



International Relations

Former Navy Personnel Sentenced to Death in Qatar

Tags:

- GS Paper - 2
- India and its Neighbourhood
- Bilateral Groupings & Agreements
- Regional Groupings

For Prelims: Former Navy Personnel Sentenced to Death in Qatar, Indian Navy, India-Qatar Relations, International Court of Justice (ICJ), United Nations (UN).

For Mains: Former Navy Personnel Sentenced to Death in Qatar, Legal options with India, and its Implications on India-Qatar Relations.

Why in News?

Recently, a Qatari court has sentenced eight former personnel of the Indian Navy to death in the Espionage Charges. The individuals were arrested in August 2022 and faced **charges related to breaching sensitive secrets**.



What is the Background of the Case?

- **Accusations:**

- The accused individuals, while employed by **Al Dahra in Doha**, were allegedly accused of breaching sensitive secrets at the time of their arrest in 2022 in **Qatar**.
- Dahra Global Technologies and Consultant Services, the company they worked for, was also linked to the production of **advanced Italian-origin submarines known for their stealth capabilities**.
- However the specific charges against the eight Indian nationals have not been made public by **Qatari authorities**.

- **Previous Trials:**

- The case has seen two trials in March and June of 2023. While the detainees were granted consular access on multiple occasions, both Indian and Qatari authorities **have maintained a veil of secrecy around the case**, citing its sensitivity.

- **India's Reaction:**

- India has expressed deep shock and concern over the death sentences imposed on its citizens and is exploring all possible legal options to secure their release.
- The **Ministry of External Affairs (MEA)** has conveyed the high importance attached to this case and **reiterated its commitment to providing consular and legal assistance** to the detained individuals.

What are the Diplomatic Implications of this Case?

- The verdict could potentially strain relations between India and Qatar, where a significant number of **Indian migrants contribute to fostering economic and diplomatic ties**.

- With over seven lakh Indians in Qatar, the Indian government is under pressure to act at the **highest level to save the lives of the detainees.**
 - They are making their contribution in different sectors. Indians are highly respected in Qatar for their sincerity, hard work, technical expertise and law-abiding nature.
 - The remittances which the Indian expatriate community in Qatar send to India are estimated to be around 750 million dollar per annum.
- This case represents the **first major crisis in the India-Qatar relationship**, which has generally been stable.
 - The two nations have engaged in high-level meetings, with the Prime Minister of India visiting Doha in 2016, followed by **meetings with the Emir of Qatar.**
- Qatar is a significant supplier of liquefied natural gas (LNG) to India, **accounting for a substantial portion of India's LNG imports.**

What are the Options India has to Prevent these Navy Personnels?

- **Diplomatic Options:**
 - India can engage in direct diplomatic negotiations with the Qatari government to seek a resolution to the case. Given the strategic and economic importance of the relationship between the two countries, **diplomatic leverage can play a significant role.**
 - The government can also use diplomatic pressure to prevent meting out the death penalty.
 - Among the possibilities being looked at is filing an appeal against the verdict or using an **agreement signed by India and Qatar in 2015 for the transfer of convicted prisoners** so that they can **complete their sentence in their home country.**

- **Legal Options:**

- The first step is to **appeal within the judicial system in Qatar**. The individuals sentenced to death can file appeals within the Qatari legal system.
 - India can provide **legal representation to the detainees and ensure that their right to appeal** is pursued vigorously.
- If due procedures are not followed or an appeal process is missing, then India can **invoke International Court of Justice (ICJ) jurisdiction**.
 - - ICJ acts as a world court **with two fold jurisdiction i.e.** legal disputes between States submitted to it by them (contentious cases) and requests for advisory opinions on legal questions referred to it by United Nations organs and specialized agencies (advisory proceedings).

In What Cases was India Involved with the ICJ?

- ☐ Kulbhushan Jadhav Case (India Vs Pakistan)
- ☐ Right of Passage over Indian Territory (Portugal v. India, culminated 1960).

Appeal Relating to the Jurisdiction of the ICAO Council (India v. Pakistan, culminated 1972).

Trial of Pakistani Prisoners of War (Pakistan v. India, culminated 1973).

Aerial Incident of 10 August 1999 (Pakistan v. India, culminated 2000).

Obligations concerning Negotiations relating to Cessation of the Nuclear Arms Race and to Nuclear Disarmament (Marshall Islands v. India, culminated 2016).

Way Forward

The way forward is likely to be challenging and may require time and persistence. It's essential for India to remain committed to the well-being and legal rights of its citizens while navigating the complexities of international diplomacy and the legal process in Qatar.

□ **Successful resolution may require a combination of diplomatic efforts, legal actions, and international cooperation.**

Science & Technology

Cloud Seeding

Tags:

- **GS Paper - 3**
- **E-Technology in the Aid of Farmers**
- **Environmental Pollution & Degradation**
- **Achievements of Indians in Science & Technology**

For Prelims: Cloud Seeding and Types, Artificial Rain, Convective Clouds

For Mains: Application of Cloud Seeding and Concerns, Atmospheric Circulation, Water Resources.

Why in News?

Cloud seeding, a groundbreaking technique to enhance rainfall, has taken centre stage in a recent study published in the *journal Bulletin of the American Meteorological Society*, conducted by the Indian Institute of Tropical Meteorology, Pune.

- The study unveils the potential of cloud seeding to boost precipitation in water-scarce regions, offering hope for tackling drought **conditions**.

Cloud seeding works if done correctly

Cloud seeding experiments were carried out in Solapur city, which gets less rainfall, from June to September in 2018 and 2019

- There was 18% increase in rainfall over a 100 sq.km area in Solapur city due to cloud seeding
- Approximate cost of producing water through cloud seeding was 18 paise per litre. The cost can drop by over 50% if indigenous seeding aircraft are used
- 20-25% of cumulus clouds produce rainfall if cloud seeding is done correctly
- Cloud seeding alone cannot mitigate droughts but can help produce additional rainfall that can partially address water requirements
- Calcium chloride flare was used for seeding the clouds. The seeding was done at the base of the warm convective clouds and at a time when the clouds were growing
- The study was carried out for two years to understand the microphysics and characteristics of convective clouds that can be targeted to enhance rainfall
- The work provides elaborate protocols and technical guidance to plan and conduct cloud seeding in India

Not all:
As microphysics of clouds vary widely, not all clouds produce rainfall through cloud seeding

What are the Key Highlights of the Study?

- **CAIPEEX Phase-4 Investigation:**
 - The Cloud Aerosol Interaction and Precipitation Enhancement Experiment (CAIPEEX phase-4) was a two-year study in Solapur (Maharashtra), conducted during the 2018 and 2019 summer monsoons.
 - Its primary objective was to assess the **effectiveness of hygroscopic seeding in deep convective clouds** and develop a cloud seeding protocol.

- Researchers used calcium chloride flares for cloud seeding.
 - A cloud seeding flare releases these particles when triggered. The seeding was done at the base of the warm convective clouds and at a time when the clouds were in their growing stage so that the seed particles could enter the clouds with minimum dispersion.
- The experiment employed **two aircraft for cloud parameter study and cloud seeding.**
- **Cloud Seeding's Effectiveness:**
 - Cloud seeding is proven effective for **enhancing rainfall under suitable conditions.**
 - A random seeding experiment selected 276 convective clouds, with 150 clouds subjected to seeding and 122 unseeded.
 - Specific cloud characteristics, including liquid **water content and vertical motion**, were used to identify clouds with potential for rainfall.
 - Targeted convective clouds were typically over one kilometer deep and likely to evolve into deep cumulus clouds.
- **Benefits:**
 - **Cost-Benefit Ratio:**
 - The approximate **cost of producing water through cloud seeding was 18 paisa per liter** during the research experiment.
 - Using indigenous seeding aircraft could reduce costs by more than 50%.
 - **Managing Drought Conditions:**

- Cloud seeding alone cannot fully mitigate droughts but can contribute to an **18% increase in rainfall, partially addressing water requirements.**
- Undertaking cloud seeding as part of catchment-scale projects could help in drought management.
- **Practical Applications:**
 - Cloud seeding can significantly benefit regions like Solapur which falls on the **leeward side of the Western Ghats and hence gets low rainfall.**
 - Additional water through cloud seeding has the potential to alleviate water scarcity issues in such areas.
- **Microphysics and Cloud Characteristics:**
 - The two-year study aimed to understand the **microphysics and characteristics of convective clouds** suitable for enhancing rainfall.
 - It provides comprehensive protocols and technical guidance for planning and conducting cloud seeding in India.
- **Cloud Variability:**
 - Not all cumulus clouds respond to cloud seeding; **approximately 20-25% can produce rainfall** if seeding is executed correctly.
 - Cloud microphysics varies widely, leading to varied results with cloud seeding.

What is Cloud Seeding?

- **About:**
 - It is the process of **artificially generating rain** by implanting clouds with particles such as silver iodide crystals.

- Cloud seeding uses planes to spray clouds with chemicals to condense smaller particles into larger rain droplets.

- **Cloud Seeding Methods:**

- **Static Cloud Seeding:**

- This method involves **introducing ice nuclei, such as silver iodide or dry ice, into cold clouds** that have supercooled liquid water droplets.
 - The ice nuclei can trigger the formation of ice crystals or snowflakes, which can grow at the expense of the liquid droplets and fall as precipitation.

- **Dynamic Cloud Seeding:**

- Dynamic cloud seeding is a method of inducing rain by **boosting vertical air currents**.
 - The process is considered more complex than static cloud seeding because it depends on a sequence of events working properly.

- **Hygroscopic Cloud Seeding:**

- This method involves spraying fine particles of hygroscopic materials, such as **salts through flares** or explosives into the base of warm clouds.
 - The particles can act as cloud condensation nuclei and increase the number and size of the cloud droplets, which can enhance the reflectivity and stability of the clouds.

- **Applications:**

- Cloud seeding is done to enhance **winter snowfall and increase mountain snowpack**, which can supplement the natural water supply for communities in the surrounding area.
- Cloud seeding can also be done to prevent hailstorms, dissipate fog, induce rainfall in drought-prone regions, or reduce air pollution.
- **Challenges:**
 - Cloud seeding requires the presence of **moisture-filled clouds**, which are not always available or predictable.
 - Cloud seeding does not occur during times when **additional precipitation would be problematic**, such as times of high flood risk or busy holiday travel periods.
 - Cloud seeding may have negative effects on the environment and health, such as altering the natural water cycle, contaminating the soil and water with chemicals, or affecting the local climate.

Biodiversity & Environment

Ammonia as a Automotive Fuel

Tags:

- GS Paper - 3
- GS Paper - 2
- Mobilization of Resources
- Scientific Innovations & Discoveries
- Conservation

- **Government Policies & Interventions**

For Prelims: Ammonia, Battery Electric Vehicles, Energy Density of Ammonia, Haber-Bosch process, Green Hydrogen/ Green Ammonia Policy.

For Mains: Advantages and Challenges Related to Ammonia as a Fuel, Scientific Innovations & Discoveries, Conservation

Recently, an **internal combustion engine** powered by ammonia is gaining traction in the automotive industry. This unique approach is sparking interest as it **explores alternative propulsion technologies** while not completely departing from **traditional Internal Combustion Engine (ICE) systems** or transitioning to **Battery Electric Vehicles (EVs)**.

What are ICE Systems and BEV Systems?

- **Internal Combustion Engine (ICE) Systems:**

- ICE vehicles use traditional engines that burn fossil fuels (e.g., petrol or diesel) to generate power.
- **Fuel is mixed with air, ignited, and the resulting explosion drives the vehicle's wheels.**
- They are commonly found in cars, trucks, and motorcycles.
- They emit exhaust gases and contribute to air pollution and greenhouse gas emissions.

- **Battery Electric Vehicles (BEVs):**

- **BEVs** are electric vehicles that rely **solely on rechargeable batteries to power an electric motor.**
- They must be charged using electricity from the grid, which can be generated from various sources, including renewable energy.
- They produce **zero tailpipe emissions** and are considered environmentally friendly.

What are the Current Major Applications of Ammonia?

- **About:**

- **Ammonia** is a chemical compound with the formula NH_3 . It is a colorless gas with a pungent odor and is widely used in various **industrial, agricultural, and household applications**.

- **Major Application:**

- **Agriculture:** Key component in the **production of ammonia-based fertilizers**, such as ammonium nitrate and urea, which are essential for crop growth.
- **Chemical Industry:** Fundamental ingredient in the production of substances like **nitric acid, ammonium sulfate, and various nitrogen-based compounds**.
 - It plays a crucial role in the manufacturing of synthetic fibers as well, like nylon
- **Manufacturing:** As a **refrigerant in industrial refrigeration systems** and air conditioning.
 - Also, ammonia is used in the manufacture of dyes and as a **pH regulator in dyeing processes**.
- **Household:** An ingredient **in household cleaning products**, including glass and surface cleaners.

What are the Advantages of Using Ammonia as a Fuel?

- **High Energy Density:** Ammonia has a **high energy density, which means it can store and release a significant amount of energy**, making it suitable for long term applications.
 - Ammonia has **9 times the energy density of lithium-ion batteries** and 3 times that of compressed hydrogen.
- **Low Carbon Emissions:** Ammonia has the potential to **produce near-zero carbon dioxide (CO₂) emissions**

during combustion, making it an environmentally friendly choice, especially when compared to fossil fuels.

- **Bridge Fuel:** Ammonia can serve as a bridge fuel, helping reduce dependence on traditional fossil fuels and offering a **transitional buffer toward cleaner energy sources**.
 - Also, using ammonia can enhance a **nation's energy security by diversifying the energy mix** and reducing reliance on a single energy source.

What are the Major Challenges Associated with Using Ammonia as a Fuel?

- **Environmental Impact:** Ammonia as a fuel holds the promise of near-zero CO₂ emissions during combustion.
 - But current ammonia engines still emit exhaust gases, including unburned **ammonia and Nitrogen oxides (NO_x)** that pose risks to **environment and health**.
 - Nitrogen in the atmosphere usually results in **more tropospheric ozone, respiratory illnesses, and acid rain**.
- **Production Challenges:** The production of ammonia typically relies on the Haber-Bosch process, which consumes a significant amount of energy and relies on fossil fuels.
 - **Green ammonia production**, which involves using renewable energy and sustainable sources of hydrogen, is still in the early stages of development and **faces cost and scalability challenges**.
- **Toxicity:** Ammonia is highly toxic, posing health risks to humans and the environment if not managed properly.
 - Also, due to its **toxicity and corrosiveness**, accidents or mishandling could have severe consequences.
- **Fuel Quality Standards:** Developing and implementing **consistent quality standards for ammonia**

as a fuel can be complex, especially when ammonia is produced from various sources or with varying levels of impurities.

Note

The **Ministry of Power, Government of India** has notified the Green Hydrogen/ Green Ammonia Policy in February 2022, which provides various incentives and support measures for the manufacturers of green hydrogen and **green ammonia using renewable power**.

Way Forward

- **Improved Engine Technology:** There is a need to invest in **research and development to create more efficient and cleaner ammonia engines**.
 - This includes optimizing combustion processes and designing engines that can handle ammonia fuel with minimal (NO_x) emissions.
 - **Practical advancements** in engine design can **make ammonia a more viable option**.
- **Safety Training:** Implementing comprehensive training programs for workers involved in the ammonia industry. **Proper handling, safety protocols, and emergency response training** can reduce the risks associated with ammonia's toxicity.
- **Market Incentives:** Creating market incentives, such as tax credits or subsidies, to encourage the adoption of ammonia as a fuel, particularly in sectors where its use can have a significant positive impact, **like maritime transport**.
- **Ammonia Hybrids:** Developing hybrid systems that **combine ammonia with other renewable energy sources**, such as solar and wind power.
 - Ammonia can then be used as a fuel during **periods of low renewable energy generation**.

UPSC Civil Services Examination, Previous Year Question

Q1. Consider the following statements: (2019)

1. Agricultural soils release nitrogen oxides into the environment.
2. Cattle release ammonia into the environment.
3. Poultry industry releases reactive nitrogen compounds into the environment.

Which of the statements given above is/are correct?

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

Ans: (d)

Q.2 With reference to chemical fertilizers in India, consider the following statements: (2020)

1. At present, the retail price of chemical fertilizers is market-driven and not administered by the Government.
2. Ammonia, which is an input of urea, is produced from natural gas.
3. Sulphur, which is a raw material for phosphoric acid fertilizer, is a by-product of oil refineries.

Which of the statements given above is/are correct?

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

Ans: (b)

