Geography Optional - 2025

ENERGY CRISIS

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ENERGY CRISIS: INDIAN PERSPECTIVE

An energy crisis typically refers to a situation where the supply of energy resources, such as electricity, oil, gas, or other forms of energy, becomes inadequate to meet the demand within a specific region or globally. This can result in various issues:

- **Shortages:** Insufficient supply of energy to meet the needs of industries, businesses, and households.
- **Price Increases:** As demand outstrips supply, prices of energy resources can rise sharply, affecting consumers and businesses.
- **Blackouts or Brownouts:** These are controlled or uncontrolled reductions in electricity supply to prevent a total collapse of the energy grid.
- **Economic Impact:** Energy shortages can hamper economic growth, disrupt production processes, and lead to job losses.
- **Environmental Concerns:** In some cases, increased use of certain energy sources during a crisis can lead to higher emissions and environmental degradation.

Energy crises can have various causes, such as geopolitical tensions affecting oil supply, natural disasters disrupting energy infrastructure, inadequate investment in new energy sources, or unforeseen spikes in energy demand. Governments, businesses, and individuals often respond by implementing energy conservation measures, investing in alternative energy sources, and sometimes enacting policies to stabilize energy markets and ensure long-term energy security.

INDIAN ENERGY CRISIS

The energy crisis in India has several underlying causes that contribute to its complexity and impact. The key factors contributing to the energy crisis in India:

- **Supply-Demand Gap:** There is often a significant gap between the demand for energy and the available supply. Rapid industrialization, urbanization, and a growing population have increased energy demand substantially, outpacing the development of new energy infrastructure.

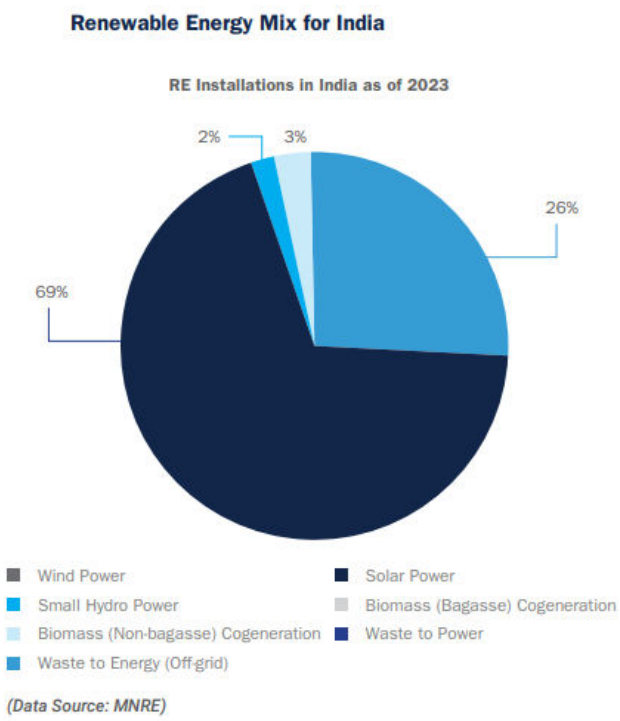
- **Dependency on Fossil Fuels:** India heavily relies on fossil fuels like coal, oil, and natural gas for its energy needs. This dependency makes the country vulnerable to fluctuations in global fuel prices and supply disruptions.
- **Inadequate Infrastructure:** The energy infrastructure in India faces challenges such as transmission and distribution losses, outdated power plants, and insufficient capacity to meet peak demand. This leads to frequent power outages and grid failures.
- **Policy and Regulatory Issues:** Inconsistent energy policies, regulatory delays, bureaucratic inefficiencies, and political factors can hinder investment in the energy sector. This affects the development of new power projects and renewable energy sources.
- **Water Scarcity and Hydropower:** Many of India's hydropower projects are affected by water scarcity due to irregular rainfall patterns and competing water uses. This impacts the generation of hydroelectric power, which is an important renewable energy source.
- **Environmental Concerns:** The reliance on coal for power generation contributes significantly to air pollution and greenhouse gas emissions, leading to environmental and health impacts. Balancing energy security with environmental sustainability is a critical challenge.
- **Financial Challenges:** Financial constraints, including high levels of debt among power distribution companies (DISCOMs), limit investments in upgrading infrastructure and adopting newer technologies.
- **Geopolitical Factors**: India's energy security is influenced by geopolitical factors, including international relations with energy-producing countries, regional conflicts, and global energy market dynamics.

Addressing these challenges requires a multi-faceted approach involving policy reforms, investment in renewable energy sources like solar and wind, improving energy efficiency, modernizing infrastructure, enhancing grid reliability, and promoting sustainable energy practices. The Indian government has been taking steps to diversify its energy mix, promote renewable energy, and enhance energy security through initiatives like the National Solar Mission and the Ujwalla, DISCOM Assurance Yojana (UDAY). However, sustained efforts and investments are needed to achieve long-term energy sustainability and resilience in India.

ENERGY MIX APPROACH IN INDIA

The energy mix approach in India refers to the strategy and composition of different energy sources used to meet the country's energy demands. India, like many countries, aims to balance several factors in its energy mix to achieve energy security, economic growth, environmental sustainability, and affordability.

- **Coal:** Historically, coal has been the dominant energy source in India, accounting for a significant portion of electricity generation. Despite its environmental impacts, coal remains important due to its affordability and availability within India.
- **Renewable Energy:** India has been actively promoting renewable energy sources to diversify its energy mix and reduce dependence on fossil fuels. Key renewable energy sources include:
- **Solar Energy:** India has abundant solar resources, making it a focus area for development. The National Solar Mission aims to increase solar capacity significantly.

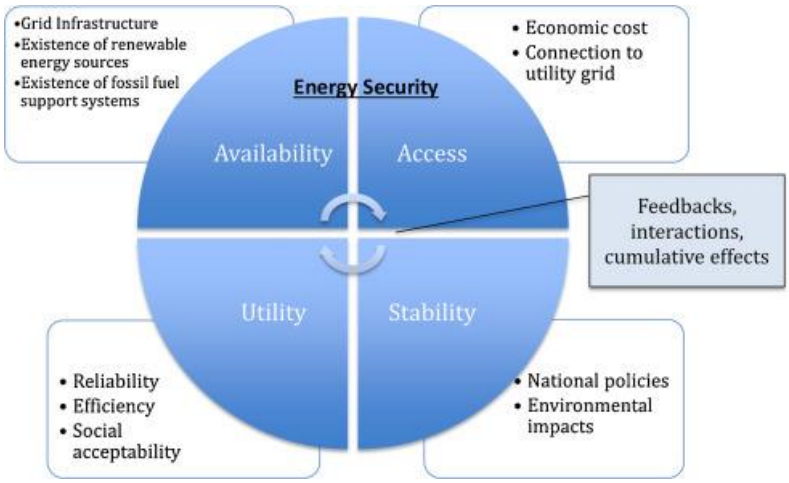


- **Wind Energy:** Wind power is another major renewable energy source in India, with significant potential in coastal and windy regions.
- **Hydropower:** Although affected by water scarcity issues, hydropower remains a crucial renewable energy source in India.
- **Natural Gas:** Natural gas is considered a cleaner alternative to coal and plays a role in balancing the energy mix. It is used for electricity generation, industry, and as a feedstock for fertilizer production.
- **Nuclear Energy:** India has a nuclear power program aimed at increasing the share of nuclear energy in the energy mix. Nuclear power provides a stable and low-carbon source of electricity.
- **Energy Efficiency:** Improving energy efficiency across sectors is a critical part of India's energy mix strategy. This includes initiatives to reduce energy consumption per unit of GDP, promote energy-efficient technologies, and enhance industrial energy efficiency.
- **Energy Access:** Ensuring access to energy for all sections of society, particularly in rural and remote areas, is a key goal. This involves expanding the reach of electricity and clean cooking solutions through grid extension, off-grid solutions, and renewable energy mini-grids.
- **Environmental Sustainability:** Balancing economic development with environmental considerations is crucial. India aims to reduce carbon intensity and mitigate environmental impacts through policies promoting cleaner technologies and sustainable practices.

India's approach to its energy mix is guided by national policies such as the Integrated Energy Policy, the National Action Plan on Climate Change, and initiatives like the International Solar Alliance. The country continues to evolve its energy mix to achieve a balance between energy security, economic growth, environmental sustainability, and affordability while addressing challenges such as infrastructure development, policy reforms, and technological advancements in energy generation and distribution.

The Clean Energy Growth Story Renewable energy, including solar and wind, continues to drive India's climate action. Globally, India ranks fourth in renewable energy installed capacity (excluding large hydro), fourth in wind power capacity and fifth in solar power capacity.

India's solar growth has been largely led by utility-scale solar—large scale solar projects were 87 percent of installations in 2023, a 33 percent year on year increase.



In addition to large scale renewable energy programs, India has been investing smaller, localized solutions linked to peoples' livelihoods.India released its "framework for promotion of decentralized renewable energy livelihood applications," geared towards developing an ecosystem that will enable widespread distributed renewable energy (DRE) solution adoption. DRE solutions have been gaining traction given their potential to address last-mile connectivity and technology accessibility issues, improve energy access, especially in rural areas, contribute to meeting India's climate commitments and become the fulcrum of economic development across India.

In January 2023, India officially launched the National Green Hydrogen Mission, which aims to make India a leading supplier of green hydrogen (defined as hydrogen produced from renewable energy sources). In August 2023, the Ministry of New and Renewable Energy notified the official Green Hydrogen Mission standards, or the emissions thresholds that must be met to for hydrogen to be considered 'green'.

The "Five Nectars" or principles for climate action in India are outlined in various national and international contexts, emphasizing the country's commitments and strategies to address climate change. These principles include:

Equity: India emphasizes equity in global climate action, highlighting the principle of "common but differentiated responsibilities" (CBDR). This principle acknowledges historical emissions by developed countries and advocates for fair and just international climate agreements that consider the varying capacities and development stages of nations.

Sustainable Lifestyles: Promoting sustainable consumption and production patterns is crucial for India's climate strategy. This involves encouraging practices that reduce environmental impact, such as adopting energy-efficient technologies, promoting renewable energy sources, and reducing waste generation.

Climate Justice: Climate justice is central to India's approach, ensuring that actions to address climate change consider the needs and vulnerabilities of marginalized and vulnerable communities, including those most affected by climate impacts such as extreme weather events and sea-level rise.

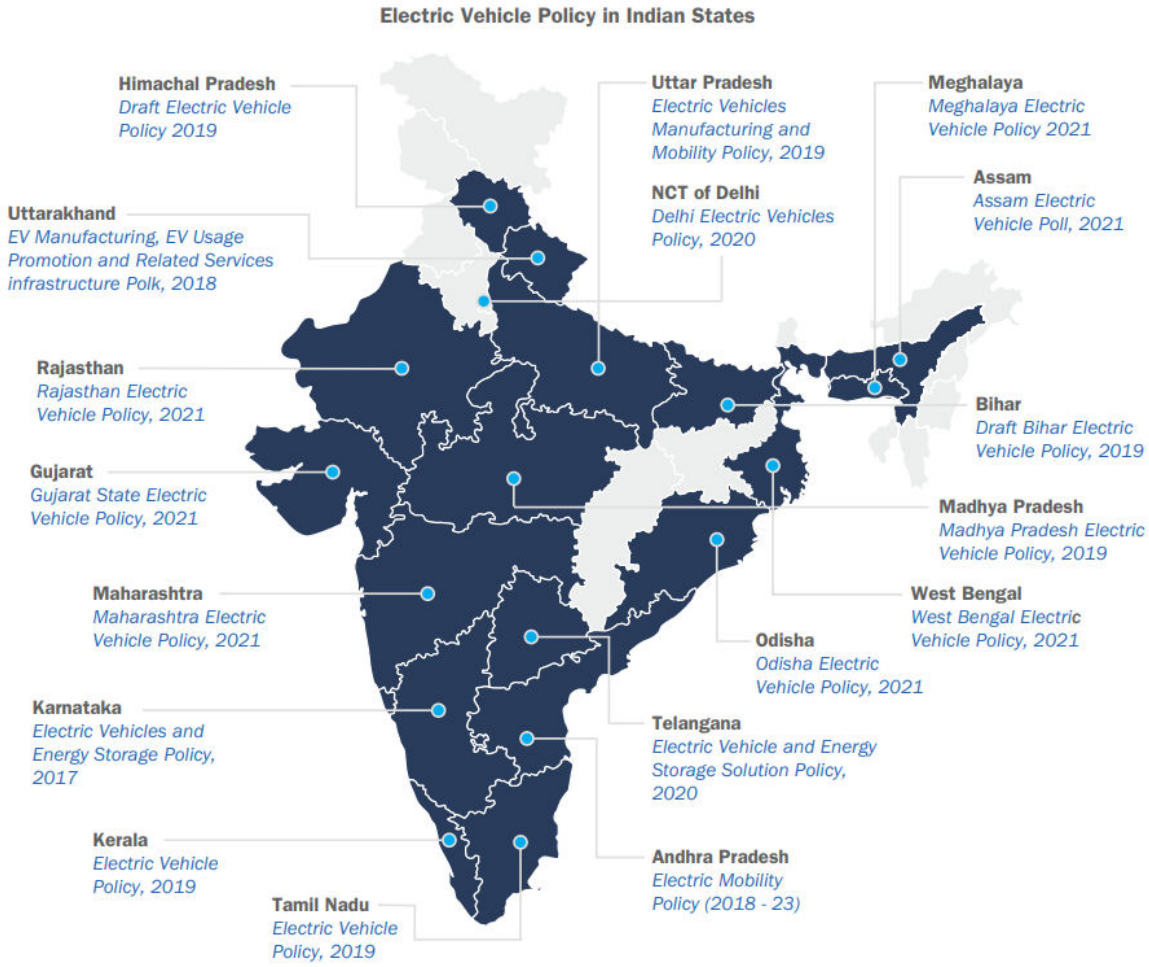
Affordable Access to Clean Energy: India is committed to expanding access to clean and affordable energy, particularly through renewable sources such as solar and wind power. Initiatives like the International Solar Alliance (ISA) aim to promote solar energy deployment globally, contributing to sustainable development and climate mitigation efforts.

Partnerships and Cooperation: India emphasizes the importance of global cooperation and partnerships in addressing climate change. This includes collaborating with other countries, international organizations, civil society, and the private sector to share knowledge, technology, and resources for effective climate action.

These principles reflect India's proactive stance on climate change, aligning with its national priorities for sustainable development, economic growth, and social equity while contributing to global efforts to mitigate greenhouse gas emissions and adapt to climate impacts.

Zero emission vehicles - Electric Vehicles

Over 21.70 lakh electric vehicles have been registered in the country through March 2023.161 Ninety percent of these EVs are two-wheelers (E2W) and three-wheelers (E3W). Electric vehicle sales in India increased by 174 percent year on year from 4,55,773 units in FY 22 to 12,47,120 units in FY 23. E2W held the largest share with 48.76 percent. E3W passenger vehicle was just behind with 43.33 percent. The sales of E3W Cargo and E-Cars were almost the same at 3.65 percent and 3.85 percent, respectively. E-bus accounted for just 0.17 percent and others, 0.24 percent.



India's electric vehicle journey started with the government putting out the National Electric Mobility Mission Plan 2020 and FAME (Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles) India The FAME India schemes supports electrification of public and shared transportation, and aims to provide demand incentive for e-vehicles and support for charging infrastructure.

The Ministry of Heavy Industries has also sanctioned capital subsidy to the three Oil Marketing Companies of the Ministry of Petroleum and Natural Gas for setting up 7,432 electric vehicle public charging stations.

To further boost the adoption of electric vehicles and ease range anxiety (fear of running out of electric charge while in transit) among customers, India is implementing initiatives to make EV charging experience simple and convenient.

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