

# UPSC CURRENT AFFAIRS NOTES 02-01-2023

## BLACK HOLES



PSLV-C58 XPoSAt: India successfully launches a satellite to study black holes from Sriharikota.

### Introduction to Black Holes

A black hole is a region in space where the gravitational pull is so immense that nothing, not even light, can escape its gravitational field once it passes the boundary called the event horizon.

### Formation Mechanism:

Stellar black holes form when massive stars collapse under their own gravity after exhausting their nuclear fuel.

Supermassive black holes likely evolve from the merging of smaller black holes and the accumulation of mass in the centers of galaxies over cosmic time.

### Classification:

Black holes are categorized based on their mass:

**Stellar Black Holes:** Formed from the remnants of massive stars, typically with masses ranging from a few to tens of solar masses.

**Supermassive Black Holes:** Found in the centers of galaxies, with masses millions to billions of times that of the Sun.

**Intermediate Black Holes:** Hypothetical black holes with masses between stellar and supermassive.



## **Structure and Characteristics:**

### **Event Horizon:**

The event horizon marks the boundary beyond which the gravitational pull is so strong that nothing, not even light, can escape.

It is the point of no return for anything approaching a black hole.

### **Singularity:**

At the heart of a black hole lies the singularity, where mass is compressed into an infinitely small point of infinite density.

### **Ergosphere and Photon Sphere:**

The ergosphere is the region outside the event horizon where a rotating black hole drags spacetime around it.

The photon sphere is the region where photons can orbit the black hole at a specific distance from the event horizon.

## **Black Hole Physics and Concepts:**

### **Hawking Radiation:**

Stephen Hawking proposed that black holes emit radiation due to quantum effects near the event horizon, causing them to gradually lose mass and potentially evaporate over vast timescales.

### **Information Paradox:**

The information paradox raises questions about the fate of information that enters a black hole, seemingly lost when the black hole evaporates, challenging principles of quantum mechanics.

### **Gravity and Time Dilation:**

Near a black hole, gravity is immensely strong, causing significant time dilation where time appears to slow down for an observer far from the black hole.

## **Observational Evidence and Detection:**

### **Indirect Observations:**

Astronomers detect black holes by observing the effects of their gravity on nearby objects, such as stars orbiting an unseen massive object.

### **Direct Observations:**

The Event Horizon Telescope captured the first image of a black hole's shadow in the galaxy M87 by linking radio telescopes worldwide, providing visual confirmation of their existence.

### **Gravitational Waves:**

LIGO (Laser Interferometer Gravitational-Wave Observatory) and Virgo have detected gravitational waves from black hole mergers, opening a new window to study cosmic events.

### **Significance:**

#### **Cosmological Insights:**

Black holes serve as crucial laboratories to test theories of gravity, understand the behavior of matter under extreme conditions, and explore the evolution of galaxies and the universe.

#### **Quantum Gravity:**

Studying black holes is fundamental to the quest for a theory that unifies quantum mechanics and general relativity, a challenge in modern physics.

#### **Technological Advances:**

Observing black holes requires cutting-edge technology and collaborative efforts, pushing the boundaries of astronomy and data analysis.

## **Operation Prosperity Guardian and Houthi conflict**





As part of a maritime security initiative in the Red Sea named Operation **Prosperity Guardian, the United States military opened fire on Yemen's Houthi rebels.**

### **Houthi conflict**

The Houthi conflict, also known as the Yemeni Civil War, involves various factions competing for control in Yemen, with the Houthi rebel movement playing a central role. Here are key points about the Houthi conflict:

### **Background:**

#### **Houthi Rebellion:**

The conflict originated with the Houthi movement, formally known as Ansar Allah, which emerged in the early 2000s in northern Yemen. The group is named after its founder, Hussein Badreddin al-Houthi.

#### **Zaidi Shia Influence:**

The Houthi movement is rooted in the Zaidi Shia sect, a minority in Yemen. It has historical grievances related to political and economic marginalization.

#### **Escalation and Chronology:**

##### **Saada Wars (2004-2010):**

The conflict began with clashes between Houthi rebels and the Yemeni government, leading to multiple Saada Wars in the Saada Governorate.

##### **Arab Spring (2011):**

The Arab Spring protests in Yemen provided an opportunity for various groups, including the Houthis, to escalate their activities against the government.

##### **Houthi Takeover (2014-2015):**

The Houthis, capitalizing on popular discontent, seized control of the Yemeni capital, Sana'a, in 2014, leading to the ousting of President Abdrabbuh Mansur Hadi.

##### **Saudi-led Intervention (2015-present):**

A coalition led by Saudi Arabia, with support from the UAE and others, intervened in 2015 to restore the Yemeni government and counter Houthi influence.

## Key Actors:

### Houthi Movement (Ansar Allah):

The Houthi rebels, with allegiance to the Zaidi Shia sect, have been central to the conflict. They control significant parts of northern Yemen, including the capital, Sana'a.

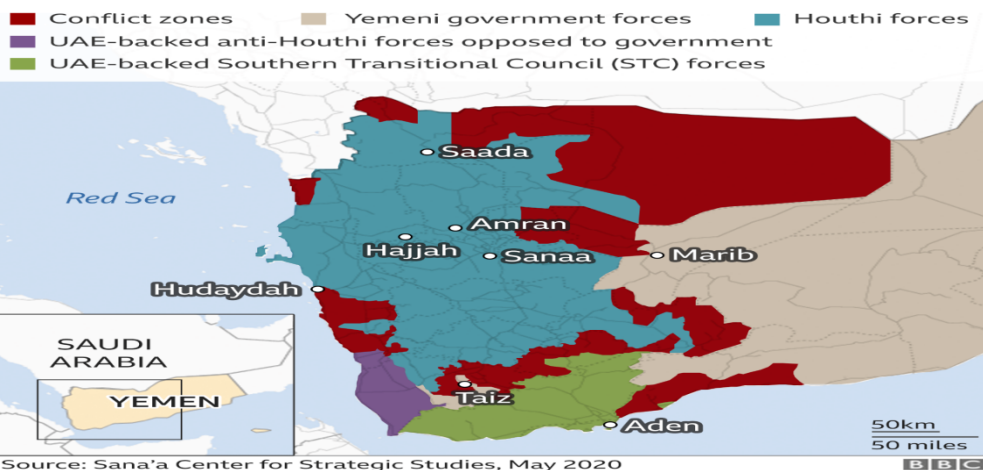
### Yemeni Government Forces:

Forces loyal to the internationally recognized government of President Hadi have received support from the Saudi-led coalition.

### Southern Separatists:

The Southern Transitional Council (STC), seeking an independent South Yemen, has at times aligned with and at times opposed both the government and the Houthis.

#### Yemen: Areas of control and conflict



## Humanitarian Crisis:

### Humanitarian Impact:

The conflict has resulted in a severe humanitarian crisis, with millions facing food insecurity, displacement, and inadequate access to healthcare.

### Cholera Outbreak:

Yemen has faced one of the world's worst cholera outbreaks, exacerbated by damaged infrastructure and limited access to clean water.



## **International Involvement:**

### **Saudi-led Coalition:**

The Saudi-led coalition, supported by the United States and other Western allies, has conducted airstrikes against Houthi targets.

### **Iranian Involvement:**

Iran has been accused of providing support to the Houthi rebels, including weapons and training, although the extent of this support is a subject of international debate.

### **Peace Efforts:**

#### **UN-led Negotiations:**

Various attempts by the United Nations to broker a political solution, including peace talks in Sweden, have faced challenges in reaching a sustainable agreement.

#### **Ceasefires and Fragile Truces:**

Periodic ceasefires and truces have been declared, but they often break down due to ongoing hostilities.

## **Remarks**

The Houthi conflict remains a complex and protracted crisis with significant regional and international implications. Efforts toward a lasting solution involve addressing the root causes of the conflict, fostering inclusive dialogue, and addressing the urgent humanitarian needs of the Yemeni population.

## **Implications of the Yemen-Houthi conflict for the Red Sea region**

The Yemen-Houthi conflict has significant implications for the Red Sea region, affecting maritime security, trade routes, and the geopolitical landscape. Here are key impacts on the Red Sea:

### **Maritime Security:**

#### **Shipping Routes Disruption:**

The conflict has raised concerns about the safety of shipping routes in the Red Sea. Houthi-controlled areas in Yemen are strategically located along the Bab el-Mandeb Strait, a crucial maritime choke point.



### Houthi Naval Threat:

Houthi rebels have targeted shipping in the Red Sea through attacks on vessels, including both commercial and military ships. These actions raise concerns about the security of maritime traffic in the region.

### Geopolitical Tensions:

#### Saudi Arabia and Iran Rivalry:

- The Houthi rebels, aligned with Iran, have contributed to the ongoing regional rivalry between Iran and Saudi Arabia. This rivalry extends to the Red Sea, impacting the geopolitical dynamics of the region.

### Regional Alliances:

- The involvement of regional actors, such as Saudi Arabia and the United Arab Emirates (UAE), in the conflict has implications for their influence along the Red Sea coastline, affecting regional alliances and security arrangements.

### Economic Impact:

#### Disruption of Trade:

- The conflict has the potential to disrupt trade and economic activities along the Red Sea, impacting countries that rely on the seaway for commerce.

#### Oil and Gas Transit:

- The Red Sea is a critical transit route for oil and gas shipments. Any disruption caused by the conflict could impact the global energy market and increase transportation costs.

### Humanitarian Concerns:

#### Refugee Flows:

- The conflict has led to a humanitarian crisis in Yemen, prompting displacement and refugee flows. Neighboring countries along the Red Sea may bear the socio-economic consequences of hosting refugees and managing the spillover effects.



## Environmental Impact:

### Potential for Maritime Pollution:

- Ongoing conflict raises concerns about the potential for maritime accidents, leading to oil spills or other forms of pollution in the Red Sea. This could have severe environmental consequences for the region.

### Counterterrorism Efforts:

### Security Challenges:

- The conflict contributes to security challenges in the Red Sea region, potentially facilitating the activities of non-state actors and terrorist groups.

### International Counterterrorism Cooperation:

- The instability caused by the conflict prompts international efforts to address terrorism-related concerns in the Red Sea, fostering collaboration among countries to enhance maritime security.

In conclusion, the Yemen-Houthi conflict has broad implications for the Red Sea region, impacting maritime security, trade, geopolitics, and the overall stability of the area. The international community has a vested interest in finding diplomatic solutions to mitigate the negative consequences and promote stability in the Red Sea.

## Indian Pangolin

The pangolin conservation project launched to protect pangolins has succeeded at Pench Tiger Reserve and Satpura Tiger Reserve, as the mammals have started to breed there.

Pangolins, also known as scaly anteaters, are the only known mammals with large keratin scales covering their skin.

Of the eight species found worldwide (four each in Asia and Africa), two are found in India: the Indian Pangolin (*Manis crassicaudata*) and the Chinese Pangolin (*Manis pentadactyla*).





## About Indian Pangolin:

The **Indian pangolin**, also called the **thick-tailed pangolin**, is native to the Indian subcontinent.

They are one of the most trafficked mammals in the world, despite an international ban on their trade.

Distribution: It lives in India (south of the Himalayas), Bangladesh, Southern Nepal, Sri Lanka, and small parts of Pakistan.

### Habitat:

They are well adapted to desert regions and prefer barren, hilly areas. Their habitat extends up to 2,500 feet above sea level.

Overall, they prefer soil that is soft and semi-sandy, suitable for digging burrows.

They have also been shown to survive in various types of tropical forests, open land, grasslands, and in close proximity to villages.

### Features:

Like other pangolins, it has large, overlapping scales on its body, which act as armor.

The Indian pangolin's armor is among the most effective in the mammalian world. **It has about 13 rows of moveable, sharp scales covering its body, which are shed periodically.**

The colour of its scales varies depending on the colour of the earth in its surroundings.

It can also curl itself into a ball for self-defense against predators.

It is an insectivore, feeding on ants and termites.

It is nocturnal and it rests in deep burrows during the day.

Conservation status:

IUCN Red List: Endangered

Wildlife (Protection) Act, 1972: Schedule I

CITES: Appendix I



## **Agreement on the Prohibition of Attack against Nuclear Installations and Facilities**

India and Pakistan exchanged the list of nuclear installations and facilities through diplomatic channels recently under the agreement on the Prohibition of Attack against Nuclear installations and facilities.

About Agreement on the Prohibition of Attack against Nuclear Installations and Facilities:

It was signed on December 31, 1988, by the then Pakistani Prime Minister Benazir Bhutto and Indian PM Rajiv Gandhi.

The treaty came into force on January 27, 1991, and has two copies each in Urdu and Hindi.

### **Need for the Agreement:**

In 1986, the Indian army carried out a massive exercise 'Brasstacks', raising fears of an attack on nuclear facilities.

Since then, both countries have been negotiating to reach an understanding towards the control of nuclear weapons, which culminated in the treaty.

### **Provisions:**

The agreement mandates both countries to inform each other about any nuclear installations and facilities to be covered under the agreement on the first of January of every calendar year, providing a confidence-building security measure environment.

The term 'nuclear installation or facility' includes nuclear power and research reactors, fuel fabrication, uranium enrichment, iso-topes separation, and reprocessing facilities, as well as any other installations with fresh or irradiated nuclear fuel and materials in any form and establishments storing significant quantities of radioactive materials.

## **Eurozone**

The eurozone economy is set for only modest growth next year, despite wages rising faster than inflation for the first time in three years, according to a recent poll of economists.



### **About Eurozone:**

The eurozone, officially known as the euro area, is a geographic and economic region that consists of all the European Union countries that have fully incorporated the euro as their national currency.

As of January 2023, the eurozone **consists of 20 countries in the European Union (EU):**

Austria, Belgium, Croatia, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia, and Spain.

Not all European Union nations participate in the eurozone; some opt to use their own currency and maintain their financial independence.

The European Central Bank (ECB) exercises the sole power to set the monetary policy for the Eurozone countries.

The **ECB** exercises the sole authority to **decide the printing and minting of euro** notes and coins. It also **decides the interest rate** for the Eurozone.

The ECBs is **headed by a president and a board, comprising the heads of the central banks of the participating nations.**

### **How do countries join the Eurozone?**

In order to join the euro area, EU member states are **required to fulfil** so-called '**convergence criteria**' which consists of **price stability, sound public finances, the durability of convergence, and exchange rate stability.**



These binding economic and legal conditions were **agreed upon in the Maastricht Treaty** in 1992 and are also known as '**Maastricht criteria**'.

**All EU Member States, except Denmark**, are required to adopt the euro and join the euro area once they are ready to fulfill them.

**The Treaty does not specify** a particular **timetable for joining the euro area** but leaves it to member states to develop their own strategies for meeting the condition for euro adoption.

The **European Commission and the ECB** jointly **decide whether the conditions are met** for euro area candidate countries to adopt the euro.

### **What is the European Union (EU)?**

The EU is a **political and economic union of 27 member states** located primarily **in Europe**.

The EU was established by the Maastricht Treaty, which entered into force on November 1, 1993.

The main goal of the EU is to promote cooperation and integration among its member states in order to enhance economic and political stability in Europe.

It has a single market where goods, services, and capital can move freely.