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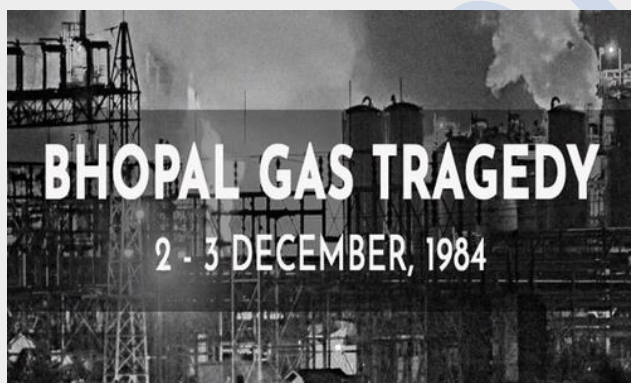
1. Why Madhya Pradesh will begin disposal of toxic waste nearly 40 years after the Bhopal Gas Tragedy

Why in News?

Nearly 40 years after Bhopal gas tragedy, the Madhya Pradesh state government will finally move ahead with its plan to incinerate 337 Metric Tons (MT) of toxic waste from the Union Carbide facility. On March 4, the central government earmarked Rs 126 crore for the purpose.

What was the Bhopal Gas Tragedy?

One of the biggest industrial disasters ever unfolded on the night of December 2, 1984, in Bhopal, Madhya Pradesh. Highly toxic Methyl Isocyanate (MIC) gas leaked from a pesticide plant owned by Union Carbide India Limited (UCIL) located on the outskirts of the city, killing around 5,000 people.



were sealed.

The survivors have been afflicted by ailments ranging from skin disease to detrimental reproductive health in women and congenital health issues in children born to those exposed to the gas.

The scale of the environmental pollution has been massive — water sources surrounding the factory were contaminated and many hand pumps

The company at the centre of it all, UCIL, a subsidiary of the US-based Union Carbide Corporation (UCC) and now a part of Dow Chemicals, has been held responsible by the survivors who have demanded just compensation for their suffering. The Supreme Court in 2023 dismissed a curative petition by the central government seeking additional compensation from UCC's successor firms.

Why has it taken four decades to begin waste disposal?

A PIL was filed by activist Alok Pratap Singh in the Madhya Pradesh High Court in 2004 to hold Dow Chemicals responsible for the pollution at the site and seek immediate action on the clean-up. The court instituted a task force chaired by the Secretary, Department of Chemicals and Petrochemicals, Government of India.

Central Pollution Control Board (CPCB) experts in 2005 identified a world-class incinerator owned by Bharuch Enviro-Infrastructure Limited (BEIL) in Ankleshwar, Gujarat, for safely disposing of the waste. Following protests in Gujarat in 2007 and the eventual intervention of the Supreme Court in 2009, this was dropped.

The task force identified other Treatment, Storage, and Disposal Facility (TSDF) sites including Dungigal in Hyderabad and Taloja in Mumbai. In 2010, the Supreme Court authorised the incineration of 346MT of waste at the TSDF in Pithampur, Madhya Pradesh after a successful trial run.

This decision was challenged two years later by the state, and it filed a Special Leave Petition in the Supreme Court in 2012 arguing that the “facility is not technically sound for incineration of the Bhopal gas toxic waste which is more hazardous in comparison to industrial waste.”

Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), which had submitted a proposal costing Rs 24.56 crores to dispose of the waste in Germany, withdrew the same in 2012 following widespread opposition from their citizens.

In 2015, the centre conducted a trial run at the Pithampur TSDF but had to suspend further plans following opposition from residents. Without consensus between the centre and the state, no action was taken for seven years.

On March 4, 2024, the central government disbursed Rs 126 crore to dispose of the waste after much prodding from the courts.

What is the plan for disposing of the toxic waste?

According to the proposal, the Madhya Pradesh Department of Bhopal Gas Tragedy Relief and Rehabilitation (BGTRR) will oversee the disposal of the toxic waste from the Union Carbide facility at the incinerator of the Treatment Storage Disposal Facility in Pithampur, Indore, from July 2024.

The project is expected to be executed in 180 days. In the first 20 days, the waste will be transported from the contaminated site to the disposal site in packed drums. Later, this waste is shifted from storage to a blending shed where it is mixed with regents and then packed into small bags weighing 3-9 kg.

The actual incineration will happen only on the 76th day after all the reports related to the incineration is sent to multiple departments for their approval before the actual disposal begins to ensure the air quality doesn't deteriorate and the incineration takes place as per standard operating procedures.

The procedure will cost Rs. 126 crore, about five times the offer of Rs. 24.56 crore made by GIZ in 2012.

Relevance: GS Prelims & Mains Paper III; Environment

Source: Indian Express

2. The relevance of pumped storage projects

Why in News?

The Union Budget for 2024-25 promised that “a policy for promoting pumped storage projects will be brought out for electricity storage and facilitating smooth integration of the growing share of renewable energy with its variable and intermittent nature.”

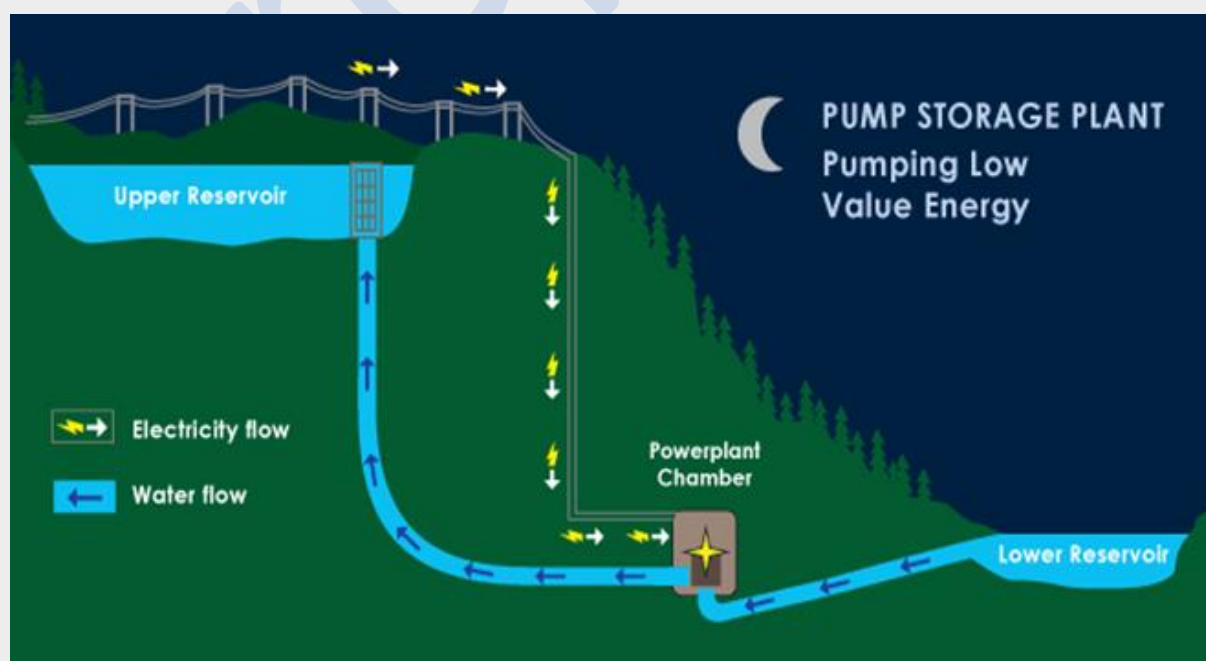
Variable nature of Renewable Power

India has planned to create an ambitious 500GW of non-fossil fuel energy by 2030. In around two years, from 2021 to 2023, it created some 23GW of non-fossil generation capacity. Out of the total 10GW added in eight months in 2023-24, 7.5GW were from wind and solar energy, pointing to how renewables will account for most of the new power generation that will be added in India. The share of actual renewable power generation will increase in times to come, but this power will necessarily vary and will be “infirm”.

Indian policies have laid down that all the power that renewable sources generate should be used and their curtailment should be last priority. State-of-the-art forecasting techniques have helped to predict more accurately how much renewable power generation might vary in the course of a day. This has helped grid operators plan in advance how to increase or decrease power generation from other sources to provide steady power to the consumer. For example, hydro power generation can be quickly ramped up or down in a matter of seconds. However, coal and nuclear energy need hours of notice.

Solutions

When the world’s attention turned to renewables and the problem of variable power generation, many solutions were proposed for storing energy and releasing it when wind and solar power generation are down. Until then, no electricity generated was stored at a large scale. Some of the proposed energy storage methods include scaling up batteries and pumping in compressed air into large caverns and then drawing on them to generate power when required. However, much of the energy storage adopted across the world today is pumped storage that uses water. These are like super large batteries but natural and use water.



Does India have pumped storage?

India has 3.3GW of pumped storage. Main ones are in Nagarjunasagar, Kadana, Kadamparai, Panchet and Bhira. China leads the world with 50GW of pumped storage supporting 1,300GW of wind and solar energy. India would need to ramp up its pumped storage capacity by several times if it wants to meet its renewable power generation targets.

Pumped storage is of two types: on river and off river. On-river is like any hydroelectric project supplied by a river. Off-river projects are those that have two reservoirs at two different levels to which the water can be pumped up or let down under gravity in a closed loop. When there is surplus power, water is pumped up from the lower reservoir to the upper, and when power is needed the water can flow down to turn the turbines and generate power. One such project is at Kadamparai, Tamil Nadu.

Pumped storage at Kadamparai

In Tamil Nadu, at noon on a typical day in July, wind and solar can generate half of all power. This is among the highest in the country. On a summer day, solar plants in Tamil Nadu currently produce some 5,000MW at noon. But that power dwindles and drops to zero at sunset. Wind also has its own vagaries. Tamil Nadu has peaks of around 17,000MW to 20,000MW on a daily basis. Wind and solar energy have must-run-status in the State which means whatever energy they produce must be taken.

Relevance: GS Prelims & Mains Paper III; Science & Technology

Source: The Hindu

3. The gender issue in the Imane Khelif vs Angela Carini boxing match controversy

Why in News?

Italy's Angela Carini withdrew from her Round of 16 boxing bout against Algeria's Imane Khelif after only 46 seconds and a couple of punches to her face, triggering the Olympics' biggest controversy yet.

Since her victory, Khelif has been the target of a wave of abuse, with many calling her a "biological man" who had an "unfair advantage" over Carini. Some people also wrongly identified Khelif as a transgender woman.

The participation of trans women, and women having certain "masculine" biological characteristics like higher testosterone levels, in women's sports has long been a subject of polarising debate.

Why did Khelif's win spark a controversy?

In 2023, Khelif and Chinese Taipei boxer Lin Yu-ting were banned from competing in the International Boxing Association's (IBA's) World Championship in New Delhi after failing a "gender eligibility" test, the details of which remain confidential. The IBA, in a statement, said that the two boxers did not "meet eligibility criteria to compete within the female category".

However, both are now competing at the Paris Olympics. This is because the IBA was derecognised by the International Olympic Committee (IOC) last June over governance and

financial issues. In Paris, the IOC-appointed unit which is governing the competition has set very different rules. The only determinant for eligibility is the gender stated in an athlete's passport — Khelif's passport says she is female.

Following Khelif's win, and the subsequent abuse, the IOC said in a statement that all boxers in the Olympics had complied with "the competition's eligibility and entry regulations", and that both Khelif and Lin have participated in women's competitions for many years, including in the Tokyo 2020 Games. It also said that IBA's "arbitrary decision" to ban the two women had been taken without following proper procedure.

Why is gender eligibility a contentious issue in women's sports?

Modern sports is organised on the basis of sex, with men and women competing in different categories. This is because men, on average, have certain physiological advantages over women.

Sex is determined based on chromosomes, which carry genes. Humans have 23 pairs of chromosomes — 22 are identical in men and women; one, the sex chromosome, is different. The XX sex chromosomes result in the development of female sex organs, and XY in male sex organs.



The SRY gene, found on the Y chromosome, is responsible for the production of testosterone. Multiple studies have attempted to decode the impact that this hormone has on physical characteristics. A 2017 paper ('Circulating Testosterone as the Hormonal Basis of Sex Differences in Athletic Performance') published in the journal *Endocrine Reviews* supported the link between testosterone and athletic performance.

Crucially, some people born with female reproductive organs may also carry the XY chromosome, in what is known as Swyer syndrome, one of many "Disorders of Sex Development", or DSDs.

This is at the heart of the debate surrounding gender eligibility in women's sports. Many argue that in order to prevent some athletes from having an unfair advantage in women's sports, women with DSDs which facilitate greater testosterone production, and other consequent athletic advantages, must not be allowed to compete with other women.

How do sports federations deal with this matter?

In 2021 the IOC decided to leave it to international sports federations to develop their own set of eligibility rules, based on an "evidence-based approach" keeping in mind principles of "fairness", "inclusion", "non-discrimination", "no presumption of advantage", and "prevention of harm". Previously, it used to take into account testosterone levels — below 10 nanomoles per litre (nmol/L) for women athletes who had transitioned from male to female.

The eligibility regulations of World Athletics still uses testosterone levels as an eligibility determinant. DSD athletes need to keep their testosterone level to below 2.5 nmol/L for at least 24 months before they become eligible to participate in any event. This is stricter than what it was before 2023, when there was a 5 nmols/L restriction for events ranging from 400 metres to a mile, and no restrictions on other events.

FINA, the world swimming body, the International Cycling Union, and the International Rugby Union have all instituted varying degrees of bans on trans women athletes.

At the end of the day, there is still lots that is not known about the impact of testosterone on sporting performance. Many question if the case of women who are born with higher levels of testosterone is any different from that of people with other genetic advantages — like LeBron James' height or Michael Phelps' massive fin-like hands.

Relevance: GS Prelims & Mains Paper III; Miscellaneous

Source: Indian Express