



DAILY CURRENT AFFAIRS

1. Emergency Gas Curbs Eased as LNG Shipments Normalise
2. Synthetic Cell: A Step Towards Artificial Life
3. Asiatic Lion Conservation: Need for a Second Home
4. Ethanol as a Key Pillar of India's Road Transport Decarbonisation
5. Immunity Boosters: Science vs Marketing

1. Emergency Gas Curbs Eased as LNG Shipments Normalise

Source: *The Hindu*

Subject: Economy | Energy Security

Why in News?

The Union Government has **withdrawn most emergency restrictions on natural gas supply** after **Liquefied Natural Gas (LNG) shipments through the Strait of Hormuz returned to normal**. The rollback follows easing of geopolitical tensions in West Asia and restoration of maritime trade.

Background

- In **March 2026**, the government invoked powers under the **Essential Commodities Act, 1955** through the **Natural Gas (Supply Regulation) Order, 2026**.
- The emergency order was issued after the **West Asia conflict** disrupted LNG shipments, with some suppliers invoking **force majeure**.
- Gas allocation was prioritised for critical sectors to safeguard domestic energy security.

Why is the Strait of Hormuz Important?

The **Strait of Hormuz** is one of the world's most critical energy chokepoints.

- Connects the **Persian Gulf** with the **Gulf of Oman and the Arabian Sea**.
- Nearly **one-fifth of global oil trade** passes through the strait.
- Around **40–45% of India's crude oil imports** and **about 65% of LNG imports** transit through this route.
- Any disruption directly impacts global energy prices, shipping costs and supply security.

Key Developments

- Government withdrew emergency gas allocation restrictions as LNG imports stabilised.
- Earlier emergency measures relating to **LPG production** and **bulk diesel sale restrictions** had also been withdrawn.
- Restoration of shipping followed the ceasefire and reopening of maritime traffic in the Gulf region.

Significance

- **Strengthens India's Energy Security:** Stable LNG supplies ensure uninterrupted power generation, fertilizer production and industrial activity.
- **Reduces Inflationary Pressures:** Normal energy supplies help moderate fuel and transportation costs.
- **Boosts Industrial Growth:** Gas-intensive sectors such as city gas distribution, steel, petrochemicals and fertilizers benefit from improved availability.
- **Demonstrates Crisis Management:** Flexible policy interventions helped minimise the impact of external geopolitical shocks.

Challenges

- India imports nearly **88% of its crude oil** and around **50% of its natural gas**, making it highly vulnerable to external disruptions.

- Heavy dependence on the **Strait of Hormuz** exposes India to geopolitical risks.
- LNG price volatility can increase import bills and current account pressures.
- Growing energy demand necessitates diversified and resilient supply chains.

Related Provision: Essential Commodities Act, 1955

- Enables the Central Government to regulate production, supply and distribution of essential commodities during emergencies.
- Aims to prevent hoarding, ensure availability and maintain price stability.
- Allows the government to issue supply regulation orders during crises affecting essential commodities, including petroleum products.

Way Forward

- Diversify crude oil and LNG import sources through long-term supply agreements.
- Expand **Strategic Petroleum Reserves (SPR)** and strengthen gas storage infrastructure.
- Increase domestic gas production and promote alternative fuels such as biogas and green hydrogen.
- Accelerate renewable energy deployment to reduce dependence on imported fossil fuels.
- Strengthen maritime security and international cooperation for safeguarding global energy supply routes.

UPSC Prelims MCQ

Q. With reference to the Strait of Hormuz, consider the following statements:

1. It connects the Persian Gulf with the Gulf of Oman.

2. A significant share of India's crude oil and LNG imports passes through this strait.

3. It lies between Iran and the Arabian Peninsula.

Which of the statements given above are correct?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

Answer: (d)

UPSC Mains Question (15 Marks)

"India's growing energy demand makes maritime chokepoints strategically important." Discuss the significance of the Strait of Hormuz for India's energy security and examine the measures required to reduce vulnerabilities arising from external geopolitical disruptions.

2.Synthetic Cell: A Step Towards Artificial Life

Source: *The Hindu*

Subject: Science & Technology | Biotechnology

Why in News?

Researchers at the **University of Minnesota (USA)** have engineered a **synthetic cell** capable of **growth, genome replication, division and Darwinian evolution (natural selection)**. The achievement marks a major milestone in **synthetic biology**, bringing scientists closer to creating programmable artificial life systems and improving our understanding of the origin of life.

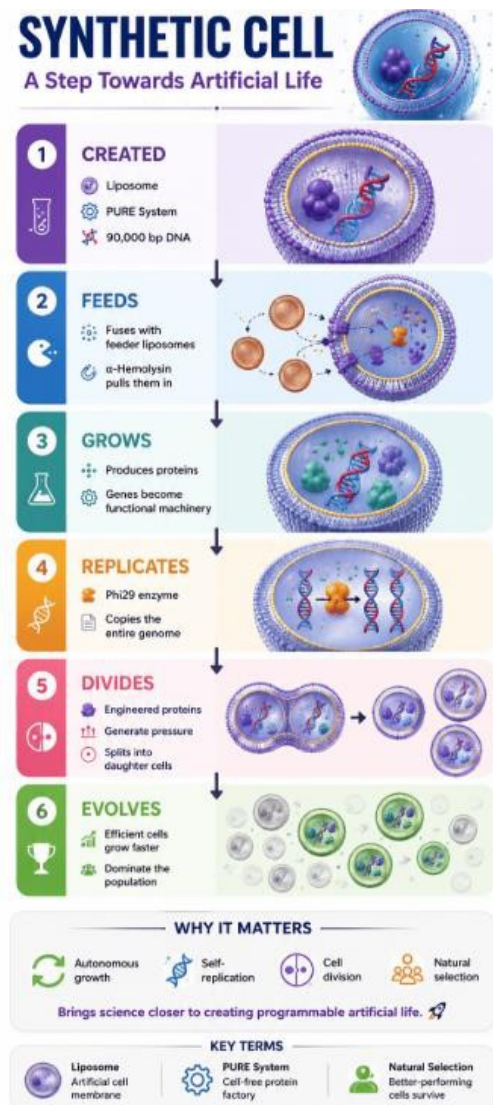
What is a Synthetic Cell?

- A **synthetic cell** is an artificially engineered cell-like structure assembled from **non-living biological molecules** that mimics the essential characteristics of living cells.

- Unlike genetically modified organisms, synthetic cells are **constructed from scratch (bottom-up approach)** to perform basic life processes such as metabolism, replication and division.

How was the Synthetic Cell Developed?

- Built using **liposomes** that mimic natural cell membranes.
- Contains the **PURE (Protein synthesis Using Recombinant Elements)** system for protein production without living cells.
- Carries a **90,000-base-pair synthetic DNA genome**.
- Uses **α -hemolysin** to absorb nutrients by fusing with feeder liposomes.
- Replicates DNA using **Phi29 DNA polymerase**.
- Divides through engineered proteins that generate membrane constriction, resembling natural cell division.
- Successfully demonstrated **natural selection**, where faster-growing cells outcompeted less efficient ones.



Significance

- Represents a major step towards creating **minimal artificial life**.
- Improves understanding of the **origin and evolution of life** on Earth.
- Provides a controllable platform for **drug discovery, vaccine development and precision medicine**.
- Enables production of pharmaceuticals, enzymes and biomaterials through **programmable biological factories**.

- Reduces dependence on animal testing by providing realistic laboratory models.
- Opens new avenues in **space biology**, **astrobiology**, regenerative medicine and industrial biotechnology.

What is Synthetic Biology?

Synthetic Biology is an **interdisciplinary field** that combines **biology, engineering, genetics, computer science and chemistry** to design and construct biological systems with desired functions.

Major Applications

- Gene and cell therapies.
- Vaccine and pharmaceutical manufacturing.
- Climate-resilient crops and precision agriculture.
- Biofuels, biodegradable materials and green chemicals.
- Bioremediation using engineered microorganisms.
- Alternative proteins and sustainable food production.

Challenges

- Ethical concerns regarding creation of artificial life.
- Biosafety and biosecurity risks from accidental or deliberate misuse.
- Regulatory gaps governing synthetic organisms.
- High technical complexity in creating fully autonomous cells.
- Intellectual property and global governance issues.

Way Forward

- Establish robust national and international biosafety frameworks.
- Promote responsible innovation with ethical oversight.
- Strengthen interdisciplinary research in synthetic biology and AI-enabled biotechnology.

- Develop clear regulatory standards for synthetic organisms.
- Enhance indigenous R&D under India's biotechnology initiatives such as the **National Biopharma Mission** and **BioE3 Policy**.

UPSC Prelims MCQ

Q. With reference to Synthetic Biology, consider the following statements:

1. It applies engineering principles to design and construct biological systems.
2. Synthetic cells are created from living cells through cloning techniques.
3. Liposomes are commonly used to mimic biological cell membranes in synthetic cell research.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 1 and 3 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

Answer: (b)

UPSC Mains Question (15 Marks)

"Synthetic biology is emerging as a transformative technology with applications ranging from healthcare to industrial biotechnology. Discuss the significance of recent advances in synthetic cell research, along with the ethical, biosafety and regulatory challenges associated with this field."

3.Asiatic Lion Conservation: Need for a Second Home

Source: *The Hindu*

Subject: Environment & Ecology | Biodiversity Conservation

Why in News?

Despite the **Asiatic lion population increasing to 891 (2025 Census)**, the species continues to remain confined largely to the **Greater Gir Landscape** in Gujarat. The delay in implementing the **Supreme Court's 2013 order** to translocate lions to **Kuno National Park (Madhya Pradesh)** has revived concerns over the species' long-term survival.

Background

- The **Asiatic Lion (*Panthera leo persica*)** is found only in India.
- Once distributed from **West Asia to northern India**, it survived only in **Gir Forest, Gujarat**, after extensive hunting and habitat loss.
- Conservation efforts have led to a remarkable recovery:
 - **Population:** 891 (2025 Census).
 - **IUCN Status:** Vulnerable.
 - **Wildlife (Protection) Act, 1972:** Schedule I.
 - **CITES:** Appendix I.

Why is a Second Population Necessary?

Conservation science recommends establishing a **geographically separate population** to improve species resilience.

- **Reduces extinction risk** from a single catastrophic event such as disease, wildfire, drought or cyclones.
- Prevents rapid spread of infectious diseases such as the **Canine Distemper Virus (CDV)**, which affected Gir lions in **2018**.
- Improves **genetic diversity** and reduces risks associated with inbreeding.
- Supports the **metapopulation approach**, where multiple



connected populations enhance long-term survival.

- Aligns with global conservation practices for endangered species.

Kuno National Park: The Proposed Second Home

- Located in **Madhya Pradesh**.
- Identified by the **Wildlife Institute of India (WII)** as the most suitable site for lion reintroduction.
- Extensive preparations have already been completed:
 - Relocation of villages.
 - Habitat restoration.
 - Expansion of prey base.
- In **2013**, the **Supreme Court** directed the translocation of Asiatic lions from Gir to Kuno, stating that **species conservation should take precedence over regional interests**.
- However, Gujarat has opposed the translocation, citing successful in-state conservation and proposing **Barda Wildlife Sanctuary** as an alternative habitat.

Significance

- Ensures long-term survival of the world's only wild Asiatic lion population.
- Reduces dependence on a single landscape for species conservation.
- Strengthens ecosystem restoration and biodiversity conservation.
- Enhances India's global leadership in wildlife conservation.
- Supports ecological stability and resilience against climate and disease-related threats.

Challenges

- Continued policy disagreement between the Centre and Gujarat.
- Political and administrative delays in implementing the Supreme Court's directive.
- Managing human-wildlife conflict as lion populations expand beyond protected areas.
- Low genetic diversity due to historical population bottlenecks.

- Ensuring adequate prey, habitat connectivity and local community participation in new landscapes.

Related Initiative: Project Lion (2020)

Project Lion is a **centrally sponsored conservation initiative** aimed at securing the long-term future of the Asiatic lion through:

- Habitat improvement and corridor development.
- Disease surveillance and wildlife healthcare.
- Technology-based monitoring (GPS collars, drones).
- Human-lion conflict mitigation.
- Development of alternative habitats, including **Barda Wildlife Sanctuary**.

Way Forward

- Implement the **Supreme Court's 2013 judgment** to establish a geographically separate lion population.
- Adopt a **metapopulation conservation strategy** instead of relying on a single habitat.
- Strengthen disease surveillance, genetic monitoring and veterinary infrastructure.
- Improve habitat connectivity and prey management.
- Promote cooperative federalism by balancing Gujarat's conservation achievements with national biodiversity priorities.

UPSC Prelims MCQ

Q. With reference to the Asiatic Lion, consider the following statements:

1. The Asiatic lion is endemic to India and is currently found only in the Greater Gir Landscape.
2. Kuno National Park was originally prepared as a second habitat for Asiatic lions.
3. The Asiatic lion is listed as **Vulnerable** on the IUCN Red List and included in **Schedule I** of the Wildlife (Protection) Act, 1972.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Answer: (d)

UPSC Mains Question (15 Marks)

"The recovery of the Asiatic lion population is one of India's greatest conservation successes, but long-term survival requires resilience rather than mere population growth." Discuss the need for establishing a second free-ranging population of Asiatic lions in the context of biodiversity conservation, ecological security and cooperative federalism.

4.Ethanol as a Key Pillar of India's Road Transport Decarbonisation

Source: *The Hindu*

Subject: Environment | Energy | Economy | Science & Technology

Why in News?

Toyota Kirloskar Motor emphasized that ethanol is the fastest and most cost-effective pathway to decarbonise India's road transport sector, advocating a technology-neutral policy supporting Ethanol, Flex-Fuel Vehicles (FFVs), Hybrids, EVs, Hydrogen and Biofuels to achieve India's energy security and net-zero goals.

Why is Ethanol Important for India?

- Reduces dependence on imported crude oil, strengthening energy security.
- Supports decarbonisation of the transport sector, one of India's largest emitters.
- Creates an additional market for sugarcane, maize and other agricultural feedstocks, increasing farmers' income.
- Saves foreign exchange by reducing petroleum imports.
- Can be adopted using existing fuel infrastructure, making it one of the least-cost decarbonisation options.
- Complements EVs and other clean mobility technologies instead of replacing them.

India's Ethanol Blending Programme (EBP)

- Launched to blend ethanol with petrol to reduce fossil fuel consumption.

- India achieved the 20% ethanol blending (E20) target in 2025, ahead of schedule.
- Government is now gradually moving towards higher ethanol blends (E25, E85 and Flex-Fuel ecosystem).
- Ethanol is produced mainly from:
 - Sugarcane molasses
 - Sugarcane juice
 - Damaged food grains
 - Maize and other approved feedstocks

Key Issues in Transition to Higher Ethanol Blends

- E20 causes only a 3–5% reduction in fuel efficiency, with no major material impact on vehicles.
- Adoption of E25 and higher blends requires extensive testing of both existing and new vehicles.
- Expansion of Flex-Fuel Vehicles (FFVs) is essential for using higher ethanol blends efficiently.
- Consumer acceptance depends upon favourable pricing, vehicle availability and supporting infrastructure.

Global Example: Brazil

- Brazil is the global leader in ethanol-based transport.
- Large-scale adoption of Flex-Fuel Vehicles (FFVs) allows vehicles to run on petrol, ethanol or any combination.
- Consistent government incentives and stable ethanol pricing have enabled widespread adoption.
- Demonstrates how policy support can successfully accelerate biofuel-based mobility.

Significance

- Supports India's Net Zero 2070 and Panchamrit commitments.
- Promotes Atmanirbhar Bharat by reducing crude oil imports.
- Strengthens rural economy through higher agricultural demand.
- Diversifies India's clean mobility strategy beyond only EVs.

- Improves energy security by utilizing domestically produced renewable fuels.

Challenges

- Food-versus-fuel concerns due to diversion of agricultural feedstocks.
- High water requirement for sugarcane cultivation.
- Need for nationwide FFV manufacturing and ethanol distribution infrastructure.
- Limited consumer awareness regarding higher ethanol blends.
- Sustainable feedstock availability and long-term pricing remain critical concerns.

Way Forward

- Expand Flex-Fuel Vehicle manufacturing with appropriate fiscal incentives.
- Diversify ethanol production towards maize, agricultural residues and second-generation (2G) biofuels.
- Develop nationwide infrastructure for higher ethanol blends.
- Promote a technology-neutral mobility policy integrating EVs, hybrids, ethanol, hydrogen and compressed biogas.
- Ensure sustainable feedstock management while balancing food security and energy needs.

UPSC Prelims MCQ

Q. With reference to India's Ethanol Blended Petrol (EBP) Programme, consider the following statements:

- 1. Ethanol blending aims to reduce crude oil imports and greenhouse gas emissions.**
- 2. Flex-Fuel Vehicles can operate on varying blends of petrol and ethanol.**
- 3. India achieved the E20 blending target ahead of its original schedule.**

Which of the statements given above is/are correct?

- (a) 1 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

Answer: (d)

UPSC Mains Question (15 Marks)

"Biofuels are emerging as an important pillar of India's energy transition and transport decarbonisation strategy." Discuss the role of ethanol blending in achieving energy security, climate goals and rural development. Also examine the challenges associated with higher ethanol adoption.

5. Immunity Boosters: Science vs Marketing

Source: *The Hindu*

Subject: Science & Technology | Health

Why in News?

A recent analysis questioned the rapidly growing "**immunity booster**" industry, arguing that most supplements marketed to enhance immunity lack robust scientific evidence. Instead, it emphasizes **vaccination and healthy lifestyle practices** as the only proven ways to maintain immune health.

Why are "Immunity Boosters" Under Scrutiny?

- Most products claiming to "boost immunity" are **not supported by strong clinical evidence**.
- The immune system is a **highly regulated biological network**, not a system that simply becomes better by increasing its activity.
- Excessive immune activation can be harmful, leading to **allergies, autoimmune diseases, chronic inflammation and cytokine storms**.
- Many herbal and dietary supplements remain **poorly regulated**, with risks of contamination, adulteration and incorrect labeling.
- Growing evidence links excessive supplement consumption to **drug-induced liver injury and other adverse health effects**.

Understanding the Human Immune System

The immune system protects the body through two complementary mechanisms:

Innate Immunity

- First line of defence against pathogens.

- Includes **skin, mucosal barriers, macrophages, neutrophils and natural killer (NK) cells**.
- Provides rapid but non-specific protection.

Adaptive Immunity

- Develops pathogen-specific protection.
- Mediated by **T lymphocytes and B lymphocytes**.
- Produces antibodies and immunological memory, providing long-term protection after infection or vaccination.

Scientific Evidence on Common Supplements

- **Vitamin C:** Does not significantly prevent common colds in the general population.
- **Zinc:** May marginally reduce illness duration when deficient but does not "boost" immunity.
- **Vitamin D:** Useful only in individuals with deficiency; routine supplementation offers limited immune benefit.
- Herbal products and nutraceuticals often lack standardized clinical validation.

Vaccination: The Proven Immunity Builder

- Vaccines stimulate the **adaptive immune system** by exposing it safely to antigens.
- Generate **memory B cells and T cells**, enabling rapid response during future infections.
- Have successfully controlled or eliminated diseases such as:
 - Smallpox
 - Polio
 - Measles
 - Diphtheria
- High vaccination coverage creates **herd immunity**, protecting vulnerable populations.

Types of Immunity

Type of Immunity	Mechanism	Duration	Example
Natural Active Immunity	Exposure to pathogen, body produces own antibodies.	Long-lasting, often lifelong.	Recovery from measles infection.
Artificial Active Immunity	Vaccination (attenuated/killed pathogen or antigen), body produces own antibodies.	Long-lasting.	MMR vaccine, Polio vaccine.
Natural Passive Immunity	Antibodies transferred from mother to child.	Short-term (weeks to months).	Maternal antibodies via placenta or breast milk.
Artificial Passive Immunity	Injection of pre-formed antibodies (antiserum).	Short-term (weeks).	Anti-venom for snake bites, tetanus antitoxin.

Significance

- Reinforces the importance of **evidence-based healthcare** over commercial health claims.
- Highlights the need for **scientific regulation of nutraceuticals and dietary supplements**.
- Prevents misinformation that may discourage vaccination or evidence-based treatment.
- Promotes rational healthcare spending by discouraging ineffective products.

Challenges

- Weak regulation of dietary supplements and nutraceuticals.
- Aggressive marketing exploiting public fear of infections.

- Spread of health misinformation through digital platforms.
- False sense of security leading to neglect of vaccination and healthy lifestyle practices.

Way Forward

- Strengthen regulation and scientific evaluation of immunity-related health products.
- Promote public awareness on evidence-based preventive healthcare.
- Encourage balanced nutrition, regular physical activity, adequate sleep and stress management.
- Improve vaccine confidence through effective public health communication.
- Strengthen surveillance against misleading medical advertisements.

UPSC Prelims MCQ

Q. With reference to the human immune system, consider the following statements:

1. The innate immune system provides immediate, non-specific protection against pathogens.
2. Vaccines primarily work by generating immunological memory through the adaptive immune system.
3. Increasing immune activity indiscriminately always improves disease resistance.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

Answer: (b)

UPSC Mains Question (15 Marks)

"Public health outcomes depend more on evidence-based interventions than commercially marketed health claims." Discuss with reference to immunity boosters, vaccination and preventive healthcare.

