GENERAL STUDIES PAPER-2

SECTION-I

Q1a. What do you know about the Collegium system? Trace its evolution to present form in India.

Ans:

The Collegium System is a system under which appointments/elevation of judges/lawyers to Supreme Court and transfers of judges of High Courts and Apex Court are decided by a forum of the Chief Justice of India and the four senior-most judges of the Supreme Court.' There is no mention of the Collegium either in the original Constitution of India or in successive amendments.

The recommendations of the Collegium are binding on the Central Government; if the Collegium sends the names of the judges/lawyers to the government for the second time. **Working**:

- The Collegium sends the recommendations of the names of lawyers or judges to the Central Government. Similarly, the Central Government also sends some of its proposed names to the Collegium. The Central Government does the fact checking and investigate the names and resends the file to the Collegium.
- Collegium considers the names or suggestions made by the Central Government and resends the file to the government for final approval. If the Collegium resends the same name again then the government has to give its assent to the names. But time limit is not fixed to reply. This is the reason that appointment of judges takes a long time.

Tracing its evolution:

- **First judges case (1982):** The court held that consultation does not mean concurrence and it only implies exchange of views
- Second judges case (1993): The court reversed its earlier ruling changed the meaning of the word consultation to concurrence. Hence, it ruled that the advice tendered by the CJI is binding on the President in matters of appointment of SC judges. But any such advice would be tendered after CJI consults with two of his most senior-judges. It was also decided in the case that President should appoint the senior-most judge in the SC as the CJI.

• **Third judges case (1998):** The consultation process to be employed should be based on plurality of judges. He should consult a collegium of four senior-most judges before making a recommendation to the President and even if two judges give an adverse opinion, he should not send the recommendation to the President.

Experts has also pointed some flaws in current system like lack of transparency, lack of Consensus among the members, delay in judicial appointments, nepotism etc. And the need of reform has been highlighted to ensure independence, reflect diversity, demonstrate professional competence and integrity in the system.

The working of the collegium system under the protocol of Memorandum of Procedure is hitherto the best possible way to appoint a judge of the Supreme Court of India. However, with the need of time, a more efficient system surely needs to be found so that appointment procedure could be fairer and the judiciary will have the best possible minds as judges.

Q1b. Examine the justification and significance of the post of Governor in India.

Ans:

Articles 153 to 167 in Part VI of the Constitution deal with the state executive. The governor is the chief executive head of the state. But, like the president, he is a **nominal executive head** (titular or constitutional head). The governor also acts as an agent of the central government. Therefore, the office of governor has a dual role.

The justification and significance of the post of Governor in India:

- It plays a crucial role in the functioning of the federal structure of the country. The Governor is the constitutional head of each state and acts as the representative of the President of India at the state level.
- The post ensures that there is a direct channel of communication between the Centre and the states. The Governor serves as a link between the Union government and the state government, and facilitates coordination and cooperation between them. The Governor also ensures that the state government functions in accordance with the Constitution and the laws of the land.
- The Governor has several important functions and powers. One of the most significant powers is the power to summon, prorogue and dissolve the state legislative assembly. The Governor also appoints the Chief Minister of the state, and in consultation with the Chief Minister, appoints other ministers of the state government. The Governor also plays a key role in the administration of the state by appointing high court judges, state election commissioners, and other officials.
- The governor also ensure that the states are able to exercise a degree of autonomy while also remaining an integral part of the Union. The Governor acts as a watchdog and ensures that the state government does not act in a manner that is detrimental to the interests of the Union or the people of the state.
- The constitution has provided numerous power to the post of governor like executive, legislative, financial and judicial powers. The Constitution envisages the possibility of the governor acting at times in his discretion e.g. reservation of a bill for the consideration of the President, recommendation for the imposition of the President's Rule in the state, appointment of chief minister when no party has a clear-cut majority in the state legislative assembly etc.

Despite its significance, the office has been criticized for political interference, lack of accountability, conflict with state governments. Going forward, the recommendations of Sarkaria and Punchhi commission should be adhered to for the smooth working of the office of governor.

Q1c. What are the techniques adopted by pressure groups to secure their purpose?

Ans:

A pressure group is a group of people who are organised actively for promoting and defending their common interest. It is called so, as it attempts to bring a change in public policy by exerting pressure on the government. It acts as a liaison between the government

CRACKINGCIVILSERVICES.COM 67 th BPSC GENERAL STUDIES TEST SERIES-2022 Copyright O by CRACKINGCIVILSERVICES.COM

and its members.

Pressure groups resort to three different techniques in securing their purposes.

- **Electioneering:** Placing in public office persons who are favourably disposed towards the interests the concerned pressure group seeks to promote.
- **Lobbying:** Persuading public officers, whether they are initially favourably disposed toward them or not, to adopt and enforce the policies that they think will prove most beneficial to their interests.
- **Propagandizing:** Influencing public opinion and thereby gaining an indirect influence over government, since the government in a democracy is substantially affected by public opinion.

Apart from above techniques, they are also use tools like litigation, strikes and even unconsitutional means like boycotts, violence etc.

Q1d. What was the main cause of removal of the right of property from the fundamental rights in India?

Ans:

The right to property was originally included in the Fundamental Rights of the Indian Constitution under Article 19(1)(f) and Article 31. However, this right was removed from the Fundamental Rights by the 44th Amendment Act in 1978 and was made a legal right under Article 300A.

The cause of removal of the right of property from the fundamental rights in India

- The main cause for the removal of the right to property from the Fundamental Rights was the conflict between economic and social justice. The original inclusion of the right to property as a Fundamental Right was based on the concept of individual liberty and freedom, which was seen as necessary for a democratic society. However, over time, it became clear that the right to property was being used by a few wealthy individuals and corporations to hoard land and resources, leading to an unequal distribution of wealth and resources in the country.
- The government has passed numerous laws restricting this right to property since 1950. The protracted discussion about the link between rights and directive principles was centred on this right.
- This led to a conflict between the right to property and the state's responsibility to promote economic and social justice. The government argued that the right to property was hindering the government's efforts to redistribute land and resources to the poor and marginalized sections of society.
- This facilitated the introduction of the land reform measures and take over the land of large landowners without having to worry about violating their fundamental rights.

Although the right to property is still immune from executive action, it is not so from legislative action. In other words, if the Parliament passes a law to this effect, the acquisition of private property by the state is legally justified. Also, there is no guaranteed right to

compensation in the event of the state acquiring the property under the legislation passed by the Parliament.

Q2. Discuss the importance of election in democracy. Bring out the issues associated with election process in India and suggest the measures to address these challenges.

Ans:

Election is the process of voting to choose an individual at regular intervals for holding public office through free will of the people in a representative democracy.

The importance of election in democracy:

- Make responsible and accountable government
- Change of leadership
- Participation of political parties
- Continuation of democracy: A rule of the people is possible without any elections if all the people can sit together everyday and take all the decisions. But, this is not possible in any large community. Nor is it possible for everyone to have the time and knowledge to take decisions on all matters.
 - Therefore in most democracies people rule through their representatives.
- There is no alternative way of selecting representatives apart from elections. For representatives are selected on the basis of age and experience or on the basis of education or knowledge.
 - The election will still be required for deciding on who is more experienced or knowledgeable. But here the public representative may not be liked by most of the people.
- Symbolic of Nationalism and Patriotism by bringing focus on common fate.
- Self-corrective system by keeping check on ruling parties and made to consider the demands of the public.
- Facilitate social and political integration by linking citizens to each other and thereby confirm the viability of the polity.
- Taking ownership of the democratic process through expressing partisanship and alienation from the political community.

Therefore, elections are considered essential in our times for any representative democracy.

The issues associated with election process in India:

• Financing of elections- use of black money, issues related to electoral funding

- Muscle power
- Misuse of Government Machinery
- Criminalisation of Politics and Politicization of Criminals: According to data of Association for Democratic Reforms (ADR) 68% of elected MLAs in Bihar face criminal charges.
- Dummy Candidates in Political Parties
- Casteism
- Communalism
- Influence of Social-Media
- Frequent elections

- Questions raised on Electronic voting machine- storage and counting concerns, lack of secrecy, claims about EVMs being vulnerable to malicious programming
- Issues of election freebies against the roots of free and fair election in a democracy
- Issued with the office of election commission- no prescribed eligibility criteria, appointment done solely by executive, expenditures are not charged on the consolidated fund of India etc.

Steps taken in this direction:

- Promoting Transparency: e Electoral Bonds, Mandatory declaration of income sources
- Increasing Voter Participation: Lowering of Voting age, Voting through postal ballot, Election Laws (Amendment) Bill, 2021
- Leveraging technologies to strengthen voting process: Electronic Voting Machines, NOTA option
- Preserving the sanctity of elections: Enactment of Anti Defection Law, Prosecution of politicians
- Creating a level playing field: Model code of conduct, Ceiling on election expenditure, Restriction on exit polls

The measures to address these challenges:

- Participatory democracy: Increase the representation of youth and women in the institutional structures of EMBs.
- Financial transparency by incorporating public scrutiny and partial state funding.
- Intra-party democracy in the parties and candidates should be selected democratically.
- Disclose their funding: They must publicly account for their assets and for the sources and use of their funds.
- State Funding of elections: This would help to curb corruption, use of black money, curb money power and cleaner candidates with less financial backup would also be able to contest elections.
- Law Commission Report: It recommended that certain serious offences such as booth capturing, rigging and intimidation of voters should itself be added as a ground of disqualification.
- Strengthening Election Commission: To regulate the affairs of a political party for a cleaner electoral process, it is important to strengthen the election commission.
- Vohra Committees Report: Recommendations given by Vohra committee on criminalization of politics and of the nexus among criminals, politicians and bureaucrats, should be implemented
- Fast track courts should be set up to quickly dispose of cases pending against politicians.
- Conduct and Better Management of Elections by putting restriction on opinion poll, proliferation of candidates, introducing the totalizer machines etc.
- Empowering Election Commission to enforce MCC by giving it legal status and power to de-register political parties if they violate MCC guidelines.
- Need Based Freebies with Transparency by segregating haves and have-nots and identifying real beneficiaries. E.g., ensuring that farm loan waiver reaches only actual farmers.

CRACKINGCIVILSERVICES.COM 67 th BPSC GENERAL STUDIES TEST SERIES-2022 Copyright O by CRACKINGCIVILSERVICES.COM

- Rethink anti-defection law: Instead of looking at internal party processes, one way to decentralise power is by getting rid of the anti-defection law. The need to canvass votes in the legislature will create room for negotiation in the party organisation too.
- use of VVPATs to avoid the issues related to EVM machine.
- Further consideration should be given on idea of ' One Nation One Election'.

Thus, holistic approach should be taken to deal with the issues related to election. If elections are conducted in ideal manner while truly abiding by the constitutional provisions, it is always good for democracy.

[OR]

Q. Are Fundamental Rights and Directive Principles of State Policy complementary and supplementary to each other? Give reasons in support of your answer.

Ans:

The fundamental rights and DPSPs are enumerated in the part III (Art 12-35) and Part IV (Art 36-51) of the constitution respectively. The Directive Principles along with the Fundamental Rights contain the philosophy of the Constitution and is the soul of the Constitution. Granville Austin has described the Directive Principles and the Fundamental Rights as the 'Conscience of the Constitution.

Some differences between Fundamental Rights and directive principles of state policies (DPSP):

Fundamental Rights	DPSP
They are enumerated in Part III of the Indian Constitution.	They are enumerated in Part IV of the Indian Constitution.
Covered under Articles 12 to 35	Covered under Articles 36 to 51.
Borrowed from US Constitution (Bill of Rights)	Borrowed from the Irish Constitution.
They are justiciable in nature i.e.; they are legally enforceable in the court of law in case of their violation.	They are non-justiciable in nature i.e.; they are not legally enforceable in the court of law.
They promote the ideal of political democracy .	They promote the ideal of social and economic democracy .
They promote the welfare of the individual .	They promote the welfare of the community.
Almost all Fundamental Rights, excluding few like Right to Education etc, do not require any legislation for their implementation . They are automatically enforced. These have legal sanctions.	DPSP's require legislation for their implementation . They are not automatically enforced. These have moral and political sanctions.

These are negative as they restrict the power of the state.	These are positive as they require the State to take certain steps.
Judiciary can declare a law as unconstitutional and invalid if it violates the Fundamental Rights.	The courts cannot declare a law violative of any of the Directive Principles as unconstitutional and invalid.

Despite these differences both of them are considered complementary and supplementary to each other:

- Fundamental Rights are the individual rights guaranteed by the Constitution to every citizen. These rights are meant to ensure that citizens have the freedom to live with dignity and security. On the other hand, Directive Principles of State Policy are the guidelines given to the government for framing policies and laws to promote the welfare of the people.
- While Fundamental Rights focus on protecting individual rights, Directive Principles of State Policy focus on promoting the collective welfare of the society. Both these principles are important for the overall development of the country.
- The Directive Principles of State Policy also provide a framework for the government to implement policies and programs that protect and promote Fundamental Rights. For example, the Right to Education (Article 21A) is a Fundamental Right that is supported by the Directive Principle of State Policy on free and compulsory education (Article 45).
- The Constitution mandates that the government must balance both Fundamental Rights and Directive Principles of State Policy while making laws and policies. This means that the government must ensure that the policies it makes do not violate Fundamental Rights, while at the same time promoting the objectives of Directive Principles of State Policy.
- in Kesavananda Bharti case: The fundamental rights and directive principles constitute the "conscience of the constitution" there is no antithesis between the fundamental rights and directive principles and one supplements the other.
- Supreme court in Minerva Mills said that the fundamental rights "are not an end in themselves but are the means to an end." The end is specified in the directive principles. And that the Indian Constitution is founded on the bedrock of the balance between Fundamental Rights and the Directive Principles.
- Various provisions indicate this: Equal pay for equal work and equitable distribution of goods under DPSP are enforceable under fundamental right of equality. Free legal aid ensures the protection of life and personal liberty under FRs.
- Under provisions of DPSP govt. reshaped fundamental right of property into legal right to property. Similarly, under right to life, SC taken cognizance of children education and declared RTE as right to life.
- The Court has held that the Directive Principles of State Policy are not justiciable, but they can be used as guidelines for interpreting Fundamental Rights.

Thus, Fundamental Rights and Directive Principles of State Policy are complementary and supplementary to each other. The Constitution mandates that the government must balance

both these principles while making laws and policies, ensuring that citizens have the freedom to live with dignity and security, while at the same time promoting the overall welfare of the people.

Q3. Pluralism and Secularism are essential for Indian Democracy. Do you agree? Comment.

Ans:

Secularism is the "indifference to, or rejection or exclusion of, religion and religious considerations." Under a brief definition, secularism means that governments should remain neutral on the matter of religion and should not enforce nor prohibit the free exercise of religion, leaving religious choice to the liberty of the people.

Pluralism in theory relates to the Co-Existence of various Religious, Cultural and Diverse Groups of people within a definite territory. Indian pluralism has been a source of inspiration to many countries, as, besides the social homogeneity witnessed in Indian Society, Pluralism to also protected by the Constitution of India under Democracy and Secularism.

Importance of Secularism for Indian democracy:

- Secularism has both positive and negative contents.
- The Constitution struck a balance between temporal parts confining it to the person professing a particular religious faith or belief and allows him to practice profess and propagate his religion, subject to public order, morality and health.
- The positive part of secularism has been entrusted to the State to regulate by law or by an executive order.
- The State is prohibited to patronise any particular religion as State religion and is enjoined to observe neutrality.
- The State strikes a balance to ensue an atmosphere of full faith and confidence among its people to realise full growth of personality and to make him a rational being on secular lines, to improve individual excellence, regional growth, progress and national integrity.
- Religious tolerance and fraternity are basic features and postulates of the Constitution as a scheme for national integration and sectional or religious unity.
- Positive secularism negates such a policy and any action in furtherance thereof would be violative of the basic features of the Constitution.

Importance of Pluralism for Indian democracy:

- Ours is a plural society and a culture imbued with considerable doses of syncretism. Our population of 1.3 billion comprises of over 4,635 communities, 78 percent of whom are not only linguistic and cultural but social categories.
- Religious minorities constitute 19.4 percent of the total. The human diversities are both hierarchical and spatial.
- It is this plurality that the Constitution endowed with a democratic polity and a secular state structure.
- Pluralism as a moral value seeks to 'transpose social plurality to the level of politics, and to suggest arrangements which articulate plurality with a single political order in which all duly constituted groups and all individuals are actors on an equal footing, reflected in the uniformity of legal capacity.
- Pluralism in this modern sense presupposes citizenship.

- Our democratic polity is pluralist because it recognizes and endorses this plurality in (a) its federal structure, (b) linguistic and religious rights to minorities, and (c) a set of individual rights.
- The first has sought to contain, with varying degrees of success, regional pressures, the second has ensured space for religious and linguistic minorities, and the third protects freedom of opinion and the right to dissent.

Tolerance alone is not a strong enough foundation for building an inclusive and pluralistic society. It must be coupled with understanding and acceptance. We must, said Swami Vivekananda, 'not only tolerate other religions, but positively embrace them, as truth is the basis of all religions.'

Constraints to pluralism and secularism today:

• Uniform Civil Code:

- No progress has been made in the evolution of a uniform Civil Code.
- There are deep religious sentiments prevailing among different religious communities.
- It limits the path to a truly secular society in India

• Politics and Religion:

- The Supreme Court had observed in the Bommai case that if religion is not separated from politics, the religion of the ruling party tends to become the state religion.
- During the time of elections most of the political parties completely forget the noble ideal of secularism and woo the voters on communal or cast lines.

• Communalism:

- Increasing violence between people of different communities or religions.
- Rise of fringe elements threatens India's history of communal harmony and peace.
- Instances like demolition of the Babri Masjid, anti-Sikh riots in Delhi and other places in 1984 are on the rise.
- Rise of fundamentalism and obscurantism:
 - Religious entities have taken up the radicalisation of youths to promote their religion.
 - This poses grave threat to the harmony and security of the nations.

Failure of the Government in Evolving a Just Economic Order:

- The failure of the government to evolve a just economic order and eliminate
- poverty also is a setback to secularism.

Cultural Symbols and Secularism:

- Many public rituals like bhoomi pujan, breaking of coconuts on inaugural occasions, performing of 'aarti' and applying 'tilak' are perceived by Hindus as cultural or nationalistic expressions, but to non-Hindus these are manifestations of Hindu culture.
- Such rituals are performed even on state functions and therefore, create unnecessary misgivings about the neutrality of the State.
- Schools today have become havens of social isolation where children of similar economic and social backgrounds are unaware of the kind of social diversity that exists outside their little worlds.

Way forward:

- Since secularism has been declared as a part of the basic structure of the Constitution, governments must be made accountable for implementing it.
- Define the word "minority". The concept of secularism is based on recognition and protection of minorities. The two cannot be separated.
- Setting up of a commission on secularism for ensuring adherence to the constitutional mandate on secularism.
- Separation of religion from politics. It is of such urgency that no time should be wasted in bringing this about.
- It is the duty of the secular and democratic forces to rally behind those political forces that really profess and practice secularism.
- In a secular state, religion is expected to be a purely personal and private matter and is not supposed to have anything to do with the governance of the country.

[OR]

Highlighting the significance of Fundamental Duties in India, examine the existence of legal provisions for their implementation.

Ans:

In 1976, the Congress Party set up **the Sardar Swaran Singh Committee** to make recommendations about fundamental duties, the need and necessity of which was felt during the operation of the internal emergency (1975–1977). The committee recommended the inclusion of a separate chapter on fundamental duties in the Constitution.

Government enacted the **42nd Constitutional Amendment Act in 1976.** This amendment added a new part, namely, **Part IVA** to the Constitution. This new part consists of only one Article, that is, **Article 51A** which for the first time specified a code of ten fundamental duties of the citizens.

Significance of Fundamental Duties in India

In spite of criticisms and opposition, the fundamental duties are considered significant from the following viewpoints:

- They serve as a **reminder to the citizens** that while enjoying their rights, they should also be **conscious of duties they owe to their country, their society and to their fellow citizens.**
- They serve as a warning **against the antinational and antisocial activities** like burning the national flag, destroying public property and so on.
- They serve as a source of **inspiration** for the citizens and **promote a sense of discipline and commitment** among them. They create a feeling that the citizens are **not mere spectators** but **active participants** in the **realisation of national goals**.
- They help the courts in examining and **determining the constitutional validity of a** law.
 - In 1992, the Supreme Court ruled that in determining the constitutionality of any law, if a court finds that the law in question seeks to give effect to a fundamental duty, it may consider such law to be 'reasonable' in relation

to Article 14 (equality before law) or Article 19 (six freedoms) and thus save such law from unconstitutionality.

• **They are enforceable by law.** Hence, the Parliament can provide for the imposition of appropriate penalty or punishment for failure to fulfil any of them.

Existence of legal provisions for the implementation of Fundamental Duties The Verma Committee on Fundamental Duties of the Citizens (1999) identified the

existence of legal provisions for the implementation of some of the Fundamental Duties. They are mentioned below:

- **The Prevention of Insults to National Honour Act (1971)** prevents disrespect to the Constitution of India, the National Flag and the National Anthem.
- The various **criminal laws in force** provide for punishments for encouraging enmity between different sections of people on grounds of language, race, place of birth, religion and so on.
- The Protection of Civil Rights Act 4 (1955) provides for punishments for offences related to caste and religion.
- The Indian Penal Code (IPC) declares the **imputations and assertions prejudicial to national integration as punishable offences.**
- The Unlawful Activities (Prevention) Act of 1967 provides for the declaration of a communal organisation as an unlawful association.
- The Representation of People Act (1951) provides for the disqualification of members of the Parliament or a state legislature for indulging in corrupt practice, that is, soliciting votes on the ground of religion or promoting enmity between different sections of people on grounds of caste, race, language, religion and so on.
- The Wildlife (Protection) Act of 1972 prohibits trade in rare and endangered species.
- **The Forest (Conservation) Act of 1980** checks indiscriminate deforestation and diversion of forest land for non-forest purposes.

The inclusion of fundamental duties has helped to strengthen democracy. The moral value of fundamental duties would be not to smother rights but to establish a democratic balance by making the people conscious of their duties equally as they are conscious of their rights'. There was an eventual consensus on the necessity and desirability of including the Fundamental Duties in the Constitution. This is clearer with the addition of one more Fundamental Duty in 2002 by the 86th Amendment Act.

SECTION-II

Q4a. Can Bihar be termed as rice bowl of India? Discuss.

Ans:

Bihar, as Rice Bowl:

- Grown in the Kharif season, rice is the **staple food crop** in Bihar.
- In 2013, Bihar got Krisihi Karman award for good production of rice.
- The compound annual growth rate (CAGR) in Rice production was among heighest with 9.6% in last three years. While CAGR of productivity was also 12.08%.

- Bihar has total 31.597 lakh hectare of area under rice cultivation with total production of 61.55 lakh tonnes.
- In terms of **production**, the **leading districts** are Rohtas (9.5 lakh tonnes), Aurangabad (6.8 lakh tonnes) and West Champaran (6 lakh tonnes), which together accounted for 30.2 percent of the total rice production in the state in 2020-21.
- Considering the **level of productivity of in 2020-21**, the leading districts are West Champaran (4620 kg per hectare), Rohtas (4370 kg per hectare), and Aurangabad (3803 kg per hectare).
- Because of high production and productivity, Rohtas district is also known as Rice bowl of Bihar.
- Overall, the rice production has improved because of the efforts of the State Government towards achieving technological breakthroughs, such as the SRI (System of Ricc Intensification) technology and zero tillage methods.
- The State Government has encouraging cultivation of **short-duration and drought-resistant varieties** of rice as well.

However, calling Bihar a rice bowl of India is questionable:

- Krishna Godavari Basin is commonly known as the rice bowl of the country, due to the high production of rice in this region.
- West Bengal is the largest rice-producing state in India. Bihar ranks at 6th position.
- Land fragmentation, lack of agri-modernization, dependency on monsoon etc. are challenges in realising full potential of rice production in Bihar.

Q4b. Write a note on the physiographical division of Bihar.

Ans:

Bihar is the twelfth-largest state of India. It's average elevation of about 150 meters above mean sea level. Bihar has three parts on basis of physical and structural conditions- **Southern Plateau Region**, **Bihar Plain**, and **Shivalik Region**.

The physiographical division of Bihar:

- The Shivalik Range Region:
 - Shivalik Hills are off-shoots of the Himalayan system and this sub-Himalayan foothills region lies in the northern part of the Bihar.
 - Its total area in Bihar is 932 sq km.
 - There are some small hills like Someshwar range, Rmnagar Dun, Dun Valley, in the extreme north of West Champaran.
 - Ramnagar Dun: Maximum height of these small hills spreading over an area of 214 sq km is 240 m.
 - Someshwar Range: It is spread over 75 sq km and the highest peak of this range is 874 m.
 - Dun valley: it lies in between Ramnagar Dun and Someshwar range. It is about 24 km long and higher than alluvial plain of Ganga, is also known as the Harha river valley.
 - South of it lies the Tarai region, a belt of marshy and sparsely populated region.
- The Indo-Gangetic Plain of Bihar:

- Bihar's Plain is located between the Southern Plateau and Northern Mountains which is bounded by 150m contour line in the North as well as in the South.
- $\circ~$ Its total area is 90,650 sq km. i.e. 96.27 % of the total area of Bihar.
- The Ganga is the most dominant river of Bihar state and is joined by the rivers: Ghaghra, Gandak, Burhi Gandak, Bagmati, Kamla-Balan, Kosi and Mahananda flowing southward from Himalayas in northern part of the Gangetic Plain.
- The vast stretch of fertile Bihar Plain is **divided by the Ganges River into two unequal part** - the North Bihar and the South Bihar.
- **Plain of north Bihar**: 56,980 sq km.
 - It extends from Ghaghra river in the west to kosi and Mahananda rivers in the east.
 - The average height from sea level is 76 km and slope is towards southeast from north-west.
- Plain of south Bihar: 33,670 sq km.
 - There are many hills in this plain like Pretshila, Ramshila, Jethiyan of Gaya, Ratnagiri of Rajgiri etc.
 - The Taal region of South Bihar is spread from Patna to Mokama.
 - The plain of south Bihar has three parts: Plain of Bhojpur, Plain of Magadh, Plain of East.
- The Southern Plateau Region:
 - The region is in the southern flanks of Bihar between Southern Plain and Chhotanagpur Plateau of Jharkhand. It lies between Kaimur in the West to Banka in the East and It is made up of hard rock's like gneiss, schist and granite. In reality it is the outer part of Peninsular plateau.
 - Its area is around 2581 sq km.
 - This region blessed with many conical hills which are made up of batholith like Pretshil, Ramshila and Jethian hill.
 - It has two parts:
 - Plateau of Kaimur: aka Plateau of Rohtas.
 - It is at height of 454 m and Primarily limestone, pyrite, sand for glass making and sand stone are found.

Hills of Kharagpur:

- Its height is 450 m.
- Granite, shell, slate and quartzite rocks are found here.

Thus, Bihar's physiographical division is characterized by the Himalayan foothills in the north, the Gangetic Plains in the central and southern parts, the Chota Nagpur Plateau in the south, and the North Bihar Plains in the northeast. Each of these regions has its unique features, which influence the geography, economy, and culture of the state.

Q4c. What are the significance and challenges associated with the river interlinking project in India?

Ans:

The river interlinking project aims to link India's rivers by a network of reservoirs and canals that will allow for their water capacities to be shared and redistributed. Some experts claim that this is an engineered panacea that will reduce persistent floods in some

parts and water shortages in other parts besides facilitating the generation of hydroelectricity for an increasingly power hungry country.

Many projects like Ken-Betwa, Bedti-Varada rivers in Karnataka, Damanganga-Pinjal, Par-Tapi-Narmada, Godavari-Krishna, Krishna-Pennar, Pennar-Cauveri are in the offing in India. **Significance of River linking projects**

- India receives most of its rain during monsoon season from June to September, most of it falls in northern and eastern part of India, the amount of rainfall in southern and western part are comparatively low. It will be these places which will have shortage of water. Interlinking of rivers will help these areas to have water throughout the year.
- This will cut farmers dependence on monsoon rains by bringing millions of hectares of cultivatable land under irrigation.
- Crop productivity would increase and so would revenues for the State.
- Even one bad monsoon has a direct and debilitating economic impact.
- The river linking project will ease the water shortages in western and southern India while mitigating the impacts of recurrent floods in eastern India.
- The Ganga Basin, Brahmaputra basin sees floods almost every year. In order to avoid this, the water from these areas has to be diverted to other areas where there is scarcity of water. This can be achieved by linking the rivers. There is a two way advantage with this floods will be controlled and scarcity of water will be reduced.
- Simultaneous floods and droughts continue to wreak havoc, destroying the lives and livelihoods of millions.
- India needs clean energy to fuel its development processes, and river water can be leveraged for this.
- Fulfilling water needs impact socio-economic life of people which will help end poverty.
- Need for interlinking of rivers to prevent inter-state water disputes.
- Potential benefits to transportation through navigation, as well as broadening income sources in rural areas through fishing.

Challenges posed

- The idea that river linking would allow us to cope with flood in the north east and shortage of water in the Deccan is the positive aspect as pointed earlier but misleading one too.
- This floods come at the time when most parts of the country run short of water, we need to hold the water somewhere to use it in dry season but the amount of flowing in the short period of time in Brahmaputra and Ganga is so huge to store and use it later.
- Variability in rainfall is high which is the main source in the country, flood and drought simultaneously within the states of Bihar and Maharashtra.
- Irrigation potential from interlinking rivers will have limited impact. The net national irrigated area from big dams has decreased and India's irrigated area has gone up primarily due to groundwater.
- Interlinking of rivers is a **very expensive proposal**. The amount required for these projects is so huge that government will have to take loans from the foreign sources which would increase the burden on the government and country will fall in a debt trap.
- The river interlinking project will adversely affect land, forests, biodiversity, rivers and the livelihood of millions of people.

CRACKINGCIVILSERVICES.COM 67 th BPSC GENERAL STUDIES TEST SERIES-2022 Copyright O by CRACKINGCIVILSERVICES.COM

- The Ken-Betwa link threatens about 200 sq. km of the Panna tiger reserve.
- Interlinking of rivers will lead to **destruction of forests, wetlands and local water bodies**, which are major groundwater recharge mechanisms.
- Less than positive experience that other countries have, like diversion of Amu Darya and the Syr Darya or the Australia's experiments in its Murray Darling basin.
- It causes massive **displacement of people**. Huge burden on the government to deal with the issue of rehabilitation of displaced people.
- Due to interlinking of rivers, there will be decrease in the amount of fresh water entering seas and this will cause a serious threat to the marine life.
- The Shah committee pointed out that the linking of rivers will affect natural supply of nutrients for agricultural lands through curtailing flooding of downstream areas.

Way forward

- To look at water as a strategic resource for development.
- Environment is one issue where anyone of us should be concerned about.
- Best practices done by China and neighbouring countries needs to be looked upon.
- The biggest, cheapest, most benign, possibly fastest and most decentralized storage option for India is the groundwater
- Invest in water conservation, more efficient irrigation and better farm practices.
- Recycling of water for internal usage as that of Israel.
- We need a mandatory enforceable river policy aimed at treating rivers as national treasure.
- Accumulation of silt in huge quantities, particularly the Ganga and its tributaries. These rivers need to be desilted.
- River linking in the south and other parts which was undertaken in the past has been going well so such model needs to be taken forward.
- Planting trees on the river banks is one way of bringing life back to the rivers.
- Forest catchments will need to be restored, wastewater from industries and towns will need to be treated, sand mining need to be stopped.
- Need to build the responsibility, capability and accountability in our water management institutions to revive our rivers.
- The judicious use of canal water, growing crops that are appropriate to a region, encouraging drip irrigation and reviving traditional systems such as tanks.

The river linking project is a great challenge and an opportunity to address the water issues arising out of climate change. The long-term solution to water scarcity lies in making the IRL project work by building a network of dams and canals across the length and breadth of the country. However, interlinking has to take place after a detailed study so that does not cause any problem to the environment or aquatic life.

Q4d. Briefly discuss about the Seven Commandments in Saat Nishchay Part-2 of Bihar Government.

Ans:

Saat Nishchay (Seven Resolves) Part-2 is a program launched by the Government of Bihar in 2020. The program focuses on seven key areas of development in Bihar, and the government has outlined seven commandments to achieve these objectives. The seven commandments are as follows:

- Yuva Shakti Bihar ki Pragati- to enable jobseekers to earn a good job and to enable students to pursue higher education.
 - **Bihar Student Credit Scheme:** An education loan of Rs. 4 lakh is being provided to every 12th pass students, willing to go for higher education who otherwise is deprived due to financial reasons.
 - **Mukhyamantri Nishchay Swayam Sahayta Bhatta Yojana:** unemployed youth between the age of 20-25 years who in search of employment, is being provided Rs.1000 per month for a maximum period of two years.
 - **Mukhyamantri Yuva Udyami Yojna** to encourage entrepreneurship and self-employment among youth of Bihar.
 - Kushal Yuva Program: Youth between the age of 15-28 who have cleared the class 10th exam or equivalent, receives basic training in language (Hindi & English) and Communication skills, Basic Computer Skills and soft skills.
 - Bihar Start Up Policy, 2016: envisages speedily industrial development. The priority areas identified under this policy are: Food processing, Tourism, Small Machine Production, Information Technology, Electricals & Electronics Hardware, Plastic and Rubber, Leather, Health Services, Renewable energy, Textile and Technical education.
 - **Bihar Industrial Investment Promotion Act, 2016** has been promulgated to simplify the process of industrial investing in the state.
 - **Free Wi-Fi facility in all universities and colleges**: to provide educated youth with internet connectivity in order to connect the youth of the state to e-Governance.
 - Establishing mega-skill development centre in each district, and tool rooms in each division.
 - The Bihar Education Project Council has conducted 'Praveshotsav-Special Enrolment Drive' in March-2021
- Sashakt Mahila Saksham Mahila- for women empowerment.
 - 35% of reservation is being provided to women in all government jobs of the State.
 - Providing cash incentive to female students: Rs 25,000 upon completing senior secondary and Rs 50,000 upon completing graduation,

Mukhyamantri Mahila Udyami Yojna: To enhance female entrepreneurship in the state, a special scheme has been planned. Under this scheme, for the industries planned by females, 50 percent of the project cost is borne by the State Government. Additionally, a maximum grant of up to Rs. 5.00 lakh and interest-free loan (maximum up to Rs. 5.00 lakh), is also given to the female entrepreneurs.

- **Encouragement of Girls for Higher Education**: To promote higher education among girls, an amount of Rs. 25,000 is given to unmarried girls on completion of intermediate and Rs. 50,000 on completion of graduation.
- **Participation of Women in Regional Administration as per Reservation**: The participation of women in regional administration, police, block, sub-

division and district-level offices is planned to be increased according to a reservation plan.

- **Mukhyamantri Nari Shakti Yojna-** a comprehensive scheme for social, economic and cultural empowerment of women.
- Har Khet Tak Paani- to provide irrigation facility to every agricultural land in the state.
 - The public expenditure in irrigation has more than doubled since last five years.
 - Many Major and Medium Irrigation schemes are running to achieve this objective by increasing irrigation potentials and water use efficiency. e.g. Baghelaghat Weir irrigation system, restoration of Western Gandal Canal system, Dhadhar Diversion system etc.
 - Under Jal-Jeevan-Jariyali Abhiyan, more than 1600 schemes has been approved of which more than 1300 has been completed. A total irrigation potential of 1.2 lakh hectares of land has been created.
- Swachcha Gaon Samridh Gaon: to make each and every village in the state clean and prosperous.
 - **Mukhyamantri street light yojana**: solar street lights will be installed in all the villages of Bihar.
 - **Mukhyamantri Gramin Peyjal Nishchay Yojana**: to provide potable (safe drinking) water facilities in rural area.
 - Mukhyamantri Gramin Peyjal (Gunvatta Prabhavit Kshetra) Nishchay Yojana: The scheme is being implemented in those Gram Panchayats where water is completely affected by Iron, Flouride and Arsenic. The motive of this scheme is to provide potable (safe & drinking) water facilities in these Panchayats.
 - Mukhyamantri Gramin Peyjal (Gair Gunvatta Prabhavit Kshetra) Nishchay Yojana: This scheme is being implemented in the wards of quality affected panchayats where the water quality is not affected.
 - Scheme for development of animal and fisheries in bihar.
- Swachh Shahar Viksit Shahar aims to improve infrastructure and constructing shelter homes for old age people, multi-storey flats for poor people and electric crematorium in all the major cities in the state.
 - Mukhyamantri Shahri Peyjal Nishchay Yojana: to provide potable (safe drinking) water facilities in households under urban local bodies of the State.
 Scheme for solid and liquid waste management.
 - The Bihar Cleaner Fuel Policy -2019: Provides one time subsidy for replacement of vehicle to CNG vehicle.
 - Mukhyamantri Bhukshavritti Nivaran Yojana- To guard the rights of beggars by ensuring care, protection and development through enabling policies.
- **Connectivity Hogi Aur Asan** To build bypass and flyovers as well as to increase rural roads connectivity in the state.
 - **Gramin Tola Sampark Nishchay Yojana:** covers all the habitations of more than 250 but less than 500 population in all the districts.
 - **Mukhyamantri Gramin Gali-Naali Nishchay Yojana:** to provide all weather connectivity and drainage facilities in all rural wards in the state.
 - **Mukhyamantri Shahri Naali Gali Nishchay Yojana :** The aim of this scheme is to provide all weather connectivity.

- Sabke Live Swasthya Suvidha- providing better health services facilities to the people, both at urban and village level.
 - Provision of telemedicine using mobile app and call centers, pathology, and screening for diabetes, blood pressure etc in primary healthcare centres.
 - Animal hospital will be built in every 8-10 panchayat.

Q5 Decentralization of Industries towards rural areas will not only ensure balanced regional growth, but will also reduce the exceeding population pressure in and around metropolis and urban centres. Do you agree?

Ans:

Industrialisation and urbanisation generally two closely related phenomena. In India the industrial growth has mostly concentrated around the mega cities. And lack of planning has resulted in disordered urbanisation and regional disparities.

Decentralization of Industries towards rural areas will ensure balanced regional growth:

- Our cities occupy just 3% of the nation's land, but their contribution to the GDP is a whopping 60%. And the cities also performs better in terms of economic indicators like percapita income, education level, infrastructure, invesment etc.
 - e.g. Patna with 44.3 percent of urbanisation has 7 time per capita income (at 1.31 lakh Rs.) to that of Sheohar(0.19 lakh Rs.) which has only 6.9 percent of urbanisation.
- Generally **more industrialised states** are also more urbanised one. And they perform better in terms of socio-economic indicators like education, health, per-capita income, infrastructure, logistics and investments etc.
 - e.g. Bihar with low industrialisation and urbanisation (15.3% according to Bihar economic survey) and also has lowest per capita income which is only 35.8 percent of national average. Maharashtra with heavy concentration of industries has per Capita income five times to that of Bihar.
- **Kerala** which focused more on decentralised planning and small scale industries has high level of urbanisation (47.7%) has been ranked state with least level of poverty in multidimensional poverty index on NitI Ayog. While Bihar has been ranked most poor state in the same index.
 - Similar trend was found in niti aayog sustainable development index 2021 with Kerala on the top and Bihar at the bottom.
 - This impact of lopsided industrial concentration is also visible in **north-south disparity in Bihar** and concentration of urban population in larger towns.
- With industrial decentralisation towards rural areas, the economic opportunities will also spread creating jobs, checking brain drain from a region, developing infrastructure, boosting investment and entrepreneurship. skill developement and reducing disguised unemployment etc.

So, to ensure balanced regional growth, there is need of expanding the spatial presence of industries towards rural region.

It will also reduce the exceeding population pressure in and around metropolis and <u>urban centres</u>:

- Most Indian metro cities are facing issue of heavy population density like 22,000 people per square kilometer in Kolkata, 21,000 people per square kilometer in Mumbai.
- As per 2011 census about **31% of Indian population is living in Urban area** and it is expected to increase **about 50% by 2050**.
 - Between 2001 to 2011 there was growth of 17.64 per cent in population living in urban area. A large portion of this growth came from the migration of people from rural to urban area.
- About **17% of Urban population is living in slum area** with little civic amenities. According to 2011 census, almost 65.5 million Indians live in urban slums and sprawls.
- Heavy pressure of population is also reflected in increase in **pollution**, **overcrowding**, **unemployment** etc.
 - According to NSO India's unemployment rate is 9.3% in urban areas in 2021.
 - According to a recent study, **fifteen of the top 20 most polluted cities in the world** are located in India.
- Increasing population has also resulted in problem of urban sprawl i.e. **dispersed outgrowth of areas outside the city's core**, engulfing many villages around it without any town planning.
 - This poses many economic, ecological and institutional challenges. These areas are often characterized by the absence of basic infrastructure and services like water, sanitation, electricity, roads and transportation.
 - Unplanned outgrowth of town is also associated with issues like urban flood, water logging, traffic congestion etc.
 - According to the World Bank's Agglomeration Index, the share of India's population living in areas with urban-like features in 2010 was 55.3 per cent. This compares to an official urban share of the population of just over 31 per cent, suggesting the existence of considerable hidden urbanisation.
 - This hidden urbanisation is symptomatic of the failure to adequately address congestion constraints that arise from the pressure of urban populations on infrastructure, basic services, land, housing, and the environment.
- Because of these core issues related to the urbanisation in India none of our cities feature among even the top 100 cities in Global Liveability Index 2022. (Mumbai is ranked at 117th position and Chennai and Ahmedabad are in the 142nd and 146th positions respectively)

However, **the decentralisation of industries towards rural area should be well planned one**. Blind decentralisation may be counter productive.

- Without quality physical **infrastructure** in rural area, moving of industries away from cities may compromise economic growth and job creation.
- Industrial locations are determined by various factors like availability of raw materials, connectivity with the market, availability of skilled labour etc. The spatial expnasion of industries still needs to consider these factors.

CRACKINGCIVILSERVICES.COM 67 th BPSC GENERAL STUDIES TEST SERIES-2022 Copyright O by CRACKINGCIVILSERVICES.COM

Government has taken various steps in this direction like National Rurban Mission (to develop a cluster of villages with inclusive urban facilities), ASPIRE (To boost Rural Industries & Entrepreneurship), promoting MSME sector (which is more regionally spread), PM Gram Sadak Yojana, Saubhagya Scheme etc.

Going forward there is need of qualitative improvement in urban planning capacity and integrating the positive elements of both urban and rural area for a building an inclusive Atmanirbhar Bharat.

[OR]

Q.Do you think that there is an inherent trade-off between the two goals of environmental protection and Economic development? Discuss how India should manage balance between economic development and environmental sustainability.

Ans:

In last few centuries, we have seen fast economic growth and rise in standard of living based on industrialisation. However the same is said to have resulted in unprecedented environmental deterioration, climate change, soil degradation and numerous disasters. This have led to the environment versus development debates among experts. ©<u>crackingcivilservices</u>.com

Because of some negative impacts of economic growth on environment, it is general view among many that there is a trade-off between the two goals of environmental protection and Economic development:

- Focus on economic growth with GDP statistics leads to serious undermining of environment and resource exploitation, leading to environmental degradation.
- According to the Sixth IPCC Assessment Report, human influence has unequivocally warmed the atmosphere, ocean and land and there has been observed increase greenhouse gas (GHG) concentrations since around 1750.
 - Human-caused global surface temperature increase from 1850–1900 to 2010– 2019 is estimated to be 1.07°C.
 - Human-induced climate change is also linked to extreme weather events such as heatwaves, heavy precipitation, droughts, and tropical cyclones etc.
- Energy needs for the functioning of all the sectors of economies and more in energyintensive sectors like transport sector and industries. It results in GHG emissions posing challenges to environmental protection. e.g. Transport in India is the third most CO2 emitting sector.
- The **green revolution** though boosted the agricultural productivity, it took a heavy toll on the environment. Overuse of pesticides, fertilisers and ground water for irrigation led to loss of soil fertility, erosion of soil, soil toxicity, diminishing water resources, pollution of underground water, salinity of underground water, increased incidence of human and livestock diseases etc.
- According to the Centre for Science and Environment's (CSE) new report entitled 'State of India's Environment in Figures 2021', over 90% of the area under the biodiversity hotspots in India have been lost, major causes being Habitat destruction, Over-exploitation of resources, deforestation, Natural and man-made disasters etc.

- India faces a growing crisis of **land degradation**: According to Desertification and Land Degradation Atlas of India- ISRO, **nearly 30% of its land area has been degraded** through deforestation, over-cultivation, soil erosion and depletion of wetlands. Need of infrastructure development and exploitation resources contributes in this.
- **Multi purpose dams** like Sardar Sarovar Dam, Damodar Ghati Project etc and also **river interlinking projects** (e.g. Ken and Betwa linking) brought extensive environmental consequences like hindering free flow of water, threat on wildlife natural habitat, waterlogging and salinization of water, silting of the river bed, deforestation etc.
- Environment protection projects needs **investment and financing** which puts extra burden on the budget of developing and underdeveloped countries. It takes away a chunk of capital which could be used to support economic growth.
- Environment protection groups speaks against the introduction of **Genetically modified crops** which can be used to increase productivity and to ensure food productivity.
- Experts argue that the fulfilment of **India's developmental imperatives** like eradication of poverty, provision of basic needs for all citizens and access to energy for all **need carbon space for emissions**.
 - A group of developing countries which have a similar stand in the United Nations climate negotiations has demanded that Developed countries must ensure net-zero emissions by 2030 to provide carbon space to the developing countries to burn fossil fuels like coal for their growth.
- Various forms of **subsidies** like fertilizer subsidy, power subsidy etc incentivise the **overuse of fossil fuels** which results in GHG emissions. However these subsidies are important for productivity and competitiveness of products in market.
 - Further, subsidies also undermine the revenue base and limit the government's capacity to invest in new, cleaner technologies.
- Urbanisation is associated with fast economic development. However, in India urban sprawl has also cause damage of wetlands, deforestation, increased air and river pollution as well as frequent disasters like urban flood and heat waves etc.
 - According to World Air Quality Report, 2022, 22 of the world's 30 most polluted cities are in India, with Delhi being ranked as the most polluted capital city globally.
- **Issues with the implementation of environment impact assessment** further increases the negative externalities of the economic projects.
 - NHAI projects in the Western Ghats, construction activities in tiger reserves and wildlife sactuaries.
 - The Dholpur Thermal Power Project, Rajasthan -> Impact on the National Chambal Sanctuary.
 - Kayamkullam Power Project, Kerala \rightarrow adjacent to a fragile system of Kayals (backwaters) in the state of Kerala.
- Unregulated quarrying and the unscientific cutting of slopes for construction and mining activities into hills aggravates the risk of soil erosion and subsequently increases the risk disasters like landslides.
- Initial phase of economic growth is linked with the rapid increase in population. Increasing population tends to **exacerbate the linkages between underdevelopment and environmental degradation.** It also increase pressure on resources and consequently worsen environmental quality.

- No Cost to Environmental Resources: Access to natural resources is entirely open and no individual user bears the full cost of environmental degradation and resources are consequently overused.
- **Trawling** used while fishing destroys the natural seafloor habitat. Similarly, **Oil spills** from ships involved in international trade threaten the biodiversity of the ocean.
- It is believed that **with gradual increase in income levels** along with growth in financial and technological capabilities, **environmental quality could be restored.**
 - But the reality is that the continued growth generating activities only increasingly deteriorates the environmental quality.

Thus, pressures on production and fast economic growth are generally associated with the deleterious effects of environmental devastation and climate change.

However, there is **complex relationship** between economy and environment. This perception of a trade-off between the two goals rests on **the view often held** — **wrongly** — **that environmental protection, not environmental degradation, is the obstacle to rapid growth**.

There is no inherent trade-off between the two goals:

- A previous World Bank report had highlighted that Pollution and other environmental degradation costs India \$80 billion a year, nearly 6% of gross domestic product.
- land loss is not only whittling away India's gross domestic product by 2.5% every year and affecting its crop yield, but also exacerbating climate change events in the country which, in turn, are causing even greater degradation.
- We can achieve growth and jobs by investing in green technologies and innovation.
 - The world can achieve economic growth and create jobs through sustainable technologies and there's no need for a trade-off between the two.
 ©crackingcivilservices.com
 - Good and smart projects can be good for the environment and good for the economy.
- One of the **biggest engines for future growth will be green projects**. Solar energy, smart grids, smart transportation will be major engines for growth for all countries and especially India since there are millions of new urban dwellers in the next decade.
- It will not be possible to sustain high growth in the coming years without environmental care. Increased disasters which is linked with environmental degradation can not only hinder the economic progress but they can also take away the economic progress achieved in years within few hours.
- Environment degradation is affecting the productivity of the agriculture sector. The proximate reason for the doubling of wheat prices over the past year is the collapse of production in the former Soviet Union and elsewhere linked to unprecedented heat waves and floods.
- The economic costs, including the losses caused by air pollution, water contamination and solid wastes as well as deforestation are estimated to amount to some three per cent of GNP in China as well as India, Argentina, Turkey and elsewhere. Strikingly, **prevention is often far cheaper than cure** — whether it's curbing industrial pollution, arresting deforestation or reinforcing structures in disaster-prone areas.

- Further, environment also directly contributes in the economy by offering the range of **ecosystem services**:
 - **Provisioning services** (food, irrigation, drinking water).
 - **Regulating services** (climate regulation, water quality regulation).
 - **Cultural services** (recreational and religious services).
 - **Supporting services** (nutrient recycling, soil formation).
 - Millions of households and **developmental activities utilise these ecosystem services** for production and consumption.
- **Significance of fossil fuel is also on decline** while focus is shifting towards renewable energy. India is among the largest importers of fossil fuels in the world, and volatility in global prices threatens its energy security. Focusing on green alternatives will only help us in long run.
- Green transition can also increase inclusion and growth: Investment in sectors such as renewable energy, electric mobility etc. has the potential to address the issues of employment, technology, energy poverty and self-reliance.
 - For instance, solar rooftops can provide decentralised access to clean energy to the poor and the marginalised, including in remote regions of India.

Going forward, accepting the idea of **sustainable development** is answer for this issue. And **holistic approach** should be taken to manage the **balance between economic development and environmental sustainability:**

- Effective implementation of environmental impact assessment. India will need to recognize and factor in environmental implications of development into its growth roadmap upfront, rather than deal with these issues as an after-thought.
- Measures to boost climate financing like Introducing carbon pricing mechanisms, building incentive structures and mechanism to promote private sector investment.
- Green GDP: Also known as environmentally adjusted domestic product, it allows the cost of natural resource depletion and environmental degradation to be subtracted from GDP.
- Gross Environment Product: A component of Green GDP, it measures the ecosystem services or the benefits derived from natural resources and processes such as food, clean water etc.
- Natural Capital Accounting can help measure the full extent of a country's natural capital. It also provides a perspective on the link between the economy, ecology and environment. It also helps in effective management of Natural resources.
- Green technologies like Solar energy, Fuel cell technology, ethanol blending etc.

• CSR, tax exemptions for green initiatives ©<u>crackingcivilservices</u>.com

- Irrigation, soil health card, organic farming, zero budget national farming.
- Better utilization of Campa funds- exclusively for afforestation purpose.
- Reducing subsidy like agricultural, fertilizer, electricity etc.
- Evergreen revolution in agriculture.
- Making industries responsible for waste management. Emphasis on zero effect zero defect.
- Bottom-up conservation methods like involving tribals in conservation of forests, making them part of development by using their traditional knowledge.
- Choosing low carbon Clean Energy Pathways.
- Effective implementation of emission norms for thermal power plant, BS emission norms 6 etc.

• Smart city mission to provide core infrastructure, clean and sustainable environment and give a decent quality of life to their citizens through the application of 'smart solutions'.

India has been proactively taking steps in this direction. The fifteen years vision document of Niti ayog aims to achieve the sustainable developments goals. In cop 26, as part of five-point action plan, India has also pledged to reach carbon neutrality by 2070 and to reduce emissions to 50% by 2030. ©<u>crackingcivilservices</u>.com

Q6 What is poverty? Examine the reason behind the poverty in Indian society. What are the steps taken by the Indian and Bihar government to remove poverty?

Ans:

Poverty is a complex phenomenon and the notion of poverty has different meaning for different people. Though there is no universally accepted definition of poverty, it is generally viewed as a state or **condition in which a person or community lacks the financial resources and essentials for a minimum standard of living-** life, food, clothing, shelter, safe drinking water etc. It also includes the **deprivation of opportunities** to health, education, skills, employment etc.

The **World Bank** conceptualises poverty as deprivation in well-being, low income and the inability to acquire the basic goods and services necessary for survival with dignity. According to world bank, the Extreme poverty level is living on less than \$1.90 a day. UNDP measures poverty in terms of a new parameter, namely, Multidimensional Poverty Index (MPI) which considers average value of living standard, health and education. Thus, Poverty is multidimensional in nature.

Poverty estimation in India is **carried out** by NITI Aayog through the **calculation of poverty line** based on the data captured by the National Sample Survey Office. While identifying the poor in India consumption expenditure that is taken into account. According to 2011 census data, 21.9% of population in India is below poverty line.

The reason behind the poverty in Indian society:

- **Colonial exploitation**: the policies of the colonial government led to disindustrialisation. At the time of Independence the incidence of poverty in India was about 80%. Domestic saving rate was only 10.4 percent of GDP.
- **Unequal distribution of land and resources** is another vital cause for poverty in India.
- **Inequality in earning** the income of the people is also a wide cause for poverty.
- To fulfil the demands of social obligations and religious ceremonies the poor community end up spending a lot which leads to poverty.
- The rapid rate of increase in population is also a factor of poverty.
- Growth is not as rapid as we need to eradicate poverty.
- **Models of growth may be unsuitable for poverty alleviation**. For example, capitalintensive growth in a labour surplus country in India.
- Poverty is a vicious cycle preventing investment and development.
- Due to urbanisation, there has been a continuous decline in the productivity of agriculture.

- **Migration of qualified and educated citizens to other countries** has reduced the economy of our country
- Shortage of Entrepreneurship
- Anti-poverty schemes not being effective due to institutional and other inadequacy.
- Insurgencies as in North-Eastern India, Naxalism as in the eastern states, communal violence etc.
- Caste ridden society, Patriarchal society.
 - IMF had earlier said that equal participation of women in economic activity can boost India's GDP by 27%.
- Lack of education and skills.
- **Natural and Man-made disasters** causes huge economic destruction e.g. devastation of infrastructure, disruption of normal life.
- **Pandemic**, like recent **Covid-19** further aggravates the poverty situation in the country and hinders the progress towards poverty elimination.

The steps taken to remove poverty:

- By the Indian government:
 - Integrated Rural Development Programme:
 - started in 1980-81 in all blocks of the country and continued as a major self-employment scheme till April 1, 1999.
 - Then, it was restructured as the **Swarnjayanti Gram Swarozgar Yojana** which aimed at self-employment of the rural poor.
 - Jawahar Rozgar Yojana (JRY):
 - It was launched as Centrally Sponsored Scheme on 1st April, 1989 by merging National Rural Employment Programme (NREP) and Rural Landless Employment Guarantee Programme (RLEGP). Its main objective was generation of additional gainful employment for the unemployed and under-employed people in rural areas through the creation of rural economic infrastructure, community and social assets.

• Jawahar Gram Samridhi Yojana:

- JRY has been strengthened and restructured as Jawahar Gram Samridhi Yojana w.e.f. 1st April, 1999.
 - The main aim of this programme was the development of rural areas. Infrastructure like roads to connect the village to different areas, which made the village more accessible and also other social, educational (schools) and infrastructure like hospitals. Its secondary objective was to give out sustained wage employment.

Antyodaya Anna Yojna (AAY):

• To target poorest of poor population and provide them relief from hunger.

• Targeted public distribution system (TPDS):

- To identify the poor households and giving them a fixed entitlement of food grains, rice and/ or wheat, at specially subsidized prices.
- Under the National Food Security Act, 2013 (NFSA), 75% of the rural population and up to 50% of the urban population of the country are covered for receiving highly subsidized foodgrains.
- PM Awas Yojna:
 - affordable housing will be provided to the urban poor

- It has two components: **PMAY-U**) for the urban poor and **PMAY-G** for the rural poor.
- **Deen Dayal Upadhyaya Antyodaya:** for helping the poor in both rural and urban India by providing skill training.
 - In includes both Deendayal Antayodaya Yojana- National Rural Livelihoods Mission(DAY-NRLM) and Deendayal Antayodaya Yojana- National Urban Livelihoods Mission(DAY-NULM).
- **Pradhan mantri ujjwala yojana**: deposit free LPG connections to women from BPL households.
- **Deendayal upadhyaya gram jyoti yojana:** 24×7 uninterrupted electricity supply to each rural household across the country by 2022.
- Saubhagya Yojana electricity connection
- **Shyama prasad mukherjee rurban mission:** It aims to create 300 rural growth clusters across the country to:
 - bridge the rural urban divide- economic, technological and those related to facilities and services.
 - spread development in the region.
 - attract investment in the rural areas.
 - stimulate local economic development with emphasis on reduction of poverty and unemployment in rural areas.
- **MGNREGA:** Providing not less than 100 days of unskilled manual work as a guaranteed employment in a financial year to every household in rural areas as per demand, resulting in creation of productive assets of prescribed quality and durability.
- **Mission Antyodaya:** To **address the multidimensionality of poverty in a time bound manner** through a convergence of resources, both financial and human to provide an opportunity for transformational changes.
 - Gram Panchayat is the basic unit for monitoring transformation and for ranking on the basis of objective criteria.
- **National social assistance programme:** To provide support to aged persons, widows, disabled persons and bereaved families on death of primary bread winner, belonging to below poverty line households.
 - It comprises schemes like- Indira Gandhi National Old Age Pension Scheme (IGNOAPS), Indira Gandhi National Disability Pension
 - Scheme (IGNDAPS), India Gandhi National Disability Pensio Scheme (IGNDPS), National Family Benefit Scheme (NFBS),
 - Annapurna Scheme

Ayushman Bharat Pradhan Mantri Jan Arogya Yojana is a scheme of the

Government of India to provide free access to healthcare for 40% of people in the country

By the Bihar government:

• Agriculture sector reforms:

- Formulation and effective implementation **Agriculture Road Map**, with a prime focus on productivity and value chain development of small and marginal farmers.
- Enhanced Agriculture sector expenditures
- Formulation of Manav Vikas Mission:
 - To identify, target and monitor social dimensions of development.
 - It identified 20 indicators to capture outcomes required for allowing each individual to develop its fullest human potential.

- In **7 nishchay resolve** the HDI and Skill development were emphasized
- **Different missions** Mahadalit Vikas mission, Bihar state water and sanitation mission and Bihar gramswaraj mission were initiated.
- Arthik Hal, Yuvaon Ka Bal: For strenthening of the youth economically.
- **Bihar Anganwadi Beneficiary Scheme**: Government transfer cash money to the bank account of all the registered beneficiaries in exchange for food and ration.
- **Bihar Mukhyamantri Vridhajan Pension Yojana-** The scheme applies to all senior citizens, wherein a sum of Rs. 400 is provided to the beneficiaries as pension. The scheme can be availed by all senior citizens irrespective of their caste, income, community and religion.
- **Bihar Unemployment Allowance Scheme**: the unemployed youth of the state who are unemployed despite being educated, get 1000 rupees per month by the Bihar government.
- Bihar Student Credit Card Scheme- Under the scheme, state government is providing education loan of up to Rs. 4 Lakh to 12th Pass students at 0% interest rate.
- Effective implementation of Housing scheme, ICDS, Mid-day-meal scheme
- The Government of Bihar (GoB), through the Bihar Rural Livelihoods
 Promotion Society (BRLPS), an autonomous body under the Department of Rural Development, is spearheading the World Bank aided Bihar Rural Livelihoods Project (BRLP), locally known as JEEViKA with the objective of social & economic empowerment of the rural poor.
 - It has mobilized 57 lakh households into 5 lakh SHGs and 50% of the poor still to be mobilized.
- Bihar's average economic growth since 2005, has been more than 11 per cent which is among the fastest in the country.

Thus both Indian and Bihar government is constantly moving forward with the goal of eradication of poverty. According to UN report, India fared best in poverty alleviation in 10 years to 2016. About 273 million Indians moved out of multi-dimensional poverty between 2005-6 and 2015-16. But, still India has highest population of poor people living in any country in the world. Going forward quality education, health, skill development as well as boosting the innovation and entrepreneurship spirit among citizen etc are key areas to focus upon.

[OR]

Q. How food and fertiliser subsidies work in India? Also explain the trends and concerns associated with these subsidies.

Ans:

Subsidies are considered as one of the quintessential attributes of any welfare state. However, there has been growing concerns (Both Economic Survey and the 15th Finance Commission have raised concerns) over the growing burden of food and fertiliser subsidies. In the 2022-23 Budget, it was estimated that the government would have needed Rs 3.55 lakh crore to dole out a variety of subsidies but the subsidy bill grew by Rs 2.06 lakh crore over

the estimate to touch Rs 5.62 lakh crore this fiscal. The main reason attributed for the rise this fiscal, according to the latest budget documents, to the extension of the free food grain programme PMGKAY upto December 2022 and greater spending on fertiliser subsidies to shield farmers from the negative effects of an increase in global fertiliser prices (because of sudden outbreak of geopolitical conflict).

The major subsidies — food, fertiliser and petroleum — is estimated to be around Rs 3.75 lakh crore, which is 1.2% of the GDP. The food subsidy touched Rs 2.87 lakh crore in 2022-23 as against an estimate of Rs 2.06 lakh crore. The fertiliser subsidy touched Rs 1.05 lakh crore in Budget estimates to Rs 2.25 lakh crore in revised estimates for this fiscal. ©crackingcivilservices.com

How food and fertiliser subsidies work in India:

- **The Food subsidy** is provided to meet the difference between economic cost of food grains procured by the government and their sales realization at the PDS rate called central issue price (CIP) under the National Food Security Act (NFSA) and other welfare schemes.
 - Food Corporation of India (FCI) is the nodal agency under responsible for the procurement, storage and movement of food grains, public distribution and maintenance of buffer stocks.
 - FCI procures food grains at minimum support price (MSP) from farmers on an open ended basis (i.e., accepting all the grains that are sold to it by farmers), provided the food grains meet Govt. of India's uniform quality specifications. The procurement is also done by State Government Agencies (SGAs) and private rice millers on behalf of the FCI.
 - All the procured food grains form the Central Pool. The grains are moved from the surplus states to the consuming states for distribution and for creation of buffer stocks and stored in FCI godowns.
 - The **economic cost to FCI** includes acquisition cost of food grains at MSP, procurement incidentals (e.g. labour & transport charges, godown rentals) and distribution cost (freight, handling, storage & interest charges, losses during storage etc).
 - Difference between Economic Cost and Central Issue Price (CIP) of food grains under various schemes (including National Food Security Act, 2013) is the operational loss to FCI and is reimbursed by Government of India as food subsidy.
 - **The fertiliser subsidy** is provided to fertiliser manufacturers and importers so that farmers can buy them at affordable price. Thus, Farmers buy fertilisers at MRPs (maximum retail price) below their normal supply-and-demand-based market rates or what it costs to produce/import them.
 - The government fixes the MRP of urea being sold in the market. The difference between the selling price and production cost is provided as subsidy.
 - e.g. The MRP of neem-coated urea, for instance, is fixed by the government at Rs 5,922.22 per tonne, whereas its average cost-plus price payable to domestic manufacturers and importers comes to around Rs 17,000 and Rs 23,000 per tonne, respectively. The difference, which varies according to plant-wise production cost and import price, is footed by the Centre as subsidy.

- Before 2018, companies were reimbursed after the material was dispatched and received by the district railhead or approved godown.
- Since 2018, DBT (direct benefit transfer) has been introduced whereby money is transferred directly to retailer's account. Retailers are reimbursed weekly after the actual sale to the farmer.
 - Each retailer there are over 2.3 lakh of them across India now has a point-of-sale (PoS) machine linked to the Department of Fertilisers' e-Urvarak DBT portal.
 - Anybody buying subsidised fertilisers is required to furnish his/her <u>Aadhaar</u> unique identity or Kisan Credit Card number. The quantities of the individual fertilisers purchased, along with the buyer's name and biometric authentication, have to be captured on the PoS device.
 - Only upon the sale getting registered on the e-Urvarak platform can a company claim subsidy, with these being processed on a weekly basis and payments remitted electronically to its bank account.
 ©crackingcivilservices.com
- For Urea:
 - The maximum retail price (MRP) for Urea is **controlled** and decided by the government. MRP of urea has been fixed at Rs 5,378 per tonne.
 - Since companies have to sell at this controlled rate, **the subsidy** (the difference between the cost of manufacturing or import and the fixed MRP) is variable.
 - Urea subsidy also includes freight subsidy for movement of urea across the country.
- **For other fertilisers:**
 - MRP has been **decontrolled** and decided by the companies themselves.
 - Nutrient-based subsidy is being provided. e.g. For 2020-21, the Centre fixed the NBS rates at Rs 18.789/kg for N, Rs 14.888/kg for P, Rs 10.116/kg for K and Rs 2.374/kg for S.
 - Therefore, depending on the nutrient content in different fertilisers, the per-tonne subsidy varies.
 - Since one tonne of DAP contains 460 kg of P and 180 kg of N, the corresponding subsidy worked out to Rs 10,231 (6,848.48 plus 3,382.02). Likewise, the subsidy on MOP (60% K) was Rs 6,070 per tonne, while Rs 8,380/tonne for the popular '10:26:26' NPK fertiliser.
 - The government only gives a fixed per-tonne subsidy to ensure they are priced at "reasonable levels". In other words, the subsidy is fixed, while the MRPs are variable.
- The subsidy goes to fertiliser companies, although its ultimate beneficiary is the farmer who pays MRPs less than the market-determined rates.

The trend and concerns associated with these subsidies:

• **High Fiscal Burden**: Food and fertiliser subsidies are 1st and 2nd highest in the subsidy items respectively.

- Recently, the subsidy for Diammonium phosphate (DAP) fertiliser was increased from Rs. 500 per bag to Rs. 1200 per bag, an increase of 140%. It will further add additional Rs 14,775 crore as subsidy in Kharif season.
- The sustainability of current subsidy regime is also being questioned as unpaid subsidy backlog is expected to increase to approximately Rs. 570 billion by the end of FY 2021.
- Food subsidies increased from Rs. 2,850 crore in 1991-92 to about Rs. 1,71,298 crore in 2018-19, an increase of over 60 times.
- In 2020-21, The food subsidy bill spiked sharply, from ₹1.15 lakh crore in the 2020-21 budget estimates to ₹4.22 lakh crore in the revised estimates, reflecting the additional cost of free foodgrain distribution in the wake of the COVID-19 pandemic, as well as the government's decision to pay the Food Corporation of India's (FCI) burgeoning loans and return to budgetary transfers to fund the food subsidy bill.
 - Union Budget 2021, Food subsidy budget set at almost ₹2.43 lakh crore. it would help clean up the government's accounts and improve the financial health of FCI.
- For several years, the budgetary allocation for PDS has not been sufficient to cover FCI's subsidy costs, forcing it to borrow from the NSSF at a rate of about 8%.
 - In 2021-22 budget speech, the finance minister discontinued the NSSF [National Small Savings Fund] loan to FCI for food subsidy.
- The Economic Survey 2020-21 recommended an increase in the issue price at which poor households receive foodgrain, observing that the food subsidy bill is becoming an "unmanageably large" expenditure for the government.
 - Central issue price (CIP) is the amount priority households pay, ₹2 per kg of wheat and ₹3 per kg of rice, to avail grain from the subsidized public distribution system.
 - The issue price for wheat and rice has not been revised since the introduction of the National Food Security Act in 2013.
 - the economic cost to the Food Corp. of India (FCI) for wheat rose to ₹27 per kg in 2020-21 from ₹19 per kg in 2013-14, while for rice it increased to ₹37 per kg from ₹26 per kg in 2013-14.
 - This implies that the government bears a subsidy of ₹25 per kg of wheat and ₹34 per kg of rice it supplies to poor households under the food security scheme.
- Notwithstanding the survey's recommendation, **increasing the issue price could be politically challenging** for the government as the covid-19 pandemic has dented incomes of poorer households and worsened the hunger situation in the country.

• Diversion of subsidised foodgrains and fertilisers as they are under-priced product.

- e.g. Being super-subsidised, urea is always prone to diversion for nonagricultural use — as a binder by plywood/particle board makers, cheap protein source by animal feed manufacturers or adulterant by milk vendors apart from being smuggled to Nepal and Bangladesh.
- According to Shanta Kumar Committee, 40-60% PDS food grains are siphoned from FCI godowns to black markets. Many such scams, like Punjab Wheat Procurement Crisis 2016, have come into the light recently
- Concerns specific to the food subsidies:

- **Excess of buffer stocks of food grains**: Open ended grain procurement has increased food grain stockpiles beyond the needs of food security. E.g. By June 2019, FCI and state agencies stockpiled 76.1 million tonnes of staples (wheat and rice) against the requirement of 61 million tonnes.
- Lack of storage for food grains: Due to inadequate number of godowns for storage, a part of procured grains is maintained as outdoor stacks ('Cover-and-Plinth' system), which face high risk of rain damage and pilferage.
- **Marginalization of private trade**: Existing system of food grain management in India is dominated by the Government, right from production (as cropping pattern is influenced by MSPs) to stocking (FCI) and marketing (APMCs).
 - Even in traditionally high producing states like Punjab and Haryana, private trade been marginalized due to **open ended procurement by FCI**.
- Concerns specific to the fertiliser subsidies:
 - In case of fertilisers, at present, the Centre is following a "no denial" policy. Anybody, non-farmers included, can purchase any quantity of fertilisers through the PoS machines. That obviously allows for bulk buying by unintended beneficiaries, who are not genuine or deserving farmers.
 - While there is a limit of 100 bags that an individual can purchase at one time, **it does not stop anyone from buying any number of times**.
 - Import Dependency of Fertiliser sector: India consumes 55 million metric ton (mmt) of fertilizers annually, of which 72% is domestically produced while the rest is imported.
 - **Imbalanced use of fertilisers due to subsidy regime**: While the ideal **NPK ratio is 4:2:1**, the present ratio in Punjab and Haryana is 25:5:1. The resultant imbalance in fertiliser use is **affecting crop yield**, **leading to deterioration in soil health** and is **adversely impacting the environment**.
 - Excessive nitrogen fertilizer applications sometime lead to **pest problems by increasing the birth rate, longevity and overall fitness of certain agricultural pests**.
 - Fertilizer burn can occur, resulting in drying out of the leaves and damage or even death of the plant.
 - **Ecological impact of excessive fertiliser usage**: Excessive use of fertilizers **emits significant quantities of greenhouse gas** into the atmosphere. In many industrialized countries, overuse of fertilizers has resulted in contamination of surface water and groundwater.
 - Nutrient-rich fertilizer runoff stimulates productivity in aquatic ecosystem, which can lead to **harmful algal blooms or fish kills**.

Way forward:

- **Direct cash transfer to Farmers**: Experts suggest a gradual transition towards direct cash transfer of subsidy, instead of routing it through companies.
 - The Commission for Agriculture Costs and Prices (CACP), in its rabi report for the 2021-22 recommended a fertiliser cash subsidy of Rs 5,000 per year.
- **Rationalisation of subsidy regime**: A shift towards more rational use of fertilisers can be made by capping the number of bags each farmer can purchase through the point-of-sale (PoS) device each season. ©<u>crackingcivilservices.com</u>

- A farmer growing irrigated wheat or paddy may use about three 45-kg bags of urea, one 50-kg bag of DAP and half-a-bag (25 kg) of MOP per acre. A total of 100 bags would easily cover the seasonal requirement of a 20-acre farmer. And that could possibly be a reasonable cap to impose; those wanting more can well afford to pay the unsubsidised rates for the extra bags.
- This, it is expected, would end even retail-level diversion and purchases by large buyers masquerading as farmers.
- Awareness among farmers: Farmers should be made aware regarding the benefits of balanced usage of fertilizers.
 - Also, modelling the fertilizer proportion according to different agro-climatic regions, is needed for the better growth and health of crops and soil.
- **Promoting Green alternatives to chemical fertilisers**: E.g., **Bio fertilisers** (Algal, fungal and bacterial) **are cost effective, eco-friendly** and can increase crop yield up to 15-25%.
- Excess buffer stocks can be allocated to poor over and above their monthly quota of 5 kg under National Food Security Act (NFSA).
- Further, decentralization in procurement should be encouraged. **Decentralized Procurement Scheme** (DCP), introduced to reduce transport cost and leakages, has been adopted by a very few states.
 - Under this scheme, the respective state governments themselves will procure food grains from farmers on the behalf of FCI and distribute them among poor beneficiaries.
- FCI needs an organizational overhaul to make it more functionally efficient.
- Experts has also advocated paying beneficiaries in cash that they can use to purchase any items of food and fertilisers. The exact ammount can be decided after discussions. ©crackingcivilservices.com

SECTION-III

Q7a. What is the basic principle behind vaccine development? How do vaccines work?

Ans:

The basic principle of vaccination is **to induce protection against a pathogen by mimicking its natural interaction with the human immune system**. It contain **weakened pathogens or inactive parts of the pathogen** that upon entering the body trigger immune response. This prepares the body and prompts the immune system to react in the same way it would when the real pathogen enters the body. The vaccine reduces the risk of complications and mortality following subsequent exposure to an infectious agent.

The working of vaccines is based on the property of memory exhibited by the immune system where the body is able to recognise an **antigen** that it has previously encountered. As a result of this immunological memory, the body's response to the subsequent exposure of the same antigen is heightened and quick, thus preventing illness. Vaccines are sometimes given in **multiple doses**, like in many COVID-19 vaccines, to develop memory cells in the body for a longer duration.

Thus, Vaccines let the immune system to learn how to fight the future onslaught of that

pathogen for which vaccine is being given. The body prepares antibodies in response to vaccination and remembers this act.

There are **different approaches** to developing a vaccine like where the <u>entire pathogen is</u> <u>used in inactivated form</u>, where just <u>the part of the pathogen</u> that triggers immune response is used and where the <u>genetic material of the pathogen</u> is used.

Based on these approached different types of vaccines are: [can be skipped for this question.]

- Live Attenuated Virus (LAV):
 - Uses a weakened (or attenuated) form of the germ that causes a disease.
 - Because these vaccines are so similar to the natural infection that they help prevent, they **create a strong and longlasting immune response**.
 - Used in case of Measles, Rubella (MMR combined vaccine), Tuberculosis, Rotavirus, Oral Polio Vaccine(OPV), Yellow fever etc
- Inactivated vaccines:
 - Uses the **killed version of the germ** that causes a disease.
 - These vaccines usually don't provide immunity that's as strong as live vaccines so several doses over time (booster shots) is needed to get ongoing immunity against diseases.
 - Used in case of Polio (IPV), Pertussis, Hepatitis A etc.
- Subunit and Recombinant vaccines:
 - Use only part of a **target pathogen** like its protein, sugar, or capsid (a casing around the germ) presenting it as an antigen on its own to provoke a response from the immune system.
 - It can also be created **via genetic engineering**.
 - The end result of this approach is a recombinant vaccine. The immune system will recognize the expressed protein and provide future protection against the target virus.
 - The Hepatitis B vaccine currently used in the United States is a recombinant vaccine.
- Conjugate vaccines:
 - Similar to recombinant vaccines but are made using pieces from the coats of bacteria. These coats are chemically linked to a carrier protein, and the combination is used as a vaccine.
 - Conjugate vaccines are used to **create a more powerful, combined immune response**: typically the "piece" of bacteria being presented would not generate a strong immune response on its own, while the carrier protein would.
 - The vaccines currently in use for children against pneumococcal bacterial infections are made using this technique.

• Toxoid vaccines:

- Uses a toxin (harmful product) made by the germ that causes a disease.
- They create **immunity to the parts of the germ that cause a disease instead of the germ itself**.
- Booster shots are needed to get ongoing protection against diseases.
- Used in case of Tetanus and Diphtheria.

The Pfizer/BioNTech vaccine was the first to receive emergency validation from WHO in December 2020. Indian vaccines manufacturers also closely followed by getting the vaccine

approved by the WHO for emergency use.

Q7b. Discuss the three-stage nuclear power programme of India.

Ans:

India's three-stage nuclear power programme was formulated by Homi Bhabha in the 1950s to secure the country's long term energy independence, through the use of uranium and thorium reserves found in the monazite sands of coastal regions of South India.

The ultimate focus of the programme is on enabling the thorium reserves of India to be utilised in meeting the country's energy requirements. Thorium is particularly attractive for India, as it has only around 1-2% of the global uranium reserves, but one of the largest shares of global thorium reserves at about 25% of the world's known thorium reserves.

However, thorium is more difficult to use than uranium as a fuel because it requires breeding, and global uranium prices remain low enough that breeding is not cost effective.

The three-stage nuclear power programme of India:



- Stage 1- Pressurized Heavy Water Reactor (PHWR):
 - PHWRs are fuelled by **natural uranium**, and light water reactors, which **produce plutonium** incidentally to their prime purpose of **electricity generation**.
 - Natural uranium has 0.711% uranium-235 (fissile isotope), 99.284% uranium-238 (not fissile), and a trace of uranium-234 by weight.
 - Heavy water (D2O) is used as moderator and coolant.
 - U-238 \rightarrow Plutonium-239 + Heat
 - PHWRs was a natural choice for implementing the first stage because it had the most efficient reactor design in terms of uranium utilisation, and the existing Indian infrastructure in the 1960s allowed for quick adoption of the PHWR technology.
 - India correctly calculated that it would be easier to create heavy water production facilities (required for PHWRs) than uranium enrichment facilities (required for LWRs).
 - Indian uranium reserves are capable of generating a total power capacity of 420 GWe-years, but the Indian government limited the number of PHWRs fueled exclusively by indigenous uranium reserves, in an attempt to ensure that existing plants get a lifetime supply of uranium.
- Stage 2-Plutonium fuelled Fast Breeder Reactor:
 - In 2nd stage, **fast breeder reactors** (FBRs) would use a **mixed oxide** (MOX) fuel made from plutonium-239 (recovered in the first stage) and natural uranium.
 - In FBRs, plutonium-239 undergoes fission to produce energy, while the uranium-238 present in the mixed oxide fuel transmutes to additional plutonium-239.
 - Thus, the Stage II FBRs are designed to "breed" more fuel than they consume.
 - The design of the country's first fast breeder, called Prototype Fast Breeder Reactor (PFBR), was done by Indira Gandhi Centre for Atomic Research (IGCAR).
 - Bharatiya Nabhikiya Vidyut Nigam Ltd (Bhavini), a public sector company under the Department of Atomic Energy (DAE), has been given the responsibility to build the fast breeder reactors in India.
 - However, the construction of this PFBR at Kalpakkam was due to be completed in 2012 is not yet complete.
 - Once the inventory of plutonium-239 is built up thorium can be introduced as a blanket material in the reactor and transmuted to **uranium-233** for use in the third stage.
 - The surplus plutonium bred in each fast reactor can be used to set up more such reactors, and might thus grow the Indian civil nuclear power capacity till the point where the third stage reactors using thorium as fuel can be brought online, which is forecasted as being possible once 50 GW of nuclear power capacity has been achieved.

- It uses fast neutron reactors burning the plutonium-239 with the blanket around the core having uranium as well as thorium, so that further plutonium (ideally high-fissile Pu) is produced as well as U-233.
- Stage 3- Advanced Heavy Water Reactors (AHWRs)/Thorium Based Reactors:
 - It involves a self-sustaining series of thorium-232–uranium-233 fuelled reactors.
 - An **alternative** stage 3 is **molten salt breeder reactors (MSBR)**, which are firming up as an option for eventual large-scale deployment.
- According to the three-stage programme:
 - Indian nuclear energy could grow to about 10 GW through PHWRs fueled by domestic uranium, and
 - \circ The growth above that would have to come from FBRs till about 50GW.
 - The third stage is to be deployed only after this capacity has been achieved.

The challenges associated with 3 stage program:

- The 3 stage program was formulated in 1950. However, **Seventy years down the line, India is still stuck in the first stage**. For the second stage, we need the fast breeder reactors.
 - A Prototype Fast Breeder Reactor (PFBR) of 500 MW capacity, construction of which began way back in 2004, is yet to come on stream.
- One of the biggest challenge of Nuclear technology is safety and waste management. Incidents like Chernobyl, Fukushima are serious cause of concern. If nuclear energy is generated adhering to the highest standards of safety, there is less possibility of catastrophic accidents.
- Availability of fissile material is also a cause of concern. Nuclear fuel is not available easily and need diplomatic efforts.
- Land acquisition and selection of location for Nuclear Power Plant (NPP) is also major problem in the country. NPP's like Kudankulam in Tamil Nadu have met with several delays due to the land acquisition related challenges.
- As India is not a signatory of NPT and NSG, nuclear supply is severely contained by sanctioned against India. This situation has changed after 2009 waiver and bilateral civil nuclear energy agreements with many countries.
- Reprocessing and enrichment capacity also required boost in India. For this India needs advanced technology to fully utilise the spent fuel and for enhancing its enrichment capacity.
- **Manpower needs:** To scale up nuclear energy in India, **human resource** for nuclear engineering is paramount. India currently faces a shortfall in nuclear scientists and engineers.
- Fear and anxiety among the people living near Nuclear power plant.
- Analysts argue that **nuclear power never received the quantum of generous subsidy the fossil fuel received in the past and renewable is receiving today**. In absence of public funding, nuclear power will find it tough to compete against natural gas and renewables in the future.
- As private investment is not allowed in the nuclear power plants, so the government owns sole responsibility of developing this sector. It has caused lack of investment in this field.

• With increased focus of the renewable energy sector, nuclear energy seems to be downgraded from the priority list.

Going forward, continuous efforts must be made to bring down capital cost of nuclear power plants. Further, safety which is a major concern should be addressed on priority basis. In this connection, setting up a **Nuclear Safety Regulatory Authority** at the earliest would be helpful to the nuclear power programmes in the country. Considering lower capacity utilisation of renewables, rising fossil fuel prices and ever soaring pollution problems, potential of nuclear power must be fully exploited as it offers clean, continuous and cheaper(in long run) energy supply. ©crackingcivilservices.com

Q7c. Despite being well-endowed with the freshwater resources India still suffers from water scarcity. What role can science and technology play in overcoming this problem?

Ans:

India is well-endowed with freshwater resources

- India has many perennial rivers in the Northern parts and many seasonal rivers in the Southern part. The country also receives a good amount of rain over the year.
- India is known as land of rivers due to large amount of rivers that flow through India from Sutlej in the north to Brahmaputra in the east to Kaveri in the south to Narmada in the west.
- India occupies 2.4% of the total land area of the world and has 4% of the world's renewable water resources. However, being home to nearly 18 per cent of the world's population we can't say that it is water abundant country.
- It receives an average annual precipitation of **4,000 billion cubic metres** (BCM) which is the principle source of fresh water in the country.
- India has about twenty major river basins running through the nation.

India still suffers from water scarcity

The Composite Water Management Index by Niti Ayog:

- nearly 600 million Indians face "high to extreme water stress" and 75% households do not have drinking water on their premises. 81.67% of rural households do not have tap water connections.
- India's annual per capita availability of water fell from 1,820 cubic meters in 2001 to 1,545 cubic meters in 2011, which may further fall to 1,341 cubic meters in 2025.
 - By CWC benchmarks, a water-stressed condition happens when per capita availability is less than 1,700 cubic metres, and
 - a water-scarcity condition when per capita availability falls below 1,000 cubic metres.

- This is against the rising water demand in the country, which is likely to double by 2030.
- One of the reasons for water scarcity is the huge and growing **population**.
 - in 1951 was 3000-4000 cubic meters per person per year water was available. Currently, it is only around 1500 cubic meters per person per year.
 - A water-stressed condition happens when per capita availability is less than 1,700 cubic metres.
- Water Pollution: Another reason is the poor water quality resulting from insufficient and delayed investment in urban water treatment facilities. Water in most rivers in India is not fit for drinking.
 - Most water sources are contaminated by sewage and agricultural runoff.
 - The facilities created for water treatment are not maintained properly because adequate fees are not charged for water supply.
 - Industrial efficient standards are not enforced because the state pollution control boards have inadequate technical and human resources.
 - By some estimates almost 70% of drinking water is contaminated.
- **Over extraction** of ground water:
 - Another problem is dwindling groundwater supplies due to over extraction by farmers.
 - Low costs charged for irrigation facilities by State Governments also means that there is inefficient and wasteful use of water for irrigation by farmers. There is a need to increase irrigated area further, but this has to be done by increasing efficiency of irrigation.

Poor Management:

- India's urban areas also have poor and leaky distribution networks leading to water waste. We have a lack of sustainable water management policies in any of the governments alongwith a lack of public investment is the same.
- Due to inefficient irrigation techniques and small land holdings for agriculture.
- Most of the water planning and development in the country has been done as per administrative boundaries rather than by using river basins as the hydrological unit.
 - This has led to water conflict as most river basins are shared by several states and water demand for meeting domestic, industrial and
 - agricultural needs within each state has gone up significantly.
 - In the absence of river basin management plans and active river basin authorities, these issues have intensified.
- In India, water governance is fragmented which leads to inconsistent water policy between the Union and states.

Uncontrolled deforestation, encroachment in wetlands etc.

Skewed Distribution:

- Regions such as Rajasthan, Vidarbha, Marathwada and other parts of central and North-West India, receive relatively less rainfall as compared to other parts of the country. These regions are also devoid of perennial rivers.
- India experiences both floods and droughts periodically. Nearly a third of the country's geographical area is drought-prone whereas 12 per cent of the area is prone to floods.
- Virtual Export of Water:
 - India is virtually exporting water by growing highly water intensive crops like rice, sugarcane and soybean and exporting them to countries like China.

- The water scarce regions (like punjab) are involved in growing water intensive crops.
- The **agriculture policies** are heavily favored towards growing water intensive crops (like paddy). Dry land farming is largely neglected.
 - Government policies such as free electricity and minimum support price(MSP) for water intensive crops has nudged the farmers into choosing unsustainable irrigation techniques.
 - **90% of ground water extracted is used in irrigation** sector followed by domestic use and industrial use (9.8%).
- Lack of recycling capacity for used water and low emphasis on water treatment and reuse along with dumping of municipal and industrial waste in water bodies has led to reduction in input to water sources.
- Low awareness about rain water harvesting, water usage efficiency coupled with increasing purchasing power of people has increased demand leading to magnification of the problem.
- Climate change increases incidences of droughts and reduce annual precipitation in drought prone central and North West India.
 - The effect of global warming further intensifies temporal and spatial variations in precipitation, melting of snow and water availability.
- Significant number of non-perennial(seasonal) rivers which depend upon monsoon.
 - Even in the area with perennial river, the water availability in the river is fluctuating through out the year. during monsoon the abundant rainfall in a short period of around three months and lean period rest of the time.
- Spatial variance in the amount of precipitation received .Numerous local factors play a role in bringing downpour which results in some receiving abundant rainfall and the other being water scarce.

The role can science and technology play in overcoming this problem:

- National Water Policy, 2012 has laid emphasis on periodic assessment of ground water resources on scientific basis.
- Under Jal Jeevan Mission to provide functional household Tap Connection (FHTC) to every rural household, There is provision for technological intervention for treatment to make water potable.

• The role of **GIS** and the **internet** in increasing transparency and participation.

This in turn can facilitate monitoring and control a classic sign of 'healthy' water management systems, which makes water managers and users mutually accountable.

"grey" strategies: manmade, technology-based measures like wastewater treatment and desalination.

- Cape Town avoided "Day Zero" through a combination of largely grey strategies.
- Space satellites used for water resource mapping.
- Bio-technology to grow dry-land crops. It can also help in reducing the need of fertilizer which is a major cause of pollution.
- Internet and computer technology to disseminate the information and creating awareness.
- Improvements in on-farm management of agricultural water, both through utilization of advanced irrigation technology and improved irrigation scheduling.

- Drip irrigation and sprinkler technology,
- Sea water desalination -> Israel uses it.
 - Graphene Filter to Make it Cheaper to Drink Seawater.
- ro water purifier
- Agricultural water usage can become "smarter," however, by using sensors to measure rainfall and soil moisture to avoid overwatering plants. Soil composition can determine water retention and is affected by the types of plants.
- Bio-remediation of waste water to make it reusable.
- Technology can be used for artificial rain in the area with water scarcity.
- River linking project can be considered based on forecasting it's impact.
- Super-computers helps in weather prediction(climate modeling) and appropriate change in the cropping decision.
- Water metering can be used to effectively charge the water usage.
- Data analytics can be used for the future demand and supply of water.
- Technologies for renewable energy can reduce the global warming which in turn will reduce the erratic rainfall and check the sea level rise.
- Knowledge of geology helped us in knowing the underline reason behind the arsenic and uranium contamination of ground water in Bihar.
- Hydrology helps us understand the natural process of water cycling and monsoon which helps us in maintaining the natural flow or be prepare for the upcoming situation.
 - e.g. understanding the El Niño Southern Oscillation helps us to be prepare for the drought condition in the country and making appropriate changes in policies.
- **IoT and its use of sensors** to intelligently monitor usage is helping reduce water consumption.
 - measures water saturation in the soil, manages irrigation and helps ensure water isn't overused on its crops.
- **Drones** Aiding Water Preservation: e.g. map the vegetation on an entire site in an afternoon. The aim is to understand the trajectory of climatic variation across these different sites and how they can be linked to changes in the water resources as well as drought
- Another innovative water saving technology is **Hydrofinity's near-waterless laundry system**. The Hydrofinity laundry system replaces up to 80% of the water used in traditional washing systems with polymer XOrbs that gently massage textiles to provide superior cleaning results as compared to conventional aqueous washing methods.

Consumption of water would escalate further with pressure from industrialisation and urbanisation. It has been estimated that by 2050, more than half of India or an estimated 800 million people will be living in urban India. Most urban areas will have to import water from further distances unless measures are taken to improve water use efficiency, reduce leakages, adoption of appropriate water tariff, rehabilitate and recharge local water bodies considering many parts of rural and urban areas suffer from insufficient water for daily use.

Q7d. What role can science and technology in managing flood disaster in Bihar? Explain with suitable examples.

Ans:

Bihar faces multiple natural disasters for example, floods, droughts, earthquakes, cyclones, heat waves, cold waves, landslides etc. However, Flood disaster has almost annual occurrence in northern Bihar.

Flood in Bihar:

- The south-west monsoon brings the maximum rainfall in the state, lasting from June to September, and often causes flood-like situation, especially in the northern districts.
- Bihar is India's most flood-prone state, with 76% population in the North Bihar living under the recurring threat of flood devastation.
- Bihar makes up 16.5% of India's flood affected area and 22.1% of India's flood affected population.
- About 73.06% of Bihar's geographical area, ie 68,800 square kilometres (26,600 sq mi) out of 94,160 square kilometres (36,360 sq mi), is flood affected.
- On an annual basis, they destroy thousands of human lives apart from livestock and assets worth millions.
- North Bihar districts are vulnerable to at least five major flood-causing rivers during monsoon Mahananda River, Koshi River, Bagmati River, Burhi Gandak River and Gandak which originate in Nepal.
- Some south Bihar districts have also become vulnerable to floods from Son, Punpun and Phalgu rivers.

The role can science and technology in managing flood disaster in Bihar:

- Early Warning Systems: Depending on the types of disasters, it uses various technologies like space remote sensing technologies, Automatic Weather Stations, Doppler radars, High Wind Speed Recorders, Ocean buoys, Unmanned Aerial Vehicles etc. They provide critical information for tracking and forecasting intensity disasters.
- **Super computing** is used to simulate weather as well as to tune forecasts to go beyond just giving rainfall estimates and factor in the potential damage of floods and cyclones.
- Acoustic remote-controlled boats uses ultrasound pulses to collect information about river levels and help predict when flooding may occur.

The above technologies are already being used for Flood and drought forecasting so that information can be used for the prevention and

preparedness of the affected areas on time.

Latest technologies are also employed in planning and designing the constructions and infrastructure in a way to minimise the risks and impact of the disasters. e.g.

- Water control/conservation technologies can reduced the occurrence flood by capturing the excess water.
- **Nanotechnology** can be used for the improving the resilience through Building Materials, sensors etc.
- **The sediment removal technologies** can prevent the flooding due to accumulation of sediments in the water reservoirs.
- Indian Metrological Department (IMD) provides information about the weather forecasting using the data from the modern communication technologies.

- **Flood modeling** can be used to predict the extent of flooding and identify areas that are at risk. This information can be used to plan for flood response and evacuation. For example, the Indian Space Research Organisation (ISRO) has developed a system called Bhuvan, which provides high-resolution satellite imagery and mapping data to help with flood modeling and planning.
- The use of technology is seen in **building back better** to prepare for the of future occurrence of the disaster. e.g. **incorporating ductility within the structure** makes the building ductile and Earthquake-resistant as the building is able to bend and flex when exposed to the horizontal or vertical shear forces of an earthquake.
- **Communication tools** like social media, messaging apps, and emergency broadcasting systems can be used to quickly disseminate information and coordinate relief efforts. For example, during the 2020 floods in Bihar, the state government used WhatsApp and Twitter to provide real-time updates and coordinate rescue and relief efforts.

Thus, Science and technology played pivotal role in complete disaster management cycle. Sendai framework has already recognised that Scientific research can help identifying the disaster risk patterns, causes and effects. Even at policy level it helps in informed decision making. Further, under the guidelines of NDMA for different disasters, there are provisions for the application of science and technology.

Bihar government has already taken various initiatives to move towards greater disaster resilience. Bihar State Disaster Management Authority (BSDMA), together with Disaster Management Department has various initiatives towards awareness generation, structural and non-structural strengthening and capacity building of various stakeholders in which science and technology has been used invariably.

Q8 How has science and technology affected our life and society? Discuss the impact of Internet and related tools on communication and related areas.

Ans:

Although science and technology had always been part of human live, in contemporary world, the impact of science and technology has come to shape almost all dimensions of our lives like never before. Our lives seem incomplete without energy needs, information communication technologies, agriculture offerings, healthcare developments, transportation system, automobile preferences, digital technologies, communication services, education advancements and above all physical comforts, which the world of science redefines and confers new dimensions to them.

Effect of science and technology on our life and society:

- **Health**: From diagnostics to treatments, health services widely relies on the science and technology. e.g. recent RT-PCR test for covid-19, use of gene sequencing for vaccine development, Arogya setu app for contact tracing to manage covid-19.
- **Political:** e-governance for service delivery, EVM during voting, Official meetings using video conferencing during pandemic, use of social media and digital mediums for election campaign etc.
- **Economical:** e-auctioning of resource to ensure transparency, Resource mapping using space technology, digital payments simplified transactions, industrialisation is

backed by the technological developments, work from home using internet during lockdown etc.

- **Energy**: Nuclear technology, bio-technology, Solar power, wind power, waste to energy etc.
- Social: Interactions via email, social media, etc.
- **Education**: Massive Open Online Courses (*MOOCs*), recent boom in the edu tech market, education in the various subjects within science and technology etc.
- **Transport**: Road, rail, water, air, all the transport mediums are driven by science and technology. New emerging technologies like- driverless cars, Delivery Drones, Hyperloop, Flying Taxis etc.
- Communication: satellite technology, ICT, Internet of things etc.
- Culture: usage of green crackers, online painting exhibition, Virtual museum etc.
- Social media platform for sharing information, images, videos, ideas etc. It has become a new tool of entertainment, interaction, acquainting with someone, even propagating political ideologies etc.
- Science and technology have facilitated human life and made us feel comfortable and enabled us to live in a modern way of life.
- Entertainment: OTT platform, video games, e-tourism, space tourism etc.
- **Disaster management**: ICT, Super computers, Srtificial intelligence (AI), the Internet of Things (IoT), Big Data, robotics and drone technology are used in disaster risk reduction and management.
- Technology has also speed up the process of globalisation which in turn has led to rising individualism, nuclear family, changes in education system etc.
- Security: State of art weapon technologies, Smart fencing for border management, Integrated Border Management system using integrated networked sensors and Command and Control centres to ensure surveillance etc.

Apart from above positive outcomes there has been some negative effects as well like incessant materialism, exploitation of natural resources, rising inequality, climate change, pollution, spread of fake news and hate speeches on social media, issues related to cyber crime etc.

The impact of Internet and related tools on communication and related areas:

- The internet has had a significant impact on the ability of people to connect and communicate globally. It has ability to facilitate instant communication across vast distances. With tools like email, instant messaging, and social media, people can communicate with one another in real-time, no matter where they are in the world.
- Before spread of internet there were impediments in communication like unable to call because of lack of network, problems with sending or receiving a large document, write letter which took many days to reach the concerned person.
- But, nowadays, the internet has revolutionized global mass communication. It allows for data and information exchange around the world. We can easily do video chat, write email, share our ideas, information and views to anyone over social media.
- The internet has made it easier than ever before to access information on any topic. With search engines like Google, people can quickly find answers to their questions, learn about new topics.
- The recent trends like 'work from home', 'virtual meeting' etc. has also emerged because of ease of communication facilitated by the use of internet.

• Even traditional medium of communication has also came to use the internet technologies to smoothen their task. E.g. India post using internet for data sharing.

Almost everything we see around us is the gift of science and technology, whether it is smartphones, fans, electricity, microwave, radio, television, laptops, wheel, vehicles, cloth, paper, toothbrushes, etc. We need science and technology in every area of our life. And internet now a days is playing a pivotal role in almost every dimension of the life especially as a medium of communication.

[OR]

Q. In the present scenario, the key issues of the country are: "Increasing population, higher health risks, degraded natural resources and dwindling farm lands". Discuss at least four scientific initiatives on each of the four areas that you would like to apply.

Ans:

Since independence India has several achievements to its credit. It is among the fastest growing economy in the world, continued to have distinguished position of being largest democracy in the world, lifted millions out of poverty, has become a space, nuclear power as well as IT super power and enjoy a respectable image at the global level. However, it is faced with numerous challenges like high poverty ratio, climate change, land degradation, low agricultural productivity, pollution etc. ©<u>crackingcivilservices.com</u>

But the key issues that makes our future uncertain are:

• Increasing population:

- According to **the UN's World Population Prospects 2019 report**, India is projected to become the most populous country by 2027 surpassing China.
- The current estimated population of India is 1.37 billion and it is expected to be 1.64 billion by 2050.
- This ever increasing population of the country is considered as **the root of the numerous other challenges** like low quality of life, high poverty and unemployment, degradation of environment, low capital availability for development, food security etc.

However, according to the National Family Health Survey (NFHS)-4, as many as 23 States and Union Territories already achieved below 2.1 TFR. And the **Economic Survey 2018-19**, notes that **India is set to witness a "sharp slowdown in population growth in the next two decades**". But, still at the current rate of growth, India's population is likely to peak by 2048 at about 1.61 billion and is a key issue for the policy makers.

- **Higher health risks:** India is faced with numerous challenges in the health sector. e.g.
 - In **the Global Health Security Index**, which measures pandemic preparedness for countries based on their ability to handle the crisis, India ranked 57, lower than the US at 1, the UK at 2, Brazil at 22, and Italy at 31, highlighting India's vulnerability.

- o Globally it has the 2nd highest number of diabetic patient,
- Being a tropical country it some of the most severe issues with infectious and Neglected Tropical Diseases diseases on the planet like Soil-transmitted helminths, kala-azar, Dengue, Malaria, Leprosy, Trachoma etc.
- According to **Global TB report 2019 of WHO**, India has highest TB burden in the world which causes about 220,000 deaths every year.
- **Out-of-Pocket Expenditure** (OOPE) as a percentage of Current Health Expenditure continue to be around 60%.
- The economic survey 2019-20 had highlighted the issues related to the medical infrastructure in the country. for example, the doctor-population ratio in India is 1:1456 against the WHO recommendation of 1:1000.
 - Uneven distribution of healthcare workforce: Most of the workforce practice in metropolitan or tier I or tier II cities, creating personnel deficiencies in small towns and villages.
- Still not so impressive health indices with Maternal Mortality Rate at 122 (in 2015-17), Infant mortality rate at 28 in 2019 and child mortality rate 34 in 2019.
- India also faces the issue of large number of cases of mental health, in 2017, there were 197.3 million people with mental disorders in India, comprising 14.3% of the total population of the country. One among every seven people in India had a mental disorder, ranging from mild to severe.
- The **Covid-19 pandemic** is not only a recently emerged health risk, it has also exposed the existing issues in the health system of the country.
- Degraded natural resources:
 - The rapid growth of population in combination with economic development and over use of natural resources have led to degradation of natural resources.
 - Land degradation: A 2016 report by the ISRO found that about 29% of India's land (in 2011-13) was degraded, this being a 0.57% increase from 2003-05.
 - Loss of soil cover, mainly due to rainfall and surface runoff is responsible for 98 per cent of desertification in the country.
 - At the COP-13, India had committed to restoring 13 million hectares of degraded and deforested land by the year 2020 and an additional 8 million hectares by 2030.
 - **About 21.40% of forest cover in India is prone to fires** as per a report by the Forest Survey of India (FSI). They cause long term damage through loss of biodiversity, ozone layer depletion, loss of habitat for wildlife and soil erosion etc.

India is the third largest electronic waste generator in the world after China and the USA as per the Global E-waste Monitor 2020. The toxic materials from electronic devices are released into bodies of water, groundwater, soil and air, affecting both land and sea animals.

• Water contamination: As per NITI Aayog's composite water management index, India is facing one of its major and most serious water crises.

- Its water demand is projected to be twice the available supply by 2030.
 While almost 80% of water supply flows back into the ecosystem as wastewater.
- In India, 70% of states treat less than half of their waste water/

- India is currently **ranked 120 among 122 countries in the water quality index**. 21% of communicable diseases in India are from usage of unsafe water.
- According to the World Air Quality Report, 2020, 22 of the top 30 most polluted cities in the world are In India
- A recent study has found that at least 30.7% of deaths in India can be attributed to air pollution from fossil fuels-- that means about 2.5 million people die every year after breathing toxic air.
- Further, Illegal mining of natural resources like coal, sand etc has led to degradation of natural resources.
- Dwindling farm lands:
 - Out of the total land mass of 328 million hectares, about 60% or 181.95 million hectares is cultivable. But in 1988-89, we had 185.142 million hectares of cultivable land and what's worse is that only 45 percent of land is under irrigation.
 - Land degradation, <u>diversion of agricultural land for urbanisation and</u> <u>infrastructural development</u>, <u>land fragmentation</u>, <u>land submergence due to</u> <u>rising sea level</u> etc are some of the major reasons behind the dwindling farm lands.
 - Since the first agriculture census over 45 years ago, the number of farms in India has more than doubled from 71 million in 1970-71 to 145 million in 2015-16, while the average farm size more than halved from 2.28 hectares (ha) to 1.08 ha.
 - The share of small and marginal holdings in the country, has risen to 86.21 per cent of total operational holding in 2015-16.
 - In India, the agricultural land is decreasing at a rate 30,000 hectares per year. Combined with the drought and floods in various states, it can threaten the food security in India.
 - The cultivable land in India has shrunk marginally by 0.43 per cent to 182.39 million hectare in last five years. This is due to shift in area for non-agricultural purposes such as buildings, road and railways among others.

Four scientific initiatives for:

- Increasing population:
 - Use of Geographic information system (GIS), data-processing software, internet technologies can be used to enhance the quality and costeffectiveness of the whole census operation, data collection and information dissemination of the data. Accurate and quality data can help the evidence based decision making regarding population control.
 - The science can also help in population control measures e.g. using **digital media platforms for spreading awareness** regarding family planning, use of **contraceptive technologies** to ensure that every pregnancy is intended and as safe as possible.
 - Science and technology also helps addressing the issues arose due to population increase. e.g. use of **internet technologies for affordability and accessibility of quality education and health services, using clean energy technologies (e.g. solar, wind, nuclear etc.) to fulfil the rising energy**

demands due to increasing population and economic development and using modern agricultural technologies to **ensure food security**.

• The skill development technology initiatives like **virtual training** can help increase the human capital and demographic burden can be turned into a demographic dividend. e.g. An initiative for capacity building through Virtual learning modules namely iGOT platform.

• <u>Higher health risks</u>:

- Leveraging Information Technology: Rolling out of e-Sanjeevani Tele Consultation Services and Arogya Setu app for self-assessment and contact tracing in case of covid-19 pandemic.
- \circ $\,$ Space technology are also used in the health sector. e.g.
 - Global navigation satellite systems and geographic information systems are used for the study and forecasting of communicable and noncommunicable diseases;
 - satellite communication and global navigation satellite systems for disaster response;
 - satellite communication for telemedicine and tele-education;
 - Various health research and technologies developed for inhabited space flights have been adapted for terrestrial use.
- Scientific measures helps in **dealing with diseases and pandemic at all the stages**. e.g.
 - RT-PCR test, rapid antigen test diagnosis of Covid 19.
 - Development of medicines and treatments e.g. Convalescent Plasma Therapy for Covid-19, Remdesivir for Ebola treatment.
 - **Bio-technologies** like Genetic Sequences and Genetic engineering is used for the development of vaccines.
 - Stem cell therapy: regenerative medicine which promotes the reparative response of diseased, dysfunctional or injured tissue using stem cells or their derivatives.
- Use of Nano-technology:
 - Nano medicine have resulted in formation of Nano scale diagnostic device which are more efficient & able to detect cancer, bacterial and viral infection.
 - Nanotechnology can help to repair damaged tissue through tissue engineering.
 - Drug Delivery: For the formation of Nano size drug which will help in lowering overall drug consumption & side effect by depositing active agent at specific places in body.
 - Nanotechnology holds the key to **stopping anti-bioticresistant bacteria and the deadly infections** they cause.
- **Food fortification technologies** can improve the nutritional profile of the food products. It will boost the immunity among the population reducing the prevalence of communicable and non-communicable diseases. e.g. **Golden Rice** with additional vitamin A.
- **Blockchain**-enabled mobile platform "**HealthPro**" to connect hospitals, insurance companies and host medical records of patients.
- **KARMI Bot** was a robot deployed by a government hospital in Ernakulam, Kerela to serve food and medicines to coronavirus patients with an aim to reduce risk of infections for doctors and health workers.

CRACKINGCIVILSERVICES.COM 67 th BPSC GENERAL STUDIES TEST SERIES-2022 Copyright O by CRACKINGCIVILSERVICES.COM

- Degraded natural resources:
 - **Space technology** (e.g. GIS) and Drone technology can be used for collecting informattion and the zoning and mapping of the degraded natural resources. It will enable the informed decision making.
 - **Biotechnology**: e.g.
 - **Bioremediation** for waste management in which microorganisms (e.g., bacteria, fungi), plants or biological enzymes are used to consume and break down environmental pollutants, in order to clean a polluted site. Example: **oil zappers**
 - Promoting use of **Bioenergy** (e.g. bioethanol and biodiesels) to check global warming,
 - Developing recyclable bioplastics to curb the environmental degradation due to plastics pollution.
 - **Nanotechnology** can be used for water and soil remediation due to their high reactivity, selectivity and versatility.e.g. nanomembranes for water purification, desalination and detoxification; Nanosensors for the detection of contaminants and pathogens etc.
 - Renewable energy technologies, Nuclear technology and Fuel Cell technology etc can be used used to replace the coal as major source of energy safeguarding the degrading environment system.
 - **Robot technology** can be employed in some conditions like **Bandicoot** to clean sewers.
- Dwindling farm lands:
 - Again **drones and GIS system** can be used for the mapping and collection of information about the available farm lands for the evidence based decision making regarding land use planning. e.g.
 - Desertification and Land Degradation Atlas released by ISRO provide National level land degradation mapping.
 - **Digital India Land Records Modernization Programme** (DILRMP) has been already been started to usher in a system of updated land records.
 - **Bhoomi project**: It was undertaken and developed by the State Government of Karnataka. It was done so in order to computerize all the records of the land in Karnataka.
 - **Super computers and big data** analysis has already been used for the timely dispersal of information about the weather related data to that farmers can minimise the production loss due to uncertain rainfall.

Soil Testing Labs (STLs) with Intensively Coupled Plasma (ICP) spectrophotometer are used for the distribution of Soil Health Cards to the farmers which helps promote sustainable farming and reduction of the use of use of chemical fertilizers which is a major cause of land degradation.

- Better input management and **increases soil fertility through use of nanotubes**, biosensors, controlled delivery systems, nanofiltration, etc.
- **Biotechnology** can be used not only for the land reclamation (e.g. bioremediation) but also to increase the productivity of crops (e.g. GM crops) to minimise the impacts of declining farm lands.

Thus, scientific initiatives can help us dealing with these key issues in a holistic manner. If India is to attain the sustainable development goals, these key challenges must be addressed. And science and technologies are important tools which will help us in this process.