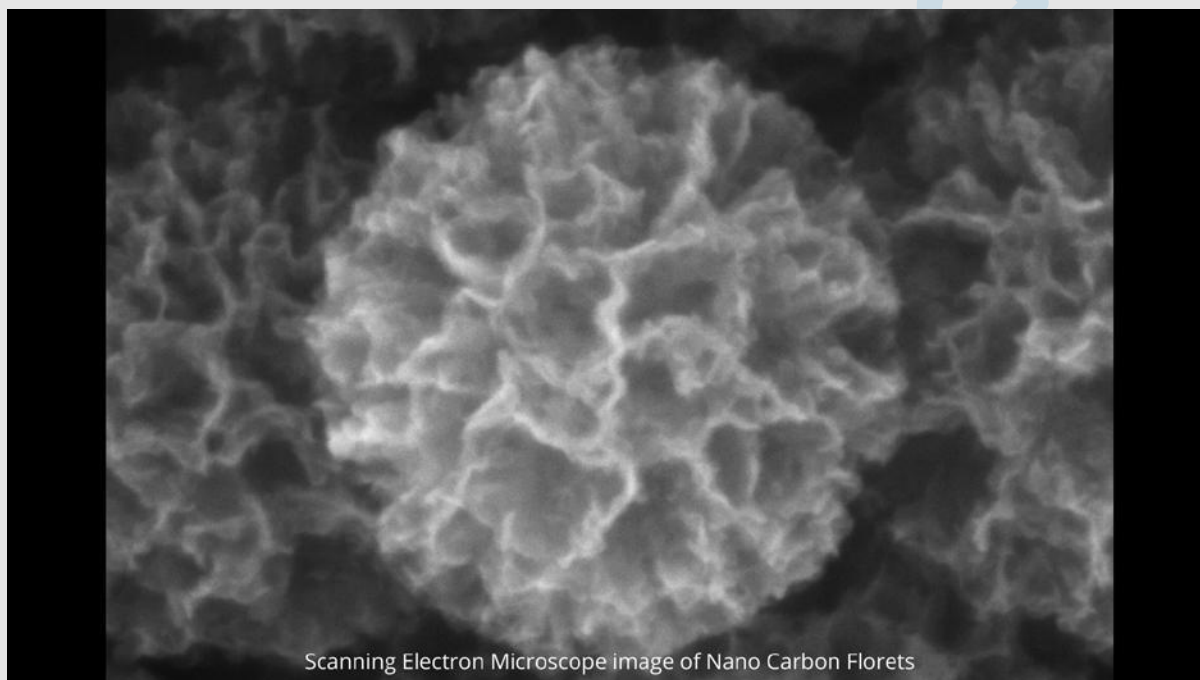


1. IIT Team Develops Efficient Carbon Nanoflorets for Solar-thermal Conversion

Researchers at IIT Bombay have developed carbon nanoflorets, a novel material capable of efficiently converting sunlight into heat. These nanoflorets have unique properties that make them ideal for a variety of applications, including heating homes and sterilizing surfaces in hospitals. The researchers have applied for a patent to commercialize this innovative technology.



Scanning Electron Microscope image of Nano Carbon Florets

Creating 'Blacker Than Black' Carbon Nanoflorets

The journey to create these carbon nanoflorets began with a material that was initially white. Researchers at IIT Bombay heated a special form of silicon dust called DFNS (dendritic fibrous nanosilica) in a furnace. By introducing acetylene gas into the chamber, they transformed the white powder into a black material, signifying the deposition of carbon on the DFNS. They then dissolved the DFNS away, leaving behind carbon particles arranged as spherical nanostructures with cone-shaped pits, resembling tiny marigold flowers.

Unprecedented Efficiency in Solar-thermal Conversion

These carbon nanoflorets can efficiently absorb multiple frequencies of sunlight, converting it into heat with an impressive 87% efficiency. This efficiency is among the highest reported for such materials, making it a promising option for solar-thermal conversion applications.

Unique Properties of Carbon Nanoflorets

The high efficiency of carbon nanoflorets can be attributed to several factors:

Broad Spectrum Absorption: Carbon nanoflorets can absorb infrared, visible light, and ultraviolet frequencies, allowing them to harness a larger portion of the solar energy spectrum compared to traditional photovoltaic materials.

Internal Light Reflection: The unique shape of the nanoflorets, with carbon cones, minimizes light reflection and maximizes internal light absorption, enhancing the conversion process.

Low Heat Dissipation: Due to long-range disorder in the material's structure, heat waves are not carried over long distances, reducing heat dissipation into the environment.

Commercial Potential and Sustainability

The researchers found that a 1 square meter coating of carbon nanoflorets could vaporize 5 liters of water in an hour, surpassing the efficiency by at least 5 times of commercial solar cells. The team has applied for a patent and is enthusiastic about commercializing this technology, considering it ideal for regions with abundant sunlight and low temperatures.

The versatility of these nanoflorets allows them to be coated on various surfaces, including paper, metal, and terracotta clay. Importantly, the coating is stable, with a minimum lifetime of 8 years. Researchers believe that the carbon nanoflorets may have a wide range of unexplored applications, thanks to their unique structural and morphological properties.

Relevance: GS Prelims; Science & Technology

Source: The Hindu

2. Kerala Blast Incident: Blast at Jehovah's Witnesses Convention

Introduction

Two people died and many were injured in a series of blasts during a Sunday prayer convention of Jehovah's Witnesses near Kochi at the Zamra International Convention and Exhibition Centre.

Perpetrator and Motivation

An estranged member of Jehovah's Witnesses claimed responsibility for the attack, citing ideological disagreements with the sect.

Jehovah's Witnesses

Jehovah's Witnesses are a Christian sect that rejects the Holy Trinity (the doctrine that God exists in three equal persons of the Father, the Son (Jesus Christ) and the Holy Spirit) and instead worships Jehovah as the one true God. They base their beliefs solely on the words of Bible, which they see as the word of God. They don't celebrate Christmas or Easter, because these festivals are not mentioned in Bible.

Origin and Leadership

Founded by Charles Taze Russell in the 1870s, the sect is currently governed by the Governing Body of Jehovah's Witnesses in Warwick, New York.

Neutrality

Jehovah's Witnesses maintain political neutrality and avoid affiliations with other religions.

Jehovah's Witnesses in India

Jehovah's Witnesses have been in India since 1905, established an office in 1926, and obtained legal registration in 1978. They enjoy constitutional protection for practicing their faith.

Landmark Supreme Court Case

In the Bijoe Emmanuel case (1986), the Supreme Court granted protection to Jehovah's Witness children who refused to sing the National Anthem at their school, citing religious beliefs.

The Supreme Court acknowledged the sincerity of Jehovah's Witnesses' beliefs and emphasized the importance of protecting the constitutional right to religious freedom.

Bloodless Liver Transplant: In 2020, a private hospital in Bengaluru successfully performed a bloodless liver transplant on a Jehovah's Witness patient to respect their religious beliefs.

In summary, the tragic incident at the Jehovah's Witnesses convention near Kochi sheds light on the sect's unique beliefs, practices, and the legal protection of their religious freedom, as demonstrated in the Bijoe Emmanuel case.

Relevance: GS Prelims & Mains Paper I; Indian Society

Source: The Indian Express

3. China's Belt and Road Initiative: A Decade of Progress and Challenges

Ten Years of BRI

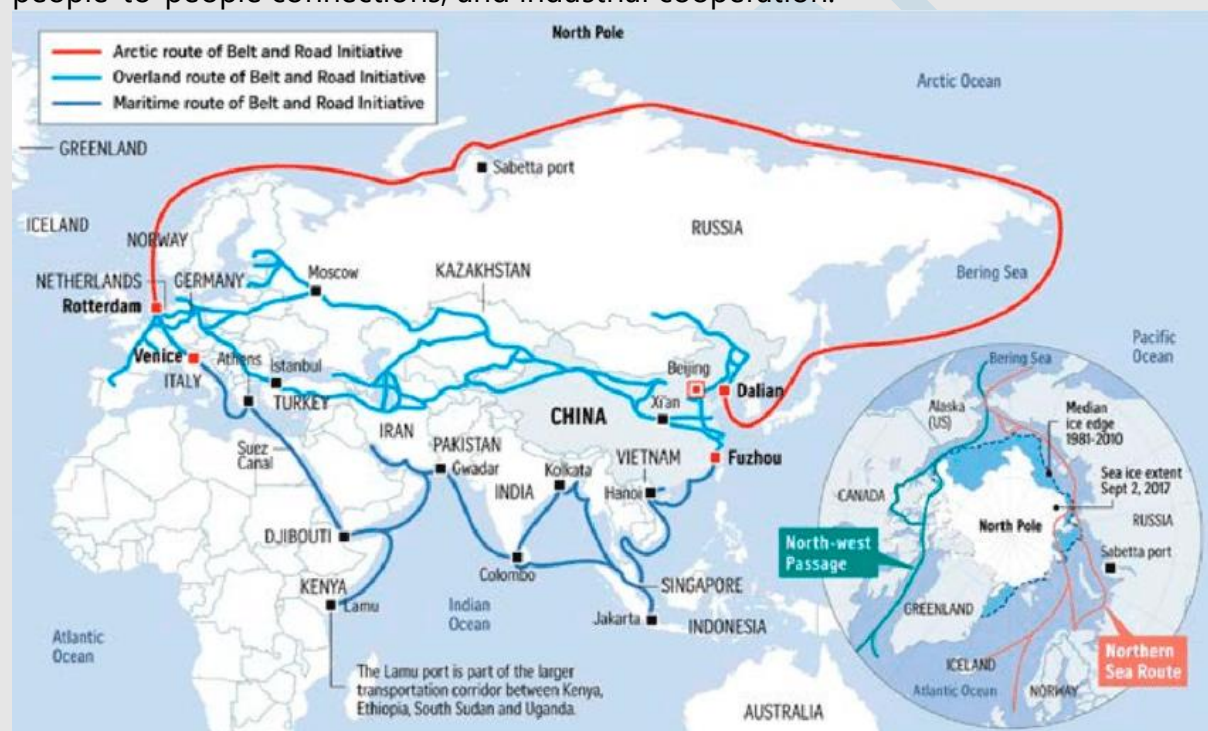
The Belt and Road Initiative (BRI) marks a decade since its inception, spanning continents with significant investments and facing scrutiny over its sustainability.

Evolution of BRI

Initial Vision: President Xi Jinping introduced the Silk Road Economic 'Belt' in 2013, aiming to enhance trade and infrastructure routes between Asia and Europe, emphasizing connectivity through Central Asia.

Maritime 'Road' Added: Subsequently, the maritime 'Road' component was introduced, focusing on connecting China with Southeast Asia, Europe, and Africa through port, bridge, and industry corridor development.

Principles: The BRI was initially based on five principles, later expanded to six, including policy coordination, infrastructure connectivity, trade, financial integration, people-to-people connections, and industrial cooperation.



BRI's Global Impact

Global Reach: The BRI has garnered support from over 150 countries and 30 international organizations, with 3,000 projects worth \$1 trillion currently underway worldwide.

International Economic Corridors: Initially, six international economic corridors were proposed, but a list of 35 major corridors/projects has since been introduced, impacting major economies globally.

Challenges and Criticisms

Debt Concerns: Some nations have accused China of 'debt trap diplomacy,' aiming to acquire assets if countries cannot repay loans.

Sustainability and Transparency: Questions about the sustainability and transparency of BRI projects have been raised, particularly by India, the United States, and the EU.

Current Status and Perceptions

Cooling Enthusiasm: Geopolitical tensions and concerns have led to a reduced number of heads of state attending recent BRI forums, signaling a cooling off in initial enthusiasm.

EU's Changing View: The EU, initially positive about the BRI, now expresses growing scepticism about Beijing's intentions and project implementation.

Italy's Symbolic Departure: Italy's potential departure from the BRI signifies a setback, as it was the only G7 country to formally join the initiative.

China-Pakistan Economic Corridor (CPEC)

China–Pakistan Economic Corridor (CPEC) is a 3000 km Chinese infrastructure network project undertaken in Pakistan. This sea-and-land-based corridor is aimed to secure and reduce the passage for China's energy imports from the Middle East by avoiding the existing route from the Straits of Malacca between Malaysia and Indonesia, which in case of war could be blocked and thus hampering the Chinese energy dependent economic avenues.



Developing a deep water port at Gwadar in the Arabian Sea and a well built road and rail line from this port to Xinjiang Province in western China would be a shortcut for boosting the trade between Europe and China.[1][9] In Pakistan, it aims to overcome an electricity shortfall, infrastructural development and modernize transportation

networks. Along with shifting it from an agricultural based economic structure to industrial based.

India's Perspective

India's Concerns: India's reservations about the BRI include projects in the Indian Ocean. India is also opposed to CPEC because it passes through Pakistan Occupied Kashmir, which is Indian territory.

AIIB Participation: While India refrains from endorsing the BRI, it actively participates in the China-headquartered Asian Infrastructure Investment Bank (AIIB).

Xi Jinping's Ambitious Endeavor

BRI as Xi's Legacy: The BRI represents President Xi's most ambitious foreign policy initiative, aimed at creating a China-dominated world and cultivating diplomatic leverage.

Adjusting Ambitions: In response to challenges, China is reorienting BRI projects toward green and smaller-scale development initiatives, while maintaining its dominance in global diplomacy and economics.

In summary, the Belt and Road Initiative, after a decade, faces both challenges and opportunities, with a changing global landscape and evolving perceptions, including concerns about sustainability and transparency, prompting China to adjust its ambitions and strategic direction.

Relevance: GS Prelims & Mains Paper II; International Relations

Source: The Indian Express