

## Mains matrix

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### Will China capture the electrolyser market?

#### Key Questions

- Why are green hydrogen technologies rapidly advancing?
- What are the two electrolyzers used in commercial plants?
- How was China able to capture the global solar PV modules market?
- Why will China have a difficult time replicating its success in the solar market when it comes to electrolyzers?

#### The Story So Far

- Green hydrogen has gained spotlight as an alternative to fossil fuels.
- Hydrogen is widely used in oil refining, ammonia, and methanol production.
- Green hydrogen technologies (production, storage, transportation, application) are rapidly advancing.

- Electrolyzers are central to hydrogen production (similar to solar PVs in solar power).
- China's dominance in solar PV supply chain may mirror in electrolyzers.

#### Is China a Dominant Player?

- By 2024, China became the world's leading hydrogen producer:
  - Annual production: **36.5 million tonnes**.
  - Green hydrogen: **1,20,000 tonnes** (half of world's output).
- **Electrolyser Market:**
  - China dominates **85% of global manufacturing capacity of Alkaline (ALK) electrolyzers**.
  - **ALK electrolyzers:** more mature, cheaper, but less efficient for fluctuating loads from renewables.
  - **Proton Exchange Membrane (PEM) electrolyzers:** better for

renewable energy, but higher cost.

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### How Did China Establish Dominance?

- China previously dominated **solar PV modules** due to:
  - Subsidies, integrated supply chain, cheap raw materials, and local demand.
- Similar pattern emerging in electrolyzers:
  - By 2023, China accounted for **60% of large-scale green hydrogen projects globally**.
  - Largest electrolyser installed (200 MW) in Inner Mongolia, 2023.
  - PEM electrolyser production also rising but less than ALK.

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### Competitors Emerging

- Outside China, firms are increasing electrolyser production capacity and expanding facilities.
- Chinese manufacturers: **LONGi, Envision, Guofa Hydrogen** entering green hydrogen space, collaborating globally (e.g., Germany).

- Envision launched world's largest green hydrogen plant for ammonia production.
- However, Chinese dominance faces limits:
  - Hydrogen sector = strategic priority in many countries (national plans).
  - Likely **trade restrictions, security checks**, and need for **system integration** (not just price competitiveness).

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### The Gist (Highlights)

- By 2024, China became world's largest hydrogen producer (**36.5M tonnes**).
- China controls **85% of global ALK electrolyser capacity**.
- Chinese solar & wind equipment giants (LONGi, Envision) entering green hydrogen space.
- Chinese firms expanding overseas, signing deals for hydrogen production facilities.
- Despite aggressive expansion, **China will face difficulties** replicating solar PV success due to:
  - National hydrogen strategies in other countries.
  - Trade/security restrictions.

- Greater importance of **system integration** over price alone.

## HOW TO USE

**Primary Relevance: GS Paper III (Economy, Environment, Security)**

### 1. Indian Economy and issues relating to Planning, Mobilization of Resources, Growth, Development and Employment:

- **How to use:** This is a critical issue of **industrial policy** and **strategic sectors**.
  - **Lesson from Solar PV:** The article explains how China captured the solar market through **subsidies, integrated supply chains, and local demand**. This serves as a cautionary tale for India. It highlights the need for India to develop its own **domestic manufacturing ecosystem** for electrolyzers to avoid future import dependence in a critical energy sector.
  - **National Hydrogen Mission:** This analysis provides the "why" behind India's **National Green Hydrogen Mission**. It underscores the mission's strategic importance not just for the environment,

but for **economic sovereignty** and avoiding a repeat of the solar panel import dependency.

### 2. Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment:

- **How to use:** Green hydrogen is central to **decarbonizing** hard-to-abate sectors like refining, fertilizers (ammonia), and heavy industry.
  - The article establishes green hydrogen as a key **clean energy carrier** for the future. Mastering its production technology is essential for India to meet its **climate commitments** (NDCs under the Paris Agreement) and ensure a just energy transition.

### 3. Challenges to Internal Security:

- **How to use:** This issue has a direct **energy security** dimension.
  - Over-reliance on a single country (China) for a critical energy technology like electrolyzers creates a **strategic vulnerability**. It is akin to depending on a single source for oil and gas. Any geopolitical friction or trade restriction could jeopardize India's green energy plans.

- The article notes that other countries are likely to impose "**trade restrictions and security checks**," indicating that this is already viewed as a strategic, security-sensitive sector.

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### Secondary Relevance: GS Paper II (International Relations)

#### 1. Effect of policies and politics of developed and developing countries on India's interests:

- **How to use:** China's industrial policy and its global expansion in green tech is a key factor shaping India's external environment.
  - Understanding China's playbook helps India formulate its own response, both domestically (through missions and subsidies) and internationally (through partnerships with other countries to diversify supply chains).

### The Crisis of Journalism

#### Context

- Journalism, historically seen as the "fourth estate," is facing a systemic crisis.
- The issues go beyond individual journalists and reflect structural

transformations in media, politics, and society.

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#### 1. The Changing Role of Sources

- **Traditional Role:**
  - Whistleblowers or "sources" challenged official narratives, exposing wrongdoing (e.g., Pentagon Papers in the U.S.).
- **Current Trend:**
  - Platforms now quote **unnamed sources** that amplify **official state narratives** instead of questioning them.
  - Raises doubts about **authenticity and independence** of information.

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#### 2. Systemic Crisis Undermining Journalism

- Journalism weakened not just by internal flaws, but by **executive overreach worldwide** (Israel, U.K., U.S., India).
- **Powerful executives:**
  - Impose high costs on whistleblowers (legal, financial, personal).
  - Intimidate legislatures & judiciary.

- Reduce transparency: official channels often conceal, not reveal, truth.

*Implication:* Journalism loses its watchdog role, becoming a passive relay of state power.

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### 3. Redundancy & New Roles for Media

- **Redundancy of Media:**
  - Social media enables governments/leaders to communicate **directly** with citizens.
  - Direct communication perceived as more “authentic,” bypassing traditional journalism.
- **New Journalist Pathways:**
  - **Joining the Mob:** Aligning with populist nationalism → guaranteed revenue & social legitimacy.
  - **Counter-Propaganda:** Creating alternate narratives to challenge dominant discourse.
  - **New Tools:** OSINT (open-source intelligence) + ground reporting → evidence-based journalism (e.g., voter list manipulation in Karnataka).

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### 4. The Critical Funding Problem

- **Challenge:** Quality public-interest journalism demands **skills, infrastructure, capital**.
- **Market Failure:**
  - Profit-seeking capitalism cannot sustain it.
  - Analogy: Like public transport → requires **state support/subsidy**.
- **Paradox:** Wealthy elites rushing to become media owners, raising concerns about independence & conflict of interest.

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### 5. The Crisis of Publicly Funded Media

- **In the West:**
  - Public broadcasters (BBC, NPR) attacked by populists as “biased,” face funding threats.
- **In India:**
  - Prasar Bharati never attained autonomy.
  - Functions largely as a **government mouthpiece** rather than an independent voice.

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### Conclusion

- Journalism’s future is at a crossroads.
- The **central question:** *Who will fund public-interest journalism?*

- Private capital creates bias.
- State support risks propaganda.
- Public-interest models (trusts, subscriptions, philanthropic funding, cooperative models) must be explored.

### HOW TO USE IT

#### Primary Relevance: GS Paper II (Governance)

The topic falls under "Important aspects of governance, transparency and accountability."

#### 1. Role of Civil Services, NGOs, and Media in Democracy:

- **How to use:** The article provides a critical analysis of the media's role as the **Fourth Estate**—a watchdog that holds power accountable.
  - **Crisis of Accountability:** The central argument is that journalism is losing its watchdog function. When media becomes a "passive relay of state power" or aligns with populist mobs, it fails its democratic duty. This directly undermines **transparency and accountability** in governance.

- **Impact on Institutions:** The point about executives intimidating "legislatures & judiciary" shows how a weakened media allows for the concentration of power and the erosion of other democratic institutions.

#### 2. Development Processes and the Development Industry:

- **How to use:** The "Funding Problem" is a key governance challenge.
  - **Market Failure:** The article correctly identifies that quality, public-interest journalism is a **public good** that the profit-driven market often fails to sustain. This is similar to public health or education.
  - **The State Funding Dilemma:** The case of **Prasar Bharati** in India is a classic example of the failure of state-supported media to achieve autonomy, turning it into a "government mouthpiece." This highlights the difficulty of designing institutions that are both publicly funded and independently operated.

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**Strong Relevance: GS Paper IV  
(Ethics, Integrity and Aptitude)**

The entire crisis is riddled with ethical dilemmas.

**1. Ethics in Governance and Public Life:**

- **How to use:** The choices journalists and media owners face are deeply ethical.
  - **Ethical Dilemmas for Journalists:**
    - **"Joining the Mob" vs. Upholding Truth:** The temptation to align with populism for revenue and safety versus the ethical duty to report truthfully, even if it's unpopular.
    - **Use of Unnamed Sources:** The ethical line between protecting a genuine whistleblower and being a conduit for state propaganda.
  - **Probity in Governance:** A government that actively conceals information and intimidates whistleblowers lacks **transparency** and a

**ccountability**, which are fundamental to ethical governance.

**2. Emotional Intelligence:**

- **How to use:** The public's perception of media "bias" and their turn towards "authentic" social media leaders requires media professionals to have high emotional intelligence to rebuild **trust** and **credibility**.

**Value Add:**

- **Case Studies:**
  - Pentagon Papers (US) → traditional whistleblower role.
  - Prasar Bharati → lack of autonomy in India.
  - BBC funding crisis → populist attacks on public media.
- **Thinkers:**
  - Habermas' Public Sphere → media as space for rational discourse.
  - Noam Chomsky's Manufacturing Consent → media often serves elite interests.

**The Ladakh Statehood Debate****1. Background and Context**

- **Trigger for Discussion:** Recent protests in Ladakh, the detention

of activist Sonam Wangchuk under the National Security Act, and ongoing demands for statehood and constitutional safeguards.

- **Political Change:** Ladakh was made a Union Territory (UT) in 2019 after the bifurcation of the former state of Jammu and Kashmir.
- **Key Stakeholders:** The debate is between civil society groups—the Leh Apex Body (LAB) and Kargil Democratic Alliance (KDA)—and the Union Government.

## 2. Arguments in Favour of Statehood for Ladakh (Sajjad Kargili's Perspective)

- **Democratic Deficit:**
  - As part of J&K, Ladakh had legislative representation and a voice in electing a state government.
  - As a UT, power rests with the unelected Lieutenant Governor (LG), leading to policies being imposed without public consent.
- **Loss of Constitutional Safeguards:**
  - Previously had protections under Article 370 and Article 35A.
  - The promise to include Ladakh under the **Sixth**

**Schedule** remains unfulfilled.

- **Economic and Employment Disempowerment:**
  - Claims that not a single person from Ladakh has been recruited for gazetted posts in six years.
  - No Public Service Commission for local recruitment.
- **Security and Patriotism:**
  - Argues that Ladakh's people are patriotic and have safeguarded India's frontiers.
  - Criticizes the government for branding protesters as "anti-national."
- **Precedent:**
  - Points out that Sikkim was granted statehood with a population similar to Ladakh's.

## 3. Arguments for a Gradualist Approach (R. Rengarajan's Perspective)

- **Constitutional Validation:**
  - The Supreme Court has upheld the creation of Ladakh as a UT.
- **Practical Considerations:**
  - Acknowledges public apprehensions but



suggests a staggered approach.

- Given Ladakh's vast area and small, concentrated population, granting **Sixth Schedule status should be the logical first step**. This would provide financial autonomy, democratic representation, and protection for tribal land rights.
- **Security is Not a Barrier:**
  - The security of borders is managed by the armed forces, irrespective of a region's status as a UT or a State.
- **Implementation Over Status:**
  - Notes that neither Sixth Schedule status nor statehood is a panacea; effective implementation is key (citing examples from Northeastern states).

#### 4. The Failure of the Current UT Model

- **Ineffective Autonomous Councils:** The Ladakh Autonomous Hill Development Council (LAHDC) lacks defined powers and is subservient to the LG's administration.
- **Financial Control:** A large portion (nearly 80%) of the central budget for Ladakh is

spent by bureaucrats, with only a small fraction controlled by the elected Hill Councils.

- **Arrests and Intimidation:** The use of stringent laws like the NSA against protesters is seen as an undignified way to handle dialogue.

#### 5. Government's Stance and Counter-Arguments

- **Positive Outcomes Cited:** The government highlights the work of a high-powered committee, pointing to:
  - Increased reservation for Scheduled Tribes.
  - Provision for women's reservation in Hill Councils.
  - Steps to protect local languages and culture.
  - Initiation of recruitment for government posts.
- **The Crucial Difference:** Protesters argue that these are merely executive orders, not **constitutional guarantees**, and can be easily amended or revoked.

#### 6. Conclusion of the Debate

The core demand is for **democratic empowerment and constitutional safeguards**. While one side views full statehood as the only solution to the "disempowerment" felt since 2019, the other suggests a phased approach,

beginning with the Sixth Schedule, to address immediate concerns over land, identity, and financial autonomy. The resolution hinges on whether the government addresses the demand for irreversible constitutional protections versus temporary executive measures.

### HOW TO USE IT

**Primary Relevance: GS Paper II (Governance, Constitution, Polity, Social Justice)**

#### 1. Indian Constitution—Historical Underpinnings, Evolution, Features:

- **How to use:** The debate is a live case study of the **asymmetric federalism** enshrined in the Indian Constitution.
  - **Special Status vs. Union Territory:** The transition of Ladakh from a region with special status (under Article 370) to a Union Territory is a significant constitutional event. You can use the arguments from the debate to discuss the merits and demerits of this change.
  - **Sixth Schedule:** The demand for inclusion under the Sixth Schedule is central. This allows you to discuss the purpose of the Sixth Schedule—to provide **autonomy and protect tribal identity** in certain Northeastern

states—and its potential applicability to Ladakh.

#### 2. Functions and Responsibilities of the Union and the States:

- **How to use:** This is a classic **Centre vs. Region** debate.
  - **Democratic Deficit:** The argument that power rests with an unelected Lieutenant Governor (LG) instead of an elected assembly highlights the challenge of **democratic governance in Union Territories**. This contrasts with the principle of representative democracy.
  - **Financial Autonomy:** The point that 80% of the budget is controlled by bureaucrats illustrates the lack of **fiscal federalism** and local self-governance.

#### 3. Separation of Powers between various organs:

- **How to use:** The use of the **National Security Act (NSA)** against protesters raises questions about the **executive's use of power** and its impact on the fundamental right to protest and dissent (Article 19).

#### 4. Development Processes and the Development Industry:

- **How to use:** The issues of **local employment** (no PSC, few gazetted posts) and control over land and resources are central to the debate. This connects the political demand for statehood to the socio-economic development of the region.
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