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POLITY AND GOVERNANCE

UPDATED PHARMA MANUFACTURING RULES UNDER SCHEDULE M OF DRUGS AND COSMETIC RULES, 1945

This article covers 'Daily Current Affairs' and the topic details of 'Updated rules under Schedule M of drugs and Cosmetic Rules, 1945' This topic is relevant in the "Government policies and Industrial growth" section of the UPSC CSE exam.

Why in the News?

The Ministry of Health and Family Welfare (MoHFW) notified the updated rules under Schedule M of the Drugs and Cosmetics Rules, 1945, in the Gazette of India in order to improve conformity to quality standards. Schedule M defines good manufacturing practices (GMP) for medicinal products.

What are Good Manufacturing Practices (GMP)?

In India's pharmaceutical business, Good Manufacturing Practices (GMP) are regulatory norms and standards defined by the Central Drugs Standard Control Organisation (CDSCO) and the World Health Organisation (WHO). GMP guarantees that pharmaceutical goods are produced and regulated in a consistent manner to fulfil the quality requirements necessary for their intended use. GMP was first included in "Schedule M of the Drugs and Cosmetics Rules 1945" in 1988, with the most recent update in 2005. Here are some important characteristics of GMP in the Indian pharmaceutical industry:

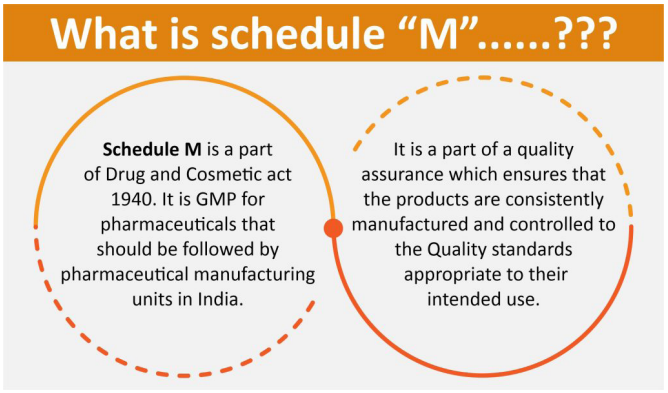
- **Quality Management System (QMS): GMP compliance requires a strong quality management system. Proper Documentation, control of quality, quality assurance, and a dedication to continual development are all part of this.**
- **Premises and Equipment**: GMP rules require pharmaceutical manufacturing plants to have appropriate and well-maintained sites and gears. The facilities' design and layout should limit cross-contamination and make thorough cleaning easier.
- **Documentation and record keeping**: Thorough and accurate documentation is an absolute must. This comprises batch records, standard operating procedures (SOPs), validation records, and other manufacturing-related documents.
- **Personnel**: GMP compliance requires adequately trained and competent personnel. GMP principles, hygiene standards, and particular procedures related to their roles should all be covered in training programmes.
- **Production and Process Control**: Pharmaceutical manufacturing processes must be well defined and regulated, according to GMP norms. This includes using tested methods, monitoring crucial parameters, and handling raw materials and finished products properly.
- **Quality control mechanisms must be in place in order to guarantee the quality of raw materials, intermediary compounds, and finished products. This includes testing, sampling, and evaluation in accordance with established processes.**

What is the Need for the Revised Rules of the Schedule M of Drugs

- This would put India's GMP standards in line with worldwide standards, particularly those set by WHO, and assure the production of drugs of globally acceptable quality
- Previously, the Ministry established a 6-month timetable for small firms and a 12-month deadline for large units to get WHO-GMP certification.
- In order to keep up with the rapidly changing manufacturing and quality domains, it was necessary to revisit and amend the GMP principles and concepts mentioned in the present Schedule M.

Amendments to the Revised Schedule M Drug Rules are –

- The changes addressed in the updated Schedule M include the addition of –
  1) Pharmaceutical quality system (PQS)
  2) Quality risk management (QRM)
  3) Product quality review (PQR)
  4) Qualification and validation of equipment
  5) Computerised storage system for all drug products.



- The updated Schedule M is divided into 13 components that give GMP standards for the specific requirements for pharmaceutical medication manufacture.
- The emphasis will fall on risk management, equipment's qualification and validation, and self-inspection will be critical contributions.
- Manufacturers are obligated to assume responsibility for the quality of pharmaceutical products to make sure that they are fit for their intended use, meet licence requirements, and do not endanger patients due to insufficient safety, quality, or potency.
- Five new medication categories have been included in the amended regulations. These categories include pharmaceutical items that contain dangerous materials such sex hormones, anabolic and androgenic steroids, cytotoxic compounds, biological products, and radiopharmaceuticals.
- Only after tests on the ingredients show "satisfactory results" then only companies go forward with marketing the final product.
- The amended guidelines will be applied based on firm turnovers, Medium and small manufacturers (with an annual turnover of less than 250 crore) required to apply the revised rules within 12 months of their publication date. Large producers with an annual revenue of more than 250 crore will have six months to comply.

The importance of Schedule M Revision:

- This will raise and upgrade the manufacturing standards of medicines, bolstering the Indian industry's reputation and boosting patient results. This will help Indian manufacturers in exporting.
- It will help in ensuring compliance with international quality standards, benefiting both the patients and the industry by encouraging the production of safe, effective, and
- The emphasis on risk management, equipment qualification and validation, and self-inspection will be critical contributions.

BILKIS BANO CASE

This article covers 'Daily Current Affairs' and the topic details of ''Supreme Court overturned remission given to 11 men sentenced in the Bilkis Bano Gangrape Case.'' This topic is relevant in the "Executive & Judiciary" section of the UPSC CSE exam.

Why in the News?

The Gujarat government's remission of 11 convicted criminals in the case of Bilkis Bano has been overturned by the Supreme Court. These prisoners were ordered by the supreme court to report to the jail administration in two weeks.

About the case?

- A small group of individuals attacked Bikinis Bano and the rest of her family following the 2002 Godhra riots in Gujarat.
- After a vicious gangrape, seven of Bilkis' family members were killed.
- Only a three-year-old, a man, and Bilkis made it out of the attack alive.

- The National Human Rights Commission (NHRC) took up her complaint, and the Supreme Court ordered the CBI to conduct an investigation.
- The case was transferred from Gujarat to Mumbai, where accusations were brought against these individuals, due to recurrent threats of death.
- A special CBI court in Mumbai had convicted all eleven suspects to life in jail in January 2008.

Release of the convicts :

- After serving 15 years and 4 months of his life sentence, one of the prisoners, Radheshyam Shah, appealed to the SC in 2022 in order to be released early.
- The Gujarat government was given this case by the Supreme Court in May 2022 and then SC requested that the Gujarat government take Shah's request for an early release into account in accordance with the state's 1992 remission policy.
- With its remission policy, the Gujarat government freed all 11 of the gangrape case's inmates on August 15, 2022.
- But this decision provoked a strong outcry from the people and led to petitions from opposing Members of Parliament.
- **Review Bilkis Bano's petition** – In order to evaluate the Gujarat government's decision to order the release of the 11 gangrape convicts, Bilkis Bano, the defendant, filed a petition for review with the Supreme Court in 2022.The present ruling was rendered in reaction to the Bano's review petition.

Current judgement of Supreme Court

- Since the trial took place in Maharashtra, the Gujarat government didn't qualify as the proper government to issue the remission order. There is incompetence in the exemption order. Only the state where they are prosecuted has the authority to release criminals.
- The bench further declared that deception and the omission of facts were used to attain the May 13, 2022, SC order.
- The Gujarat government needs to have submitted a plea arguing that they are not the appropriate government and asking for a reconsideration of the 2022 judgement.
- In May 2022, the Supreme Court severely disregarded its own ruling. The SC decided in May 2022 that two separate states cannot have simultaneous authority over the matter of remission.
- The policy in effect in the State where the crime was committed must be taken into consideration when deciding whether to release a criminal early. Therefore, the Gujrat government's remission policy was used to have these prisoners released.

What is remission?

A sentence that ends completely at a reduced point is called a remission. It is different from both furlough and parole because it is a sentence reduction rather than a release from incarceration.

Constitutional provision about remission –

- The Constitution grants the sovereign power of pardon to both the President and the Governor.
- According to Article 72, the President may pardon, reprieve, respite, or remit punishment, or

he may suspend, remit, or commute the sentence of any individual found guilty of any offence –

(a) in any situation in which the prison term or sentence was handed down by a court martial (b) in all situations where the sentence consists of the death penalty (c) in all situations where the penalty or punishment is death.

- A Governor under "Article 161",can pardon, reprieve, respite, or remit the punishment, as well as suspend, remit, or commute the sentence.

Statutory remission authority –

- The "Code of Criminal Procedure (CrPC)" allows for prison term remission. This is due to the fact that prisons are a state subject. Although the Bharatiya Nagarik Suraksha (Second) Sanhita is planned to succeed the CrPC. The law was successfully approved by Parliament and had received the President's approval, but it has yet to go into effect.
- **Section 432** – The 'relevant government' may suspend or remit a sentence, in whole or in part, with or without restrictions,
- **Section 433** – The appropriate authorities can commute any sentence to a lighter one.
- State governments have this authority, which allows them to order the release of prisoners before their sentences are completed.

Case law related to remission :

The Supreme Court established five grounds for remission in '**Laxman Naskar v. Union of India**' (2000) –

1. Whether that offence is a single act of crime which has no societal impact.
2. Is there a probability that the crime may be committed in the future?
3. Whether the convicted person has perished the ability to conduct crime
4. Whether there is any benefit in retaining the offender in prison.
5. The convict's and his / her family socio-economic situation

Conclusion :

The ruling explains who has jurisdiction in remission matters, emphasising the significance of due process and legal conformity. This decision establishes an example for future remission cases, emphasising the importance of carefully considering the nature of the offence and its societal impact in such determinations.

PRELIMS QUESTIONS

Q1. What is the major role of the Central Drugs Standard Control Organisation (CDSCO) in India, according to the Drugs and Cosmetics Rules, 1945?

a) Pharmaceutical product marketing
b) Clinical trials' regulatory approval
c) Good Manufacturing Practices (GMP)
d) Providing Medical consultations

Q2. Which constitutional principle is often invoked when exercising remission power?

1. Rule of Law
2. Separation of Powers
3. Due Process
4. Federalism

Q3. The remission power is primarily exercised in cases related to:

1. Civil offenses
2. Constitutional violations
3. Criminal offenses
4. Administrative misconduct

ANSWERS

S. No.	Answers
1.	B
2.	B
3	C

MAINS QUESTIONS

Q1. What exactly is Schedule M in the Drugs and Cosmetics Act of 1945?

Q2. Describe the regulatory framework established by the 1945 Drugs and Cosmetics Rules. How does this system ensure pharmaceutical and cosmetic safety, efficacy, and quality in India?

Q3. Discuss the significance of the remission power in the criminal justice system and its role in ensuring fairness and rehabilitation.

Q4. Explore the balance required between executive discretion and the principles of justice, taking into account potential abuse of the remission power.

SCIENCE & TECHNOLOGY

USING AI IN CANCER TREATMENT

This article covers 'Daily Current Affairs' and the topic details of 'Use of AI in cancer treatment' This topic is relevant in the "Science & Technology" section of the UPSC CSE exam.

UPSC Mains GS-3 SYLLABUS : Science and technology-developments and their applications and effects in everyday life.

Why in the News?

Given an increasing number of cancer cases, the scarcity of professionals poses a major challenge in reducing mortality rates. To fill this gap, Mumbai's Tata Memorial Hospital (TMH), India's largest cancer hospital, is resorting to artificial intelligence (AI).The hospital is using deep learning to create a cancer-specific customised algorithm which helps in early-stage cancer identification by establishing a 'Bio-Imaging Bank' for cancer.

About Bio-imaging Banks :

- The Bio-Imaging Bank is a collection of radiology and pathology pictures that are linked to clinical data, outcome statistics, therapy specifics, and other metadata.
- It is a type of biosensing that uses light to create non-invasive visual illustrations of biological processes in cells, tissues, and anatomy for more precise diagnosis and treatment. Bioimaging attempts to interfere with biological processes with as little disruption as possible.
- It is also used to obtain information on the 3-D structure of an observed specimen from the outside, i.e. without physical disturbance.
- Methods for visualising biological material that has been fixed for observation are also included in bioimaging.
- Deep learning is being used by the hospital to create a cancer-specific customised algorithm that will aid in the initial stages of cancer identification.

How AI will help in detection of Cancer :

- **Data Learning**: AI analyses huge databases of radiological and pathological pictures to identify features linked with specific malignancies.
- **Early detection**: Early detection is achieved by detecting tissue alterations and probable cancers.
- Chronic patient data generated by thorough imaging aids in understanding the behaviour, treatment response, illness recurrence, and life expectancy.This data is used by AI and machine learning procedures to construct forecasts for cancer survival and to influence treatment aggressiveness.
- The compilation of a cancer image bank enables the development of algorithms for various tumours, the assessment of treatment reactions using only images, and the avoidance of wasteful chemotherapy for anticipated non-responders.
- This means that children will be exposed to far less radiation while keeping diagnostic quality with no degradation.

Use of AI in future in treating cancers and tumours :

- **Personalised treatment** : AI is projected to per-

sonalise treatment techniques based on patient profiles, optimise therapeutic outcomes.

- **Facilitating Diagnosis**: AI could allow physicians to diagnose complex cancers with a single click, increasing the accuracy of cancer treatments.
- **Continuous Learning**: As AI learns and develops, it offers more accurate cancer diagnosis, improved patient outcomes, and assistance to healthcare workers.

National Cancer Grid :

In India, the National Cancer Grid (NCG) is a network of major cancer centres, academic institutions, and regional cancer centres that work in tandem to standardise cancer care and facilitate oncology research. The National Cancer Grid's major objective is to improve cancer care quality, support research, and ensure that the most recent advances in cancer treatment reach patients across the country.

Conclusion :

While AI has enormous potential, it is critical to combine technical breakthroughs with human skill, as well as address ethical and legal issues, in order to provide the best possible care for patients.

SUCCESSFUL TESTING OF PEM FUEL CELL BY ISRO

This article covers 'Daily Current Affairs' and the topic details of 'successful testing of PEM fuel cell by ISRO.'' This topic is relevant in the "Science and Technology" section of the UPSC CSE exam.

UPSC MAINS GS3 Syllabus : Indigenization of technology

Why in the News?

ISRO has achieved success in testing a 100 W class Polymer Electrolyte Membrane Fuel Cell (PEMFC)-based Power System aboard the orbiting vehicle POEM3. POEM3, which was launched onboard PSLV-C58.

About PEMFC Test

- Its goal is to evaluate Polymer Electrolyte Membrane Fuel cell operation in space and collect data that will help in the layout of systems for upcoming missions.
- It is an electric generator that operates on electrochemical principles, similar to those used in batteries, rather than the combustion reactions used in traditional generators.
- ISRO tested a PEMFC of 100 watts that transforms both oxygen and hydrogen into energy, water, and heat. This method has various advantages over typical space power sources, which includes: (a) PEMFCs convert gasoline directly into energy, resulting in much higher efficiency than batteries. (b) PEMFCs emit just water as a by-product, avoiding the need for sophisticated waste management systems. (c) The PEMFC water can be utilised for on-board consumption or electrolysis to generate extra oxygen.These characteristics make them excellent choices for space travel by human missions when electric power, water, and heat are required because a single system may handle numerous mission needs.
- Fuel Cells have enormous societal potential for application as well – (a) They are regarded as the best choice for replacing engines in various vehicles and powering backup power systems today. (b) It can provide the same range and fuel recharge time as a traditional engine, providing it an unambiguous benefit over batteries, and is projected to promote emission-free transportation.

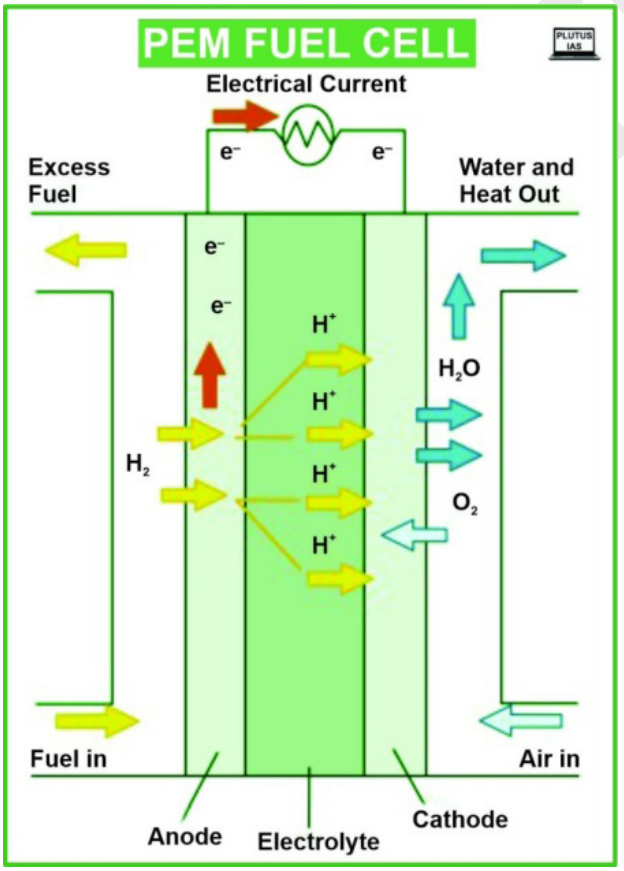
Applications for future missions

- Fuel cells are ideal for manned space missions because they provide critical power, water, and heat from just one device.
- PEMFCs are perfect for running the envisioned Indian space station due to their great efficiency and water production capabilities.
- PEMFCs have the potential to provide a dependable and sustainable source of power for long-duration journeys to deep space destinations like Mars.

- Fuel cells have comparable performance and refuelling time to conventional engines and are intended to provide emission-free transportation.

About POEM (PSLV Orbital Experimental Module) initiative

- Energy generation, telemetry, telecommand stabilisation, orbital station holding, and orbital manoeuvring are all supported by ISRO's POEM platform, which has standard interfaces and packaging.
- This enables space agencies and private enterprises to create, test, and evaluate experimental orbital payloads.
- ISRO's PSLV rocket is a four-stage rocket in its conventional configuration. (a) The first three spent stages re-enter the water, while the fourth goes up in space as debris after sending satellites into orbit. (b) The POEM programme, on the other hand, uses the wasted final stage as a "stabilised platform to conduct experiments."



What is a Fuel Cell?

- A fuel cell is a type of an electrochemical device that directly transforms the chemical energy of a fuel (such as hydrogen) and an oxidant (such as oxygen) into electricity.
- Unlike batteries, which store chemical energy before converting it to electrical energy, fuel cells produce electricity continuously for as long as they are supplied with fuel and an oxidant.

How Fuel Cell works or its operation

- At the anode, hydrogen molecules (H2) are divided into protons (H+) and electrons (e-). Only protons can travel through the PEM to the cathode.
- Electrons pass through an external circuit to the cathode, creating an electric current.
- At the cathode, oxygen molecules (O2) from the air interact with protons and electrons to generate water (H2O).
- Heat is produced during the reaction, and this heat can be exploited to heat certain applications.

Some important types of fuel cell –

- **Polymer Electrolyte Membrane Fuel Cells**: These fuel cells are perfect for portable applications since they incorporate a thin but solid polymer membrane as the electrolyte.
- **SOFCs (Solid Oxide Fuel Cells)**: SOFCs have a ceramic electrolyte which can withstand high temperatures. They are more expensive and sophisticated than PEMFCs, but they are more efficient.
- **Alkaline Fuel Cells (AFCs)**: AFCs use a potassium hydroxide (KOH) liquid electrolyte. They tend to be less efficient in comparison to PEMFCs and SOFCs, but they are more affordable and more tolerant of fuel impurities.

PRELIMS QUESTION

Q1. What is the function of chemotherapy in the treatment of cancer?

a) Tumour's removal by surgery
b) Immune system boosting
c) Drug-assisted targeted killing of cancer cells
d) Interfering with hormone production

Q2. What environmental benefit is associated with PEM Fuel Cells?

A) Increased air pollution
B) Reduced greenhouse gas emissions
C) Depletion of ozone layer
D) Soil contamination

Q3. What is the byproduct of the electrochemical reaction in a PEM Fuel Cell?

A) Water
B) Carbon dioxide
C) Nitrogen
D) Oxygen

ANSWERS

S. No.	Answers
1.	C
2.	B
3.	A

ECONOMY

FOOD PROCESSING INDUSTRIES

This article covers 'Daily Current Affairs' and the topic details of "Growth in the Food processing sector ''. This topic is relevant in the "Indian Economy" section of the UPSC CSE exam.

UPSC MAINS GS3 Syllabus : Food processing and related industries in India

Why in the News?

Indian processed food exports have shown a spectacular 150% growth since the last nine years as per minister for commerce & industry, consumer affairs, food & public distribution Piyush Goyal

Status of Food Processing Sector in India

- One of the pillars of the Indian economy, the food processing industry in India has been expanding recently.
- Representing one of the biggest sectors of the global food processing industry, it accounts for around 32% of India's total food market. About 35 million people are indirectly employed by it, in addition to 13 million directly.

About Food processing Sector of India :

- **Agricultural Exports**: At this time, India's agricultural exports have been over $53 billion.
- **GI tags (GIs)**: India boasts 158 food and Agri Geographical Indications (GIs), emphasizing the unique and region-specific nature of its food products.
- **One District One Product (ODOP) Scheme**: The ODOP project has discovered 708 unique culinary dishes throughout districts, promoting local specialties.
- **Capital Investment in the Processed Food sector**: India's Food Processing Sector emerged as the sunrise sector and attracted FDI investments of about Rs 50,000 crore in the past nine years
- **Global Demand for Indian Foods**: The global demand for Indian dishes is increasing.
- **Potential**: The food processing market in India is expected to be worth $535 billion by 2025.

Government Initiatives to support Food Processing Sector :

- Cold chain and food and agro-based processing facilities were added to the list of agricultural activities covered by Priority Sector Lending (**PSL**) regulations in April 2015.
- In an effort to make business easier, the Food Safety and Standards Authority of India (FSSAI) changed its clearance process in 2016 from one that was based on product approval to one that was based on ingredient and additive approval. This change was made through notifications.
- Enabling **100**% Foreign Direct Investment (**FDI**) approval using automatic route for the food processing sector.
- A production-linked incentive scheme (**PLI**) for the food processing sector
- Setting of a Dedicated Food Processing Fund of Rs. 2000 crore by (NABARD).
- The MoFPI launched the **National Cold Chain Grid (NCCG)**, which aims to connect cold storage facilities nationwide in a seamless network. The nutritional value and shelf life of food products can be increased, and post-harvest losses can be decreased with the use of this network.
- **Pradhan Mantri Kisan Sampada Yojana (PMKSY)** : India's food processing industry, including the supply chain, is to be modernised and upgraded through this scheme .
- The government offers financial support under this programme for the construction of cold

storage facilities, processing facilities, and logistical support for the food processing industry.

Challenges Related to Food Processing Sector

- **Availability of Cold chain Network and Storage**: Significant post-harvest losses of perishable goods are caused by insufficient cold storage and transportation facilities. This has an effect on farmer revenue in addition to food quality.
- **Complicated Rules**: It can be difficult for firms to negotiate the complicated network of licences, permissions, and laws that apply to the food processing industry. Unfair competition and problems with quality might result from inconsistent enforcement of regulations.
- **Worries about Food Safety** : Maintaining the quality and safety of food requirements throughout the supply chain is still quite difficult. Food products that are tainted or contaminated can endanger public health and tarnish the industry's reputation.
- **Weak Supply Chain**: India's supply chain is extremely dispersed, which raises expenses and causes inefficiencies. Inadequate rail and road infrastructure can cause losses and delays when moving.
- **Inadequate Processing Levels**: In India, only about 10% of all agricultural and horticultural produce is processed, compared to 60–80% in wealthy countries. Lack of skills prevents value creation and product diversity.
- **Dependency on APMCs and institutional problems in the supply chain**: Before connecting to bulk processors, reliance on dispersed APMC mandi middlemen adds three to four extra steps, waste, and commission fee burdens. impedes modernising initiatives.
- **Research and Development**: The creation of novel, value-added products and innovation are hampered by a lack of funding for research and development.

Way Forward :

- **Waste-free Processing**: Using methods of processing that make full use of all of the raw material. For example, turning food waste into biofuels or producing new goods like bio-plastics or livestock feed out of food leftovers.
- **Community-based processing centres** : Developing community-based food processing plants in rural areas . By acting as hubs for nearby farmers to prepare their products, these facilities help lower post-harvest losses and generate jobs in rural areas.
- The creation of a variety of functional and nutraceutical foods suited to particular health requirements is known as nutraceutical innovation. These may have foods that have been fortified with probiotics, vital nutrients, and bioactive chemicals to treat common health issues that the Indian population faces.

Conclusion :

The future of food processing appears bright, so long as the government provides sufficient support. It has the power to rescue millions from malnutrition. The government faces a formidable task in developing industry in a manner that caters to small-scale businesses while also drawing large-scale domestic and international investments.

7 ODISHA PRODUCTS GET GI TAG

This article covers 'Daily Current Affairs' and the topic details of '7 Odisha products get GI tag' This topic is relevant in the "Culture and Indian Economy" section of the UPSC CSE exam.

Why in the News?

Owing to their uniqueness within the state, seven goods from Odisha—from the embroidered Kapdaganda shawl to the Similipal Kai chutney prepared with red weaver ants—have been awarded the coveted Geographical Indication (GI) marking. Recently, a total of 17 items from various states have been assigned the GI tag.

What is a GI tag?

- A geographical indicator, often known as a GI, is a label applied to goods that are known for coming from a certain place and have characteristics or an image that is unique to that place.
- According to the Paris Convention for the safeguarding of Industrial Property, geographical indications are protected as a form of intellectual property.
- The WTO Declaration on Trade-Related Aspects of Intellectual Property Rights (TRIPS) governs and guides it.
- The Geographical Indications of Goods (Registration and Protection) Act, 1999 oversees the Geographical Indications certification process in India.
- Products related to agriculture, cuisine, wine and spirit drinks, handicrafts, and industry are generally classified according to their geographic origin.
- Famous goods like Pashmina Shawls, Basmati Rice, Kancheepuram Silk, and Darjeeling Tea are just a few that have been awarded GI tags.
- **Validity** : 1) A product can use its GI tag for 10 years after it was first issued. 2) It could still be extended for an additional ten years. 3) No one else may use a GI tag for a goods that is not made in the designated geographical region while the tag is valid. 4) By doing this, the original producer' rights are safeguarded and other parties are prevented from using the tag on their goods. 5) Customers are additionally reassured regarding the product's genuineness thanks to it.

GI registration :

- The correct procedure for registering geographically indicated products involves submitting an application, being subject to preliminary investigation and scrutiny, publishing a show cause notice in the geographical indications magazine, receiving objections to registration, and finally registering the product.
- Applications may be made by any group of individuals, producers, organisations, or authorities created by or under the legislation. The applicant needs to speak on behalf of the producers.

Advantages of GI Labeling :

- It assists in locating the authentic goods originating from a particular area.
- This contributes to the products' promotion and rise in consumption.
- By prohibiting others from using the GI tag on their products, it aids in defending the rights of the original creators.
- This aids in preserving the products' authenticity and quality.
- It aids in advancing the conventional knowledge and abilities related to the product's production.
- This contributes to the preservation of the area's cultural legacy.

A brief overview of the seven products –

- **Kapdaganda shawl** : The shawl is a representation of the rich tribal heritage of the Dongria Kondh tribe. It was spun and beaded by the women of the tribe.The Dongaria Kondh tribe is one of the particularly vulnerable tribal groups (PVTG).
- **Lanjia Saura Painting**: Also referred to as Idital, this painting is among the earliest examples of tribal art. The artworks are renowned for their

symbolism, ritual associations, beauty, and elegance. The Lanjia Saura community, a PVTG that primarily resides in the Rayagada district, is the owner of the art form.

- **Koraput Kala Jeera Rice**: Known as the "Prince of Rice," this black-colored rice type is renowned for its flavour, texture, scent, and nutritional content.This rice variety has been conserved for over a millennium by tribal farmers in the Koraput region.
- **Similipal Kai Chutney**: In the Mayurbhanj region of Odisha, tribal households have an ancestral delicacy created from red weaver ants. The Similipal forests are home to the ants in the Mayurbhanj forests.
- **Kanteimundi Brinjal** : The entire plant, as well as the stems, of the Kanteimundi brinjal are renowned for their sharp thorns. The plants may be cultivated with little pesticide because they are resistant to large insects.
- **Khajuri Guda**: Originating in the Gajapati area of Odisha, "Khajuri Guda" or jaggery is a natural sweetener made from date palm trees. Since jaggery is organic by nature, it is traditionally made in a trapezoidal form known as "Patali Gur."

Although India is confronted with the following GI-Tag challenges:

- **State Conflicts**: As evidenced by the Rasogolla case, state-level disagreements persist on GI ownership.
- **Absence of Commercial Strategy**: Inadequate plans for utilising GIs in international trade.
- **Unauthorised Use**: When GIs are misused by unapproved parties, they deceive customers and harm legitimate producers.
- **IP Controversy Still Alive**: The topic of GI protection in intellectual property rights is still quite controversial.
- **Limited Organised activities**: Not much in the way of organised activities other than defining uniqueness.
- **Neglecting Quality Control**: Pay more attention to source indication than to quality control, as demonstrated by Alphonso Mango.
- **Marketing and Branding Gaps**: Poor branding, advertising, and promotion—Basmati rice is one example of this.

PRELIMS QUESTION

Q1. Which of the following is the primary purpose of a Geographical Indication (GI) tag?

a) To protect the rights of individuals
b) To promote global trade
c) To identify products as originating from a specific geographical location
d) To encourage competition among producers

Q2. A Geographical Indication (GI) tag ensures that:

a) Products are available worldwide without restrictions
b) Only products from a specific region can use the designated name
c) Any producer can use the GI tag without permission
d) Consumers are not aware of the product's origin

Q3. Which of the following statements regarding the Food Processing Industry in India is correct?

1. India is the world's largest exporter of processed food products.
2. The food processing industry in India primarily focuses on raw material exports.
3. The Ministry of Agriculture oversees the regulatory aspects of the food processing sector. Which of the following statements are incorrect?

A) 1 only
B) 1 and 2
C) 2 and 3
D) 1 and 3

Q4. What is the primary objective of the Pradhan Mantri Kisan Sampada Yojana (PMKSY) in the context of the food processing industry in India?

1. Promoting the export of raw agricultural produce.
2. Enhancing the income of farmers through value addition and processing.
3. Restricting the expansion of food processing units.
Which statement is correct?

A) 1 only
B) 2 only
C) 1 and 3
D) 2 and 3

ANSWERS

S. No.	Answers
1.	C
2.	B
3.	C
4.	B

MAINS QUESTIONS

Q1. How can PEMFCs contribute to addressing energy storage challenges in renewable energy systems?

Q2. What are the key advantages of Polymer Electrolyte Membrane Fuel Cells over other types of fuel cells?

Q3. Examine the impact of AI on personalised medicine. What aspects should be examined for the successful deployment of AI algorithms in customised treatment programmes based on specific patient characteristics?

Q4. Explain the role of the World Intellectual Property Organization (WIPO) in the protection of Geographical Indications (GIs). How does WIPO contribute to the global framework for safeguarding the rights associated with GIs?

Q5. Describe in detail the measures the Indian government has made to address the issues facing the food processing industry.

Q6. What are the reasons for the poor acceptance of a cost-effective small processing unit? How can the food processing sector aid in uplifting the socioeconomic condition of poor farmers?

ECOLOGY AND ENVIRONMENT

DETERIORATING AIR QUALITY IN INDIA

This article covers 'Daily Current Affairs' and the topic details of 'Report of Respirer Living Sciences and Climate Trends about Particulate Matter Pollution in India''. This topic is relevant in the "Environment" section of the UPSC CSE exam.

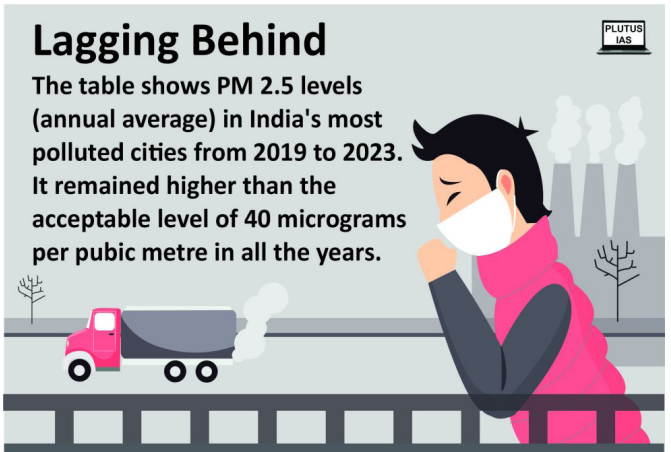
UPSC MAINS GS3 Syllabus : Environmental pollution and degradation

Why in the News?

Respirer Living Sciences and Climate Trends have just published a study which revealed that the vast majority of cities are far from India's National Clean Air Programme (NCAP) clean air targets.

Key highlights of the study

- **PM 2.5 :**
  - Only 27 of the 49 cities having continuous PM2.5 data over five years demonstrated a decrease in PM2.5 levels, with only four cities meeting or exceeding the targeted fall as per National Clean Air Campaign (NCAP) Goals.
  - The NCAP's objective is to decrease aggregate particulate matter (PM) concentrations in 131 cities by 40% by 2026.
  - The target was originally set for a 20-40% decrease by 2024, however it was subsequently postponed to 2026.
- **Regional vulnerabilities :**
  - While some places, such as Varanasi, Agra, and Jodhpur, had large reductions in PM2.5 levels, others, such as Delhi, saw just moderate reductions (only 5.9%) or even increased pollution loads.
  - Varanasi saw the most significant drop, with a 72% average fall in PM2.5 levels through a 69% decrease in PM10 levels between 2019 and 2023.



Rank in 2023	City	2019	2020	2021	2022	2023
1.	Delhi	108.4	95.3	107.6	99.5	102
2.	Patna	119.6	72.8	76.5	91.3	89.5
3.	Faridabad	94.5	87.6	95.6	95.3	87.9
4.	Muzaffarpur	108.1	67.4	122.6	85.7	83.6
5.	Noida	113.8	97.9	100.8	79.3	83.6

- **Challenges while monitoring**
  - Annual pollutant concentrations are heavily influenced by the availability and deployment of permanent ambient air quality monitoring.
  - However, many Indian cities do not have a sufficient number of such monitoring stations.While cities like Mumbai and Delhi have a number of such stations, other Indian cities only have a few.
  - A mere four out of 92 cities possess more than ten stations of this type.
  - **Pollution Influencing Factors:** Variability in levels of pollution can be related to geographical regions, various emission sources, meteorological impacts, and the interaction between emissions and Meteorology, all of which warrant more exploration.

What is National Clean Programme

- The Ministry of Environment, Forests, and Climate Change (MoEFCC) launched it in January 2019.
- It is the nation's first attempt to develop a national framework for air quality control with a time-bound reduction target.
- The NCAP's objective is to decrease average particulate matter (PM) levels in 131 cities by 40% by 2026. The target was originally set for a 20-40% decrease by 2024, however it was subsequently pushed up to 2026.
- It applies to the 131 non-attainment cities listed by the Central Pollution Control Board (CPCB) : (a) Non-attainment cities have failed to meet the National Ambient Air Quality Standards (NAAQS) for more than five years. (b) NAAQs are ambient air quality standards based on numerous identified pollutant notifications made by the CPCB under the Air (Prevention and Control of Pollution) Act of 1981. (c) Pollutants covered by NAAQS include PM10, PM2.5, SO2, NO2, CO, NH3, Ozone, Lead, Benzene, Benzo-Pyrene, Arsenic, and Nickel.
- PRANA (site for Regulation of Air Pollution in Non-Attainment Cities) is a monitoring site for NCAP implementation.

About Particulate Matter

- Particulate matter is an airborne combination of solid particles and droplets of liquid. Sulphates, nitrates, black carbon, particle-bounded water, elements (cadmium, copper, nickel, and zinc), hydrocarbons, and biological components such as allergens and microbial chemicals are all Particulate matter.
- **Different types of PM**
  - **PM 10**: Inhalable particles having sizes of fewer than 10 micrometres.
  - **PM 2.5**: Inhalable fine particles with a diameter of less than or equal to 2.5 micrometres.
- **Sources:**
  - Man-made causes is fromEmissions from power plants, factories, industries, incinerators, diesel generators, and autos, dust from building sites and unpaved roads, and garbage burning.
  - Natural causes include volcanic eruptions, soil erosion, sea salt, and so on.
- **Harmful effects :**
  - **Respiratory disorders**: Prolonged exposure can result in chronic obstructive pulmonary disease, asthma, bronchitis, chest getting tighter, and harm to the lungs.
  - As per WHO, practically 3.7 million deaths occur prematurely each year as a result of outdoor air pollution, with respiratory illnesses and malignancies induced by PM exposure accounting for 20% of these deaths.

Initiatives Taken to Control Air Pollution?

- The National Air Quality Monitoring Programme (NAMP) has identified four air pollutants for regular surveillance across the country: SO2, NO2, PM10, and PM2.5.
- System of Air Quality and Weather Forecasting and Research (SAFAR) Portal
- The Air Quality Index (AQI) was created for eight pollutants: PM2.5, PM10, ammonia, lead, nitrogen oxides, sulphur dioxide, ozone, and carbon monoxide.
- To Reduce Vehicle Pollution: BS-VI Vehicles introduced, Electric Vehicle (EV) Push by government(FAME scheme, Production Linked Incentive scheme)

Way Forward :

- **Transition to Clean Energy Sources**: Promote the use of renewable energy sources such as solar, wind, and hydropower.Transition away from fossil fuels by encouraging electric vehicles and investing in public transportation.
- **Stringent Emission Standards**:Implement and

enforce strict emission standards for industries, vehicles, and power plants.Regularly update and improve emission standards to keep up with technological advancements.

- Cooperation spanning regional and national jurisdictional borders will assist in the implementation of cost-effective solutions to improve air quality control.

Conclusion

The report by Respirer Living Sciences and Climate Trends highlights the ongoing problem of air pollution in Indian cities, with many cities failing to fulfil the targets set by the National Clean Air Programme. To combat particulate matter pollution in susceptible cities, focused actions, improved monitoring infrastructure, and long-term development are required.

HIGH RESOLUTION LANDSLIDE SUSCEPTIBILITY MAP OF INDIA

This article covers 'Daily Current Affairs' and the topic details of "Development of high resolution landslide susceptibility map of India''. This topic is relevant in the "Disaster and geography" section of the UPSC CSE exam.

UPSC MAINS GS1,3 Syllabus : Disaster and disaster management, Important geophysical phenomenon such as earthquakes, landslides etc.

Why in the News ?

The first high-resolution landslide susceptibility map of India has been developed by the Indian Institute of Technology Delhi, Since it covers the entire nation and excludes no area, it is the first of its type.

About National Landslide Susceptibility Map

- **Detailed Mapping**: Having a resolution of 100 square metres, this high-resolution map provides an extensive perspective of India's susceptibility to landslides, highlighting hitherto unidentified places.
- **Exploring New Risk places**: The map broadens the scope of places that need to be monitored for landslides by identifying not only typical high-risk zones but also recently unknown locations of concern.
- **Unique Analysis Technique**: To increase forecast accuracy and close data gaps in uncharted territory, the mapping made use of an ensemble machine learning technique.
- **Advantages of Ensemble Models**: This method expertly combines several models, providing a more reliable evaluation of landslip risks.

Process of Data collection and Analysis :

- **Data Collection**: Data from several sources, including the Geological Survey of India, were combined with information on about 150,000 landslip incidents by scientists.
- **Identification of Contributing Factors**: The research team discovered 16 significant elements impacting the susceptibility to landslides by using instruments like GeoSadak for remote data collection.

Benefits of such maps

- **Permanent Danger** : Landslides, which affect a large but restricted area of India, are a recurrent concern, especially in hilly regions.
- **Challenges of Management** : Historically, the localised and intermittent nature of landslides has made it difficult to monitor and predict the event, highlighting the need for an all-encompassing mapping system.

Programme for National Landslide Susceptibility Mapping (NLSM)

1) In 2014, the Geological Survey of India launched the National Landslide Susceptibility Mapping (NLSM) programme at a Macro Scale of 1:50,000.

2) Mapping the 0.42 million sq. km of terrain that is vulnerable to landslides nationwide is the aim.

3) **Aim of the programme** :
A) To establish a comprehensive National Landslide Susceptibility Geodatabase for India.
B) To create continuous, 1:50,000 scale GIS-

based maps of India's landslip susceptibility. C) To create a national GIS-based landslide inventory repository.

About Landslides :

A landslip is defined as a mass of rock, earth, or debris sliding down a slope. **Areas at Risk of Landslides**: Areas at risk of landslides are generally those with less trees, those near road construction, and locally steeper slopes. These areas are also more unstable.

Causes of Landslide

Natural Causes: earthquakes, undercutting of slopes due to flooding or excavation, snowmelt, Rainfall, etc. **Anthropogenic Causes**: Mining, excessive development, Overgrazing by cattle terrain cutting and filling.etc.

- **External causes of landslide are** – Undercutting of the hillside's base as a result of quarrying, excavating for roads and canals, and river erosion, among other reasons.
    - An increase in external loads, such as those from structures, reservoirs, vehicles, rock piles, alluvium buildup on slopes, etc.
    - Increased water content causes a rise in the slope material's unit weight.
    - Vibrations brought on by blasting, traffic, earthquakes, etc. that raise shearing strains.
    - Human alterations brought on by deforestation
    - Tunnelling, cavern collapse, seepage erosion, etc. all result in undermining.
- **Internal causes of landslides are** –
    - A rise in the pressure of pore water.
    - Decline in cohesive capacity produced by gradual lateralization.
    - Cracks brought on by tension-induced alternating swelling and shrinking.
    - The existence and orientation of faults, joints, bedding planes, cleavage, etc.
    - The heating and cooling of rocks and soils.
    - Earth material's physical characteristics, such as its compressive and shearing strengths.

Impact of Landslides

- **Effect on the Economy**: Property is destroyed by landslides. Millions were spent on its reconstruction and restoration.
- **Infrastructure Damages**: A landslide's forceful flow of mud, rocks, and debris can seriously harm people's personal belongings as well as important infrastructures including roads, trains, recreation areas, buildings, and communication systems.
- **Death toll:** Landslides are more likely to occur in communities near the base of hills and mountains. Because most disaster-prone places are densely populated, people's lives are made much more unpleasant.
- **Impacts landscape beauty**: The movement of dirt, rock, and other material ruins a location's natural appearance.
- **River ecosystems in decline**: The materials that landslides carry with them obstruct or impair the natural flow of these systems. Because it tampers with the normal movement of water, fish, which are found in many river environments, may perish.
- **Trigger Flood**: It may result in the diversion of river water, which may cause flooding and property loss in some locations.
- **Impact on daily wages**: Communities who rely on the beaches or rivers for irrigation, household chores, and other purposes will be negatively impacted.

Mitigation

- **Region-Specific Measures**: Whenever possible, it's best to cope with landslides by implementing area-specific measures.
- **Afforestation**: Some constructive measures include advocating for extensive afforestation ini-

tiatives and building bunds to slow down water flow.

- **Limitations on Construction**: It is important to enforce restrictions on the construction of roads, dams, and other developmental projects, to restrict farming to valleys and regions with mild slopes, and to control the growth of large settlements in high-vulnerability zones.
- **Early Warning and Monitoring System for Landslides**: To notify residents in regions at risk of landslides ahead of time in order to reduce the loss.
- "**Hazard maps**" are used to identify regions that are vulnerable to landslides. Therefore, it is best to avoid developing communities in such places.
- **Terrace Farming**: In the hill states of the northeast, where Jhumming (Slash and Burn/Shifting Cultivation) remains common, terrace farming should be promoted.

Conclusion

Disasters caused by landslides are usually far less dramatic than those caused by earthquakes, volcanic eruptions, tsunamis, and cyclones, yet they still have just as devastating an impact on the environment and the nation's economy.They are typically impacted by extremely localised variables, compared to other disasters that are abrupt or unanticipated, and are generally governed by macro or regional forces.

PRELIMS QUESTION

Q1. What is the primary mechanism by which PM affects human health?

1. Direct contact with the skin
2. Inhalation into the respiratory system
3. Ingestion through contaminated food
4. Absorption through the eyes

Q2. What is the size range of particles classified as PM2.5?

2. Less than 2.5 micrometers
3. Less than 25 micrometers
4. Less than 2.5 millimeters
5. Less than 0.25 micrometers

Q3. What role does heavy rainfall play in triggering landslides in the Himalayan region of India?

1 Heavy rainfall is not a significant factor in Himalayan landslides.
2 Heavy rainfall can saturate the soil, leading to increased landslide risk.
3 Heavy rainfall stabilizes the soil, reducing the likelihood of landslides.
Which statement is correct?
A) 1 only
B) 2 only
C) 3 only
D) 2 and 3

Q4. Which of the following statements regarding landslides is correct?

1) Landslides are exclusively caused by human activities.
2) Landslides can occur only in mountainous regions.
3) Excessive rainfall is a common trigger for landslides.
Which of the following statements are incorrect?
A) 1 only
B) 1 and 2
C) 2 and 3
D) 1 and 3

ANSWERS

S. No.	Answers
1.	B
2.	A
3.	B
4.	D

MAINS QUESTIONS

Q1. Discuss the contribution of manufacturing industries on particulate matter emissions. What steps may businesses take to lessen their environmental impact

Q2. Analyze the role of community engagement and awareness programs in landslide risk reduction. How can the NDMA work with local communities to enhance their resilience and preparedness for potential landslide events?

Q3. Discuss the role of the National Disaster Management Authority (NDMA) in mitigating and managing landslide risks in a country. How does the NDMA collaborate with other agencies and communities to enhance landslide preparedness and response?

SOCIAL ISSUES

LANCET REPORT ON THE ISSUE OF CHILD MARRIAGE IN INDIA

This article covers 'Daily Current Affairs' and the topic details of ''A Lancet report on the issue of child marriage in India.'' This topic is relevant in the "Social Empowerment" section of the UPSC CSE exam.

UPSC MAINS GS1 Syllabus : Social Empowerment, salient features of Indian society

Why in the News?

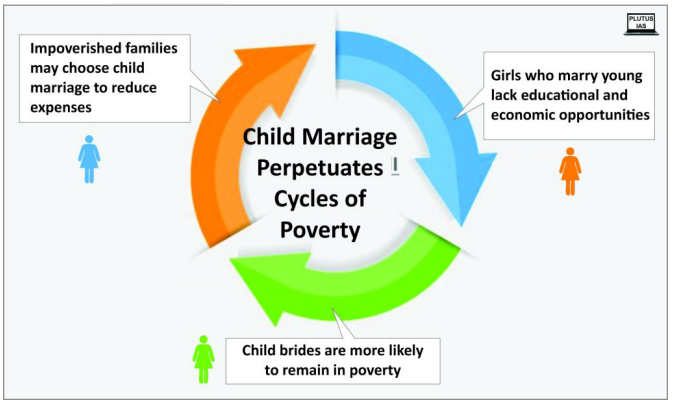
A study published in the Lancet sheds light on the persistent problem of child marriage in India, where it is particularly common in regions like West Bengal. It is well known that child marriages are common in Bihar, West Bengal, Uttar Pradesh, and Maharashtra, especially among females.

What does the report say ?

- Between 1993 and 2021, the number of girl child marriages decreased in all states but Manipur.
- Researchers found that in 2021, there were 13,464,450 child marriages for girls and 14,54,894 for boys.
- According to the report, one in five Indian females gets married before they are legally allowed to do so, with significant state-by-state variations.
- Over 500,000 more females have been married as minors in West Bengal, where there has been a notable rise in child weddings.
- The researchers conclude that in order to end child marriage by 2030, there is still a pressing need for improved national and state-level policies. Scholars have observed significant differences in the frequency of child marriages between girls and boys among the states and Union Territories under investigation.
- The state with the biggest absolute rise is West Bengal, which had nearly 500,000 more girls get married as children.

Impact of Child marriage –

- Girls and boys who get married young are prone to lack the skills, knowledge, and work opportunities needed to assist their families transcend poverty and contribute to their country's social and economic growth.
- The overall fertility rate of women is elevated by 17%, causing harm to developing nations grappling with rapid population expansion.
- Child marriage is seen as a kind of sexual and gender-based violence and as a violation of human rights. West Bengal has one of the highest rates of child marriages in Murshidabad, one of the State's economically disadvantaged districts.
- Maternal and child health are negatively impacted by child marriage. In the course of a single day, 10 infants passed away at Murshidabad Medical College and Hospital. A large number of the infants were born with exceptionally low birth weights, according to hospital authorities.



Reasons for the incidence of child marriage in India

- **Lack of education**: Education is a major driver of marital age. As per NFHS-4, approximately 45% of women with no education and 40% of women with primary education married before

the age of 18.

- **Poverty**: In terms of economic position, women from low-income families marry earlier. While more than 30% of women in the poorest two wealth quintiles were married by the age of 18, only 8% in the richest quintile.
- **Social background** : Child marriages are more common in rural regions especially among Scheduled Castes and Scheduled Tribes.
- **Trafficking**: Poor families are lured to sell their daughters into prostitution rather than marriage since the transaction allows enormous sums of money to benefit the girl's family while harming the girl. There is apathy towards their daughters, and the proceeds from the sale of their daughters are used to help their boys.
- Girls are frequently viewed as a burden with poor economic potential. Women's work is limited to the home and is undervalued. Furthermore, there is the issue of dowry. Although dowry has been illegal in India for over five decades (Dowry Prohibition Act, 1961), it is nevertheless typical for parents of females to offer presents to the groom or his family, in cash or in goods. The dowry sum rises with the girl's age and academic level. As a result, the "incentive" of the dowry system fosters child marriages.

Government measures to curb child marriages

- **Prohibition of Child Marriage Act, 2006** : This Act superseded the Child Marriage Restraint Act of 1929, which was passed during the British reign. It defines a child as a male under the age of 21 and a female under the age of 18.According to the Majority of Act, a "minor" is someone who has not reached the age of majority. It proposes punishing child marriage with two years of harsh jail and/or a fine of Rs. 1 lakh. The Act also calls for the establishment of a Child Marriage Prohibition Officer, whose job it is to prevent child weddings and raise awareness about them.
- The Prohibition of Child Marriage (Amendment) Bill, 2021 proposes raising the legal marriage age for women from 18 to 21 years.

Plans/Policies to Prevent Girl Child Marriage

- **SSY (Sukanya Samriddhi Yojana)**: Sukanya Samriddhi Yojana (SSY) was established in 2015 to enhance the welfare of girls. It inspires parents to invest in and plan for their daughters' schooling and marriage expenses in the future.
- **Balika Samriddhi Yojana**: Another central government plan to assist girls in financially challenged areas of society is the Balika Samriddhi Yojana. This programme ensures the enrollment and retention of female students in primary and secondary institutions.

It strives to improve the well-being of a girl's child by providing a higher-quality education.

Initiatives in bengal –

- **Kanyashree Prakalpa initiative**: A conditional donation initiative aimed at supporting teenage girls' education and avoiding child marriage.
- **Rupashree Prakalpa**: An economically rewarding scheme for girl marriage that occasionally challenges Kanyashree's ideals.

Measures needed to be taken

- **Education** : It is one of the most successful methods of protecting minors from marriage. When girls are allowed to continue in school, an attitude shift towards their community chances might emerge.
- **Empowerment of girls**: Every girl child should have access to life skills, protection skills, higher education, and employment prospects.Girls' primary and secondary education should be encouraged.
- **Bringing together child protection workers**: One strategy to keep child marriages under control during the pandemic would be to have a robust cohort of child protection workers among vital health staff. In these difficult times, India has a robust system of grassroots workers who have done a great job in ensuring that health and other social security services reach people.If such personnel were integrated into the

system, they could monitor girl youngsters at danger of early marriage and take preventative measures.

Conclusion

Despite regulatory measures, child marriage remains a major issue in India, particularly in districts such as West Bengal. While programmes like Kanyashree and Rupashree seek to address the problem, combining incentives with tough law enforcement is critical. To effectively oppose child marriage and defend the rights of young girls, a concerted effort involving all stakeholders, as well as a strong political commitment, is required.

Prelims question :

Q1. Which of the following is a common driver of child marriages in some societies?

A) Gender equality
B) Economic stability
C) Access to healthcare
D) Strong legal frameworks

ANSWERS

S. No.	Answers
1.	B

MAINS QUESTION

Q1. What influence do you believe child marriage has on the general well-being and development of the young girls and boys involved?

Q2. What sociocultural elements, in your opinion, contribute to the persistence of child marriage in specific groups or regions?