large low cost production bases for domestic and export markets. Cost of production in India is lower by about 40 per cent over a comparable location in EU. Along with these factor conditions, India has access to significant investments to facilitate food processing industry. There have been increasing investments not only by domestic firms and Indian government, but also foreign direct investment.

- **Related and Supporting Industries**

  The Indian food processing industry has significant support from the well-developed R&D and technical capabilities of Indian firms. India has a large number of research institutions like Central Food Technological Research Institute, Central Institute of Fisheries Technology, National Dairy Research Institute, National Research and Development Centre etc. to support the technology and development in the food processing sector in India.

- **Government Regulations and Support**

  The Government of India has taken several initiatives to develop the food processing industry in India. The government has been developing agri-zones and mega food parks to promote food processing industry in India. In order to promote investment in the food processing sector, several policy initiatives have been taken during recent years, such as allowing 100% FDI.

- **Large Number of Players**

  There are a large number of players in the organized as well as unorganized sector. The organized sector is small but growing - for example, it forms less than 15 per cent of the dairy sector and around 48 per cent of the fruits and vegetable processing. The sector offers potential for growth and a large number of Multi National Corporations have entered into India to leverage this opportunity.

Apart from above-mentioned strengths, the following areas have been identified by the Ministry of Food Processing Industries where investments are required:

- Mega food parks
- Agri-infrastructure and supply chain integration
- Logistics and cold chain infrastructure
- Fruit and vegetable products
- Animal products, meat and dairy
- Fisheries and sea food
- Cereals, consumer foods and ready-to-eat foods
- Wine and beer
- Machinery and packaging

8. A Brief SWOT Analysis of the Food Processing Industry in India

Strengths	Weaknesses	Opportunities	Threats
Round the year availability of raw materials. Social acceptability of food-processing as an important area and support from the central government. Vast network of manufacturing facilities all over the country. Vast domestic market.	High requirement of working capital. Low availability of new, reliable and better accuracy instruments and equipments Inadequate automation w.r.t. information management. Remuneration is less attractive for talent in comparison to contemporary	Large crop and material base in the country due to agro-ecological variability offers vast potential for food processing activities. Integration of developments in contemporary technologies such as electronics, material science, computer, bio-technology etc. offer vast scope for rapid	Competition from global players Loss of trained manpower to other industries and other professions due to better working conditions prevailing there may lead to further shortage of manpower. Rapid developments in contemporary and requirements of the

	disciplines. Inadequately developed linkages between R&D labs and industry.	improvement and progress. Opening of global markets may lead to export of our developed technologies and facilitate generation of additional income and employment opportunities.	industry may lead to fast obsolescence.

9. Policy Initiatives and Measures Taken by the Government to Support the Food Processing Sector

In order to facilitate and harness the growth potential of this sector, the government has initiated extensive reforms. Some of the key measures undertaken by the Government include: amendment of the Agriculture Produce Marketing Committee Act, rationalization of food laws, implementation of the National Horticulture mission etc. The government has sought to address the low scale of processing activity in the country by setting up the mega food parks, with integrated facilities for procurement, processing, storage and transport.

- Most of the processed food items have been exempted from the purview of licensing under the Industries (Development and regulation) Act, 1951, except items reserved for small-scale sector and alcoholic beverages.
- Food processing industries were included in the list of priority sector for bank lending in 1999.
- Automatic approval for foreign equity up to 100 per cent is available for most of the processed food items except alcohol, beer and those reserved for small-scale sector subject to certain conditions.
- Full repatriation of profits and capital has been allowed.
- Zero duty import of capital goods and raw material for 100 per cent export oriented units.
- Full duty exemption on all imports for units in export processing zones has been done.
- In Union Budget 2017-18, the Government of India has set up a dairy processing infra fund worth Rs 8,000 crore (US$ 1.2 billion).
- Union Budget 2016-17 proposed 100 per cent FDI in marketing of food products produced and manufactured in India.
- The Government of India has relaxed foreign direct investment (FDI) norms for the sector, allowing up to 100 per cent FDI in food product e-commerce through automatic route.
- The Food Safety and Standards Authority of India (FSSAI) plans to invest around Rs 482 crore (US$ 72.3 million) to strengthen the food testing infrastructure in India, by upgrading 59 existing food testing laboratories and setting up 62 new mobile testing labs across the country.
- The Indian Council for Fertilizer and Nutrient Research (ICFNR) will adopt international best practices for research in fertiliser sector, which will enable farmers to get good quality fertilisers at affordable rates and thereby achieve food security for the common man.
- The Government of India allocated Rs 1,500 crore (US$ 225.7 million) and announced various measures under the Merchandise Exports from India Scheme (MEIS), including setting up of agencies for aquaculture and fisheries in coastal states and export incentives for marine products.

- FSSAI has issued new rules for importing products, to address concerns over the entry of sub-standard items and simplify the process by setting shelf-life norms and relaxing labelling guidelines.
- The Ministry of Food Processing Industries announced a scheme for Human Resource Development (HRD) in the food processing sector. The HRD scheme is being implemented through State Governments under the National Mission on Food Processing. The scheme has the following four components:
  - Creation of infrastructure facilities for degree/diploma courses in food processing sector
  - Entrepreneurship Development Programme (EDP)
  - Food Processing Training Centres (FPTC)
  - Training at recognised institutions at State/National level
- FSSAI under the Ministry of Health and Family Welfare has issued the Food Safety and Standards (Food Product Standards and Food Additives) Regulations, 2011 and the Food Safety and Standards (Contaminants, Toxins and Residues) Regulations, 2011 which prescribe the quality and safety standards respectively for food products.
- The Government of India has approved the setting up of five numbers of Mega Food Parks in the states of Bihar, Maharashtra, Himachal Pradesh and Chhattisgarh. The Government plans to set up 42 such mega food parks across the country in next three to four years.
- Pradhan Mantri Kisan SAMPADA Yojana has been launched (Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters) with an allocation of Rs. 6,000 crore for the period 2016-20 coterminous with the 14th Finance Commission cycle.

PM Kisan SAMPADA Yojana

It is a comprehensive package which will result in creation of modern infrastructure with efficient supply chain management from farm gate to retail outlet. It will not only provide a big boost to the growth of food processing sector in the country but also help in providing better returns to farmers and is a big step towards doubling of farmers income, creating huge employment opportunities especially in the rural areas, reducing wastage of agricultural produce, increasing the processing level and enhancing the export of the processed foods.

The following schemes will be implemented under PM Kisan SAMPADA Yojana :

- Mega Food Parks
- Integrated Cold Chain and Value Addition Infrastructure
- Creation / Expansion of Food Processing & Preservation Capacities
- Infrastructure for Agro-processing Clusters
- Creation of Backward and Forward Linkages
- Food Safety and Quality Assurance Infrastructure
- Human Resources and Institutions

New Provisions for Food Processing Sector in Budget 2018-19

- Pradhan Mantri Kisan Sampada Yojna (PMKSY) - Allocation has been increased from Rs. 715 crore in RE 2017-18 to Rs. 1400 crore in RE 2018-19.
- Department of Agriculture Cooperation & Farmers Welfare (DAC & FW) would reorient its ongoing schemes and promote cluster based development of Agri commodities and regions in partnership with the MoFPI, commerce and other allied Ministries.
- Tomato, Onion and Potato processing- Operation Green has been launched to promote FPOs, agro logistics, processing facilities and professional management with a sum of Rs. 500 crore.

- State of the Art testing facility would be set up at 42 Mega Food Park to promote Agri export from current US $ 30 billion to US $ 100 billion.
- Corporate Income Tax has been reduced from 30 percent to 25 percent to companies having annual turnover up to Rs. 250 crores for all sectors.
- 100 percent income tax exemption from profit derived from activities such as post-harvest value addition to agriculture would promote operation Green as well as PMKSY. This provision is applicable to FPOs' having annual turnover up to Rs. 100 crores.
- Setting up of a Fisheries and Aquaculture Infrastructure Development Fund (FAIDF) for fisheries sector and an Animal Husbandry Infrastructure Development Fund (AHIDF) for financing infrastructure requirement of animal husbandry sector. Total Corpus of these two new Funds would be Rs. 10,000 crore.

9.1. Food Safety and Standard Act, 2006

Till the year 2005, thirteen different laws were applicable on the food and food processing sector. Multiple laws/ regulations prescribe varied standards regarding food additives, contaminants, food colours, preservatives and labelling. In order to rationalize the multiplicity of food laws, a Group of Ministers (GoM) was set up to suggest legislative and other changes to formulate integrated food law, to be a single reference point in relation to regulation of food products. Based on the recommendations of the GoM, the Ministry of Food Processing enacted the Food Safety & Standard Act (FSSA), 2006.

This Act was meant to consolidate the laws relating to food and to establish the Food Safety and Standards Authority of India for laying down science based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import, to ensure availability of safe and wholesome food for human consumption and for matters connected therewith or incidental thereto.

Salient features of the Act

- Establish the Food Safety and Standards Authority of India for laying down science-based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import, to ensure availability of safe and wholesome food for human consumption.

Food Safety and Standards Authority of India consists of a chairperson and 22 members, of which *one-third shall be women.*

- Food Safety and Standards Authority of India to be aided by several scientific panels and a central advisory committee to lay down standards for food safety. These standards will include specifications for ingredients, contaminants, pesticide residue, biological hazards and labels.
- The law to be enforced through State Commissioners of Food Safety and local level officials.
- Everyone in the food sector is required to get a licence or a registration which would be issued by local authorities.
- Every distributor is required to be able to identify any food article to its manufacturer, and every seller to its distributor.
- Anyone in the sector should be able to initiate recall procedures if he finds that the food sold had violated specified standards.

9.2. Infrastructure Development in the Food Processing Sector

Government attaches highest priority to development and expansion of physical infrastructure for facilitating prompt growth of industries. In order to address the problem of infrastructure in food processing sector, the Government has implemented the scheme for infrastructure development comprising the following components:

In order to raise India's processed-product quality to international standards, to address health concerns and harness the export opportunity, the government is establishing a network of quality control and testing laboratories and testing centers across India, supported by R&D through research institutes.

- **Scheme for Cold Chain, Value Addition and Preservation Infrastructure**

  The objective of the scheme is to facilitate creation of integrated cold chain and preservation infrastructure facilities without any break from farm to consumer. It intends to address the shortage of cold storage capacity. The scheme mentions three types of facilities to be created such as:

  - Minimal processing centre at the farm gate level having facilities like weighing, sorting, grading, pre-cooling, CA/MA storage, IQF and normal storage facilities
  - Mobile pre- cooling vans and reefer trucks
  - Distribution hubs having facilities such as multi-purpose cold stores, variable humidity stores, Quick Freezing and blast freezing etc.

- **Modernization of Abattoirs**

  The objective is modernize existing abattoirs or establish modern abattoirs promoting scientific and hygienic slaughtering, application of modern technology for waste management, better by product utilization, provision of chilling facility, retail cold chain management etc. under PPP mode with the involvement of local bodies (panchayats or municipalities) on build-own-operate/build-operate-transfer (BOT)/Joint venture(JV) basis.

- **Make In India**

  As part of the Make In India campaign, food processing sector was identified as one of the 25 focus areas.

- **Food Processing Fund**

  A special fund in the NABARD worth INR 2,000 crore, designated as the Food Processing Fund, was set up in the FY 2014-15 for providing affordable credit to food processing units in Mega & Designated Food Parks.

- **National Institute of Food Technology Entrepreneurship and Management (NIFTEM)**

  Set up at Kundli (Haryana), it functions as a knowledge center in food processing.

- **Mega Food Parks Scheme**

  The idea behind setting up of mega food parks is that small and medium entrepreneurs find it difficult to invest in capital-intensive activities. It aims at providing a mechanism to link agricultural production to the market by bringing together farmers, processors and retailers so as to ensure maximizing value addition, minimizing wastage, increasing farmers' income and creating employment opportunities particularly in rural sector

  Mega food park typically consist of supply chain infrastructure including collection centers, primary processing centers, central processing centers, cold chain and around 30-35 fully developed plots for entrepreneurs to set up food processing units.

  Common facilities include cold storage, food testing and analysis lab, affluent treatment plant, common processing facilities, packaging centre, power supply, water supply, seminar/ conference / training facilities etc.

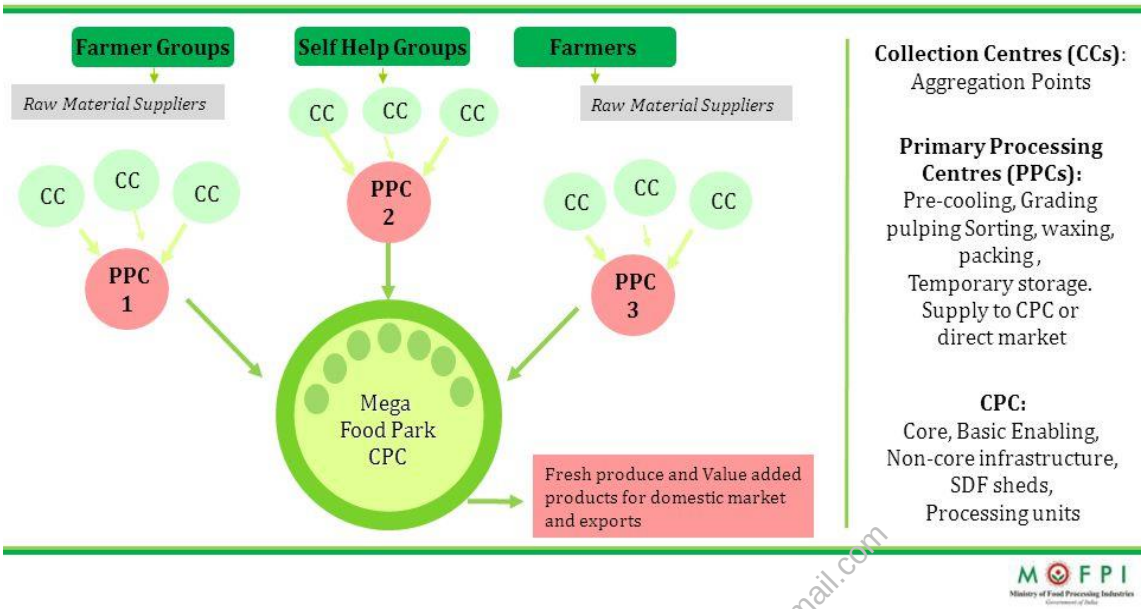
  The Mega Food Park Scheme is a "Cluster" approach on **Hub and Spoke model**. It envisages creation of state of art support infrastructure in a well-defined agri / horticultural zone for

setting up of modern food processing units in the industrial plots provided in the park with well-established supply chain.

This cluster approach makes food processing more economically viable. The state-of-the art processing infrastructure gives them the required technical edge. Mega Food parks have the potential to revive the agriculture in the surrounding areas by increasing returns for farmers, besides creating large employment opportunities in rural areas.

The Mega Food Park project is implemented by a Special Purpose Vehicle (SPV) which is a Body Corporate registered under the Companies Act. State Government, State Government entities and Cooperatives are not required to form a separate SPV for implementation of Mega Food Park project.

A Hub and Spoke Model



Despite continual efforts and initiatives of the Government to provide the required stimulus to the sector, processing activity is still at a nascent stage in India with low penetration. The level of processing is currently low across the product categories.

9.3. Challenges that still remain despite Government Initiatives

The challenges for the food processing sector are diverse and demanding, and need to be addressed on several fronts to derive maximum market benefits. A combination of uncontrollable and controllable factors has affected the growth of the sector and has acted as a hindrance in achieving its potential.

The **uncontrollable factors** which are difficult to address and hence have to be discounted for while accounting for the inadequate growth of the sector. It include fragmentation of land holdings which has resulted in lack of scale and has made investments in automation unviable; regional climatic variations which impact the production; and the constraints in land availability due to competing pressure from urbanization, constructions and industrialization.

Controllable factors which can be addressed by intervention of Government and private enterprises. It includes issues of quality and quantity of raw produce, low labor productivity with slow adoption of technology. On the Infrastructure front, we have supply chain and wastage related problems and low levels of value addition etc. The other issues of concern, holding this sector back are impaired access to credit; inconsistency in state and central polices, which requires both the Center and the State to work as one single cohesive unit.

Vision 2015 document on Food Processing Industries and Future Prospects of the Food Processing Industry

A vision, strategy and action plan has been finalized for giving boost to growth of food processing sector. The Vision 2015 adopted by the Ministry of Food Processing aims to achieve the following:

- Trebling the size of the processed food sector
- Increasing level of processing of perishables from 6 % to 20 %.
- Value addition to increase from 20 % to 35%
- Share in global food trade to increase from 1.5 % to 3%
- The level of processing for fruits and vegetables is envisaged to increase to 15% in 2015
- The Cabinet has also approved the integrated strategy for promotion of agri business and vision, strategy and action plan for the Food Processing Sector.

Vision Document Projections		
	2003-04 ($ billion)	2014-15 ($ billion)
Total food consumption	205	
Processed foods	126	274
Primary processed food	79	136
Value Added Food	48	138
Share of value added products in food production	16%	50%

Indian food-processing industry is poised for explosive growth driven by changing demographics, growing population and rapid urbanization along with increased government support. These factors will increase the demand for value added products and thus improve the prospects of food-processing industry in India.

The government's focus towards food processing industry as a priority sector will ensure policies to support investment in this sector and attract more FDI. India with its vast pool of natural resources and growing technical knowledge base has strong comparative advantages over other nations. According to CII has estimates, food-processing sector has the potential of attracting US $33 billion of investment in 10 years and generate employment of 9 million person-days. The food processing sector in India is clearly an attractive sector for investment and offers significant growth potential to investors.

10. Suggestions and Way Forward

The need of the hour is to adopt an integrated approach to address the above mentioned tailbacks with a clear-cut focus on improving the quality and value of the output, reducing the cost of raw material for the processors, while improving the farmers' income levels.

To promote this sector, attempts are required to be made to promote farmer–producer interaction, provide appropriate tax incentives and holidays for setting up food processing industries, taking care of expenses on market promotion and ancillary activities.

Policy initiatives to plug supply side and infrastructure bottlenecks

- Foster development of backward linkages by evolving conducive regulatory framework for contract and corporate farming
- The North Eastern Region, the Hilly States (J&K, HP and Western UP), the Islands (A&N, Lakshadweep) areas in the country should be given special consideration as they are naturally conducive for Food Processing Industries.
- Encourage commodity clusters and intensive livestock rearing.

- Promote private sector participation with well-defined roles of the participants, risk sharing mechanisms, fiscal incentives and partnership models for creation of infrastructure for logistics, storage and processing.
- Encourage technology up gradation of existing facilities and investment in development of ancillary industries like research and development, packaging, food processing equipment manufacturing, food safety certifying agencies by extending fiscal incentives to investors.
- Enable better access to credit by augmenting current cap of Rs 10 crore investments in plant and machinery to qualify as Priority Sector Credit to accommodate the high cost technology adoption and scale enhancement.

Streamlining the regulatory structure

- Remove impediments of multiple departments and laws in seeking approvals by bringing them under a single window.
- Ensure uniform implementation of the APMC act to encourage private sector investment in infrastructure development.

Change in mindset - Orienting stakeholders towards 'demand and profit driven production'

- Participants across the agri value- chain need to shift their focus from trying to market 'what is produced' to producing 'processable varieties and marketable products' meeting global quality standards and traceability requirements, duly adopting need based viable technologies and quality controls.

Human resource development-to meet increasing demand for skilled manpower

- Stimulate industry, academia and government to put in combined efforts for development of specialized institutes and courses for providing training on managerial, safety and enforcements, technology and production, warehousing and distribution aspects.
- Encourage State Agricultural Universities to commence courses in food packaging, processing, bio-technology, information technology in agriculture and such allied fields.

11. Previous Year Vision IAS GS Mains Test Series Questions

1. "Despite continuous efforts and initiatives of the Government to provide the required stimulus to the food processing sector, processing activity is still at a nascent stage in India with low penetration". In the above context, examine the challenges ailing the food processing sector in India.

Approach:

- First give some facts about food processing activities in India and government initiatives.
- Then bring forward the challenges faced by this industry in India.

Answer:

India is one of the world's largest producers as well as consumer of food products. In order to facilitate and exploit the growth potential of the sector, the government on its part has initiated extensive reforms. Some of the key measures: amendment of the Agriculture Produce Marketing Committee Act, rationalization of food laws, implementation of the National Horticulture mission etc. The government has also outlined a plan to address the low scale of processing activity in the country by setting up the mega food parks, with integrated facilities for procurement, processing, storage and transport. 100% FDI in the food processing & cold chain infrastructure is also allowed.

However, despite of continual efforts and initiatives of the Government to provide the required stimulus to the sector, processing activity is still at a nascent stage in India with low penetration. In terms of development of the country's total agriculture and food produce, only 2 % is processed.

Following are the major factors hampering the growth of food processing sector:

- **Inadequate Infrastructure Facilities** is the biggest bottleneck in expanding the food processing sector: long and fragmented supply chain, inadequate cold storage and warehousing facilities, rail, road and port infrastructure. Also, lack of modern logistics infrastructure such as logistics parks, integrated cold chain solutions, last mile connectivity, dependence on road over rail, customized transportation, technology adoption (barcoding, RFIDs) and government support via incentivizing private public partnerships are some of the lacunae that exist in supply chain & logistics sector in India.
- **Absence of Comprehensive national level policy on food processing sector:** The food processing sector is governed by statues rather than a single comprehensive policy on food processing.
- **Food Safety Laws & Inconsistency in State and Central policies:** Though historically various laws were introduced to complement and supplement each other in achieving total food sufficiency, safety and quality the result is that the food sector in India is governed by a number of different statutes rather than a single comprehensive enactment.
- **Lack of adequate trained manpower:** Many positive developments in the food processing sector have also resulted in the apprehension about the emerging skill shortages due to mismatch between the demand for specific skills and available supply.
- **Uncontrollable and controllable factors which affected the growth of the sector:** The uncontrollable factors include fragmentation of land holdings which has resulted in lack of scale and has made investments in automation unviable, regional climatic variations which impact the production and constraints in land availability due to competing pressure from urbanisation, constructions and industrialization. While, controllable factors includes issues of quality of raw materials, low labour productivity, with slow adoption of technology etc.

Apart from the above major challenges hampering the growth of sector, the other identified constraints are in raw material production, taxation, access to credit, processing plants with obsolete technologies, lack of applied research etc.

2. Explain the backward and forward linkages across the supply chain in the Food Processing Sector. Also discuss their importance in ensuring the success of Supply Chain Management in the Food Processing Industry of India.

Approach:

Students should focus on explaining the meaning of backward and forward linkages. Any examples given should add to the weight of the answer. Additionally, the second part should focus on how FPI in India lacks in proper backward and forward linkages and improvement in this aspect would lead to overall growth of the FPI in India.

Answer:

- Forward and backward linkages mean the connectivity of the Food Processing Industry with the market and source of raw materials respectively.

- One important linkage falling under the backward linkages is the raw material linkage to the extent the FPI procures the raw material from the agro sector of the country. Other important backward linkages include the demand for the capital goods and machinery used in production, packing of the finished material.
- Some of the products of forward linkages are directly consumed by the people whereas some products may be used as input in other industries for production of more refined agro based products.
- For example, if one makes jams on a small scale, his backward linkage is the infrastructure, which connects him with his source of raw fruits, and his forward linkage is the infrastructure which connects him with the market
- The backward linkages of the production process involves searching for and extracting raw materials. This part of the production process does not do anything with the material itself, such as processing the material. This part of the process simply finds and extracts the raw material. Thus, any industry that relies on the extraction of raw materials commonly has an upstream stage in its production process.
- The forward linkage in the production process involves processing the materials collected into a finished product. The forward linkages further includes the actual sale of that product to other businesses, governments or private individuals. Forward linkages have direct contact with customers through the finished product.

Importance of forward and backward linkages

- The extent to which the FPI will generate the needed impetus for the overall industrial development of the state will depend upon their various linkage effects.
- Companies in the processed food manufacturing space face problems on the inbound supply chain side in terms of inconsistency of inputs quality, high level of wastages as the product reaches the manufacturing base and unwanted cost additions with minimal value additions.
- This is due to the long and fragmented supply chain which results in these wastages and price escalations. This generates requirement for companies to invest in creating **backward linkages** through contract farming, which would enable the company to control the inputs at an assured quality level with minimal wastages.
- Both backward and forward linkages are important for the uninterrupted temperature and climate controlled agricultural supply chain from the farm gate to the market. Majority of the processed foods require controlled temperature at the point of sale.
- Coming of food processing industries with strong forward and backward linkages will push farmers to cultivate crops as per the demand in market. With other benefits, this will cut our heavy import of oilseeds and pulses.
- As per some estimates, strengthening of backward and forward linkages will help in controlling the food wastage, which is estimated at over Rs 40,000 crore, and also aids in curbing inflation.

3. Food processing industry needs a fillip in the form of better logistics, access to credit, technology indigenisation and implementation of food safety laws. Discuss.

Approach:

- Briefly introduce the potential of food processing industry in India.
- Explain the need for the development of better logistics, access to credit, technology indigenisation and implementation of food safety laws in order to exploit the complete potential of food processing industry.

- The given issues can be discussed under separate headings along with the suggestions.

Answer:

Food and food products are the biggest consumption category in India, with spending on food accounting for nearly 21% of India's GDP. But the overall processing level is just 10% in India whereas it has reached nearly 80% in some developed countries. Its share in exports of processed food in world trade is just 1.5%.

Some of the major constraints to food processing industry are: inadequate logistics, access to credit, technology indigenisation and implementation of food safety laws.

Need for better logistics

- The national highways are highly strained by low capacity and high traffic volumes, leading to delays in transit.
- Rail freight network suffers due to lack of last mile connectivity, inefficiency, low availability of wagons, lack of private participation etc.
- The dependence on manual labour and low technology usage affects turnaround times at ports, including cost.
- There is an urgent need to develop dedicated freight corridors in rail, supplemented by concretised dual carriageways for the State and national highways.
- There is a need to support development of organised strategic logistics hubs and incentivise operators in setting up end-to-end logistics and warehousing.

Access to credit

- The Government should establish a national bank, on the lines of NABARD, or extend the scope of NABARD, to lend credit to food processing industries.
- This will ensure speedy disbursal of funds to the food processing sector, which is always grappling with the issue of lack of access to credit from banks.
- State governments should play a catalytic role in partnership with banks, financial institutions, technical and management institutions and farmers' groups, so that small and unorganised players become globally competitive.

Technology Indigenisation

- Most R&D institutions have not been able to develop innovative products, processes and machinery of a global stature. The key reasons for this are segregation of academics from applied research, inadequate industry interface, low commercial orientation and lack of collaborative efforts with global peers.
- Technology is still being imported for the establishment of large-scale, exported-oriented units for production of items such as even banana paste, concentrates of various fruit juices, sorting, cleaning, washing, waxing and packaging of raw fruits and vegetables.
- In order to achieve global standards and self-sufficiency there is an urgent need for technology indigenisation in food processing industry.

Implementation of Food Safety Laws

- The Government should ensure enforcement of the Food Safety and Standards Act (FSSA) in spirit, including increasing radically the number of trained inspectors and state-of-the-art lab facilities.
- Given the objective of the FSSA and the mandated transparency, it is important that: food authorities, scientific panels and scientific committees must be given

defined tasks with specified objective of rule-making; public and industry participation at an early date.

- In order to increase the exports of processed foods, there is a need for enforcing strict safety standards as per the global requirements. There have been many incidents of rejection of Indian food products due to safety concerns.

The National Mission on Food Processing is an important initiative of the government, which aims to overcome the above constraints and reap the potential of food processing sector in India.

4. Despite numerous schemes and programmes the growth of food processing industry has been very slow in India. In this context examine the problems with respect to various government initiatives to boost the food processing sector in India.

Approach:

- Briefly mention the growth attained by the food processing sector.
- Mention few of the government schemes in this regard.
- Explain how it is yet performing below its potential.
- Bring out the factors that have led to limited success of these schemes.

Answer:

Accounting for about 32% of India's total food market, the Food Processing Industry (FPI) is ranked 5th in terms of consumption, export and expected growth. Government has taken following initiatives for the growth of the sector:

- Till 2005, there were about 13 laws regarding FPI. Government passed Food Safety and Standard Act, 2006 to act as a single reference point for regulation.
- Government has allowed 100% FDI in industry.
- Infrastructure Facilities: Mega Food Parks, Packaging centers, Integrated clod chain facility, Value Added Centre, Irradiation Facilities, Modernization of Abattoir
- National Mission on Food Processing for all round development of industry.
- Reforms in APMC Act and rationalization of Food Laws.

Because, of these efforts by the government, the industry is growing at a satisfactory rate. However, it's still well below the potential as the processing activity is still at a nascent stage with low penetration.

Government schemes have not been adequately able to address the following problems that arise due to inadequacy and poor implementation of reforms.

- The inadequate support infrastructure is the biggest bottleneck in expanding the sector, in terms of both investment and exports. Long and fragmented supply chain, inadequate cold storage and warehousing facilities, road, rail and port infrastructure, lack of modern logistics infrastructure such as logistics parks, integrated cold chain solutions, last mile connectivity, dependence on road over rail, customized transportation, technology adoption (barcoding, RFIDs) are still not addressed.
- Inconsistency in State and Central policies. In a survey done by FICCI, absence of comprehensive national level policy on food processing sector has been identified as the second most critical factor hampering Industry's growth.
- Shortage of skilled, semi-skilled and unskilled workers has harmed the competitiveness sector.
- Declining support to R&D.

- Constraints in raw material availability because of inconsistent and insufficient supply of raw material due to seasonality of crops, poor quality of raw material supply and high losses during transport from farm to factory.
- Lack of enthusiastic private sector participation in important schemes like Mega Food Parks which still prefers to outsource and as a result about 50% processed food sold by FMCGs in India is outsourced.
- Still credit is a big problem to the industry which includes farmers and micro and small enterprises on a large scale.
- Failure to integrate land holdings and promote contract farming, which are key to the success of industry.

5. Discuss the potential of Food Processing Industry with regards to employment generation in India. What are the key impediments which need to be overcome before the sector can become internationally competitive and achieve high growth?

Approach:

- Discuss the opportunities that the Food Processing Industry can offer for raising employment.
- Key impediments that the industry is facing.
- How can it become internationally competitive and achieve high growth.

Answer:

Potential of Food Processing industry for employment generation

- The industry involves gamut of activites involved in reaching the final product to the consumer, starting with farm activity to supply chain.
- 42 mega food parks being set up with an allocated investment of INR 98 Billion.
- The cost of skilled manpower is relatively low as compared to other countries.
- Food Processing Industry is one of the major employment intensive segments contributing 13.04% of employment generated in all Registered Factory sector in 2012-13.
- Food is the biggest expense for an urban and rural Indian household constituting share of 38.5% and 48.6% of the total consumption expenditure of households in 2011-12 respectively.
- Favourable economic & cultural transformation, shift in attitudes & lifestyles, consumers are experimenting with different cuisines, tastes and new brands. There is an increase in awareness and concern for wellness and health, high protein, low fat, wholegrain and organic food.

Impediments faced by Food Processing industry

- Fragmentation of land holdings which has made investments in automation unviable;
- Regional climatic variations which impact the production ; and the constraints in land availability due to competing pressure from urbanization.
- Slow adoption of technology, waste related problems, low levels of value addition.
- High requirement for working capital.
- Low availability of new, reliable and better accuracy instruments and equipments.
- Inadequate automation w.r.t. information management.
- Remuneration is less attractive for talent in comparison to contemporary disciplines.
- Inadequately developed linkages between R&D labs and industry.

Student Notes:

Food Processing industry can reach its potential with both Government and Private Sector initiative. The industry can create millions of jobs, ensure food security and reduce wastage.

6. Food safety laws are a critical factor hampering the growth of food processing industry in India. Analyse.

Approach:

- Highlight the issues with the Food Safety Laws and rules.
- Discuss how it has negatively impacted the industry.
- Suggest some remedial measures.

Answer:

In 2006, Food Safety and Standards Act (FSSA) was passed with twin objectives of introducing a single statutory body relating to food and providing for a scientific development of food processing industry. It replaced multiple laws existing for the sector. However, a recent survey by FICCI has identified implementation bottlenecks in food safety laws as the third critical area of concern for food processing sector.

Some of the important limitations are:

- Slack implementation of Act.
- Ill trained and understaffed FSSAI personnel.
- Majority of laboratories in India do not have accreditation, and only few laboratories are fully equipped to cater domestic and export regulatory testing needs of food industry.
- Act extends its jurisdiction to all persons by whom food business is carried or owned under the definition of Food Business Operators, which is a huge base to cover.
- Onus of contamination lies with the manufacturer. However, most of the times they don't have control over raw food which is bought from outside and may be contaminated.

As a result, checks are not done or done with much delay and red tape. The regulations have resulted in arbitrary rulings, discouraging industry investors. Lack of uniform and accurate food security apparatus in place puts industry in the line of litigations. The recent controversy related to standards in Maggi and different results from different labs for the same product does not augur well for the industry.

Hence, the need of the hour is to strengthen the implementation of the Act and ensure:

- Manpower development and up gradation of laboratories in terms of infrastructure and sophisticated equipment.
- Setting up of state-of-the-art advanced centers of excellence to undertake analytical research work to cater to requirements of industries, policy makers, regulators and consumers.
- Residue-monitoring plans for determining presence of toxic contaminants.
- Collaborative effort between Centre, states and private sector along with effective consumer awareness.
- Encouraging contract farming so that industry can maintain its own raw material standards without blame shifting.

All this will help in attaining global standards in food safety and make the sector an attractive destination for entrepreneurs.

7. Discuss the significance of food processing industry in the economic development of the country and the challenges which need to be tackled for sustained growth of the industry. Also elaborate on the salient features of National Mission on Food Processing.

***Approach**:*

- Discuss the significance and the underlying challenges related to food processing industry in India.
- Mention the highlights of the NMFP.

Answer:

The Food Processing Industry (FPI) in India is significant due to abundance of food production, presence of diverse agro-climatic regions, large proportion of manpower engaged in agriculture, low cost of processing, labour intensive nature and Its potential to boost exports.

At the same time Government's initiative to make India a Global Food Factory and Global Food Market brings immense opportunities for food processing sector. Other factors include:

- It contributes around 14 per cent of manufacturing GDP, 13 per cent of India's exports and six per cent of total industrial investment. It is a sunrise industry, with double-digit growth rate globally. It has more than 10% growth rate in India.
- A developed FPI can help in achieving favourable terms of trade for Indian agriculture both in the domestic and international markets.
- Enhance nation's food security.
- It will help farmers get better prices for their produce, thus improving their income levels. It will stabilise prices by creating an assured demand for agricultural produce. It will also eliminate undue advantage currently accruing to middlemen at the cost of farmer's remuneration.
- It will lead to efficient utilization of food resources of the country. India witnesses nearly 4-18% wastage in fruits and vegetables annually, due to lack of modern harvesting technologies and cold chain infrastructure. The wastage levels in other perishables are also significantly high.
- It will help develop vital linkages between the two pillars of our economy- industry and agriculture.
- Huge potential for skilled and semi skilled employment generation.

However the sector faces a number of **challenges**:

- **Supply side bottlenecks:**
  - Small and dispersed marketable surplus due to fragmented holdings
  - Low farm productivity
  - Low level of linkage between the industry and the farmers for the raw materials
  - High seasonality
  - Indian agriculture focuses on traditional crops rather commercial crops desired by the market
- **Infrastructure bottlenecks:**
  - Inadequate cold chain infrastructure and inadequate logistics
- **Deficiencies in the regulatory environment:**
  - Multiplicity of laws and rules which leads to contradictions and delays
  - Absence of a comprehensive National Policy on food processing for a long time

- Delays in Commissioning of Food Processing Projects, obtaining Licenses/ Statutory Clearances, pending reforms in APMC act by State governments etc.

- Low **Research & Development**

The National Mission on Food Processing

"National Mission on Food Processing" was launched during the 12th five year plan to cater the different aspects of food processing industry viz. modernization of food processing industries, establishing of mega food parks, integrated cold chains and preservation and modernization of abattoirs. It addresses both institutional and infrastructural gaps along the value chains. It also has provision for promoting skill development, training and entrepreneurship in post-harvest management. Broadly, it aims to :

- enhance the capacity of food processing through new technologies
- improve the quality of food products as per international standards
- reduce wastage of agricultural produce
- infuse new technologies
- upgrade human resource capacities

Recently, the Government of India has provided flexibility to state governments to set their own physical targets and identify focus areas to harness the potential of value addition by using locally grown raw material.