

Prelims Exam Topics

COAL GASIFICATION

Context

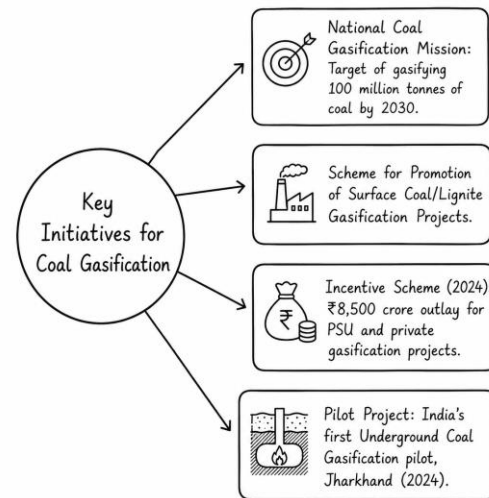
India's first commercial-scale coal-to-ammonium nitrate plant, the Lakhanpur Project in Odisha, is set to be launched, built on indigenous coal gasification technology.

Lakhanpur Coal-to-Ammonium Nitrate Project

- **Developer:** Bharat Coal Gasification and Chemicals Limited (BCGCL), a joint venture between BHEL and CIL.
- **Capacity:** Will produce 2,000 tonnes per day (TPD) of ammonium nitrate using BHEL's indigenous coal gasification technology.

About Coal Gasification

- **Meaning:** Process converting coal into synthesis gas (syngas), used to manufacture value-added products like methanol, urea, ammonium nitrate, synthetic natural gas (SNG), and other chemical feedstocks.
- **Significance of Coal Gasification**
 - **Import Substitution:** India currently imports end-use and intermediate chemical products worth nearly ₹2.7 lakh crore annually.
 - **Investment Catalyst:** Expected to draw investments of ₹2.5–3 lakh crore and generate around 50,000 direct/indirect jobs across roughly 25 projects in coal-bearing regions.
 - **Resource Potential:** India is the world's second-largest producer and consumer of coal, holding the world's fifth-largest coal reserves (over 400 billion tonnes); CIL itself is the world's largest coal producer.
 - **Optimal Resource Use:** Seen as key to long-term economic growth and competitiveness, on the lines of the US shale gas revolution and China's coal-to-chemicals programme.



PYQ anchor

Q. Consider the following substances: (UPSC 2025)

I. Ethanol

II. Nitroglycerine

III. Urea

Coal gasification technology can be used in the production of how many of the above?

(a) Only one

(b) Only two

(c) All three

(d) None

Answer: B

BIOCHAR

Context

India burns over 20 million tonnes of paddy straw annually in Punjab and Haryana, while soils elsewhere suffer from low organic carbon. Biochar offers a carbon-negative solution to both problems.

About Biochar

- **Meaning:** A carbon-rich material produced by heating agricultural or organic waste under low-oxygen conditions (pyrolysis); breaks down very slowly, locking carbon in soil for long periods.
- **Feedstock:** Agricultural residues (paddy straw, maize stalks, coconut leaf stalks, sugarcane bagasse) as well as urban organic waste and sewage sludge.

Benefits to Agriculture

- **Soil Improvement:** Highly porous structure aggregates soil particles, improves water-holding capacity, and supports beneficial microorganisms.
- **Productivity Gains:** Field studies show 10–30% improvement in crop productivity and 10–25% improvement in water-holding capacity, especially in nutrient-poor soils.
- **Climate Resilience:** Enhances nutrient-use efficiency and moisture retention, helping crops withstand droughts and erratic rainfall

Climate & Carbon Credit Potential

- **Carbon Sequestration:** Classified as a persistent carbon dioxide removal technology under accepted international accounting standards.
- **Carbon Credits:** Under the VM0042 methodology, each tonne of certified biochar can generate 2–2.8 tonnes of CO₂-equivalent credits, creating income potential for farmers and project developers.

- The KISAN kiln (developed by IIT Kharagpur) enables smallholders to convert farm waste into biochar and monetise it.

PYQ Anchor**Q. What is the use of biochar in farming? (UPSC 2020)**

1. Biochar can be used as a part of the growing medium in vertical farming.
2. When biochar is a part of the growing medium, it promotes the growth of nitrogen-fixing microorganisms.
3. When biochar is a part of the growing medium, it enables the growing medium to retain water for a longer time.

Which of the statements given above is/are correct?

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

Answer: D

PROJECT NIMBUS**Context**

Google CEO Sundar Pichai's Stanford speech was disrupted by student protests against Project Nimbus.

About Project Nimbus

- It is a cloud-computing contract worth over \$1 billion between the Israeli government and Google and Amazon, signed in 2021.
- **Scope:** Provides cloud services to Israeli government ministries, authorities, and government-owned companies; initially for seven years, extendable up to 23 years.
- **Concerns:** Israeli military allegedly stored Palestinian surveillance data on AWS for possible airstrike planning, while the contract barred Google and Amazon from restricting Israeli government use of cloud services even on violations.

FINANCIAL ACTION TASK FORCE**Context**

Vivek Aggarwal has become the first Indian to be elected Vice President of the Financial Action Task Force (FATF).

About FATF

- **Genesis:** Inter-governmental body set up in 1989 at the G7 Summit in Paris.
- **Headquarters:** Paris, France.
- **Functions:** Acts as the global watchdog against money laundering and terrorist financing; sets international standards to curb these activities and the harm they cause to society.
- **Membership:** 40 members; India joined in 2010.
- **FATF Risk Classifications**
 - **Black List (High-Risk Jurisdictions subject to a Call for Action):** Countries with serious strategic deficiencies in tackling money laundering, terrorist financing, and proliferation financing.
 - **Grey List (Jurisdictions under Increased Monitoring):** Countries actively working with FATF to address identified strategic deficiencies.

ABHIGYAN APP

Context

The Union Home Minister has launched the Abhigyan App to help field police identify suspects through fingerprint matching.

About Abhigyan App

- **Developer:** National Crime Records Bureau (NCRB).
- **Function:** Allows field police personnel to search the National Fingerprint Database from any location, using a certified fingerprint scanner, to identify suspects through fingerprint matching.
- **Linkage:** Connected to the National Automated Fingerprint Identification System (NAFIS).

About NAFIS

- **Implemented by:** NCRB.
- **Function:** Stores fingerprint scans of accused persons, convicts, and prison inmates on a centralised platform for nationwide search and matching.

FAST X-RAY TRANSIENTS (FXTS)

Context

Astronomers at the Indian Institute of Astrophysics (IIA) have traced the cosmic origin of a Fast X-ray Transient (FXT) named EP241107a, linking it to the collapse of a massive star or a neutron star merger.

About Fast X-ray Transients (FXTs)

- **Meaning:** Energetic, non-repeating bursts of X-rays associated with violent cosmic processes.
- **Characteristics:** Appear as sudden bursts of low-energy X-rays lasting from a few minutes to several hours.
 - Their brief duration makes them difficult to study, leaving their origin largely unclear.

About EP241107a

- Detected by the Einstein Probe, a dedicated X-ray monitoring satellite designed to capture such fast, faint transients.
- Linked to the collapse of a massive star (core-collapse) or the merger of two neutron stars; both extreme, high-energy astrophysical events.

Neutron Star: An extremely dense, collapsed core of a massive star formed after a supernova explosion, composed almost entirely of neutrons.

DEVELOPMENT POLICY FINANCING

Context

The World Bank has approved a \$1.5 billion financing package for India under its Development Policy Financing (DPF) operation to support growth and job creation.

About Development Policy Financing (DPF)

- It is a World Bank lending instrument that disburses funds against policy reforms rather than specific project outputs, unlike traditional project financing.
- **Objective:** Provides quick-disbursing finance to help a borrower country meet actual or anticipated development financing needs.
- **Support Areas:** Backs borrowers in pursuing poverty reduction and climate-friendly, sustainable, and inclusive growth through a programme of policy and institutional reforms.
- **Instruments:** Can be extended as loans, credits/grants, or guarantees.
- **Conditions for Fund Disbursement**
 - **Macroeconomic Stability:** Borrowers must maintain an adequate macroeconomic policy framework.
 - **Reform Implementation:** Satisfactory progress on the overall reform programme.
 - **Policy Actions:** Completion of a defined set of critical policy and institutional measures.
 - **Climate Alignment:** Consistency with the goals of the Paris Agreement.

SMALL MODULAR REACTOR

Context

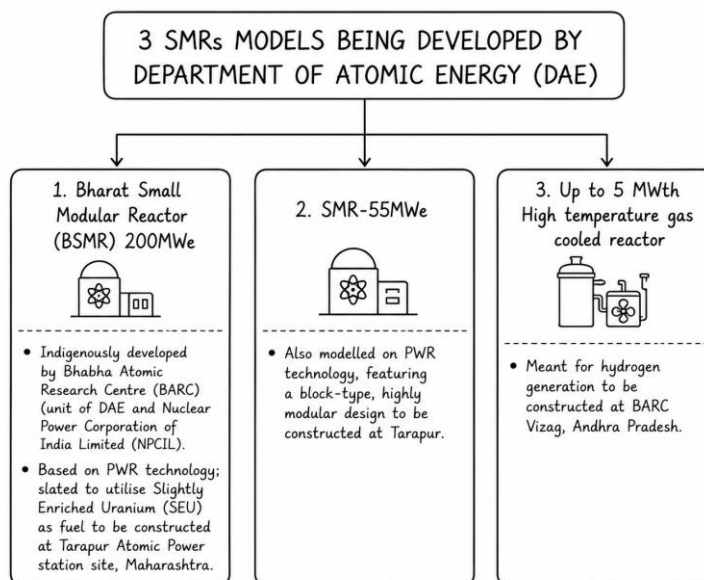
India's nuclear regulator is set to apply the same safety and licensing norms to Small Modular Reactors (SMRs) as to large nuclear reactors, even as SMRs gain traction under the new SHANTI Act.

About Small Modular Reactors (SMRs)

- **Meaning:** Advanced small nuclear reactors with a power capacity of 30 MWe to 300 MWe per unit, compared to 500 MW or more for conventional reactors.

- **Coolant Types:** Four main types based on coolant used: light water, high-temperature gas, liquid metal, and molten salt; light water reactors are the most common and easiest to design, being similar to conventional water-cooled plants.

- **Advantage:** Modular factory-built design reduces gestation period and offers economies of scale, allows incremental scalability per demand, ensures passive safety without human intervention, and provides low-carbon power for rising needs like AI.



STATE OF WORLD FISHERIES AND AQUACULTURE (SOFIA) REPORT 2026

Context

The FAO has released its report on global fisheries and aquaculture under the theme "Blue Transformation: Turning Vision into Impact."

Key Findings

- **Global**
 - Global aquatic animal production reached 235 million tonnes in 2024.
 - Aquaculture accounted for 53% of total aquatic animal production.

- **Key Concern:** Share of sustainably fished stocks declined from 64.5% (2021) to 62.4% (2023).

- **India**

- India contributed 9% of global aquatic animal production in 2024, ranking second worldwide after China.
- Ranked first globally in inland capture fisheries.
- Accounted for 5% of global marine capture fisheries.

FAO's Blue Transformation Vision (2021): Aims to transform aquatic food systems through sustainable aquaculture expansion, effective fisheries management, and efficient, inclusive, and sustainable value chains.

CAN POLICE RE-OPEN PROBE WITHOUT COURT APPROVAL?

Context

The Supreme Court, in *Palaniswamy Veeraraja & Ors. v. State of Karnataka*, has reiterated that investigating agencies must obtain a Magistrate's permission before conducting further investigation after filing a closure report.

Legal Provisions on Further Investigation

- **Section 173(2), CrPC:** Requires the police to forward a final report to the Magistrate on completion of investigation.
- **Section 173(8), CrPC:** Allows the police to file a supplementary report if additional evidence is found after submitting the final report, but is silent on requiring the Magistrate's prior permission.
- **BNSS Equivalent:** Section 193(9) of the Bharatiya Nagarik Suraksha Sanhita (BNSS) is *pari materia* (dealing with the same subject) to Section 173(8) of the CrPC.