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LAKSHYA ACADEMY®

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# 1 - Madhya Pradesh is home to India's first small-scale LNG unit:

## GS III

### Infrastructure related issues

- **Context:**

- There are three issues that are related to development, growth, and development, renewable energy, environmental pollution, and degradation. Tags: GS Paper - 3
- First Small-scale Liquefied Natural Gas Unit in India, Composition of Natural Gas, LNG and CNG, BioCNG, and Major Applications of LNG are the topics that will be covered in the preliminary examination.

- Specifically, the difficulties associated with LNG and the requirement for small-scale LNG.

- **In the News, why?**

- GAIL (India) Ltd.'s Vijaipur complex in Madhya Pradesh was recently the location of the first small-scale liquefied natural gas (SSLNG) unit in India, which was recently inaugurated by the Union Minister for Petroleum and Natural Gas.
- This development is a component of a larger project undertaken by the government to encourage the utilisation of natural gas in a variety of industries and to raise the proportion of natural gas in the primary energy mix of the country to fifteen percent by the year 2030.

- **What exactly are LNG and SSLNG?**

- A natural gas that has been cooled to a liquid condition, around -260 degrees Fahrenheit (-162 degrees Celsius), in order to make it easier and safer to store and transport is referred to as liquefied natural gas (LNG).
- Natural gas is an alternative to conventional hydrocarbons such as coal and oil that is both more environmentally friendly and more cost-effective. As a result, natural gas is an essential component in India's shift towards greener energy sources.
- Methane is the most important component of natural gas, accounting for between 70 and 90 percent of its total makeup.
- Approximately one quarter of the world's electricity is generated by natural gas, as stated by the International Energy Agency (IEA).
- At the moment, natural gas constitutes 6.7% of the total energy component in India's energy basket.

- There are three countries that produce the most natural gas: the United States of America, Russia, and Iran.
- Small-Scale LNG (SSLNG) is a method of transporting natural gas that requires liquefying and transporting it on a smaller scale. This method is used to serve regions that do not have pipeline connections and utilises specialised trucks and vessels.
- SSLNG is able to supply LNG directly to consumers via cryogenic road tankers or small vessels, either in liquid form or regasified for traditional usage. This process begins with large-scale LNG import facilities and continues until the LNG is delivered.
- It will result in a decreased reliance on expensive petrol imports, particularly if it replaces a considerable amount of diesel consumption, which will result in significant savings in terms of foreign cash.
- Furthermore, it encourages the use of cleaner energy and provides assistance to India in its transition towards sustainable fuel sources.

- **Application of the Masses:**

- As a result of its reduced emissions of sulphur oxides (SO<sub>x</sub>) and particulate matter in comparison to traditional marine fuels, liquefied natural gas (LNG) is becoming an increasingly popular choice for use as a fuel for ships and vessels, particularly in locations where emissions are required to be restricted.
- In comparison to diesel, the emissions of nitrogen oxides (NO<sub>x</sub>), particulate matter, and greenhouse gases that are produced by heavy-duty vehicles that run on the road are significantly lower when using LNG as a fuel source. This includes trucks, buses, and other heavy-duty vehicles.

- **Various Applications in Industry:**

- Liquefied natural gas (LNG) is utilised in gas-fired power plants for the purpose of generating electricity. This technology offers a more environmentally friendly option to coal or oil-fired power plants, as it produces fewer emissions of pollutants.
- It is possible to use liquefied natural gas (LNG) in industrial processes for the purpose of heating and cooling applications. Some examples of these applications are manufacturing, food processing, and refrigeration.

- **Storing Energy and Providing Backup:**

- Integration of Renewable Energy: LNG can be used to supplement renewable energy sources such as wind and solar by providing backup power in situations where renewable supply is either inconsistent or unavailable.

- **Problems that are Related:**

- **High Costs:** The construction of facilities for the liquefaction and regasification of LNG is a costly endeavour. On top of that, the transportation method itself necessitates the utilisation of specific cryogenic (very cold) containers, which further contributes to the overall cost.
- In contrast to countries such as China, who have successfully integrated LNG into commercial vehicles, India is confronted with a number of hurdles, including a restricted availability of LNG cars, greater starting costs, and a lack of financing and retail networks for LNG.
- While the manufacturing and transportation of LNG are less harmful to the environment than coal, there are still certain environmental impacts associated with these processes, such as the emission of methane.
- The second most abundant greenhouse gas after carbon dioxide is methane. Methane has a significantly bigger influence on warming the globe than carbon dioxide does, despite the fact that it is released into the atmosphere at a faster rate.
- **Concerns Regarding Safety** Although LPG is very combustible, it can present considerable safety risks if it is not handled in the appropriate manner. It is possible for leaks, fires, or explosions to occur if items are stored, handled, or used improperly.

- **Do you know what compressed natural gas is?**

- Natural gas that has been compressed under high pressure is referred to as compressed natural gas (CNG). This process allows natural gas to take up less space in fuel tanks.
- It is typically compressed at pressures ranging from 200 to 250 kg/cm<sup>2</sup>, which reduces its volume to less than one percent of its size when it is at atmospheric pressure.
- CNG is predominantly composed of methane in a gaseous state, as opposed to LPG, which is a mixture of compressed propane and butane. CNG is typically composed of 80 to 90 percent methane.
- The difference between compressed natural gas (CNG) and liquefied natural gas (LNG) rests in their respective physical states: CNG is defined as a gas, whereas LNG is defined as a liquid that is subsequently regasified for use.

- **CNG has the following advantages:**

- In the event of a leak, it swiftly disperses because it is lighter than air.
- Burns cleanly with very little residue, which eliminates the need for engine maintenance.
- In comparison to petrol or diesel, it produces fewer emissions of greenhouse gases.
- Its high auto-ignition temperature contributes to its high level of safety.
- In comparison to petrol and diesel, it is more cost-effective, and it has a greater calorific equivalent.

- **CNG has the following drawbacks:**

- Demands the use of big gasoline tanks.
  - a restricted range for each fill-up.
  - A reduced number of petrol stations are available.
  - It can be difficult to convert older automobiles to run on compressed natural gas.
  - In addition to being referred to as biomethane, biocompressed natural gas (BioCNG) is a transportation fuel that is generated from biological waste and burns cleanly. In order to manufacture it, biogas is cleaned up to the same standard as natural gas.
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- The development of LNG infrastructure includes making investments in the expansion of LNG import terminals and regasification facilities in order to improve the availability of LNG.
  - In addition, the construction of a robust infrastructure for SCNG, which includes specialised trucks, vessels, and storage facilities, in order to access regions that do not have pipeline connections.
  - The development of the market involves raising awareness and promoting the advantages of liquefied natural gas (LNG) and liquefied propane gas (SLNG) among commercial users, industry, and the transportation sector.
  - Incentives and financing alternatives for the adoption of LNG-powered cars and equipment are being offered in order to encourage investment in these commodities.
  - Regulatory Support This includes the development of clear regulatory frameworks and standards for LNG and SSLNG operations, as well as the assurance of safety, compliance with environmental regulations, and quality control.
  - In order to improve efficiency and cut costs, it is important to invest in research and development of modern LNG technologies. Some examples of these technologies are cryogenic storage and transportation systems.
  - At the Conference of the Parties (COP28), the United Nations Framework Convention on Climate Change (UNFCCC) addressed "transitional fuels" for energy security in its outcome of the First Global Stocktake with a reference to natural gas. This is an example of an effort to encourage international collaboration.
  - It is possible for India to strengthen its position in the global LNG market by participating in regional and global initiatives for the trade of LNG, the development of infrastructure, and the harmonisation of policies respectively.

**Source → The Hindu**

## **2 - Drug Ketamine:**

### **GS II**

#### **Election related issues**

- **Context:**
- In a recent interview, Elon Musk disclosed that he takes ketamine that he has been prescribed in order to treat what he referred to as a "negative chemical state" that is comparable to depression.
- Ketamine is a drug that is predominantly utilised in different medical contexts for the purpose of causing anaesthesia and drowsiness.
- The fact that it is a member of the class of medications known as dissociative anaesthetics indicates that it has the potential to make a person feel disconnected from reality and to give them a sensation of separation from their surroundings.
- Despite the fact that ketamine has shown some promise in treating depression, particularly in cases that have been resistant to treatment, it is not a cure. Typically, it is utilised in conjunction with many other forms of treatment.
- When ketamine is abused, it can result in negative consequences such as hallucinations, confusion, and dissociation. Additionally, when ketamine is taken in excessive amounts, it can create major health difficulties or life-threatening situations.

*Source → The Hindu*

## **3 - Effectiveness of Energy Use in the Construction Industry:**

### **GS III**

#### **Environmental Conservation related issues**

- **Context:**
- The building industry in India has experienced remarkable growth, which has resulted in increased economic opportunities and higher living standards. However, this growth has also

resulted in substantial environmental issues. Under these circumstances, it is of the utmost importance to address the issue of energy inefficiency in residential structures.

- **What are the reasons for the importance of addressing energy inefficiency in India's construction sector?**

- Given India's increased demand for energy and cooling as a result of economic expansion, urbanisation, heat islands, and climate change, it is of the utmost importance to address energy inefficiency in residential structures.
- The construction industry in India is experiencing a boom unlike anything that has ever been seen before, with over 300,000 housing units being built every year. These economic opportunities and improvements in living standards are brought about by this growth, but it also brings about substantial environmental issues.
- Buildings are responsible for more than 33 percent of India's total electricity consumption, which contributes to the deterioration of the environment and the acceleration of climate change.
- During the period between 2017 and 2037, the India Cooling Action Plan anticipates an eightfold rise in the demand for cooling. This plan places an emphasis on the requirement for thermal comfort while simultaneously reducing the demand for active cooling.
- Increasing energy efficiency is a huge potential to cut down on energy usage and the emissions of greenhouse gases (GHG) that are usually linked with it.
- Buildings that are well-designed and energy-efficient provide improved indoor air quality, thermal comfort, and natural lighting, which in turn improves the well-being of the people who live in them.
- It is estimated that the Buildings sector is responsible for around 37% of the CO<sub>2</sub> emissions that are related to energy worldwide.
- It is estimated that the construction, heating, cooling, and lighting of homes and businesses accounts for more than 34 percent of the total energy consumption worldwide.
- According to the Intergovernmental Panel on Climate Change (IPCC), measures that promote energy efficiency in buildings have the potential to reduce greenhouse gas emissions by as much as forty percent in wealthy countries and as much as eighty percent in poor ones.
- The implementation of such policies has the potential to assist in eliminating energy poverty for as many as 2.8 billion people living in developing nations.

- **To what extent does India intend to improve energy efficiency in the construction industry through its initiatives?**

- ECO Niwas Samhita is an Energy Conservation Building Code for Residential Buildings (ECBC-R) that was introduced by the Ministry of Power in the month of December in 2018.
- In order to improve the quality of life for residents and the environment, the code intends to encourage energy efficiency in the planning and construction of residential buildings, apartment complexes and townships.

- There is a legislative organisation known as the Bureau of Energy Efficiency (BEE) that is responsible for putting into action policies and programmes that are related to energy conservation and efficiency.
- A metre that measures heat transfer through the envelope of a structure (which includes the walls, roof, and windows) was introduced by the ENS. This metric is known as the Residential Envelope Transmittance Value (RETV).
- The lower the RETV values, the cooler the indoor conditions, and the lower the amount of energy that is used for cooling.
- One of the recommendations made by the ENS is to keep the RETV at 15W/m<sup>2</sup> or lower in order to achieve maximum efficiency, enhanced occupant comfort, and reduced maintenance costs.
- (ECBC) stands for the Energy Conservation Building Code.
- For commercial buildings, the minimum energy standards are established by the Energy Conservation Building Code (ECBC), which was initially introduced by the Bureau of Energy Efficiency (BEE) in 2007 and was most recently amended in 2017.
- It is applicable to commercial buildings that have a high connected load and intends to generate energy savings of between 25 and 50 percent in buildings that comply with the regulations.
- ECBC is primarily concerned with six aspects of building design, which are the envelope, lighting systems, heating, ventilation, and air conditioning, and the envelope itself, as well as electrical power systems and heating, ventilation, and air conditioning (HVAC) systems.
- The revised code for 2017 places an emphasis on the incorporation of renewable energy sources, the simplicity of compliance, the incorporation of passive building design concepts, and the flexibility allowed to designers.
- It provides efficiency tags that range from ECBC to Super ECBC, and these tags are determined by the level of compliance.

- **Amendment of Energy Conservation Act:**

- By incorporating measures relating to embedded carbon, net zero emissions, materials and resource efficiency, deployment of clean energy, and circularity, the Energy Conservation (Amendment) Act, 2022 allows for the transformation of the Energy Conservation and Sustainability Building Code (ECB) into the Energy Conservation and Sustainability Building Code by the incorporation of additional provisions.
- In addition, the Energy Conservation (Amendment) Act of 2022 makes the consumption of ECO Niwas Samhita, which is the residential building energy code, obligatory.
- Buildings that are in compliance with the Energy Conservation Building Code 2017 (ECBC 2017) were recognised and promoted through the National Energy Efficiency Roadmap for Movement towards Affordable and Natural Habitat (NEERMAN) Awards.
- The 'Azadi Ka Amrit Mahotsav' programme was responsible for the awards that were presented.



- **Buildings Deserving of the BEE Star Rating:**

- The Building Energy Efficiency (BEE) Star Rating for Buildings is a one-of-a-kind instrument that was developed to evaluate the current state of energy efficiency in commercial buildings.
- It is possible to use this rating system for buildings that have a connected load that is higher than or equal to 100 kW.
- This method of evaluation assigns a star rating between one and five stars to the building based on how much energy it consumes.
- The rating is determined by a number of factors, including the built-up area, the conditioned and unconditioned spaces, the kind of building, the number of hours that the building is open throughout the day, the climate zone, and various other information that pertains to the facility.

- **According to the Green Rating for Integrated Habitat Assessment (GRIHA):**

- A nationwide rating system for environmentally friendly buildings, known as GRIHA, is currently being utilised in the process of developing and evaluating new structures. It has been decided that the Ministry of New and Renewable Energy will use this particular instrument.
- IGBC stands for the Indian Green Building Council.
- In the year 2001, the Indian Government Business Council (IGBC), which is a component of the Confederation of Indian Industry (CII), was established. "To enable a sustainable built environment for all and to facilitate India to become one of the global leaders in the sustainable built environment by the year 2025," is the vision that the council has for the future.

- **What steps can be taken to make the construction industry more energy efficient?**

- **Automated Aerated Concrete (AAC) Blocks are utilised in the following ways:**

- The popularity of materials such as Autoclaved Aerated Concrete (AAC) blocks, red bricks, fly ash, and monolithic concrete (Mivan) was compared in a study that was conducted in four locations in India that had warmer climates.
- The term "acc" refers to concrete that has been made to have air pockets that are closed off. In terms of weight, AAC is one-fifth that of concrete.
- When subjected to a wide range of climatic conditions, AAC blocks demonstrate exceptional thermal efficiency.
- When compared to other materials, they have the lowest RETV coefficient, which indicates that they have the potential to be energy efficient.
- When compared to red bricks and monolithic concrete, AAC blocks provide for a more optimal balance between the amount of embodied energy and the amount of time required for construction.

- **Investigating the Use of Innovative Building Materials:**
  - India boasts a potential for novel building materials that has not yet been fully realised.
  - It is possible to optimise techniques for energy-efficient building design through the integration of interdisciplinary collaborations with sustainability experts.
- **With Regards to Concerns Regarding Sustainability:**
  - There are issues over the construction industry's predilection for materials such as monolithic concrete due to the high amount of embodied carbon and the discomfort caused by the temperature.
  - One technique of construction is known as monolithic construction, which involves the construction of walls and slabs together.
  - Manufacturers need to be innovative in order to produce solutions that are both durable and cost-effective in order to achieve sustainable construction.
- **Fostering an Environment That Is Sustainable:**
  - It is possible to greatly improve energy efficiency and environmental sustainability by reimagining construction techniques and cultivating a culture of sustainability.
  - Materials for construction that are not only affordable but also long-lasting and resistant to the effects of climate change have the potential to improve quality of life and accord with environmental goals.
- **Utilisation of Intelligent Building Systems with:**
  - The integration of technologies such as artificial intelligence, 3D printing, smart building systems, and the Internet of Things (IoT) into construction projects is recommended in order to maximise the efficiency of energy use.
  - Install intelligent heating, ventilation, and air conditioning (HVAC) systems that can adapt themselves based on occupancy levels in order to reduce energy usage while maintaining occupant comfort.
  - Take advantage of 3D printing to produce construction components that are both energy-efficient and waste as little material as possible.

*Source → The Hindu*

## **4 - Matabari Pera and Pachra of Tripura have been accorded a GI Tag:**

### **GS I**

#### **Indian Culture**

- **Context:**

- Matabari Pera and Pachra, two traditional goods from the state of Tripura, have been awarded the Geographical Indication (GI) designation, signifying a significant milestone for local artisans and weavers. This announcement was made by the Chief Minister of Tripura.

- **About:**

- Matabari Pera, a dessert made from dairy products that was once utilised as prasad at the Tripurasundari temple, and Pachra, a handwoven textile that was utilised by Indigenous people, have both been awarded the prized Geographical Indication (GI) designation.
- Authenticity is protected, and the cultural legacy that is linked with the product is preserved, thanks to the Geographical Indication (GI) marking, which provides legal protection against unauthorised replication or misuse of the product.
- Additionally, this recognition makes it easier to gain access to markets and promote products, both locally and internationally, which in turn creates economic prospects for the communities that are involved in the manufacturing of the product.
- Previously, the world-famous queen pineapple from Tripura was awarded the Geographical Indication (GI) label, along with thirteen other items from the Northeast, which served to emphasise the region's broad and distinctive variety of products.

**Source → The Hindu**