



## Global Stocktake Report

**For Prelims:** Global Stocktake Report, United Nations Climate Secretariat, [Climate Change, Paris Agreement 2015](#), [Greenhouse Gas \(GHG\)](#), Nationally Determined Contribution.

**For Mains:** Global Stocktake Report and its Recommendations.

[Source: TH](#)

### Why in News?

Recently, the synthesis report of the first **Global Stocktake** released by the [United Nations Framework Convention on Climate Change \(UNFCCC\)](#) ahead of the [18thG-20 summit in New Delhi](#).

- The synthesis report presents **17 key findings**, painting a concerning picture of the world's progress towards **Paris Agreement targets**. While there is a limited window for corrective action, the report echoes **previous warnings that global efforts** are falling short.

### What is Global Stocktake?

- The Global Stocktake is a **periodic review mechanism** established under the [Paris Agreement in 2015](#).
  - The stocktake **takes place every five years**, with the first-ever stocktake scheduled to conclude at the UN Climate Change Conference (COP28) at the end of 2023.
- Its primary objectives **are to assess individual countries' efforts** to reduce [Greenhouse Gas \(GHG\)](#) emissions and transition to renewable energy sources.
- The stocktake is **designed to keep countries accountable and encourage** them to increase their climate ambitions over time.
  - In 2015, when countries committed in Paris **to keep global temperatures from rising beyond 2 degrees Celsius by the end of the century** and “as far as possible” below 1.5 degrees Celsius, they also agreed to **periodically review, or take stock of efforts**, made by individual countries in containing greenhouse gasses.
- While countries have laid out their [Nationally Determined Contributions \(NDC\)](#), they are expected to — but not obliged to — increase their ambitions every five years.
- While the latest NDC were submitted in 2020, a stocktake also aims to push countries to set higher targets before the next **NDCs are published in 2025**.

### What are the Key Recommendations of the Report?

- **Galvanizing Effect of Paris Agreement:**
  - The Paris Agreement has galvanised countries into **setting goals and signalling the urgency of the climate crisis**.
  - Governments need to support ways to transition their economies away from fossil fuel businesses and that states and communities must strengthen efforts.
- **Equitable Economic Transition:**
  - While rapid change could be “disruptive,” countries should work on ensuring that the

**economic transition is equitable and inclusive.**

- Much more ambition is needed to reduce global GHG emissions by **43% by 2030 and further by 60% in 2035** and reach net zero CO<sub>2</sub> emissions by 2050 globally.
- Rapid change should prioritize equitable and inclusive economic transitions.
- **Scaling Up Renewable Energy and Halting Deforestation:**
  - Renewable energy has to be scaled up and all 'unabated fossil fuels are to be **rapidly eliminated**.
  - Deforestation and land-degradation **have to be halted and reversed and agricultural practices** critical to reducing emissions and conserving and enhancing carbon sinks have to be encouraged.
- **Fragmented Adaptation Efforts:**
  - While the world, as a whole, has committed to scale up **steps to help adapt to the unfolding and future impacts of climate change**, most efforts were "fragmented, incremental, sector-specific and unequally distributed across regions."
  - Transparent reporting on **adaptation could facilitate and enhance understanding**, implementation and international cooperation.
- **Addressing Loss and Damage:**
  - Averting, **minimising and addressing 'loss and damage,'** requires urgent action across climate and development policies to manage risks comprehensively and provide support to impacted communities.
  - Support for adaptation and funding **arrangements for averting, minimising and addressing loss and damage**, from the impact of climate change, needed to be rapidly scaled up from expanded and innovative sources.
- **Enhancing Climate Finance Access:**
  - Financial flows **needed to be made consistent** with climate-resilient development to meet urgent and increasing needs.
  - A substantial shift in financial flows is **essential to support low greenhouse gas emissions** and climate-resilient development.

## What is the Impact of Global Stocktake Report?

- The global stocktake report influenced the [G20 Leaders Declaration](#), a significant outcome of the summit. For the first time, the declaration formally recognized the substantial financial requirements for transitioning to renewable energy.
- It noted the need for USD 5.8-5.9 trillion in the pre-2030 period for developing countries and USD 4 trillion per year for clean energy technologies by 2030 to achieve [Net-Zero emissions by 2050](#).

## UPSC Civil Services Examination Previous Year Question (PYQ)

**Q.1 With reference to the Agreement at the UNFCCC Meeting in Paris in 2015, which of the following statements is/are correct? (2016)**

1. The Agreement was signed by all the member countries of the UN and it will go into effect in 2017.
2. The Agreement aims to limit the greenhouse gas emissions so that the rise in average global temperature by the end of this century does not exceed 2°C or even 1.5°C above pre-industrial levels.
3. Developed countries acknowledged their historical responsibility in global warming and committed to donate \$ 1000 billion a year from 2020 to help developing countries to cope with climate change.

**Select the correct answer using the code given below:**

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

**Ans: (b)**

**Q2. The term 'Intended Nationally Determined Contributions' is sometimes seen in the news in the context of (2016)**

- (a) pledges made by the European countries to rehabilitate refugees from the war-affected Middle East
- (b) plan of action outlined by the countries of the world to combat climate change
- (c) capital contributed by the member countries in the establishment of Asian Infrastructure Investment Bank
- (d) plan of action outlined by the countries of the world regarding Sustainable Development Goals

**Ans: (b)**

## RBI to Discontinue I-CRR

**For Prelims:** RBI to discontinue I-CRR, Incremental Cash Reserve Ratio, Statutory Liquidity Ratio, [Monetary Policy](#), [Reserve Bank of India](#).

**For Mains:** RBI to Discontinue I-CRR, its Need and Implications.

[Source: TH](#)

### Why in News?

Recently, the Reserve Bank of India (RBI) announced that it would discontinue the [Incremental Cash Reserve Ratio \(I-CRR\)](#) in a phased manner.

- The central bank will release the amount that banks have maintained under I-CRR in stages.

### How Will the RBI Implement Discontinuation of I-CRR?

- The discontinuation of the I-CRR will be **implemented in stages** to ensure a smooth transition and **prevent sudden shocks to the system's liquidity**.
  - In the first and second stages of the I-CRR reversal, 25 % of each of the Banks' impounded funds will be released. The remaining 50% of the balance will be released in the third stage.
- This measured approach aims to ensure that **banks have sufficient liquidity to meet increased credit demand** during the **upcoming festival season**.

### What is I-CRR?

- **Background:**
  - On 10<sup>th</sup> August 2023, following the announcement of the [monetary policy](#) and the [demonetization](#) of Rs 2000 notes, the RBI declared that banks would be required to maintain an [Incremental Cash Reserve Ratio \(I-CRR\)](#) of 10% on the increase in their [Net Demand and Time Liabilities \(NDTL\)](#).
    - **NDTL** is the **difference** between the **sum of demand and time liabilities** (deposits) of a bank (with the public or the other bank) and the deposits in the form

of **assets held by the other banks.**

- Stated that it would review it in September 2023, or earlier.

▪ **Purpose of Introducing I-CRR:**

- The RBI introduced the I-CRR as a temporary measure to **manage excess Liquidity** in the banking system.
  - Several **factors contributed** to the **Surplus Liquidity**, including the demonetisation of Rs 2,000 banknotes.
- RBI's surplus transfer to the government, increased **government spending, and capital inflows.**
- This liquidity surge had the **potential to disrupt price stability and financial stability**, necessitating efficient liquidity management.

▪ **Impact of I-CRR on Liquidity Conditions:**

- The I-CRR measure would absorb over **Rs 1 lakh crore of excess liquidity** from the banking system.
- As a result of the I-CRR mandate, the banking system's **liquidity temporarily turned into a deficit on 21<sup>st</sup> August 2023**, exacerbated by **outflows related to Goods and Services Tax (GST)** and central bank intervention to stabilize the rupee.
- However, liquidity conditions returned to Liquidity from the system.

## What is the Cash Reserve Ratio (CRR)?

▪ **About:**

- The percentage of cash required to be kept in reserves as against the bank's total deposits, is called CRR.
- All banks in India, except Regional Rural Banks (RRBs) and Local Area Banks (LABs), have to deposit the CRR money to RBI.
  - RRBs and LABs are exempted from maintaining CRR with RBI, **as per the RBI Act, 1934.** However, they have to maintain CRR with themselves in the form of **cash or gold or unencumbered approved securities.**
- Banks can't lend the CRR money to **corporates or individual borrowers**, banks can't use that money for investment purposes, and **Banks don't earn any interest on that money.**

▪ **Need to Have Reserve cash with the RBI:**

- Since a part of the bank's deposits is with the RBI, it ensures the **security of the amount in case of any emergencies.**
- The cash is **readily available when customers want** their deposits back.
- CRR helps in keeping **inflation under control.** If there is a threat of high inflation in the economy, RBI increases the CRR, so that banks need to keep more money in reserves, effectively reducing the amount of money that is available to the banks.
  - This curbs the **excess flow of money in the economy.**
- When there is a need to pump funds into the market, the RBI lowers the CRR rate, which in turn, helps the banks provide loans to a large number of businesses and industries for investment purposes. **Lower CRR also boosts the growth rate of the economy.**
- The CRR and other monetary tools require every commercial bank to maintain but not the NBFC.

## Why is RBI using I-CRR in the Case of Demonetisation?

- RBI has chosen to implement I-CRR in the case of a **sudden influx of liquidity, such as during demonetization.**
  - **RBI used I-CRR in November 2016**, after the **demonetization of Rs 500 and Rs 1,000 banknotes.**
- It allows the RBI to **address the issue without affecting other aspects of monetary policy.** This precision can be crucial, especially during **unique situations like demonetization.**
- The I-CRR **can be implemented relatively quickly.** When there is a sudden surge in liquidity due to a large-scale event like the **return of demonetized currency notes**, the central bank may need a tool that can be put into effect promptly.
- The **I-CRR is typically intended to be a temporary measure.** It can be introduced when there is a need to absorb excess liquidity temporarily and can be phased out once the liquidity situation

stabilizes.

- But on the other hand **Other tools such as Repo Rate, Statutory Liquidity Ratio (SLR) etc may have rather long term and slower impact on liquidity.**

## What are the Monetary Policy Instruments Available to the RBI?

### ▪ Qualitative:

- **Moral Suasion:** This is a **non-binding technique where the RBI uses persuasion and communication** to influence banks' lending and investment behavior.
- **Direct Credit Controls:** These are measures that involve **regulating the flow of credit to specific sectors or industries.** The RBI can issue directives on lending to certain sectors or set credit limits to achieve policy objectives.
- **Selective Credit Controls:** These are **more specific than direct credit controls and target particular types of loans, such as consumer credit,** to control demand in specific areas of the economy.

### ▪ Quantitative:

- **Cash Reserve Ratio (CRR):** CRR is the proportion of a **bank's deposits that it must keep as reserves with the RBI** in the form of cash. By adjusting the CRR, the RBI can control the amount of funds available for lending by banks.
- **Repo Rate:** The repo rate is the **interest rate at which the RBI lends money to commercial banks for the short term.** A change in the repo rate can influence banks' borrowing costs and, subsequently, their lending rates.
- **Reverse Repo Rate:** The reverse **repo rate is the interest rate at which banks can park their excess funds with the RBI.** It provides a floor for short-term interest rates and helps manage liquidity.
- **Bank Rate:** The bank rate is the rate at which the **RBI provides long-term funds to banks and financial institutions.** It influences interest rates in the long-term money market.
- **Open Market Operations (OMOs):** OMOs involve the **buying or selling of government securities by the RBI in the open market.** This action affects the money supply and liquidity in the banking system.
- **Liquidity Adjustment Facility (LAF):** The LAF includes the repo rate and the reverse repo rate and is used by banks for their short-term liquidity needs. It **helps the RBI manage daily liquidity conditions.**
- **Marginal Standing Facility (MSF):** MSF is the rate at which **banks can borrow overnight funds from the RBI against the collateral of government securities.** It serves as a secondary source of funding for banks.
- **Statutory Liquidity Ratio (SLR):** SLR is the percentage of a bank's net demand and time liabilities (NDTL) that it must maintain in the form of approved securities.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

### Prelims

**Q1. When the Reserve Bank of India announces an increase of the Cash Reserve Ratio, what does it mean? (2010)**

- (a) The commercial banks will have less money to lend
- (b) The Reserve Bank of India will have less money to lend
- (c) The Union Government will have less money to lend
- (d) The commercial banks will have more money to lend

**Ans: (a)**

**Q2. Which of the following terms indicate a mechanism used by commercial banks for providing credit to the government? (2010)**

- (a) Cash Credit Ratio
- (b) Debt Service Obligation
- (c) Liquidity Adjustment Facility
- (d) Statutory Liquidity Ratio

**Ans: (d)**

**Q3. With reference to Indian economy, consider the following: (2015)**

1. Bank rate
2. Open market operations
3. Public debt
4. Public revenue

**Which of the above is/are component/ components of Monetary Policy?**

- (a) 1 only
- (b) 2, 3 and 4
- (c) 1 and 2
- (d) 1, 3 and 4

**Ans: C**

**Q4. In the context of Indian economy, 'Open Market Operations' refers to (2013)**

- (a) borrowing by scheduled banks from the RBI
- (b) lending by commercial banks to industry and trade
- (c) purchase and sale of government securities by the RBI
- (d) None of the above

**Ans: C**

**Q5. In the context of Indian economy, which of the following is/are the purpose/purposes of 'Statutory Reserve Requirements'? (2014)**

1. To enable the Central Bank to control the amount of advances the banks can create
2. To make the people's deposits with banks safe and liquid
3. To prevent the commercial banks from making excessive profits
4. To force the banks to have sufficient vault cash to meet their day-to-day requirements

**Select the correct answer using the code given below:**

- (a) 1 only
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 1, 2, 3 and 4

**Ans: (a)**

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## **Mains**

**Q.** Do you agree with the view that steady GDP growth and low inflation have left the Indian economy in good shape? Give reasons in support of your arguments. **(2019)**

# India's Socio Economic Performance in Comparison to G20 Nations

**For Prelims:** [G20](#), [GDP per Capita](#), [Human Development Index \(HDI\)](#)

**For Mains:** Impact of Socioeconomic Indicators on India's Global Standing

[Source: TH](#)

## Why in News?

Recently, India hosted the [18<sup>th</sup> G20 Summit](#) in New Delhi under the theme 'One Earth, One Family, One Future.'

- As India handed over the G20 Presidency of 2024 to Brazil, it was essential to evaluate its socioeconomic performance in comparison to fellow G20 nations. Unfortunately, India's recent performance in key socioeconomic indicators lagged behind its G20 counterparts.

## What is the Status of India's Progress on Various Metrics in Comparison to G20 Members?

- **Gross Domestic Product (GDP) per capita:**
  - [GDP per capita](#) is the sum of gross value added by all resident producers in the economy divided by mid-year population.
  - In 1970, India ranked 18<sup>th</sup> out of 19 regions analysed (Russia excluded), with a GDP per capita of USD 111.97.
    - By 2022, India's GDP per capita had increased to USD 2,388.62 but remained at the bottom among the 19 regions.
- **Human Development Index (HDI):**
  - [HDI](#) is a composite index that measures average achievement in human development taking into account four indicators:
    - **Life expectancy at birth** ([Sustainable Development Goal 3](#)),
    - **Expected years of schooling** ([Sustainable Development Goal 4.3](#)),
    - **Mean years of schooling** ([Sustainable Development Goal 4.4](#)),
    - **Gross national income (GNI)** ([Sustainable Development Goal 8.5](#)).
  - HDI is measured on a scale of 0 (worst) to 1 (best). The HDI of 19 countries ([European Union\(EU\) excluded](#)) between 1990 and 2021 is compared and India's HDI improved from 0.43 in 1990 to 0.63 in 2021, reflecting progress in life expectancy, education, and living standards.
    - However, despite its progress in absolute terms, India ranked at the bottom of the list.
- **Health Metrics:**
  - **Life Expectancy:**
    - India's average life expectancy increased from 45.22 years in 1990 to 67.24 years in 2021, surpassing South Africa but still lagging behind China.
  - **Infant Mortality:**
    - In 1990, India ranked last with an infant mortality rate of 88.8. By 2021, the rate improved to 25.5, but India ranked 19th out of 20 regions.
- **Labour Force Participation Rate (LFPR):**
  - The [\(LFPR\)](#) above 15 years of age in the 20 regions was compared between 1990 and

2021-22.

- In 1990, with an LFPR of 54.2%, India ranked 18, above Italy (49.7%) and Saudi Arabia (53.3%).
- However, **by 2021-22, India's LFPR slipped to 19<sup>th</sup> place, only ahead of Italy, with a reduced LFPR of 49.5%.**

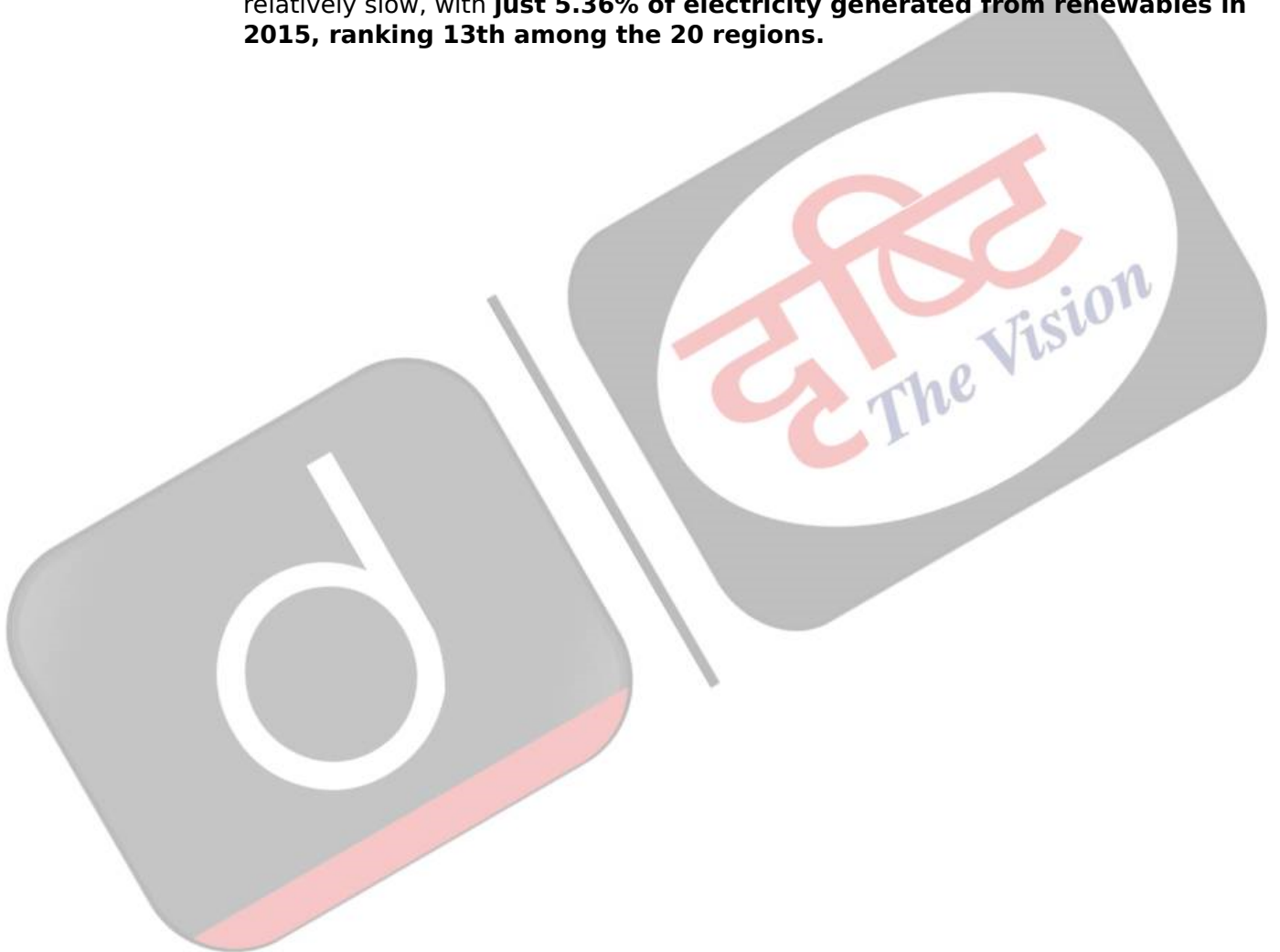
▪ **Women in Parliament:**

- The share of **women in the Parliament** of 19 regions (Saudi Arabia excluded) was compared between 1998 and 2022.
  - India's share of women in Parliament increased **from 8.1% in 1998 to 14.9% in 2022.**
  - However, compared to other G20 countries and the EU, **India's rank declined from 15<sup>th</sup> in 1998 to 18<sup>th</sup> in 2022, just ahead of Japan.**

▪ **Environmental Performance:**

- India has effectively curbed **carbon emissions** over the past three decades, consistently ranking as the lowest emitter among the 20 regions.
  - However, India's progress in adopting eco-friendly energy sources has been relatively slow, with **just 5.36% of electricity generated from renewables in 2015, ranking 13<sup>th</sup> among the 20 regions.**

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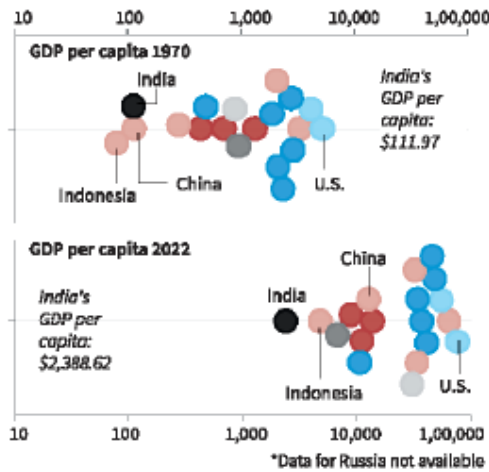
# Falling behind

The charts are based on data collated from the World Bank Open Data and Our World in Data

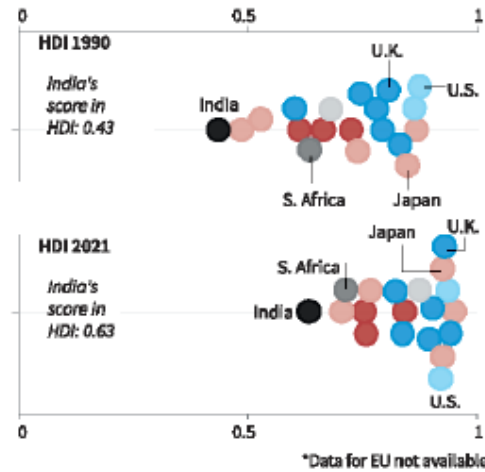
The G20 comprises India (●); Australia, China, Indonesia, Japan, South Korea [East Asia and Pacific (●)]; France, Germany, Italy, Russia, Turkey, U.K., EU [Europe and Central Asia (●)]; Argentina, Brazil, Mexico [Latin America and the Caribbean (●)]; Canada, U.S. [North America (●)]; South Africa [Sub-Saharan Africa (●)]; and Saudi Arabia [West Asia and North Africa (●)].



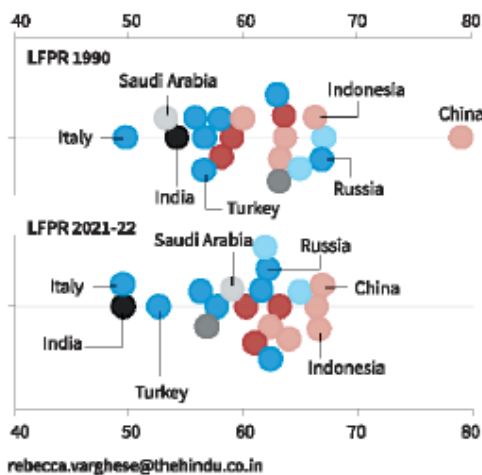
**Chart 1:** The chart compares the GDP per capita (in \$) of 19 regions (18 countries plus the EU) between 1970 and 2022



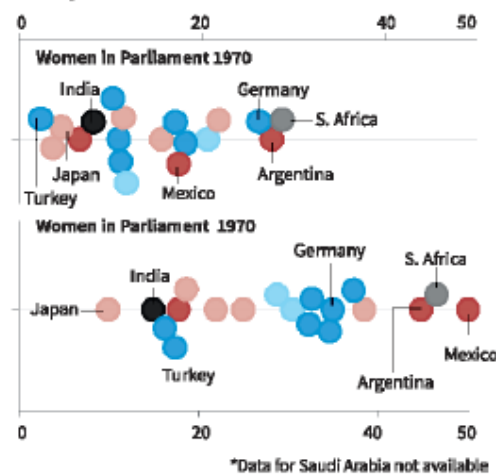
**Chart 2:** The chart compares the Human Development Index (HDI) of 19 countries between 1990 and 2021



**Chart 3:** The chart compares LFPR in 20 regions between 1990 and 2021-22



**Chart 4:** The chart compares the share of women in Parliament of 19 regions (18 countries + EU) between 1998 and 2022



## Way Forward

- India should focus on policies that ensure **economic growth reaches all segments of society**. Targeted interventions for **marginalized communities, rural development, and skill enhancement programs** can help bridge income disparities.
  - Policies should focus on **creating more job opportunities**, especially for the youth. Encouraging **entrepreneurship** can reduce unemployment, fostering inclusive development.
- India should focus on reducing infant mortality through targeted healthcare interventions, including **maternal and child healthcare**, immunisation, and sanitation infrastructure investments.

- Implement policies and programs that **promote gender equality, including women's participation in the workforce and leadership roles.**
- Accelerate the adoption of **eco-friendly energy sources** and increase renewable energy generation.
  - Encouraging more women to enter politics and leadership roles is essential.
- Strengthen **anti-corruption measures and promote ethical governance** at all levels.

## UPSC Civil Services Examination Previous Year Question (PYQ)

### Q. Consider the following statements about G-20 :(2023)

1. The G-20 group was originally established as a platform for the Finance Ministers and Central Bank Governors to discuss the international economic and financial issues.
2. Digital public infrastructure is one of India's G-20 priorities.

### 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

**Ans: (c)**

### The G20:

- It was founded in 1999 after the Asian financial crisis as a forum for the Finance Ministers and Central Bank Governors to discuss global economic and financial issues. **Hence statement 1 is correct.**
- It was upgraded to the level of Heads of State/Government in the wake of the global economic and financial crisis of 2007, and, in 2009.
- The G20 Summit is held annually, under the leadership of a rotating Presidency.
- It is initially focused largely on broad macroeconomic issues, but it has since expanded its agenda to include trade, sustainable development, health, agriculture, energy, environment, climate change, and anti-corruption.

### Digital Public Infrastructure (DPI):

- It is a shared means to many ends. It is a critical enabler of digital transformation and is helping to improve public service delivery at scale.
- Designed and implemented well, it can help countries achieve their national priorities and accelerate the Sustainable Development Goals.
- **The Ministry of Electronics & Information Technology (MeitY), Government of India** has partnered with the **United Nations Development Programme (UNDP)** to drive collective action on digital public infrastructure during India's G20 Presidency. **Hence, statement 2 is correct.**

## Mains

**Q.** Despite Consistent experience of high growth, India still goes with the lowest indicators of human development. Examine the issues that make balanced and inclusive development elusive. **(2016)**

## Leopard Sterilisation

[Source: DTE](#)

## Why in News?

Recently, the Maharashtra Government has decided **to sterilize Leopards for the sustainable management of population for leopards** in the State.

- Gujarat's forest department has also proposed sterilisation of leopards, especially in and around [Gir National Park](#).

## What is the Need for Sterilizing Leopards and Concerns?

- **Need:**
  - In 2019-20 alone, Maharashtra saw **58 human deaths due to leopards**—over half the 97 casualties in 2010-18.
  - Maharashtra has decided to sterilize leopards as a response to the increasing **leopard-human conflicts**, rising leopard population, and the need to protect both leopards and human communities.
  - The proposed sterilisation program aims to address these challenges while complying with environmental conservation laws and regulations.
- **Concerns:**
  - Concerns about the sterilisation of leopards include **doubts about its effectiveness**, the need for comprehensive scientific research, veterinary skill development, potential stress on leopards, challenges with traditional methods, and alternative contraception options.
  - There is also an emphasis on **addressing conflicts and gaining community support for conservation efforts**.

## What are the Key Points Related to Leopards?

- **Scientific Name:** Panthera pardus
- **About:**
  - The leopard is the smallest of the Big Cats (Of genus Panthera namely the [Tiger](#), [Lion](#), [Jaguar](#), [Leopard](#), and [Snow Leopard](#)), and known for its ability to adapt in a variety of habitats.
  - A nocturnal animal, the leopard hunts by night.
  - It feeds on smaller species of herbivores found in its range, such as the chital, hog deer and wild boar.
  - Melanism is a common occurrence in leopards, wherein the entire skin of the animal is black in colour, including its spots.
    - A melanistic leopard is often called [black panther](#) and mistakenly thought to be a different species.



▪ **Habitat:**

- It occurs in a wide range in sub-Saharan Africa, in small parts of Western and Central Asia, on the Indian subcontinent to Southeast and East Asia.
  - The Indian leopard (*Panthera pardus fusca*) is a leopard widely distributed on the Indian subcontinent.

▪ **Population in India:**

- As per a recent report '[Status of leopards in India, 2018](#)' released by the Ministry of Environment, Forest and Climate Change, there has been a "60% increase in the population count of leopards in India from 2014 estimates".
  - The 2014 estimates placed the population of leopards at nearly 8,000 which has increased to 12,852.
- The largest number of leopards have been estimated in **Madhya Pradesh (3,421) followed by Karnataka (1,783) and Maharashtra (1,690).**

▪ **Threats:**

- Poaching for the illegal trade of skins and body parts.
- Habitat loss and fragmentation
- Human-Leopard conflict

▪ **Conservation Status:**

- [IUCN Red List](#): Vulnerable
- [CITES](#): Appendix-I
- [Indian Wildlife \(Protection\) Act, 1972](#): Schedule-I

## UPSC Civil Services Exam, Previous Year Questions (PYQ)

**Q. Consider the following: (2012)**

1. Black-necked crane
2. Cheetah
3. Flying squirrel
4. Snow leopard

**Which of the above are naturally found in India?**

- (a) 1, 2 and 3 only  
(b) 1, 3 and 4 only  
(c) 2 and 4 only  
(d) 1, 2, 3 and 4

Ans: (b)

## Marine Light Pollution

**For Prelims:** [Artificial lighting](#), [corals](#) and [plankton](#)

**For Mains:** Artificial Light at Night (ALAN) - significance and associated issues, Impact of artificial lightning on organisms, [Light Pollution](#)

**Source:** [DTE](#)

### Why in News?

The impact of [artificial lighting](#) on land-based life (humans, fireflies, and birds) has been known for quite some time.

- However, a recent US-based study has argued to consider light pollution's influence on coastal [marine organisms](#) as well which affects everything from **whales to fish, corals, and plankton**.

### What is Artificial Lighting in the Marine Environment?

- **About:**
  - Artificial lighting refers to the light that is produced from **artificial sources such as candles, fire, electricity, etc.**
    - Ecologists and biologists have long recognized that artificial light at night can have adverse effects on the health of humans and terrestrial wildlife.
  - Recent research is showing that **marine life is also sensitive to artificial light**, including extremely low levels and certain wavelengths, **particularly blue and green light.**
- **Marine Light Pollution:** When this **artificial light is used excessively or poorly**, it becomes [light pollution](#) and disrupts the natural patterns of wildlife, contributing to the **increase in carbon dioxide (CO<sub>2</sub>)** in the atmosphere.
  - The scientists found that 1.9 million km<sup>2</sup> of the ocean experience biologically significant amounts of artificial light pollution to a depth of 1 metre.
    - This represents about **3% of the world's [Exclusive Economic Zones \(EEZs\)](#).**
  - Significant areas of the ocean are seeing **light exposures to depths of 10 metres, 20 metres, or more.**
    - In areas with very clear water, the light at night can reach depths of more than 40 metres.
- **Sources:**
  - **Coastal development** (e.g., buildings, streetlights, billboards, ports, piers, docks and, light house).
  - **Vessels** (e.g., fishing and merchant marine vessels), harbours and offshore infrastructure such as oil rigs.
  - Some of the common types of artificial lights in the marine environment are **LED, fluorescent, metal halide, and plasma lamps.**
    - **White LEDs produce broad spectrum light that is sensed by a wide range of organisms** and have a peak at short wavelengths (blue and green light) to which many marine organisms are particularly sensitive.

## Note:

- The **Earth is getting artificially brighter, at a rate of 2.2% per year**. As a result of these brighter nights, the impacts of **artificial light at night (ALAN)** have become an increasing focus in terrestrial ecology.
  - As per studies, [non-natural light increased the brightness of Skyglow](#), by 9.2-10% every year between 2011 and 2022
- Research has shown that **ALAN is a major form of anthropogenic pollution** that can affect a wide range of biotic processes, including physiology, behaviour, animal movements, species interactions, community structure and reproduction.



### LIGHT POLLUTION DEVASTATES WILDLIFE.

Plants and animals depend on Earth's daily light and dark cycle to govern life-sustaining behaviors. Research shows that artificial light at night has adverse and even deadly effects on many species.



### LIGHT POLLUTION CAN MAKE YOU LESS SAFE.

There is no clear scientific evidence that increased outdoor lighting deters crime. Poor outdoor lighting can decrease personal safety by making victims and property more visible to criminals.



### LIGHT POLLUTION WASTES ENERGY AND MONEY.

As much as 50% of outdoor lighting is wasted, which increases greenhouse gas emissions, contributes to climate change, and renders us all more energy-dependent.



### LIGHT POLLUTION MAY HARM YOUR HEALTH.

Studies suggest that artificial light at night negatively affects human health by increasing our risks for obesity, sleep disorders, depression, diabetes, breast cancer, and more.



### LIGHT POLLUTION ROBS US OF OUR HERITAGE.

Our ancestors experienced a night sky that inspired science, religion, philosophy, art, and literature. Now, millions of children across the globe will never know the wonder of the Milky Way.

## How does Artificial Lighting Affect the Marine Ecosystem?

- **Disruption of Normal Cycles:** As per the study, it already took marine organisms an **evolution of over millions of years to adapt to natural light** and now the threat of ever-increasing anthropogenic light pollution has been posing several threats to them.
  - Artificial light can easily **wash out the glow of moonlight and starlight consequently disrupting their hormonal cycles, inter-species behaviour, and reproduction cycles.**
- **Illustration:** For instance, to lay their eggs, **female sea turtles** try to find a quiet, dark spot and avoid light. However, due to artificial lighting, they may end up not coming ashore at all.
  - Moreover, their hatchlings head toward inland lights instead of moonlight on the water and then die of dehydration or starvation.
- **LEDs Worsening the Impact:** The ever-growing usage of LED lighting is also altering the very nature of artificial light.
- **Suggestion:**
  - Encouraging land-based **Lights Out efforts** (local, state, and regional campaigns to darken skies) to help [migrating birds](#) that are drawn to light at night. It will also benefit marine systems near coastal cities.
  - **Increasing the usage of red light in coastal areas** as much as possible and **putting up barriers to shield the coastline from artificial light.**
    - Red light, having the longest wavelength in the visible spectrum, doesn't penetrate as far into the water.

