

**SCIENCE AND TECHNOLOGY**

**E-20 PETROL**

**In Context:** Minister of State, Ministry of Petroleum & Natural Gas informed the Rajya Sabha about the E20 programme of the government.

**About E20 fuel:**

- ✓ The number “20” in “E20” refers to the percentage of ethanol in the gasoline blend.
- ✓ Simply put, the higher the number, the higher the percentage of Ethanol in the gasoline.
- ✓ India’s current ethanol-to-petroleum mix is 10%, the highest it has ever been.
- ✓ Because it is made from biomass, ethanol does not require crude oil.
- ✓ Ethanol is primarily produced from crops such as corn and sugarcane.
- ✓ India already produces significant quantities of grain and sugarcane. It may allow automobiles to use a higher proportion of Ethanol.

**Ethanol blending:**

**FEEDSTOCK AND LAND REQUIREMENTS FOR ACHIEVING E20 BY 2025-26**

FEEDSTOCK	SUPPLY TARGET (BILLION LITRES)	ETHANOL YIELD PER TONNE FEEDSTOCK (LITRES)	FEEDSTOCK REQUIRED (MILLION METRIC TONNES)	LAND REQUIREMENT (MILLION HECTARES) ^
SUGARCANE*	5.5	20	275	3.3
MAIZE	2.33	380	6.1	1.8
RICE	2.33	425**	5.5	2.0
<b>TOTAL</b>	<b>10.16</b>	<b>---</b>	<b>---</b>	<b>7.1</b>

**NOTE**

- ★ It is assumed that all ethanol is produced through the B-Heavy molasses route. Ethanol yields are taken from NITI Aayog’s ethanol roadmap except for sugarcane.
- ★ ★ As per NITI Aayog, ethanol yield from FCI rice and (broken) rice sourced from open market is 450 and 400 litres/tonne respectively, we have assumed an average yield of 425/tonne of rice.
- ^ Crop yields are taken for year 2021-22 as 8.4 tns/ha for sugarcane, 3.4 tns/ha for maize, and 2.8 tns/ha for rice.

SOURCE: ARCUS POLICY RESEARCH REPORT

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- ✓ **Naturally, Produced**– Ethanol is a biofuel, naturally produced by the fermentation of sugars by yeasts or by petrochemical processes like ethylene hydration.
- ✓ **Derived from agricultural products**– In ethanol blending, a blended motor fuel containing ethyl alcohol derived from agricultural products is blended with petrol specifically.
- ✓ **High in oxygen content**– Ethanol is high in oxygen content, allowing an engine to combust fuel more thoroughly.

**Ethanol Blended with Petrol (EBP) programme:**

- ✓ EBP programme was launched by the government in 2003 to promote the use of alternative and environmentally friendly fuels.
- ✓ This intervention also aimed to reduce import dependency for energy requirements, and give boost to the agriculture sector (supply of straw, additional income to farmers).
- ✓ Oil marketing companies (OMCs) were mandated to sell ethanol-blended petrol with percentage of ethanol up to 10 per cent.
  - The government allowed procurement of ethanol produced from non-food feed stocks, like cellulosic and ligno-cellulosic materials, including petrochemical route.
- ✓ **Ligno-cellulosic materials:** It describes the main constituents in most plants, namely cellulose, hemicelluloses, and lignin. Ligno-cellulose is a complex matrix, comprising many different polysaccharides, phenolic polymers and proteins.
  - Cellulose, the major component of cell walls of land plants, is a glucan polysaccharide containing large reservoirs of energy that provide real potential for conversion into biofuels.
  - It is the non-starch based fibrous part of plant material.

**Advantages of E20 fuel**

- ✓ **Environmentally friendly:** Pointing out that vehicular emissions such as carbon monoxide (CO), hydrocarbons (HC) and oxides of nitrogen (NOx) are currently under regulation in India.
  - Ethanol blended gasoline decreases these emissions.
- ✓ **Cost savings:** About 85% of India’s fuel needs are met by imports.
  - The use of petrol with a 20% ethanol mix in India would result in significant cost savings for the nation.
- ✓ **Employment generation:** When innovative technologies are put into practice, new employment possibilities emerge.

- New positions will be created in the original equipment manufacturing (OEM) sector, as well as in the component supplier and aftermarket service provider sectors.
- ✓ **Benefit to agriculture:** India's government believes that reaching its goal of 20% ethanol in gasoline would benefit the country's agricultural industry.
  - The government asserts that farmers' incomes would rise because of these measures.

**Challenges:**

- ✓ **Consumer acceptance:** Consumer acceptance of new technology is subject to be tested.
  - The anxiety about using new technology will remain a concern.
- ✓ **Huge investment:** A new technology implementation on a mass scale certainly requires a huge sum of investment from the industry stakeholders.
  - After spending a huge amount of money on BS-VI migration from BS-IV in record time, it will be hard for the auto industry stakeholders to invest another huge sum.
- ✓ **Farmers acceptance:** Farmers who have been traditionally farming sugarcane can be benefitted from the strategy.
  - However, it is hard to believe that a large scale of farmers will opt for sugarcane farming, which is the main ingredient for ethanol production.
- ✓ **Timeframe:** With the Covid-19 and subsequent troubling situations disrupting the auto industry operations, achieving the target by the set deadline could be a challenge.

**Present utilisation of E20 Fuels in India:**

- ✓ **India's Creta, Venue, and Alcazar SUVs** from Hyundai Motor are said to be capable of running on E20 gasoline as of the 2023 MY model year.
- ✓ **Tata Motors** debuted two new turbocharged petrol engine at the **Auto Expo 2023. (1.2-litre and 1.5-litre).**
- ✓ Tata has stated that its vehicles longer than 4 meters will soon be equipped with E20 fuel-compatible engines.
- ✓ Similar developments are planned for vehicles manufactured by Mahindra, Maruti Suzuki, Kia, and others.

**Way Forward:** India being a large agricultural economy, there is a large amount of agricultural residues available; therefore, the scope of producing biofuels is immense in the country. Biofuels can help in rural and agricultural development in the form of new cash crops.

**ENVIRONMENT**

**Seeds for growth: How technology can boost Indian agriculture**

**In Context:** recently the Indian government is **promoting technology-enabled sustainable farming**, including natural, regenerative and organic systems, during its G20 presidency.

**More need to be done in agriculture sector**

- ✓ Though India has achieved food security with the production of food grains reaching 330 MT still the demand for coarse cereals, pulses, oilseeds and vegetables is not fully met.
- ✓ In addition, they are not affordable for a large part of the population, leading to a high proportion of the under/malnourished population, with a sizable percentage of child wasting (19.3 per cent).
- ✓ Alongside fulfilling its goal of increasing profitability in agriculture and its share of export in the world market, India needs to close the gap between potential and achievable productivity in most grain crops and vegetables
  - By reducing the cost of production
  - promoting cultivation and consumption of nutritionally-rich crops like millets, and
  - focus on the quality of the agricultural produce.
- ✓ Therefore, it's imperative that focus be given to ensuring the availability of quality seeds and maximising the performance value of every seed — the most critical input in agriculture.

**There is need to adopt technology in agriculture sector**

- ✓ Currently, agriculture sectors are facing multidimensional challenges such as depletion of natural resources, a burgeoning population, extreme weather conditions and natural disasters because of climate change. It poses bigger challenges to Indian and regional agriculture, dominated by smallholder farmers.
- ✓ India's performance in achieving the SDGs, especially goals one, two and three, ones linked to agriculture, are yet to reach desired levels.
- ✓ To ensure that India meet the targets for food and nutrition security, and the population's well-being in a sustainable manner, it's crucial to effectively utilise every available technology including traditional knowledge in agriculture.

**Role of seed industry in India's agriculture growth:**

- ✓ The Indian seed industry was built on a strong foundation in the 1960s with the establishment of the National Seeds Corporation and further boosted with several enabling policies and regulatory support from the late '80s.
- ✓ The introduction of the Protection of Plant Varieties & Farmers Rights Act, 2001, and the release of Bt cotton hybrids for commercial cultivation in 2002 were important milestones towards the era of a technology-driven seed sector, which boosted the industry and helped Indian farmers with better productivity.
- ✓ Therefore, the focus of the seed industry should be to promote varieties and technologies to combat the serious threats posed by climate change.

**Promoting technology in seed sector**

- ✓ Being nutrient-rich, hardy and grown in a short cycle, millets are recognised as well-suited for sustainable agriculture.
- ✓ India is the global leader in millet production. By producing quality-assured seeds of improved varieties of millets, especially minor millets, it has the potential to capture the global seed market.
- ✓ The advancements made in seed technology can maximise the availability and quality of seeds and help them perform well under a wide range of conditions.
- ✓ Therefore, in upcoming years molecular technologies, speed breeding and gene-editing tools, applied seed technologies would ensure good performance even under less favourable, unpredictable, and harsh environments.
- ✓ Hence, seed technology today must combine genetic advancement with applied technologies to provide quality-enhanced seeds of improved varieties having higher productivity, high input use efficiency and the ability to withstand a range of biotic and abiotic stressors
- ✓ Along with promoting R&D efforts in public and private sectors can complement each other in developing environment-friendly, better-performing seeds at affordable cost

**Seed-based technology would comprise:**

- ✓ Development of technology in seed sector will result into
  - Genetic manipulation in variety development that are subject to regulatory compliances;
  - priming or physiological advancement protocols; **film coating**, pelleting with or without active formulations;
  - **seed treatments with biologicals, or chemical pesticides** having contact or systemic mode of action; bio-stimulants and nutrients for higher germination and faster seedling establishment;
  - **incorporation of AI responsive sensors/substances in seed** to help modulate plant responses to external stimuli; and production of “clean and green” planting materials in horticultural crops.
  - For e.g. India is using most common these **priming and film coating technology**, which can be applied both under organic and inorganic cultivation to improve seed handling, precision planting and use as carriers of pesticides, nutrients, growth promoters and microbial inoculum
- ✓ Therefore, Priming and enhancement technologies are emerging as an essential package of practices to ensure that seeds perform well under a wide range of growing conditions.
- ✓ These are especially beneficial in agro-eco-regions that frequently experience moisture, temperature, and other abiotic stressors, or are prone to diseases and pest damages.
- ✓ Such treatments can work independently or complement the genotype of the seed in a manner that enhances its overall performance

**India’s vision for “Clean Green Mission”**

- ✓ A robust regulatory mechanism covering quality seedlings and planting materials is needed under the newly proposed “Clean Green Mission” by the Government of India as part of its G20 commitment to “Green Development”.
- ✓ “Next Gen” technologies may also introduce AI-based responses from seeds under specific external conditions (for example, moisture, temperature); or incorporate such molecules or metabolites that act as metabolic cues in biological pathways, which will require appropriate guidelines for application.
- ✓ Therefore, in the case of any technology, supportive regulatory guidelines will go a long way in the adoption and popularization of seed technologies.

**PRELIM FACTS**

**1. Cott-Ally Mobile App**

**In context:** The Union Minister of State for Ministry of Textiles has informed recently that the Cott-Ally mobile app has been developed exclusively for the cotton farmers.

**About :** The app has been developed by the Cotton Corporation of India Limited (CCI).

**The various features of “Cott-Ally” are as follows:**

- ✓ Easy to operate in regional languages.
- ✓ Minimum Support Price (MSP) cotton rates state-wise, variety-wise and quality-wise can be seen.
- ✓ Farmers can track real time payment status of their kapas sold to CCI under MSP.
- ✓ Contact details of procurement centers opened by the CCI.
- ✓ Direct interaction with CCI through Live chat to resolve doubts & grievances, if any.

**The Cotton Corporation of India Limited (CCI)**

- ✓ CCI was established in 1970 under the administrative control of the Ministry of Textiles, Government of India as a Public Sector Undertaking under the Companies Act 1956.
- ✓ Functions: The major role of the CCI is to undertake price support operations, whenever the market prices of kapas fall below the minimum support prices (MSP) announced by Govt. of India, without any quantitative limit.
- ✓ Besides MSP operations, to fulfil the raw material requirement of the domestic textile industry particularly for lean season, CCI undertakes commercial purchase operations.

## 2. Belem Declaration

**In Context:** The eight countries that make up the Amazon Cooperation Treaty Organization (ACTO) signed the Belém Declaration during the Amazon Summit.

### About the Belem Declaration

1. **Aim:** An agreement to address the threats to the Amazon rainforest and highlight its significance in confronting the climate crisis.
  - It consolidates the consensus agenda of Brazil, Bolivia, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela for the region.
2. The Belém Declaration contains 113 cross-cutting objectives and principles signed in the Brazilian city of Belém.
  - The declaration promotes sustainable use of biodiversity resources in the Amazon.
3. It recognises Indigenous knowledge as a condition for biodiversity conservation and calls for ensuring full and effective participation of Indigenous Peoples in decision-making and public policy formulation processes.
4. The Belém Declaration also provides for the "creation of financial mechanisms aimed at promoting sustainable development."
5. ACTO will play a central role in implementing the new Amazon cooperation agenda.

### Need for the Declaration

- ✓ The document underscores the urgent need for regional awareness and cooperation to avoid the so-called "point of no return" in the Amazon—a term used by experts to refer to the point at which the forest loses its ability to self-regenerate, due to deforestation, degradation, and global warming.
- ✓ The eight presidents have committed to launching the Amazon Alliance to Combat Deforestation, based on national goals, such as zero deforestation by 2030.

## 3. World Lion Day

**In Context:** World Lion Day is observed on **August 10 every year throughout the world** to create awareness about conservation & protection of Lions.

### Historical Context

- ✓ **World Lion Day** was first established in **2013 by Big Cat Rescue**, the world's largest accredited sanctuary dedicated to lions.
- ✓ It was **co-founded by Dereck and Beverly Joubert**, a husband and wife team who recognised the need to focus on declining lion populations and the threats they faced in the wild.
- ✓ In 2009, the Jouberts approached "**National Geographic**" and formed a partnership with them to create the **Big Cat Initiative (B.C.I.)**.

### Objectives of World Lion Day

- ✓ To increase public awareness of the lion's status and other problems the species face in the wild.
- ✓ To develop new national parks and other similar places, as well as strategies to safeguard its natural habitat.
- ✓ To inform those who live close to wild cats about the risks and how to stay safe.

### Significance of the Day

- ✓ **Cultural Relevance:** Their earliest known references may be found in the pillars of the Mauryan empire, which demonstrates their illustrious status in Indian history and culture. The majestic lion is depicted on all four sides of the Indian national emblem.
- ✓ **Risk of Extinction:** Lions are already a vulnerable species, thus we must take action to prevent their extinction.
- ✓ **Trade and Abuse:** Unfortunately, lion cruelty and trade are pervasive across the world. Lion Day calls attention to this problem and urges world leaders to take appropriate action.

### More about the Lions

- ✓ **Scientific Name:** **Panthera leo**.
- ✓ **Grouping:** Lions are one of the most sociable cats and live in a group called Prides.
- ✓ **IUCN Status:**
  - **African Lion:** Vulnerable
    - The African lion (*Panthera leo leo*) is found in Africa, south of the Sahara desert.
  - **Asiatic Lion:** Endangered
    - The Asiatic lion (Persian lion or Indian lion) is presently found only in and around the Gir Forest in the Saurashtra peninsula of Gujarat in western India.
- ✓ **Population Status:**
  - Lions have disappeared from 80% of their historical range in the last century.
  - Earlier they can be found in woodlands of Africa, Asia, North America, and the Eurasian subcontinent. Unfortunately, they can only currently be found in Africa and some areas of Asia.
  - As per the Researchers, there are between 30,000 and 100,000 lions left in the world today. Lion populations have almost cut in half during the last three decades.
- ✓ **Threats:** Poaching, trophy hunting and the destruction of natural habitat.
- ✓ **Role in Ecology:** Lions are an essential component of the ecosystem because they are the top predators in their habitat and control the population of grazers, keeping the ecological balance.
- ✓ **Conservation Efforts:**

- Asiatic Lion Conservation Project: It was launched by the Union Ministry of Environment, Forests and Climate Change (MoEFCC).
- The lion census is conducted once every five years.
- Project Lion: Modeled after Project Tiger and Project Elephant, it was unveiled in August 2020.
- The Minister of State for Environment, Forest and Climate Change has released the Project Lion document titled "Lion @ 47: Vision for Amrutkal".

#### 4. **Saansad Adarsh Gram Yojana**

**In Context:** There are 1782 Gram Panchayats adopted under the Saansad Adarsh Gram Yojana (SAGY) during the last five years.

##### **About the scheme:**

- ✓ Sansad Adarsh Gram Yojana is a rural development programme broadly focusing upon the development in the villages.
- ✓ The programme was launched in 2014.
- ✓ It is:
  - demand driven
  - inspired by society
  - based on people's participation.
- ✓ The **main objectives** of SAGY are:
  - To trigger processes which lead to holistic development of the identified Gram Panchayats
  - To substantially improve the standard of living and quality of life of all sections of the population through
    - Improved basic amenities
    - Higher productivity
    - Enhanced human development
    - Better livelihood opportunities
    - Reduced disparities
    - Access to rights and entitlements
    - Wider social mobilization
    - Enriched social capital
- ✓ **Key features:**
  - A Gram panchayat would be the basic unit.
  - It will have a population of 3000-5000 in plain areas and 1000-3000 in the hilly, tribal and difficult area.
  - The Member of Parliament would be free to identify a suitable Gram Panchayat to be developed as Adarsh Gram, other than his/her own village or that of his/her spouse.
  - The MP will identify one Gram Panchayat to be taken up immediately, and two others to be taken up little later.
  - Lok Sabha MP has to choose a Gram Panchayat from within his/her constituency and Rajya Sabha MP a Gram Panchayat from the rural area of a district of his/her choice in the State from which he/she is elected.

#### ANSWER WRITING

**Q. Disaster preparedness is the first step in any disaster management process. Explain how hazard zonation mapping will help in disaster mitigation in the case of landslides.**

**Introduction:** "Prevention is better than cure" is the motto of disaster management strategists around the world. The first step is disaster preparedness embodies half of the disaster management planning process. Better preparedness against disaster checks the excess loss of life and property and thus, saves the revenues of the government to a greater extent. Hazard Zonation Mapping is an efficient measure to check disaster loss to a greater extent by micro-management of the different disaster-prone zones. It considers a particular disaster, such as earthquake and map it according to its severity and impact in different areas. Landslide hazard zonation mapping and its use in disaster management process.

- ✓ Landslide hazard zonation mapping at regional level of a large area provides a broad trend of potential landslide zones. A macro level landslide hazard zonation for a small area may provide a better insight into the landslide hazards.
- ✓ The hazard zonation map produced by using techniques, such as Landslide Hazard Evaluation Factor rating scheme classifies the area into relative hazard classes in which the high hazard zones well correspond with high frequency of landslides.
- ✓ In general, it displays the spatial distribution of landslides in a region.
- ✓ Based on landslide zonation map, different approach can be applied for different areas of vulnerability based on severity of landslide.

- ✓ This helps in better management of resources and reduces the cost of disaster preparedness. Further, landslides of different intensity require different approach. This can help planners to do cost effective and smart planning.
- ✓ The major landslide prone areas in India include the Western Ghats and Konkan Hills (Tamil Nadu, Kerala, Karnataka, Goa and Maharashtra), Eastern Ghats (Araku region in Andhra Pradesh), North-East Himalayas (Darjeeling and Sikkim) and North West Himalayas (Uttarakhand, Himachal Pradesh, Jammu and Kashmir).
- ✓ Micro-management through landslide zonation will help to mitigate disaster related threats in a better way.

**Conclusion:** India ratified United Nations Convention for Disaster Risk Reduction which is the custodian of 'Sendai framework' that aims to reduce disaster risks, decrease losses and help in effective mitigation. It has seven targets and four priorities for action. Disaster risk reduction cuts across different aspects and sectors of development. There are 25 targets related to disaster risk reduction in 10 of the 17 sustainable development goals, firmly establishing the role of disaster risk reduction as a core development strategy. India must implement better strategies, such as landslide zonation mapping to achieve these targets and strive towards for achieving them.

**MCQ**

1. Considered the following statement regarding Ethanol Blended with Petrol (EBP) programme:
  1. EBP programme was launched by the government in 2003
  2. To promote the use of alternative and environmentally friendly fuels.
  3. India's current ethanol-to-petroleum mix is 20% only.
 How many above statements is/are correct?
  - a) Only 1
  - b) **Only 2**
  - c) Only 3
  - d) None
2. Considered the following statement Cott-Ally Mobile App
  1. The Cott-Ally mobile app has been developed exclusively for the cotton farmers.
  2. The app has been developed by the Cotton Corporation of India Limited (CCI).
 Which of the following statement is/are correct?
  - a) Only 1
  - b) Only 2
  - c) **Both 1 and 2**
  - d) Neither 1 nor 2
3. Considered the following statement regarding Belem Declaration:
  1. Amazon Cooperation Treaty Organization (ACTO) signed the Belém Declaration during the Amazon Summit.
  2. The Belém Declaration provides for the "creation of financial mechanisms aimed at promoting sustainable development."
 Which of the following statement is/are correct?
  - a) Only 1
  - b) Only 2
  - c) **Both 1 and 2**
  - d) Neither 1 nor 2
4. Considered the following statement:
  1. It is observed on **August 11 every year throughout the world.**
  2. The Minister of State for Environment, Forest and Climate Change has released the Project Lion document titled "Lion @ 47: Vision for Amrutkal".
 Which of the following statement is/are incorrect?
  - a) **Only 1**
  - b) Only 2
  - c) Both 1 and 2
  - d) Neither 1 nor 2
5. Considered the following statement regarding Sansad Adarsh Gram Yojana.
  1. Sansad Adarsh Gram Yojana is a rural and urban development programme broadly focusing upon the development in the villages.
  2. The programme was launched in 2014.
6. Which of the following statement is/are correct?
  - a) Only 1
  - b) **Only 2**
  - c) Both 1 and 2
  - d) Neither 1 nor 2
7. Recently Hmar community is in news, Consider the following statements regarding
  1. They are recognised as Scheduled Tribe under the Constitution of India.
  2. They build their villages on hill-tops and houses are constructed on wooden planks.
 Which of the statements given above is/are correct?
  - a) 1 only
  - b) 2 only
  - c) **Both 1 and 2**
  - d) Neither 1 nor 2
8. Exercise Zayed Talwar, a naval exercise which was recently seen in the news, is conducted between:
  - a) India and Japan
  - b) India and Russia
  - c) India and France
  - d) **India and United Arab Emirates**
9. With reference to the Amazon Cooperation Treaty Organization, consider the following statements:
  1. It is an intergovernmental organization formed by signing the Amazon Cooperation Treaty.
  2. It was founded to promote the preservation of the Amazon basin.
  3. India is a member country of this organization.
 How many of the statements given above are correct?
  - a) Only one
  - b) **Only two**
  - c) All three
  - d) None
10. Considered the following statement regarding Raisina Dialogue
  1. 8<sup>th</sup> edition annual conference was held in Delhi.
  2. Theme of this year is Provocation, Uncertainty Turbulence: Lighthouse in the Tempest.
 Which of the following statement is/are correct?
  - a) Only 1
  - b) Only 2
  - c) **Both 1 and 2**
  - d) Neither 1 nor 2
11. Recently, PUSHp Portal is in news, which was launched by?
  - a) **Ministry of Power**
  - b) Ministry of health and family welfare
  - c) Ministry of personal
  - d) None of the above