



EDEN IAS

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TYPES OF INTERACTIONS IN E-GOVERNANCE

e-Governance facilitates interaction between different stake holders in governance. These interactions may be described as follows:

- a) **G2G (Government to Government)** – In this case, Information and Communications Technology is used not only to restructure the governmental processes involved in the functioning of government entities but also to increase the flow of information and services within and between different entities. This kind of interaction is only within the sphere of government and can be both horizontal i.e. between different government agencies as well as between different functional areas within an organisation, or vertical i.e. between national, provincial and local government agencies as well as between different levels within an organisation. The primary objective is to increase efficiency, performance and output.
- b) **G2C (Government to Citizens)** – In this case, an interface is created between the government and citizens which enables the citizens to benefit from efficient delivery of a large range of public services. This expands the availability and accessibility of public services on the one hand and improves the quality of services on the other. It gives citizens the choice of when to interact with the government (e.g. 24 hours a day, 7 days a week), from where to interact with the government (e.g. service centre, unattended kiosk or from one's home/workplace) and how to interact with the government (e.g. through internet, fax, telephone, email, face-to-face, etc). The primary purpose is to make government, citizen-friendly.
- c) **G2B (Government to Business)** – Here, e-Governance tools are used to aid the business community – providers of goods and services – to seamlessly interact with the government. The objective is to cut red tape, save time, reduce operational costs and to create a more transparent business environment when dealing with the government. The G2B initiatives can be transactional, such as in licensing, permits,

procurement and revenue collection. They can also be promotional and facilitative, such as in trade, tourism and investment. These measures help to provide a congenial environment to businesses to enable them to perform more efficiently.

- d) **G2E (Government to Employees)** – Government is by far the biggest employer and like any organisation, it has to interact with its employees on a regular basis. This interaction is a two-way process between the organisation and the employee. Use of ICT tools helps in making these interactions fast and efficient on the one hand and increase satisfaction levels of employees on the other.

PUBLIC ACCOUNTS COMMITTEE

This committee was set up first in 1921 under the provisions of the Government of India Act of 1919 and has since been in existence. At present, it consists of 22 members (15 from the Lok Sabha and 7 from the Rajya Sabha). The members are elected by the Parliament every year from amongst its members according to the principle of proportional representation by means of the single transferable vote. Thus, all parties get due representation in it.

The term of office of the members is one year. A minister cannot be elected as a member of the committee. The chairman of the committee is appointed from amongst its members by the Speaker. Until 1966 - '67, the chairman of the committee belonged to the ruling party. However, since 1967 a convention has developed whereby the chairman of the committee is selected invariably from the Opposition.

The function of the committee is to examine the annual audit reports of the Comptroller and Auditor General of India (CAG), which are laid before the Parliament by the President. The CAG submits three audit reports to the President, namely, audit report on appropriation accounts, audit report on finance accounts and audit report on public undertakings.

The committee examines public expenditure not only from legal and formal point of view to discover technical irregularities but also from the point of view of economy, prudence, wisdom and propriety to bring out the cases of waste, loss, corruption, extravagance, inefficiency and nugatory expenses.

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The functions of the committee are(in more details):

1. To examine the appropriation accounts and the finance accounts of the Union government and any other accounts laid before the Lok Sabha. The appropriation accounts compare the actual expenditure with the expenditure sanctioned by the Parliament through the Appropriation Act, while the finance accounts show the annual receipts and disbursements of the Union Government.
2. In scrutinising the appropriation accounts and the audit report of CAG on it, the committee has to satisfy itself that
 - (a) The money that has been disbursed was legally available for the applied service or purpose
 - (b) The expenditure conforms to the authority that governs it
 - (c) Every re-appropriation has been made in accordance with the related rules
3. To examine the accounts of state corporations, trading concerns and manufacturing projects and the audit report of CAG on them (except those public undertakings which are allotted to the Committee on Public Undertakings)
4. To examine the accounts of autonomous and semi autonomous bodies, the audit of which is conducted by the CAG
5. To consider the report of the CAG relating to the audit of any receipt or to examine the accounts of stores and stocks
6. To examine the money spent on any service during a financial year in excess of the amount granted by the Lok Sabha for that purpose

In the fulfillment of the above functions, the committee is assisted by the CAG. In fact, the CAG acts as a guide, friend and philosopher of the committee.

On the role played by the committee, Ashok Chanda (who himself has been a CAG of India) observed: "Over a period of years, the committee has entirely fulfilled the expectation that it should develop into a powerful force in the control of public expenditure. It may be claimed that the traditions established and conventions developed by the Public Accounts Committee conform to the highest traditions of parliamentary democracy."

However, the effectiveness of the role of the committee is limited by the following:

- (a) It is not concerned with the questions of policy in a broader sense.
- (b) It conducts a post-mortem examination of accounts (showing the expenditure already incurred).
- (c) It cannot intervene in the matters of day-to-day administration.
- (d) Its recommendations are advisory and not binding on the ministries.
- (e) It is not vested with the power of disallowance of expenditures by the departments.
- (f) It is not an executive body and hence, cannot issue an order.

Only the Parliament can take a final decision on its findings.

RIG VEDIC AGE AND CULTURE

Vedic Literature

The word 'Veda' is derived from the root 'vid', which means to know. In other words, the term 'Veda' signifies 'superior knowledge'. The Vedic literature consists of the four Vedas – Rig, Yajur, Sama and Atharva. The Rig Veda is the earliest of the four Vedas and it consists of 1028 hymns. The hymns were sung in praise of various gods. The Yajur Veda consists of various details of rules to be observed at the time of sacrifice. The Sama Veda is set to tune for the purpose of chanting during sacrifice. It is called the book of chants and the origins of Indian music are traced in it. The Atharva Veda contains details of rituals.

Besides the Vedas, there are other sacred works like the Brahmanas, the Upanishads, the Aranyakas and the epics Ramayana and Mahabharata. The Brahmanas are the treatises relating to prayer and sacrificial ceremony. The Upanishads are philosophical texts dealing with topics like the soul, the absolute, the origin of the world and the mysteries of nature. The Aranyakas are called forest books and they deal with mysticism, rites, rituals and sacrifices. The author of Ramayana was Valmiki and that of Mahabharata was Vedavyas.

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Rig Vedic Age or Early Vedic Period (1500 - 1000 B.C.)

During the Rig Vedic period, the Aryans were mostly confined to the Indus region. The Rig Veda refers to Saptasindhu or the land of seven rivers. This includes the five rivers of Punjab, namely Jhelum, Chenab, Ravi, Beas and Sutlej along with the Indus and Saraswathi. The political, social and cultural life of the Rig Vedic people can be traced from the hymns of the Rig Veda.

Political Organization

The basic unit of political organization was kula or family. Several families joined together on the basis of their kinship to form a village or grama. The leader of grama was known as gramani. A group of villages constituted a larger unit called visu. It was headed by vishayapati. The highest political unit was called jana or tribe.

There were several tribal kingdoms during the Rig Vedic period such as Bharatas, Matsyas, Yadus and Purus. The head of the kingdom was called as rajan or king. The Rig Vedic polity was normally monarchical and the succession was hereditary. The king was assisted by purohita or priest and sena or commander of the army in his administration. There were two popular bodies called the Sabha and Samiti. The former seems to have been a council of elders and the latter, a general assembly of the entire people.

Social Life

The Rig Vedic society was patriarchal. The basic unit of society was family or graham. The head of the family was known as grahapathi. Monogamy was generally practiced while polygamy was prevalent among the royal and noble families. The wife took care of the household and participated in all the major ceremonies.

Women were given equal opportunities as men for their spiritual and intellectual development. There were women poets like Apala, Viswavara, Ghosa and Lopamudra during the Rig Vedic period. Women could even attend the popular assemblies. There was no child marriage and the practice of sati was absent.

Both men and women wore upper and lower garments made of cotton and wool. A variety of ornaments were used by both men and women. Wheat and barley, milk and its products like curd and ghee, vegetables and fruits were the chief articles of food. The eating of cow's meat was prohibited since it was a sacred animal. Chariot racing, horse racing, dicing, music and dance were the favourite pastimes. The social divisions were not rigid during the Rig Vedic period as it was in the later Vedic period.

Economic Condition

The Rig Vedic Aryans were pastoral people and their main occupation was cattle rearing. Their wealth was estimated in terms of their cattle. When they permanently settled in North India, they began to practice agriculture. With the knowledge and use of iron they were able to clear forests and bring more lands under cultivation. Carpentry was another important profession and the availability of wood from the forests cleared made the profession profitable. Carpenters produced chariots and ploughs. Workers in metal made a variety of articles with copper, bronze and iron. Spinning was another important occupation and cotton and woollen fabrics were made. Goldsmiths were active in making ornaments. The potters made various kinds of vessels for domestic use.

Trade was another important economic activity and rivers served as important means of transport. Trade was conducted on barter system. In the later times, gold coins called nishka were used as media of exchange in large transactions.

Religion

The Rig Vedic Aryans worshiped the natural forces like earth, fire, wind, rain and thunder. They personified these natural forces into many gods and worshipped them. The important Rig Vedic gods were Prithvi (Earth), Agni (Fire), Vayu (Wind), Varuna (Rain) and Indra (Thunder). Indra was the most popular among them during the early Vedic period. Next in importance to Indra was Agni who was regarded as an intermediary between the gods and people.

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Varuna was supposed to be the upholder of the natural order. There were also female gods like Aditi and Ushas. There were no temples and no idol worship during the early Vedic period. Prayers were offered to the gods in the expectation of rewards. Ghee, milk and grain were given as offerings. Elaborate rituals were followed during the worship.

THE GREEK (MACEDONIAN) INVASION AND ITS IMPACT ON INDIAN CULTURE

During the fourth century BC, the Greeks and the Persians fought for supremacy over West Asia. The Achaemenid empire was finally destroyed by the Greeks under the leadership of Alexander of Macedon. He conquered Asia Minor, Iraq and Iran and then marched towards India. According to the Greek historian Herodotus, Alexander was greatly attracted towards India because of her fabulous wealth.

On the eve of Alexander's invasion, north western India was divided into a number of small principalities. Lack of unity among them helped the Greeks to conquer these principalities one after another. However, Alexander's army refused to march ahead when they heard about the vast army and the strength of the Nandas of Magadha. Alexander had to return. He died at Babylon at the young age of 32 on his way back to Macedon.

Alexander hardly had any time to reorganise his conquests. Most of the conquered states were restored to their rulers, who had submitted to his authority. He divided his territorial possessions covering parts of eastern Europe and a large area in western Asia into three parts and placed them under three Greek governors. The eastern part of his empire was given to Seleucus Nikator, who declared himself a king after the death of his master, Alexander.

Though the contact between the Macedonians and ancient Indians was for a brief period, its impact was fairly wide in range. Alexander's invasion brought Europe, for the first time, in close contact with India, as routes, by sea and by land, were opened between India and the

West. A close commercial relation was also established. The traders and craftsmen used to follow these routes. Alexander asked his friend Nearchus to explore the sea coast from the mouth of the Indus to the Euphrates in search of harbours. The Greek writers have left many valuable geographical accounts of this region for us.

Alexander's invasion paved the way for political unification of north western India by conquering the warring tribes of this region. It seems that by his campaigns Alexander made Chandragupta Maurya's work of annexing this area easier. Soon after Alexander's departure, Chandragupta defeated one of his generals, Seleucus Nikator and brought the whole of north western India up to Afghanistan under his control.

The influence of Greek art is found in the development of Indian sculpture as well. The combination of the Greek and the Indian style formed the Gandhara School of art. Indians also learnt the art of making well-shaped and beautifully designed gold and silver coins from the Greeks. The Greeks had some influence on Indian astrology as well.

Many valuable information about the social and economic condition of northern and northwestern India of that time are known from the Greek accounts left by Arrian, admiral Nearchus, and Megasthenes. They tell us about the developed condition of many crafts, existence of a brisk trade with the outside world, and about the general prosperous condition of the country. Much has also been said in these accounts of carpentry as a flourishing trade in India. It seems the fleet which Alexander sent along the western coast of India under Nearchus was built in India.

Alexander's adventure also helped the West to know something about the Indian life and thinking. It has been said that the ideas and notions of Indian philosophy and religion which filtered into the Roman empire flowed through the channel opened by Alexander.

As the Greek writers left dated records of Alexander's campaign, it helped us a great deal to frame the chronology of ancient Indian history. The date of Alexander's invasion – 326 BC provides a definite 'marker' for arranging the sequence of historical events in India.

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THE PERSIAN INVASION AND ITS IMPACT ON INDIAN CULTURE

In the first half of sixth century BC, there were a number of small tribal states in north west India. There was no sovereign power to unite these warring tribes. The Achaemenid rulers of Persia or Iran took advantage of the political disunity of this region. Cyrus, the founder of the Achaemenid dynasty, and his successor Darius I annexed parts of Punjab and Sindh. It was believed to be the most fertile and populous part of the Achaemenid empire.

Indian subjects were also enrolled in the Achaemenid army. The Persian rule in north western India lasted for nearly two centuries. During this period there must have been regular contact between the two regions. The naval expedition of Skylax probably encouraged trade and commerce between Persia and India. Some ancient Persian gold and silver coins have been found in Punjab.

Though the mountainous passes in the north western border were being used from very early times, it seems that Darius entered India through these passes for the first time. Later on, a section of Alexander's army traversed the same route, when he invaded Punjab.

The administrative structure of the Mauryan empire was influenced in some measure by the system of the Achaemenid rulers of Persia. It may be mentioned here that the Persian title of satrapa (governor) continued to be used by the Indian provincial governors as kshatrapa for quite a long time.

The cultural effects of the contacts with the Persians were also significant. The Persians brought into India a new style of writing. It is called kharoshthi. It was derived from the Aramaic script, which was written from right to left. Many of Asoka's inscriptions found in north western India are written in kharoshthi. This script continued to be used in north western India till about third century AD. The Persian influence may also be traced in the preamble of Asokan edicts. The Mauryan art and architecture were also greatly influenced by the Persian art. The monolithic pillar edicts of Asoka with their bell-shaped capitals are somewhat like the victory pillars of the Achaemenid emperors which have been found in Persepolis.

The Persian influence found in Chandragupta Maurya's court was in the form of the ceremonial hair bath taken by the emperor on his birthday. It was in typical Persian style. It is mentioned in the Arthashastra that whenever the king consults the physician or the ascetic, he should sit in a room where the sacred fire was kept. This indicates the influence of Zoroastrianism, the religion of ancient Iranians.

TYPES OF CURRENCIES

HARD CURRENCY

It is the international currency in which the highest faith is shown and is needed by every economy. The strongest currency of the world is one which has a high level of liquidity. Basically, the economy with the highest as well as highly diversified exports that are compulsive imports for other countries (as of high-level technology, defence products, life-saving medicines and petroleum products) will also create high demand for its currency in the world and become the hard currency. It is always scarce.

Up to the second world war, the best hard currency was the Pound Sterling (£) of the UK, but soon it was replaced by the US Dollar. Some of the best hard currencies of the world today are the US Dollar, the Euro (€), Japanese Yen (¥) and the UK Sterling Pound (£). Meanwhile, by late 2015, the IMF allowed the SDR to be denominated in the Chinese 'Yuan'—paving the way for a new hard currency to be implemented in 2016.

SOFT CURRENCY

A term used in the foreign exchange market which denotes the currency that is easily available in any economy in its forex market. For example, rupee is a soft currency in the Indian forex market. It is basically the opposite term for the hard currency.

HOT CURRENCY

Hot currency is a term of the forex market and is a temporary name for any hard currency. Due to certain reasons, if a hard currency is exiting an economy at a fast pace for the time, the hard currency is known to be hot. As in the case of the SE Asian crisis, the US dollar had become hot.

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HEATED CURRENCY

A term used in the forex market to denote the domestic currency which is under enough pressure (heat) of depreciation due to a hard currency's high tendency of exiting the economy (since it has become hot). It is also known as a currency under heat or under hammering.

CHEAP CURRENCY

A term first used by the economist J. M. Keynes (1930s). If a government starts re-purchasing its bonds before their maturities (at full-maturity prices) the money which flows into the economy is known as the cheap currency, also called cheap money. In the banking industry, it means a period of comparatively lower/softer interest rates regime.

DEAR CURRENCY

This term was popularized by economists in early 1930s to show the opposite of the cheap currency. When a government issues bonds, the money which flows from the public to the government or the money in the economy in general is called dear currency, also called as dear money.

In the banking industry, it means a period of comparatively higher/costlier interest rates regime.

BIODIVERSITY & TYPES

Syllabus section: Ecology, Environment and Biodiversity / GS Paper III

Biodiversity

- The term 'Biodiversity' refers to 'The variety and variability among living organisms and the ecological complexes in which they occur. It can be defined as 'the totality of genes, species and ecosystems of a region'.

Levels of Biodiversity:

- The biological diversity includes three hierarchical levels.
 1. **Genetic Diversity**
 2. **Species diversity**
 3. **Community and ecosystem diversity**
 1. **Genetic Diversity**
 - The genetic variation existing within a species is called genetic diversity.

- The genetic variation may be in alleles (different variants of same genes) in entire genes (the traits determining particular characteristics) or in chromosomal structures.
- A population is able to adapt to its environment and respond to natural selection due to its genetic diversity. The evolution of new species i.e. speciation, depends upon the amount of genetic variation.

2. **Species Diversity:**

- Species diversity refers to the variety of species within a region. The species diversity of a region is measured on the basis of two parameters.
 1. **Species Richness** Refers to the number of species per unit area. The number of species increases with the area of the site
 2. **Species Evenness** Indicates the evenness in the number of individuals of a species.
 3. **Community and Ecosystem Diversity:**
 - Refers to the variations in the biological communities in which species live. There are three perspectives of diversity at the level of community.

a. **Alpha Diversity**

- Refers to the diversity of organisms sharing the same community or habitat.
- A combination of species richness and evenness is used to represent diversity within a community or habitat

b. **Beta Diversity**

- Indicates diversity between communities.
- Species frequently change when habitat or community changes. There are differences in species composition of communities along environmental gradients like latitudinal gradients, moisture gradients thereby increasing dissimilarity between communities.

c. **Gamma Diversity**

- Refers to the diversity of the habitats over the total landscape or geographical area

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ECONOMY TERMS AND CONCEPTS

Syllabus Section: Economy / GS Paper III

PARTICIPATORY NOTES (P NOTES):

- P-Notes are Offshore Derivative Instruments (ODIs)
- Participatory Notes (P-Notes) are instruments used by foreign funds and investors not registered with the Securities and Exchange Board of India (SEBI) to invest in Indian securities.
- They are generally issued overseas by registered foreign institutional investors (FII) and domestic institutional investors.

WAYS AND MEANS ADVANCE:

- It is a facility for both the Centre and states to borrow from the RBI to enable it to meet temporary mismatches between revenue and expenditure.
- Section 17(5) of the RBI Act, 1934 authorizes the central bank to lend to the Centre and state governments subject to their being repayable "not later than three months from the date of the making of the advance".
- The government has to pay an interest rate equal to the repo rate, while the tenure is three months.

FUND OF FUNDS (FOF):

- A Fund of Funds (FoF) is a scheme that invests in units of other Mutual Fund (MF) schemes. ie FoF is a MF scheme that does not invest directly in stocks or securities but in other Mutual Fund schemes.
- The biggest advantage of the FOF is, it gives the investor an opportunity to invest in different schemes managed by different fund managers.
- With a single FoF, the investor will be able to benefit from the diverse investment approach.

TERMS RELATED TO BONDS:

1. **Face Value of Bond:** In bond investing, face value, or par value, is commonly referred to the amount paid to a bondholder at the maturity date, given the issuer doesn't default. The face value is also known as the repayment amount.

2. **Coupon:** A coupon payment on a bond is a periodic interest payment that the bondholder receives during the time between when the bond is issued and when it matures.

3. **Maturity Date:** Maturity date is the date when the principal (face value) is paid back. The final coupon and the face value of a debt security is repaid to the investor on the maturity date.

BOND PRICE:

- Bond price is the present discounted value of future cash stream generated by a bond.
- It refers to the sum of the present values of all likely coupon payments plus the present value of the par value at maturity.
- To calculate the bond price, one has to simply discount the known future cash flows.
- The price of a bond and its yield-to-maturity are negatively correlated to each other.
- When the yield-to-maturity is higher than the coupon rate, the price of a bond is less than the face value and vice-versa.
- Usually bonds are issued at coupon rates close to the prevailing interest rate, so that they can be sold close to their face values.

BONDS & EQUITIES:

- Bonds and equities are two important instruments issued by corporate to mobilize funds.
- Bonds are debt, whereas stocks are equity. By purchasing equity (stock), an investor becomes an owner in the issuing entity.
- By purchasing a debt instrument like bond, an investor becomes a creditor to the corporation (or government).
- The primary advantage of being a creditor (by purchasing bonds) is that he has a higher claim on assets than shareholders do.
- In the case of bankruptcy, a bondholder will get his money back before a shareholder.

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MASALA BONDS:

- They are rupee-denominated bonds i.e. the funds would be raised from overseas market in Indian rupees.
- Any corporate, body corporate and Indian bank is eligible to issue Rupee denominated bonds overseas.
- The first Masala bond was issued in 2014 by International Finance Corporation (IFC) for the infrastructure projects in India.
- Money raised through such bonds cannot be used for real estate activities other than for development of integrated township or affordable housing projects.
- Masala bonds are regulated under the External Commercial Borrowings (ECB) Policy of RBI.
- Other countries also have similar local currency denominated bonds such as Dim sum bonds (denominated in Chinese Renminbi), Samurai bonds (denominated in Japanese Yen) and Komodo bonds (denominated in Indonesian Rupiah) etc.

PLAIN VANILLA BONDS:

- A plain vanilla bond is a bond without any unusual features; These are a type of unsecured, perpetual bonds that banks issue to shore up their core capital base to meet the Basel-III norms.
- It is one of the simplest forms of bond with a fixed coupon and a defined maturity and is usually issued and redeemed at the face value. It is also known as a straight bond or a bullet bond.
- These are the most basic or standard version of financial instruments, usually options, bonds, futures and swaps etc.

DEPOSITORY RECIEPTS:

- Shares of foreign stocks offered in foreign markets are comprehensively referred as Depository receipts.
- ADRs and GDRs are two types of depository receipts with other types including European depository receipts (EDRs), Luxembourg depository receipt (LDRs), and Indian depository receipts (IDRs).
- ADRs are shares of a single foreign company issued in the U.S.

- An American depository house acquires shares from Indian shareholders and subsequently issues ADRs to US investor (in dollar terms) according to conversion ratios that vary from stock to stock
- GDRs are shares of a single foreign company issued in more than one country as part of a GDR program.
- Companies can issue depository receipts in individual countries or they may choose to issue their shares in multiple foreign markets at once through a GDR.
- IDRs are similar to ADRs and GDRs. Here, a foreign company lists its shares in Indian stock exchange.

AGRICULTURE RELATED CONCEPTS

Syllabus Section: Economy- Agriculture/ Gs Paper 3

Minimum Support Price

- Minimum Support Price (MSP) is a form of market intervention by the Government of India to insure agricultural producers against any sharp fall in farm prices —a guarantee price to save farmers from distress sale.
- The MSPs are announced at the beginning of the sowing season for certain crops on the basis of the recommendations of the Commission for Agricultural Costs and Prices (CACP, 1985).
- The major objectives are to support the farmers from distress sales and to procure food grains for public distribution.
- In case the market price for the commodity falls below the announced minimum price due to bumper production and glut in the market, government agencies purchase the entire quantity offered by the farmers at the announced minimum price.
- Commencing with 'wheat' for the 1966–67, currently the MSPs are announced for 24 commodities including seven cereals (paddy, wheat, barley, jowar, bajra, maize and ragi; five pulses (gram, arhar/tur, moong, urad and lentil); eight oilseeds (groundnut, rapeseed/mustard, toria, soyabean, sunflower seed, sesamum, safflower seed and nigerseed); copra, raw cotton, raw jute and virginia flu cured (VFC) tobacco.

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Market Intervention Scheme

- The Market Intervention Scheme (MIS) is similar to MSP, which is implemented on the request of state governments for procurement of perishable and horticultural commodities in the event of fall in market prices.
- The scheme is implemented when there is at least 10 per cent increase in production or 10 per cent decrease in the ruling rates over the previous normal year.
- Proposal of MIS is approved on the specific request of the state/UT governments, if the states/UTs are ready to bear 50 per cent loss (25 per cent in case of North Eastern states) incurred on its implementation.

Procurement Prices

- In 1966–67, the Government of India announced a 'procurement price' for wheat, a bit higher than its MSP (the purpose being security of food procurement for requirement of the PDS).
- The MSP was announced before sowing, while the procurement price was announced before harvesting—the purpose was to encourage farmers to sell a bit more and get encouraged to produce more.
- But this increased price hardly served the purpose as a suitable incentive to farmers.
- It would have been better had it been announced before sowing and not after harvesting.
- That is why since the fiscal 1968–69 the government announced only the MSP, which is also considered the effective procurement price.

Buffer Stock

- India has a policy of maintaining a minimum reserve of food grains (only for wheat and rice) so that food is available throughout the country at affordable prices round the year.
- The main supply from here goes to the PDS and at times goes for Open Market Sale to check the rising prices, if needed.
- The Buffer stocking norms (of 2005) was revised by the government (by mid-2014) in the backdrop of increased requirement of food grains.

Open Market Sale Scheme

- The FCI has been undertaking sale of wheat at pre-determined prices (reserve prices) in the open market from time to time, known as the Open Market Sale Scheme (OMSS).
- This is aimed at serving the following objectives:
 1. To enhance market supply of food grains;
 2. To exercise a moderating influence on open market prices; and
 3. To offload surplus stocks.
- Under the Open Market Sale Scheme (Domestic), the government now adopts a policy of differential prices to encourage sale of older stock first.

Price Stabilization Fund

- The Government of India, by late March 2015, launched the Price Stabilization Fund (PSF) as a Central Sector Scheme to support market interventions for price control of perishable agri horticultural commodities.
- The cost to be borne between the centre and the states in equal ratio (in case of the North Eastern-states, the respective share will be 75:25).
- The scheme will commence with only two crops, viz., onion and potato.

Farm Subsidies:

- Farm subsidies form an integral part of the government's budget.
- In the case of developed countries, the agricultural or farm subsidies compose nearly 40 per cent of the total budgetary outlay, while in India's case it is much lower (around 7.8 per cent of GDP) and of different nature.
- Direct farm subsidies: These are the kinds of subsidies in which direct cash incentives are paid to the farmers in order to make their products more competitive in the global markets
- Indirect farm subsidies: These are the farm subsidies which are provided in the form of cheaper credit facilities, farm loan waivers, reduction in irrigation and electricity bills, fertilizers, seeds and pesticides subsidy as well as the investments in agricultural research, environmental assistance, farmer training, etc. These subsidies are also provided to make farm products more competitive in the global market.

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INDIAN PUPPETRY

Syllabus Section: History - Art & Culture/ GS Paper I

Puppetry

Puppetry is one of the ancient forms of entertainment. The suggestive element of a puppet being controlled by a master makes it a captivating experience, while the low cost of animation and production of a performance makes it popular among freelance artists. The form gives unrestricted freedom to the artist in form, design, color and movement and makes it one of the most ingenious inventions of mankind.

Origin of Puppetry In India:

Puppetry has long been of interest in India, both for education and entertainment purposes. The excavation sites at Harappa and Mohenjo-Daro have yielded puppets with sockets attached to them which suggest the presence of puppetry as an art form. Oldest written reference to puppetry has been found at Tamil classic Silappadikaaram written around 1st and 2nd Century BC. Although puppetry has found references in mythology and art but due to the lack of a devoted audience and financial insecurity, there has been a steady decline in this art form.

Types of Puppetry:

1. **String puppet** : Kathputli, kundhei, Gombeyatta, Bommalattam
2. **Shadow puppet** : Tholu bommalatta, Ravanchhaya, Togalu Gombeyaata
3. **Glove puppet** : Pavakutthu
4. **Rod puppet** : Yampuri, Putul Nachh

STRING PUPPETS:

The Puppets are chiseled out of wood and are 9 inch miniatures. Oil color is used to paint the wood to skin color and paint features like eyes, nose etc on it. Strings are attached to small holes in the hands, head and back of the body which are then controlled by the puppeteer. Miniature jewellery is attached to give puppets a realistic feelings. Some examples of string puppets are:

1. **Kathputli** : Traditional string puppets of rajasthan are known as Kathputli, which means a wooden doll. The puppets are covered in traditional bright rajasthani dresses. The show is accompanied by dramatic folk music. A unique feature is the absence of legs. Strings are attached to the fingers of the puppeteers.

2. **Kundhei** : These are the names of the string puppets of Odisha. These are made of light wood and dressed in short skirts. These puppets have more joints and give the puppeteer more flexibility. The strings are attached to a triangular prop.
3. **Gombayetta** : This is the traditional theatre of Karnataka. It has influence of Yakshagana theatre of Karnataka. Usually, the presence of more than one puppeteer is there to manipulate each puppet.
4. **Bomalattam** : Indigenous form of art of Tamil Nadu. A iron ring is attached to the strings of the puppet. This ring is worn by the puppeteer to his head. Bommalattam puppets are the largest and heaviest of the marionettes in India. Some are as tall as 5 feet in height and 10 kg weight.

SHADOW PUPPETS:

These are flat figures cut of leather. Figures are painted on both sides of the leather. Puppets are placed on a white screen with light falling from behind to create a shadow effect on the screen. The figures are manipulated such that the silhouettes created on the blank screen create a telling imagery. Some examples of this form are:

1. **Togalu Gobeyatta** : Popular theatre show of Karnataka. The size of the puppets changes with the social status of the character. Hence kings are shown at a higher size than commoners.
2. **Ravanchhaya** : A popular form of entertainment in Odisha. The theatre uses puppets without joints and thus requires skill for operations. The use of non human puppets is also seen.
3. **Tholu Bommalata** : Shadow puppetry theatre of Andhra Pradesh. The show is accompanied by classical music and is themed around devotional tales in Purana. Puppets are larger in size and colored on both sides.

GLOVE PUPPETS:

Glove Puppets are also known as sleeve, hand or palm puppets. The head is made of either papier mache, cloth or wood, with two hands emerging from just below the neck. The rest of the figure consists of a long flowing skirt. These puppets are like limp dolls, but in the hands of an able puppeteer, are capable of producing a wide range of movements.

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The manipulation technique is simple the movements are controlled by the human hand the first finger inserted in the head and the middle finger and the thumb are the two arms of the puppet. With the help of these three fingers, the glove puppet comes alive. The tradition of glove puppets in India is popular in Uttar Pradesh, Orissa, West Bengal and Kerala.

1. **Pavakoothu:** In Kerala, the traditional glove puppet play is called Pavakoothu. It came into existence during the 18th century due to the influence of Kathakali, the famous classical dance-drama of Kerala, on puppet performances. In Pavakoothu, the height of a puppet varies from one foot to two feet. The head and the arms are carved of wood and joined together with thick cloth, cut and stitched into a small bag. The theme for Glove puppet plays in Kerala is based on the episodes from either the Ramayana or the Mahabharata.

ROD PUPPETS:

Rod puppets are an extension of glove-puppets, but often much larger and supported and manipulated by rods from below. This form of puppetry now is found mostly in West Bengal and Orissa.

1. **Yampuri:** The traditional Rod puppet of Bihar is known as Yampuri. These puppets are made of wood. Unlike the traditional Rod puppets of West Bengal and Orissa, these puppets are in one piece and have no joints. As these puppets have no joints, the manipulation is different from other Rod puppets and requires greater dexterity.

Source: CCRT

BIO REMEDIATION

Syllabus Section: Environment and Ecology

BIO REMEDIATION: Bioremediation can be defined as the methodology to remove or neutralize the waste and toxic substances in the environment with the help of microorganism and plants. In other words, it is the process to detoxify the pollution from the environment with the help of microorganisms, plants, or microbial or plant enzymes

A) IN-SITU BIOREMEDIATION: The process of treatment of contaminated soil in the location where it was found is known as in- situ bioremediation.

- Bioventing - Biodegradation of contaminants in soil by providing air or oxygen to existing soil microorganisms-uses low air flow rates to provide only enough oxygen.
- Biosparging- Uses indigenous microorganisms to biodegrade organic constituents in the saturated zone.
- Bioaugmentation- Adding culture microorganisms into the subsurface for the purpose of biodegrading specific soil and groundwater contaminants.

B) EX- SITU BIOREMEDIATION: The process involves deliberate relocation of the contaminated material (soil and water) to a different place & then treating it with micro organisms.

- Land farming – It is a simple technique in which contaminated soil is excavated and then spread over an already prepared bed and at regular intervals tilled until pollutants are degraded.
- Composting: It is a procedure that involves bringing together contaminated soil with non-hazardous organic materials such as manure or agricultural wastes.
- Bio piles: They are a mixture of land farming and composting. Fundamentally, engineered cells are built as aerated compost piles.
- Bioreactors – A slurry bioreactor is a containment vessel and machinery used to create a three-phase (solid, liquid, and gas) mixing condition to expand the bioremediation rate of soil-bound and water-soluble pollutants.

BANKING RELATED TERMINOLOGY

Syllabus section: Economy/ GS Paper III

REPO RATE:

- Repo rate is the rate at which the central bank of a country (Reserve Bank of India in case of India) lends money to commercial banks in the event of any shortfall of funds.
- Repo rate is used by monetary authorities to control inflation

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REVERSE REPO RATE:

- The reverse repo rate is the rate at which RBI borrows funds from commercial banks.
- It is the rate at which commercial banks in India park their excess money with RBI usually for the short term.

CASH RESERVE RATIO (CRR):

- CRR or cash reserve ratio is the percentage of total deposits that banks are required to keep in reserves with RBI so that the same can be given to bank's customers if the need arises.
- Banks do not get any interest on this money.
- It is one of the major weapons in RBI's arsenal that allows it to maintain a desired level of inflation, control money supply and liquidity in the economy.
- The lower the CRR, the higher liquidity with banks, which in turn goes into investment and lending and vice-versa.

STATUTORY LIQUIDITY RATIO (SLR):

- It is a quantitative monetary policy instrument of the RBI.
- Under SLR, commercial banks have to keep a certain proportion of the Net Demand and Time Liabilities (NDTL) as liquid assets in their own vault.
- Liquid asset includes assets in the form of cash, gold and approved securities (government securities).

MARGINAL STANDING FACILITY (MSF):

- Marginal Standing Facility is an overnight liquidity support provided by RBI to commercial banks with a higher interest rate over the repo rate.
- MSF can be used by a bank after it exhausts its eligible security holdings for borrowing under other options like the LAF repo.
- Usually, when banks need short term loans from the RBI, they pledge their security holdings that are above the SLR holdings with the RBI to get one day loans under repo.
- Under MSF, a bank can borrow one-day loans from the RBI, even if it doesn't have any eligible securities excess of its SLR requirement (maintains only the SLR).
- The MSF was introduced by the RBI in its monetary policy for 2011-12.

- The RBI, as a temporary measure, had increased the borrowing limit of scheduled banks under the marginal standing facility (MSF) scheme from 2 per cent to 3 per cent of their Net Demand and Time Liabilities (NDTL) or deposits from March 27, 2020.

LIQUIDITY ADJUSTMENT FACILITY (LAF):

- Liquidity Adjustment Facility is a Monetary Policy tool that helps banks to borrow money via repurchase agreements.
- To adjust the everyday mismatches in the liquidity, LAF is a useful.
- The major elements of LAF are repo & reverse repo. The minimum bidding amount is Rs. 5 crores.
- Repo Rate is a primary tool used in the monetary policy in India by RBI. There are other rates like Marginal Standing Facility Rate, SLR, CRR are often directly linked with the Repo Rate of RBI.
- The RBI introduced the LAF as part of the outcome of the Narasimham Committee on Banking Sector Reforms of 1998.

BANK RATE:

- Bank rate is the rate of interest that a Central bank (RBI in India) charges on the loans and advances to a commercial bank.

MARGINAL COST OF FUNDS BASED LENDING RATE (MCLR):

- MCLR is an acronym for the Marginal Cost of Funds based Lending Rate. It replaced the Base Rate system from April 2016. (Base Rate is the minimum rate, as set by the RBI, below which banks are not allowed to lend to its customers).
- MCLR is a tenor- based internal benchmark lending rate, instead of a single rate. The banks can now price their loans, as per their funding composition and strategies on different MCLR's.
- Banks need to review and publish their MCLR monthly.

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PUBLIC PRIVATE PARTNERSHIP MODELS (PPP MODELS)| GS ARTICLES

Syllabus Section: Economy/ GS Paper III

1. BOT model:

- **A build-operate-transfer (BOT) contract** is a model used to finance large projects, typically infrastructure projects developed through public-private partnerships.
- The BOT scheme refers to the initial concession by a public entity such as a local government to a private firm to both build and operate the project in question. After a set time frame, typically two or three decades, control over the project is returned to the public entity.
- Under a build-operate-transfer (BOT) contract, an entity—usually a government—grants a concession to a private company to finance, build and operate a project. The company operates the project for a period of time (perhaps 20 or 30 years) with the goal of recouping its investment, then transfers control of the project to the government.
- BOT projects are normally large-scale, Greenfield infrastructure projects that would otherwise be financed, built and operated solely by the government. Examples include a highway in Pakistan, a wastewater treatment facility in China and a power plant in the Philippines.

2. The Build Operate and Transfer (BOT) Annuity Model:

- Under BOT annuity, a developer builds a highway, operates it for a specified duration and transfers it back to the government. The government starts payment to the developer after the launch of commercial operation of the project. Payment will be made on a six month basis.

3. BOT Toll Model:

- In this toll based BOT model, a road developer constructs the road and he is allowed to recover his investment through toll collection. This toll collection will be over a long period which is nearly 30 years in most cases. There is no government payment to the developer as he earns his money invested from tolls.

4. BOOT MODEL:

- BOOT (build, own, operate, transfer) is a public-private partnership (PPP) project model in which a private organization conducts a large development project under contract to a public-sector partner, such as a government agency. A BOOT project is often seen as a way to develop a large public infrastructure project with private funding.
- BOOT is sometimes known as BOT (build, own, transfer). Variations on the BOOT model include BOO (build, own, operate), BLT (build, lease, transfer) and BLOT (build, lease, operate, transfer).

5. Engineering Procurement and construction (EPC) Model:

- Under this system the entire project is funded by the government.
- The EPC entails the contractor build the project by designing, installing and procuring necessary labour and land to construct the infrastructure, either directly or by subcontracting.
- 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.
- In EPC as 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.

6. The Hybrid Annuity Model (HAM):

- In India, the new HAM is a mix of BOT Annuity and EPC models. As per the design, the government will contribute to 40% of the project cost in the first five years through annual payments (annuity). The remaining payment will be made on the basis of the assets created and the performance of the developer.
- Here, hybrid annuity means the first 40% payment is made as fixed amount in five equal installments whereas the remaining 60% is paid as variable annuity amount after the completion of the project depending upon the value of assets created.
- As the government pays only 40%, during the construction stage, the developer should find money for the remaining amount.

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- Here, he has to raise the remaining 60% in the form of equity or loans.
- There is no toll right for the developer. Under HAM, Revenue collection would be the responsibility of the National Highways Authority of India (NHAI).
- By features the HAM is a mix between the existing two models – BOT Annuity and EPC. Hence to understand the HAM, the basic features of the existing PPP models are elucidated first.

7. SWISS CHALLENGE METHOD

- Swiss Challenge method is one of the ways of awarding government contracts to private players. Without an invitation from government, a private player can submit a proposal to government for development of an infrastructure project with exclusive intellectual property rights.
- Then government has two options with the proposal.

One, Government can buy the intellectual property rights from the original proponent and call for a competitive bidding to award the project.

Two, Government allows other players with similar capabilities to submit their proposals. If any proposal is better than the proposal of the original proponent, the original proponent is asked to match with the other proposal. If he fails, then it would be awarded to the best bidder.

Strengths of Swiss Challenge Method

The following are the advantages of Swiss Challenge Method

- This method is very useful for the governments that have limited technical and financial capacity to develop projects
- This method promotes innovation and incentivizes to propose new ideas
- It also reduces transaction cost
- If the project is awarded to project proponent it can be implemented faster.
- This method incentivizes private sector participation.
- This method is Potential route for furthering local projects that are not national priorities.

Under this methodology, certainty of success is ensured as at least one willing private partner is available right from the beginning.

- This method results in better project structuring as the project proponent does a detailed
- Feasibility and financial analysis of a project. The initial structuring by the project
- proponent brings in efficiency and better understanding of financial implication resulting
- In development of economically sustainable model.
- The identification of timelines, identification of risks and their allocation along with
- Transparent bidding criteria becomes easier for the authority because the project
- Preparation is done in more professional manner.
- Time and cost saving in respect of pre project activities and feasibility studies as these studies have to be conducted in advance by the authority in case of other Public, Private partnership Models.
- Benchmarking of project costs, revenues and returns can be done through undertaking necessary technical and financial studies before the bidding stage.

Weaknesses of Swiss Challenge Method

- There are risks of insufficient transparency and inadequate competition in the Swiss Challenge Method.
- There is no legal validity of using this method when a counter proposal contains different Specifications than the original proposal.
- There is no symmetry in bidding time given to bidders to prepare counter proposals in relation to time taken by originator for preparation
- It is very difficult to measure monetary value of unsolicited proposal when contract or project is not given to original proponent.
- There is no guarantee that that unsolicited bidder won't withdraw its offer.

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INDIGENIZATION OF DEFENCE TECHNOLOGY | GS ARTICLES

Syllabus Section: Science and Technology / GS Paper III

A government bears ultimate responsibility for a country's security. Its ability to equip its armed forces using its own industrial and technological capabilities is of great importance. A successful defence industry provides strategic leverage with other countries, including as a potential supplier to neighbors who may otherwise turn to competitors. Furthermore, defence exports reduce the costs of defence acquisitions and can help subsidise a country's defence budget, hence the indigenization of a defence industry is a necessary and worthwhile national security objective, particularly for a large country like India with an expanding economy, a wide variety of security challenges, and growing international obligations.

Indigenization means building systems or parts thereof in the country which includes assembling knock down kits to building from scratch. All these have been part of an extended trial and error process. The services too have set up considerable a technology infrastructure.

Indigenization of defence technology is the capability of developing and producing any defence equipment within the country for the dual purpose of achieving self reliance and reducing the burden of imports. Self-reliance in defence manufacturing is one of the key objectives of Department of Defence Production

Need For Indigenization of Defence Technology

- **Fiscal improvisation:** Being the second largest arms importer in the world (after Saudi Arabia) lead to increase in the fiscal deficit as we procure 60% of its weapon systems from foreign markets. Indigenization will lower the deficit.
- **Improved BOP-** India can export its indigenous defence technology and equipment to the neighboring nations.
- **Economic growth-** It will boost of the GDP as well, as the reduced import bills will be replaced by indigenous production and other factors of production.

- **Security Measures:** Indigenization in defence is critical to national security also. It keeps intact the technological expertise.
- **Strategic Independence-** While formulating bilateral relation, defence equipment import dependency will no more affect the rational decisions. Self-sufficient and self-reliant defence industry will place India among the top global powers.
- **Employment generation:** As per government estimates, a reduction in 20-25% in defence related imports could directly create an additional 100,000 to 120,000 highly skilled jobs in India.
- **Societal and Psychological impact-** Nationalism and Patriotism can increase with indigenous production of defence equipment, that in turn will not only boost the trust and confidence of the Indian forces but will also strengthen a sense of integrity and sovereignty in them.

Government Initiatives:

- **Defence Acquisition Procedure 2020-** New DAP incorporates several measures to boost domestic Defence industry and Make in India; Procedures simplified to reduce time delays and enhance ease of doing business.
- **New FDI Policy :** Some new provisions like new category 'Buy (Global - Manufacture in India)' done to encourage foreign Original Equipment Manufacturer (OEMs) to setup 'manufacturing / maintenance entities' through its subsidiary in India while enabling requisite protections to domestic industry. FDI through automatic approval is increased from 49% to 74%.
- **Preference to 'Buy (Indian)', 'Buy & Make (Indian)' & 'Make' categories** of acquisition over 'Buy (Global)' category, thereby giving preference to Indian industry in procurement.
- **Industrial Corridors-** The government has inaugurated two defence industrial corridors, in Tamil Nadu and in Uttar Pradesh, to boost the flagship 'Make in India' programme that in turn would attract investments as well as encourage employment generation

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- **E- Biz Portal-** The portal will provide a one-stop shop for providing G2B services to investors and business communities in India and help in reducing the delays and complexity in obtaining information and services.
- **Mission Raksha Gyanshakti:** with the objective of creating greater Intellectual Property in Defence Production Ecosystem.
- **Artificial Intelligence in Defence:** Creation of Defence Artificial Intelligence Project Agency (DAIPA) in, 2019 for greater thrust on Artificial Intelligence (AI) in Defence.
- **Innovations for Defence Excellence (iDEX):** The objective of iDEX is bringing startups to innovate, develop technology and solve problems related to defence and aerospace.

Draft Defence Production and Export Promotion Policy (2020):

The Ministry of Defence has formulated a draft Defence Production and Export Promotion Policy 2020 (DPEPP 2020) which is envisaged as overarching guiding document of MoD to provide a focused, structured and significant thrust to defence production capabilities of the country for self-reliance and exports.

The policy has laid out following goals and objectives:

- To achieve a turnover of Rs 1, 75,000 Crores (US\$ 25Bn) including export of Rs 35,000 Crore (US\$ 5 Billion) in Aerospace and Defence goods and services by 2025.
- To develop a dynamic, robust and competitive Defence industry, including Aerospace and Naval Shipbuilding industry to cater to the needs of Armed forces with quality products.
- To reduce dependence on imports and take forward "Make in India" initiatives through domestic design and development
- To promote export of defence products and become part of the global defence value chains.
- To create an environment that encourages R&D, rewards innovation, creates Indian IP ownership and promotes a robust and self-reliant defence industry.

Issues/Challenges with Defence Production in India:

- Archaic Model of Defence Production- Public enterprises have shown a very low rate of return on the capital invested. This has inhibited their ability to regenerate themselves in terms of new investments as well as in technology development.
- Gross Inefficiency of the DPSUs and OFs- It is worth noting that while there has been some improvement on the issue of Defence Public Sector Undertakings (DPSUs), virtually no action has been taken for improving the management of the Ordnance Factories (OFs), which continue to function as a department-run organisation.
- Inefficiency of DRDO and its Separation from Production Agencies- Some of the problem's organisation facing the organisation is lack of organizational reforms, poor accountability, meager resources and poor human resource management.
- Dispute Settlement body: There is an urgent need for a permanent arbitration committee which can settle disputes expeditiously. In the USA, the procurement agency DARPA has a permanent arbitration committee which resolves such issues amicably and their decision is final.
- Separation of Procurement from Indigenization- If the separation of R&D from production has been a major problem in India's industrial defence development, the separation of procurement from production has also been an equally contributory factor

Way Ahead:

- Structural reform and more power to DRDO in order to enhance its confidence and authority.
- Identification of self-reliance goals backed by technology audit by the Military Industrial Commission, followed by prioritization and perspective planning on Indigenization.
- R&D needs to be given precedence with technology transfer preferences in selective disciplines.

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- Integration of Military Maintenance Infrastructure with DPSUs, PSUs, and Private Sector: The military would become relatively freer to focus on its operational ethos. It would enable Indian industry to gain valuable defence technology insights.
- Software Industry and technologies like Artificial intelligence and cyber security should be used to develop and manufacture the “chip” indigenously.
- Efficient Supply Chain is critical for a defence manufacturer looking to optimize costs.

Conclusion

Despite the numerous reform measures undertaken by the Government of India, the Indian defence industry still suffers from several legacy issues which need to be addressed in order to establish an efficient and credible defence industrial base. The reform agenda that needs to be pursued must be multi-pronged one and it needs to be implemented systematically. It should begin with an overarching and integrated institutional structure that would be responsible for the three critical but inter-related functions of procurement, production and R&D.

POVERTY ESTIMATION COMMITTEES IN POST INDEPENDENT INDIA | GS ARTICLES

Syllabus Section: Economy

1. Planning Commission Expert Group (1962):

- Planning Commission Expert Group (1962), working group constituted by the Planning Commission formulated the separate poverty lines for rural and urban areas (20 and 25 per capita per year respectively).

2. VM Dandekar and N Rath committee (1971) :

- The committee made the first systematic assessment of poverty in India, based on National Sample Survey (NSS) data.
- Unlike previous committees VM Dandekar and N Rath were of the view that poverty line must be derived from the expenditure that was adequate to provide 2250 calories per day in both rural and urban areas.

- The Expenditure based Poverty line estimation, generated a debate on minimum calorie consumption norms.

3. Y.K. Alagh Committee (1979):

- The Task force constituted by the Planning Commission under the chairmanship of YK Alagh, constructed a poverty line for rural and urban areas on the basis of nutritional requirements and related consumption expenditure.
- Poverty estimates for subsequent years were to be calculated by adjusting the price level for inflation.

4. Lakdawala Committee (1993):

- The Task Force chaired by DT Lakdawala, based on the assumption that the basket of goods and services used to calculate Consumer Price Index-Industrial Workers (CPI-IW) and Consumer Price Index- Agricultural Laborers (CPI-AL) reflect the consumption patterns of the poor.
- The committee made the following suggestions:
 1. Consumption expenditure should be calculated based on calorie consumption as earlier.
 2. State specific poverty lines should be constructed and these should be updated using the CPI-IW in urban areas and CPI-AL in rural areas.
 3. Discontinuation of scaling of poverty estimates based on National Accounts Statistics.
 5. Suresh Tendulkar Committee (2009):
 - Expert group constituted by the Planning Commission and, chaired by Suresh Tendulkar, was constituted to review methodology for poverty estimation and to address the various shortcomings of the previous methods.

Recommendations

- **Shift from Calorie Consumption based Poverty Estimation:** It based its calculations on the consumption of the items like cereal, pulses, milk, edible oil, non-vegetarian items, vegetables, fresh fruits, dry fruits, sugar, salt & spices, other food, intoxicants, fuel, clothing, footwear, education, medical (non-institutional and institutional), entertainment, personal & toilet goods.

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- **Uniform Poverty line Basket:** The Tendulkar Committee computed new poverty lines for rural and urban areas of each state based on the uniform poverty line basket and found that all India poverty line (2004-05) was:
 - 446.68 per capita per month in rural areas
 - 578.80 per capita per month in urban areas
 - **Mixed Reference Period:** The Committee recommended using Mixed Reference Period based estimates, as opposed to Uniform Reference Period based estimates that were used in earlier methods for estimating poverty.
 - Tendulkar committee computed poverty lines for 2004-05 at a level that was equivalent, in Purchasing Power Parity (PPP) terms to Rs 33 per day.
- 6. RANGARAJAN COMMITTEE 2014:**
- The committee was set up in the backdrop of national outrage over the Planning Commission's suggested poverty line of 22 a day for rural areas.

Recommendations:

- **Methodology Used:** The Rangarajan committee estimation is based on an independent large survey of households by Center for Monitoring Indian Economy (CMIE).
 - It has also used different methodology wherein a household is considered poor if it is unable to save.
 - Normative and Behavioural level: Poverty line should be based on:
 - **Normative level of adequate nutrition:** Ideal and desirable level of nutrition.
 - **Behavioral determination of non-food expenses:** What people use or consume as per general behavior.
 - **Nutritional Requirement:** For normative levels of adequate nutrition – average requirements of calories, proteins and fats based on Indian Council of Medical Research (ICMR) norms, differentiated by age, gender and activity for all-India rural and urban regions is considered:
1. **Calories:** 2090 kcal in urban areas and 2155 Kcal in rural areas.
 2. **Protein:** For rural areas 48 gm and for urban areas 50 gm.

3. **Fat:** For urban areas 28 gm and for rural areas 26 gm.
- **Poverty Threshold:** Persons spending below 47 a day in cities and 32 in villages be considered poor.
 - Based on this methodology, Rangarajan committee estimated that the number of poor were 19% higher in rural areas and 41% more in urban areas than what was estimated using Tendulkar committee formula.
 - **Modified Mixed reference period:** Instead of Mixed reference Period (MRP) it recommended Modified Mixed Reference Period (MMRP).

INDIA'S NUCLEAR DOCTRINE

Syllabus Section: International Relations/ Paper II

A nuclear doctrine is a set of principles that guides a nuclear weapon state regarding how to administer the nuclear weapons during the war and peace time. India's nuclear doctrine is based on the principle of credible minimum deterrence with No first use policy. India is following the same doctrine since last two decades.

However, in the changing global order, creation of protective and deterrent environment for a country is equally important as the other nuclear powers are moving with their aggressive policies. Therefore, the nuclear doctrines have been emerged as dynamic processes that evolve with exigencies of time and security environment.

Key features of India's nuclear doctrine:

1. Building and maintaining a credible minimum deterrent.
2. **A posture of "No First Use policy":** Nuclear weapons will only be used in retaliation against a nuclear attack on Indian Territory or on Indian forces anywhere.
3. Nuclear retaliation to a first strike will be massive and designed to inflict unacceptable damage.
4. Nuclear retaliatory attacks can only be authorized by the civilian political leadership through the Nuclear Command Authority.
5. Non-use of nuclear weapons against non-nuclear weapon states;

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6. However, in the event of a major attack against India, or Indian forces anywhere, by biological or chemical weapons, India will retain the option of retaliating with nuclear weapons;
7. A continuance of strict controls on export of nuclear and missile related materials and technologies, participation in the Fissile Material Cutoff Treaty negotiations, and continued observance of the moratorium on nuclear tests.
8. Continued commitment to the goal of a nuclear weapon free world, through global, verifiable and non-discriminatory nuclear disarmament.

Concerns related to India's nuclear doctrine:

- **With respect to No first Use policy:** The major factor behind the questioning of the Nuclear Doctrine stems from concerns about No first use policy and the dissatisfaction with our NFU posture is continuing since past decade.
- **Doctrine relied only for retaliation purposes:** The assumption among critics has been that a policy that relied on retaliation only, in which India will wait until it is attacked before it uses its nuclear weapons
- **India is at a disadvantageous position:** In India the NFU policy has been called into question on the grounds that it allows Pakistan and other countries to take the first initiative and puts India in a disadvantageous position.
- **No first use principle is not universally accepted:** Above all, No first use policy is not universally accepted principle by all countries, so why should India follow it sternly? Questions one section of people.
- **Controversial from the beginning:** India adopted a No First Use (NFU) nuclear doctrine in 2003, but the counter-intuitive logic of the doctrine was controversial from the very beginning.

In the wake of above concerns and as the world is undergoing rapid changes in terms of nuclear postures with major transformations, Recently there was a demand surfed in the news to revisit India's nuclear doctrine based on the present needs the security environments.

Implications in revisiting India's nuclear doctrine:

- **Abrogates the universal goal of nuclear disarmament:** Revisiting the doctrine may abrogate India's commitment to the universal goal of nuclear disarmament and upset the regional balance in the sub-continent.
- **India will lose its status as a responsible nuclear power:** Withdrawing the NFU policy and making a declaration to that effect can affect India's status as a responsible nuclear power.
- **Entry to Multilateral nuclear groupings will become difficult:** Support for our entry into Nuclear Supplier Group, other multilateral nuclear export control regimes as well as our civil nuclear cooperation agreements will be under threat.
- **Budgetary and expenditure constraints:** It would enormously complicate and increase the expenditure incurred by us in regard to our command and control mechanisms which would have to be reconfigured to engage in calibrated nuclear war fighting.
- **May encourage the use of tactical nuclear weapons:** It would encourage the use of tactical nuclear weapons against us under the illusion of no massive response

Although revisiting the doctrine may be a good step for enhanced protection but Instead of doing so, India can potentially make use of available alternative mechanisms like Interceptor missiles to face no notice nuclear threats and then can attack further effectively.

In this regard as a responsible player to promote the global peace, India can further diplomatically conduct dialogues with all the other nuclear countries to establish a uniform global nuclear doctrine which is the need of the hour.

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INDIA- SRI LANKA RELATIONS | GS ARTICLES

Syllabus Section: International Relations/ GS Paper II

Introduction

The relationship between India and Sri Lanka is more than 2,500 years old. Both countries have a legacy of intellectual, cultural, religious and linguistic interaction. In recent years, the relationship has been marked by close contacts at all levels. Trade and investment have grown and there is cooperation in the fields of development, education, culture and defence. Both countries share a broad understanding on major issues of international interest. In recent years, significant progress in implementation of developmental assistance projects for Internally Displaced Persons (IDPs) and

Disadvantaged sections of the population in Sri Lanka has helped further cement the bonds of friendship between the two countries.

India-Sri Lanka Commercial Relations

- Sri Lanka has long been a priority destination for direct investment from India. Sri Lanka is one of India's largest trading partners in SAARC (South Asian Association of Regional Cooperation). Trade between the two countries grew particularly rapidly after the entry into force of the India-Sri Lanka Free Trade Agreement in March 2000. According to Sri Lankan Customs, bilateral trade in 2018 amounted to US \$ 4.93 billion.
- Exports from India to Sri Lanka in 2018 were US\$ 4.16 billion, while exports from Sri Lanka to India are US\$ 767 million. The main items of exports from Sri Lanka to India are: Base Oil, Poultry feeds, Areca nuts, (waste and scrap) paper or paperboard, Pepper, Ignition Wiring Sets, Copper wire, Marble, travertine and alabaster.
- Main items of Imports from India to Sri Lanka are: Gas oil/ Diesel, Motorcycles, Pharmaceutical Products, Portland cement, Semi finished products of Iron, Military weapon, Fuel oil, Rice, Cement clinkers, Kerosene Type jet Fuel.
- India is one of the largest investors in Sri Lanka with cumulative investments of around USD 1.239 billion.

- The investments are in diverse areas including petroleum retail, IT, financial services, real estate, telecommunication, hospitality & tourism, banking and food processing (tea & fruit juices), copper and other metal industries), tires, cement, glass manufacturing, and infrastructure development (railway, power, water supply).

India – Sri Lanka Security Co-operation

- Sri Lankan military personnel are trained by India.
- Joint Military training exercise between Indian Army and Sri Lankan Army was conducted from December 1 to 14, 2019 at Foreign Training Node (FTN) in Pune. This military training exercise between Indian Army and Sri Lankan Army is known as 'Mitra Shakti.'
- 'Mitra Shakti 2019' was the 7th edition of the Joint Military training between Indian and Sri Lankan Army.
- The focus was on achieving the desired level of interoperability and cohesive operational ability of the troops from both India and Sri Lanka through mutual exchange of operational experience and best practices.
- India has exported Military hardware to Sri Lanka.
- 7th Bilateral Maritime Exercise between Indian Navy and Sri Lankan Navy was held from 7th September 2019 to 12th September 2019. It was a 6 day joint exercise conducted off the coast of Visakhapatnam. Indian Navy was represented by 'INS Khukri' and Naval Offshore Patrol Vessel 'INS Sumedha.' The Sri Lankan Navy was represented by Advanced Offshore Patrol Vessel SLNS Sindhurala and SLNS Suranimala. This regularly conducted Maritime Exercise between Indian Navy and Sri Lankan Navy is known as 'SLINEX.'

Significance of Indo- Sri Lankan Bilateral Relations:

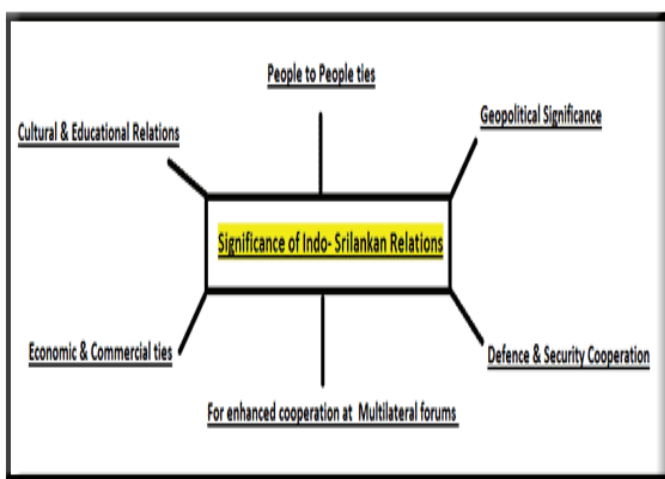
- **Geopolitical Significance:** Sri Lanka's location in the Indian Ocean region as an island State has been of strategic geopolitical relevance to India's maritime interests in region

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- **Cultural & Educational Relations:** Both the countries shares long and historical cultural ties with Buddhism as common link. Apart from this the cultural cooperation agreement 1977 also serves as the basis for periodic cultural exchange program.
- **People to people ties:** India's principal interest in Sri Lanka arises out of the fact that Sinhala majority Sri Lanka has a substantial Tamil Population with close emotional, cultural and people to people ties with Tamils in India.
- **Defence & Security Cooperation:** Both the countries regularly conduct joint Military exercise- MitraShakti and Join Naval exercise (SLINEX). This increases synergy between both militaries thus safeguarding the common interest of countries.
- **Economic & Commercial ties:** Sri Lanka has long been a priority destination for FDI and Sri Lanka is one of India's largest trading partners among the SAARC countries. India in turn is Sri Lanka's largest trade partner globally.
- **For enhanced cooperation at multilateral forums:** Sri Lanka and India both share the member ship of multi lateral regional groupings like BIMSTEC and SAARC etc.
- **India's 'Neighborhood First Policy:** Sri Lanka is at the core of our 'Neighborhood First' policy and SAGAR doctrine.
- **Maritime interests:** it is important for the coast guards of the two countries to establish the safety and security of the Indian Ocean region.

India-Sri Lanka: Issues and Conflicts

- Issues with respect to Tamilian interests: India hopes that the expectations of the Tamil people for equality, justice, peace, and respect would be realized and that devolution of powers according to the 13th amendment would be taken forward. But Colombo has given no commitment on this.
- Fisherman and fishing issues: The Palk Bay region has become a highly contested site in recent decades. Multiple issues include ongoing disagreement over, frequent poaching by Indian fishermen in Sri Lankan waters, and the damaging economic and environmental effects of trawling.
- Continued Katchchatheevu Island dispute: Through the 1974 agreement, India agreed to Sri Lanka's sovereignty over Katchchatheevu Island but with some safeguards to its Indian fishermen through Article 5 but it was vague enough for the Sri Lankan government to deny the fishing rights. Tamil Nadu is seeking the retrieval of Katchchatheevu from Sri Lanka
- Reluctance in approval of infrastructure projects: The present Sri Lankan government has ruled out taking forward the MoU signed by his predecessor allowing Indian participation in energy and infrastructure projects in Trincomalee and Indian stake in Mattala airport.
- Sri Lanka's security dilemma: Growing too close to China could create problems with India while leaning too much in favor of India could affect Chinese military sales to the country and other aspects of their bilateral relationship.
- Strategic Issues due to growing Sri Lanka's ties with China:
- In the period of low profile relationship between the two nations, SL apparently started favoring China over India and The presence of China in Sri Lanka increased significantly in the recent years .
- Over the years Chinese funds started flowing, in fact it has started big buck infrastructure projects in the Island nation..



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- China has been the largest supplier of arms to Sri Lanka since the 1950s. In 2014 Sri Lanka allowed two Chinese submarines and a warship to dock at its port in Colombo. This was seen as a major breach of trust between New Delhi and Colombo and also heightened tensions with Beijing.
- As part of Maritime Silk Route (MSR) policy, China built two ports in Sri Lanka, one in Colombo and another in Hambantota.
- China has also collaborated in satellite launching activities with Supreme SAT (Pvt.), Sri Lanka's only satellite operator.
- In an effort to counter China India is planning to build Trincomalee Port which is envisioned as an Indian counterweight to Chinese developments at Hambantota Port.

Conclusion

While treating the India first policy of Sri Lanka as response to India's neighborhood first policy, Indian authorities must give serious thought to response on requests or concern raised by Sri Lankan authorities on all respects. India must engage, understand, and assist Sri Lanka in a non-reciprocal manner with respect to development of infrastructural projects, but it has to ensure that it is not taken for granted under any circumstance. India should not be complacent with the policy announcement from Colombo and must insist that India's concerns and interests should be taken due care of.

INCLUSIVE GROWTH AND ISSUES ARAISING FROM IT | GS ARTICLES

Syllabus Section: Economic and Social Development/ GS Paper III

What is Inclusive Growth?

The OECD defines inclusive growth as "economic growth that creates opportunity for all segments of the population and distributes the dividends of increased prosperity, both in monetary and non-monetary terms, fairly across society".

The United Nations Development Programme's (UNDP) perspective is based both an outcome and process. Inclusive growth implies participation and benefit-sharing ensuring that while everyone can participate in the growth process (both in decision-making and in participating in growth) and benefits of growth are shared equally.

Therefore, Inclusive growth is both a process and an outcome. As a process the focus is on wider participation in the process of growth and as an outcome it concerns with benefit sharing removal of poverty and reducing income inequalities. Inclusive growth has become central focal point of all policies, fiscal policy, monetary policy, trade policy, labour market policy, price policy, etc., across the globe.

The key features of Inclusive growth

- Economic growth is a precondition for inclusive growth, though the nature and composition of growth has to be conducive to inclusion.
- Inclusive growth is to include the poor and lagging socio-economic groups such as ethnic / tribal groups, weaker sections as well as lagging regions as partners and beneficiaries of economic growth.
- The Inclusive growth addresses the constraints of the excluded and the marginalized. It has to open up opportunities for them to be partners in growth.
- Inclusive growth should be non-discriminatory and favorable for the excluded. This implies that inclusive growth has to be broad-based in terms of coverage of regions, and labour-intensive in terms of creating large-scale productive employment opportunities in the economy.
- Inclusive growth is expected to reduce poverty faster in the sense that it has to have a higher elasticity of poverty reduction.
- Inclusive growth has to ensure access of people to basic infrastructure and basic services/capabilities such as basic health and education. This access should include not only the quantity, but also quality of these basic services.
- Inclusive growth should reduce vertical as well as horizontal inequalities in incomes and assets.

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Elements of Inclusive Growth

Major components of the inclusive growth strategy included a sharp upsurge in investment in rural areas, rural infrastructure and agriculture spurt in credit for farmers, increase in rural employment through a unique social safety net and a sharp increase in public spending on education and health care.

There are several interrelated elements of inclusive growth:

- Poverty Reduction
- Employment generation
- Agriculture Development
- Industrial Development
- Social Sector Development
- Reduction in regional disparities
- Protecting the environment.
- Equal distribution of income
- Agriculture Development
- Industrial Development
- Environment protection
- Reduction in Regional Disparities
- Equal distribution of income
- Social Sector Development

KEY PILLARS AND INDICATORS OF INCLUSIVE GROWTH

Key drivers and dimensions of Inclusive growth Problems before Inclusive Growth Strategies in India For a developing country like India, the need of inclusive growth is vital to achieve the overall progress of the country. Though it is positive for macro-economic stability, 2008-09 has resulted a relative growth slowdown, mostly from the spillover effects of the weakening of the global economic momentum and volatile financial markets. The following problems are the major concerns for developing countries like India to achieve the inclusive growth. They are:

1. Poverty
2. Employment
3. Agriculture
4. Problems in Social Development
5. Regional Disparities

Challenges before Inclusive Growth Strategies in India

The key components of the inclusive growth strategy included a sharp increase in investment in rural areas, rural infrastructure and agriculture spurt in credit for farmers; increase in rural employment through a unique social safety net and sharp increase in public spending on education and health care. The government also should go for a variety of legislative interventions to empower the disadvantaged.

Some of the challenges and opportunities before inclusive growth strategies in India are:

- Poverty alleviation is one of the big challenges for India. Eradication of poverty in India is generally only considered to be a long-term goal. Poverty alleviation is expected to make better progress in the next 50 years than in the past, as a trickledown effect of the growing middle class. Increasing stress on education, reservation of seats in government jobs and the increasing empowerment of women and the economically weaker sections of society, are also expected to contribute to the alleviation of poverty.
- For agricultural growth, the private players can participate in to bridge the gap including providing micro finance. Contract farming, setting up storage facilities for agro-produce, and producing them from farmers. The private sector could also develop heritage sites and tourist spots and encourage the promotion of traditional arts and carafats in joint ventures with rural enterprises. The government of India should also increase its present moratorium on interest payments, lowering of farm credit rates for increase in agricultural growth.

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- **Skill development and unemployment:** Government schemes should target eradication of both poverty and unemployment (which in recent decades has sent millions of poor and unskilled people into urban areas in search of livelihoods) attempt to solve the problem, by providing financial assistance for setting up businesses, skill honing, setting up public sector enterprises, reservations in governments, etc. The decreased role of the public sector after liberalization has further underlined the need for focusing on better education and has also put political pressure on further reforms.
- **Child labour:** Child labor is a complex problem that is basically rooted in poverty. The Indian government is implementing the world's largest child labor elimination program, with primary education targeted for around 250 million. Numerous nongovernmental and voluntary organizations are also involved. Failure to implement the law and poor rehabilitation policies need urgent attention which is a big challenge for India to achieve inclusive growth.
- **Women Empowerment & Regional disparities:** Social development is possible through achieving Women Empowerment and eradicating the regional disparities. Though the Government is giving the women empowerment by giving special reservations, the women's advancement in India is still not matched the expectations for inclusive growth. To bring in inclusive growth, it is necessary to enhance the capabilities of women by providing education, so that they get the opportunity of getting employed and be self sustainable.
- Development of manufacturing sector is important for creation of productive employment.
- Equality of opportunities (education) should be given.
- South East Asian and East Asian experience can be used.
- Shift focus of reforms to delivery systems.
- Importance of women's economic and social empowerment
- Decentralization and Economic reforms in relation to socio-political environment

Conclusion

Inclusive growth is necessary for sustainable development and equitable distribution of wealth and prosperity. Achieving inclusive growth is the biggest challenge in a country like India. In a democratic country like India, bringing 600 million people living in rural India into the mainstream is the biggest concern. The challenge is to take the levels of growth to all section of the society and to all parts of the country. The best way to achieve inclusive growth is through developing people's skills.

MAJOR CROPS- CROPPING SEASONS

Syllabus section: Economy/ Agriculture

Introduction

India is an agriculturally important country. Two-thirds of its population is engaged in agricultural activities. Agriculture is a primary activity, which produces most of the food that we consume. Besides food grains, it also produces raw material for various industries. India's agriculture and allied sector contributing to around three-fourths of the Gross Domestic Product (GDP) and providing employment to more than four-fifths of the population.

Cropping Seasons

Agriculture is decided by the soil types and climatic parameters in India. These two major parameters determine the overall agro-ecological setting for nourishment and appropriateness of the crops for cultivation. The three distinct crop seasons in India are:

Way forward and suggestions

- Equity is important for economic development so it should be preferred.
- Agricultural Development is necessary for economic development.
- Economic reforms are important. But macro-poor policies (fiscal, trade, financial, monetary etc.) should have pro-poor focus.
- Structural change should have followed agriculture-industry-services sequence.

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- (1) **Kharif Season:** Kharif crops are grown with the onset of monsoon in different parts of the country. These are also known as monsoon crops. These are harvested in September-October. Important crops of this season are paddy, maize, jowar, bajra, tur (arhar), moong, urad, cotton, jute, groundnut and soyabean.
- (2) **Rabi Season:** Rabi crops are sown in winter from October to December and harvested in summer from April to June. Some of the important Rabi crops are wheat, barley, peas, gram and mustard.
- (3) **Zaid Season:** In between the rabi and the Kharif seasons, there is a short season during the summer months known as the Zaid season. Some of the crops produced during 'Zaid' are watermelon, muskmelon, cucumber vegetables and fodder crops.

Major Crops

The broader classification of the agricultural crops on the basis of their economical use is described as under:

- **Cereal crops:** Rice, wheat, maize, sorghum.
- **Pulse crops:** Pigeon pea, urdbean, moonbeam, kidney bean, cowpea, chickpea, lentil, pea, etc.
- **Oilseed crops:** Soybean, rapeseed & mustard, groundnut, sunflower, sesame, safflower, etc.
- **Fodder crops:** Berseem, red clover, Lucerne, etc.
- **Fibre crops:** Cotton, jute, Mesta, etc.
- **Commercial crops:** Sugarcane, tea, coffee, etc

Major Crops and Their producing Regions

Rice

- Our country is the second largest producer of rice in the world after China.
- It requires high temperature, (above 25°C) and high humidity with annual rainfall above 100 cm.
- In the areas of less rainfall, it grows with the help of irrigation.
- Rice is grown in the plains of north and north-eastern India, coastal areas and the deltaic regions.

Wheat

- This is the second most important cereal crop.
- It is the main food crop, in north and north-western part of the country.
- This rabi crop requires a cool growing season and a bright sunshine at the time of ripening.
- It requires 50 to 75 cm of annual rainfall evenly distributed over the growing season.
- There are two important wheat-growing zones in the country – the Ganga-Satluj plains in the northwest and black soil region of the Deccan.

Millets

- Though, these are known as coarse grains, they have very high nutritional value.
- Jowar, bajra and ragi are the important millets grown in India.
- They provide food and fodder both.

Jowar

Jowar is the third most important food crop with respect to area and production.

It is a rain-fed crop mostly grown in the moist areas which hardly needs irrigation. It requires more than 30cm rainfall during growing period and cannot grow if rainfall exceeds 100cm.

Maharashtra, Karnataka, Andhra Pradesh and Madhya Pradesh are important Jowar producing states.

Bajra

Bajra grows well on sandy soils and shallow black soil.

Bajra grows well in dry and warm climate conditions and it's drought tolerant crop which requires low annual rainfall ranging between 40 cm to 60 cm. Ideal temperature for bajra cultivation is between 20 to 30.

Top Bajra producing states are Rajasthan followed by Maharashtra, Haryana, Gujarat and Uttar Pradesh. Top high yielding state is Tamil Nadu.

Ragi

Ragi grows well on red, black, sandy, loamy and shallow black soils.

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Finger millet is a crop of tropical and subtropical climate and can be cultivated up to an altitude of 2100 meters.

It is heat loving plant and for its germination, the minimum temperature required is 8-10. A mean temperature range of 26-29 during the growth is the best for proper development and good crop yield.

Top producers are Karnataka, Uttarakhand, Tamil Nadu.

Maize

- It is a crop which is used as both food and fodder.
- It is a Kharif crop (in some states it is grown in rabi season e.g. Bihar) which requires temperature between 21°C to 27°C and grows well in old alluvial soil.
- Major maize-producing states are Karnataka, Uttar Pradesh, Bihar, Andhra Pradesh, Telangana and Madhya Pradesh.

Pulses

- India is the largest producer as well as the consumer of pulses in the world.
- These are the major source of protein in a vegetarian diet.
- Major pulses that are grown in India are tur (arhar), urad, moong, masur, peas and gram.

ORBIT AND TYPES OF ORBITS|

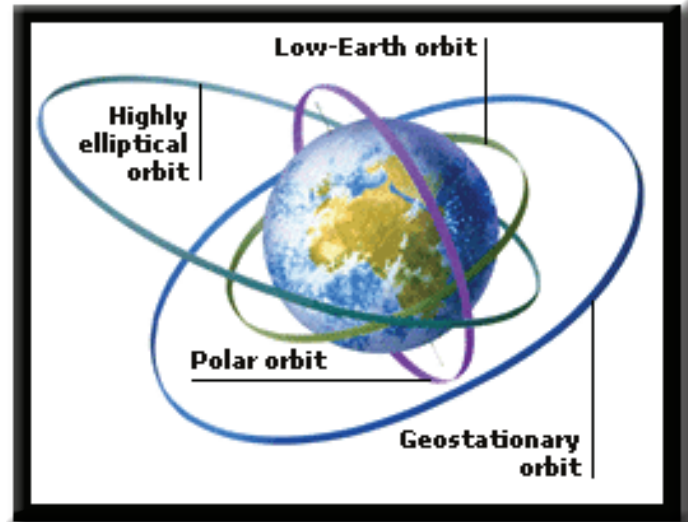
Syllabus Section: Science and Technology

Orbit

An orbit is the curved path that an object in space (such as a star, planet, moon, asteroid or spacecraft) takes around another object due to gravity. Gravity causes objects in space that have mass to be attracted to other nearby objects. If this attraction brings them together with enough momentum, they can sometimes begin to orbit each other.

When rockets launch our satellites, they put them into orbit in space. There, gravity keeps the satellite on its required orbit – in the same way that gravity keeps the Moon in orbit around Earth.

This happens in a way that is similar to throwing a ball out of the window of a tall tower – to get the ball going, you need to first give it a ‘push’ by throwing it, making the ball fall towards the ground on a curved path. Whilst it is your throw that gives the ball its initial speed, it is gravity alone that keeps the ball moving towards the ground once you let go.



Types of orbits:

Upon launch, a satellite or spacecraft is most often placed in one of several particular orbits around Earth – or it might be sent on an interplanetary journey, meaning that it does not orbit Earth anymore, but instead orbits the Sun until its arrival at its final destination, like Mars or Jupiter.

- Geostationary orbit (GEO)
- Low Earth orbit (LEO)
- Medium Earth orbit (MEO)
- Polar orbit and Sun-synchronous orbit (SSO)
- Transfer orbits and geostationary transfer orbit (GTO)

Geostationary orbit (GEO)

- Satellites in geostationary orbit (GEO) circle Earth above the equator from west to east following Earth’s rotation – taking 23 hours 56 minutes and 4 seconds – by travelling at exactly the same rate as Earth.
- This makes satellites in GEO appear to be ‘stationary’ over a fixed position. In order to perfectly match Earth’s rotation, the speed of GEO satellites should be about 3 km per second at an altitude of 35 786 km.
- This is much farther from Earth’s surface compared to many satellites.
- GEO is used by satellites that need to stay constantly above one particular place over Earth, such as telecommunication satellites.
- This way, an antenna on Earth can be fixed to always stay pointed towards that satellite without moving.

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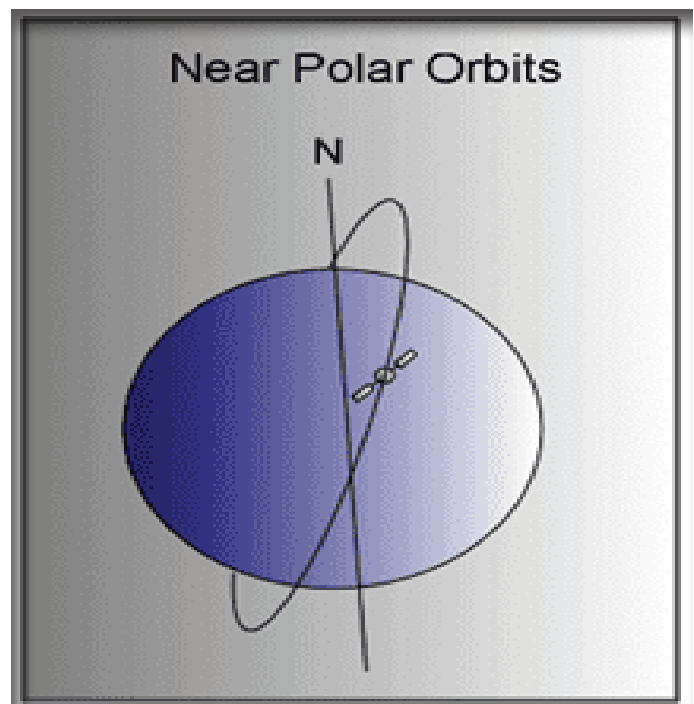
- It can also be used by weather monitoring satellites, because they can continually observe specific areas to see how weather trends emerge there.
- Satellites in GEO cover a large range of Earth so as few as three equally-spaced satellites can provide near global coverage.
- This is because when a satellite is this far from Earth, it can cover large sections at once.
- This is akin to being able to see more of a map from a meter away compared with if you were a centimeter from it. So, to see all of Earth at once from GEO far fewer satellites are needed than at a lower altitude.
- It is also the orbit used for the International Space Station (ISS), as it is easier for astronauts to travel to and from it at a shorter distance. Satellites in this orbit travel at a speed of around 7.8 km per second; at this speed, a satellite takes approximately 90 minutes to circle Earth, meaning the ISS travels around Earth about 16 times a day.
- However, individual LEO satellites are less useful for tasks such as telecommunication, because they move so fast across the sky and therefore require a lot of effort to track from ground stations.
- Instead, communications satellites in LEO often work as part of a large combination or constellation, of multiple satellites to give constant coverage. In order to increase coverage, sometimes constellations like this, consisting of several of the same or similar satellites, are launched together to create a 'net' around Earth.
- This lets them cover large areas of Earth simultaneously by working together.

Low Earth orbit (LEO)

- A low Earth orbit (LEO) is, as the name suggests, an orbit that is relatively close to Earth's surface.
- It is normally at an altitude of less than 1000 km but could be as low as 160 km above Earth – which is low compared to other orbits, but still very far above Earth's surface.
- By comparison, most commercial aero planes do not fly at altitudes much greater than approximately 14 km, so even the lowest LEO is more than ten times higher than that.
- Unlike satellites in GEO that must always orbit along Earth's equator, LEO satellites do not always have to follow a particular path around Earth in the same way – their plane can be tilted.
- This means there are more available routes for satellites in LEO, which is one of the reasons why LEO is a very commonly used orbit.
- LEO's close proximity to Earth makes it useful for several reasons.
- It is the orbit most commonly used for satellite imaging, as being near the surface allows it to take images of higher resolution.

Medium Earth orbit (MEO)

Medium Earth orbit comprises a wide range of orbits anywhere between LEO and GEO. It is similar to LEO in that it also does not need to take specific paths around Earth, and it is used by a variety of satellites with many different applications.



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Polar Orbits

- The more correct term would be near polar orbits.
- These orbits have an inclination near 90 degrees. This allows the satellite to see virtually every part of the Earth as the Earth rotates underneath it.
- It takes approximately 90 minutes for the satellite to complete one orbit.
- These satellites have many uses such as measuring ozone concentrations in the stratosphere or measuring temperatures in the atmosphere.

Geosynchronous Orbits

- Also known as geostationary orbits, satellites in these orbits circle the Earth at the same rate as the Earth spins.
- The Earth actually takes 23 hours, 56 minutes, and 4.09 seconds to make one full revolution. So based on Kepler's

Laws of Planetary Motion, this would put the satellite at approximately 35,790 km above the Earth.

- The satellites are located near the equator since at this latitude, there is a constant force of gravity from all directions. At other latitudes, the bulge at the center of the Earth would pull on the satellite.
- Geosynchronous orbits allow the satellite to observe almost a full hemisphere of the Earth. These satellites are used to study large scale phenomenon such as hurricanes, or cyclones. These orbits are also used for communication satellites.
- The disadvantage of this type of orbit is that since these satellites are very far away, they have poor resolution.
- The other disadvantage is that these satellites have trouble monitoring activities near the poles.

