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From Energy Access to Energy Resilience: India's Clean-Cooking Governance under Geopolitical and Supply-Chain Shocks

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ABSTRACT

India's clean-cooking transition has been one of the country's most significant social infrastructure transformations. Liquefied petroleum gas (LPG) has become the principal household clean-cooking fuel, supported by the Pradhan Mantri Ujjwala Yojana (PMUY), the public-sector Oil Marketing Companies (OMCs) and an extensive distributor network. The geopolitical and supply-chain disruption of 2026, however, exposed a critical distinction between energy access and energy resilience. A household may possess an LPG connection while remaining vulnerable to disruptions in international supply, shipping routes, domestic production, storage, distribution or affordability. This Article examines the extent to which India's clean-cooking governance architecture demonstrated resilience during the 2026 disruption and identifies the regulatory and institutional reforms required for the transition from LPG access to resilient clean-cooking security. It analyses five interacting governance layers: judicial oversight; Union Government intervention; OMC and distributor implementation; enforcement and digital governance; and consumer response. Particular attention is given to the Essential Commodities Act, 1955 (ECA), the LPG Control Order, emergency prioritisation of domestic LPG, C3-C4 diversion, supply rationalisation, the Delivery Authentication Code (DAC), biometric Aadhaar authentication, accelerated piped natural gas (PNG) expansion and fiscal support for LPG. The Article argues that India's response demonstrated considerable adaptive capacity, but that resilience remains incomplete because the system continues to face concentration, infrastructure and affordability vulnerabilities. It proposes an original Clean Cooking Resilience Framework based on seven dimensions: Access, Affordability, Availability, Adaptability, Accountability, Alternatives and Autonomy. The Article concludes with regulatory and institutional reforms aimed at transforming crisis response into permanent resilience governance.

Keywords: *Clean Cooking, LPG, Energy Resilience, Essential Commodities Act, Public Administration, Energy Justice, PNG, Energy Security*

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I. Introduction

India's clean-cooking transition has moved beyond the question of whether households can obtain a clean-fuel connection. As of September 1, 2026, India had approximately 327.75 million active domestic liquefied petroleum gas (LPG) connections, including approximately 105.72 million Pradhan Mantri Ujjwala Yojana (PMUY) connections, and LPG consumption had risen substantially over the preceding decade.[1] The scale of this transformation has converted LPG from a household commodity into critical social infrastructure.

The policy achievement nevertheless creates a resilience paradox: the greater the dependence on LPG, the greater the consequences of any disruption to LPG supply. Research on India's clean-cooking transition has repeatedly demonstrated that owning a connection does not necessarily result in exclusive or sustained LPG use, because affordability, access to refills and household economic circumstances continue to influence fuel choice.[2] The 2026 geopolitical disruption therefore posed a more demanding governance question than access: could the system continue to provide affordable and reliable clean cooking when exposed to an external shock?

The principal research question of this Article is:

> To what extent did India's clean-cooking governance architecture demonstrate resilience during the 2026 geopolitical and supply-chain disruption, and what regulatory and institutional reforms are required to transition from LPG access to resilient clean-cooking security?

The central argument is that India demonstrated substantial adaptive resilience through emergency production prioritisation, demand management, supply allocation, enforcement, digital authentication, fiscal support and infrastructure diversification. Yet these measures largely operated as crisis responses. The next stage of governance must convert them into a permanent resilience architecture.

II. LPG as an Essential Public Utility

The legal character of LPG is central to understanding the State's role. Petroleum and petroleum products are listed in the Schedule to the Essential Commodities Act, 1955 (ECA). Section 3 empowers the Central Government, where it is of opinion that it is necessary or expedient to do

[1] Petroleum Planning & Analysis Cell, Ministry of Petroleum & Natural Gas, Government of India, *PPAC Tracker: Active LPG Domestic Connections and PMUY Connections* (as on Sept. 1, 2026).
[2] Sunil Mani, Abhishek Jain, Saurabh Tripathi & Carlos F. Gould, *The Drivers of Sustained Use of Liquified Petroleum Gas in India*, 5 Nature Energy 450 (2020), https://doi.org/10.1038/s41560-020-0596-7.

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so for maintaining or increasing supplies of an essential commodity or for securing its equitable distribution and availability at fair prices, to provide by order for regulating or prohibiting its production, supply and distribution and trade and commerce in it.[3] The Liquefied Petroleum Gas (Regulation of Supply and Distribution) Order, 2000, made under Section 3, further regulates the possession, supply, distribution and use of LPG.[4]

The Supreme Court's jurisprudence recognises the unusually strong governmental role in domestic LPG. In *Rajasthan Cylinders & Containers Ltd. v. Union of India*, the Court recorded that LPG supplied in 14.2-kg cylinders is an essential commodity, distributed through a government-regulated public distribution system and subject to government control over the consumer price.[5] The Court also accepted that the award of contracts to every participant in the bidding process was "aimed at ensuring a bigger pool of manufacturers so that the supply of this essential product is always maintained for the benefit of the general public."[6]

This legal architecture means that LPG governance cannot be understood merely through ordinary principles of commercial contract. The distributor, the OMC, the regulator and the Government operate within a public-interest framework in which continuity of household supply has regulatory significance.

The constitutional context strengthens this interpretation, without implying that the Constitution creates an independently enforceable fundamental right to LPG. Article 21 protects life and personal liberty, while Articles 47, 48A and 51A(g) reflect constitutional commitments to public health and environmental protection.[7] Judicial environmental jurisprudence has interpreted Article 21 to encompass aspects of environmental quality and human health.[8] Clean cooking consequently occupies an important constitutional-policy space at the intersection of health, dignity, environment and welfare.

III. 2026 AS A RESILIENCE STRESS TEST OF CLEAN-COOKING GOVERNANCE

The 2026 geopolitical disruption exposed the international dimension of India's household energy security. The International Energy Agency (IEA) reported severe disruption to LPG

[3] Essential Commodities Act, No. 10 of 1955, INDIA CODE (1955), § 3(1), sched. item 5, https://dfpd.gov.in/WriteReadData/Other/act5.pdf.
[4] Liquefied Petroleum Gas (Regulation of Supply and Distribution) Order, 2000, G.S.R. 487(E), Gazette of India, Extraordinary, pt. II, sec. 3(i) (Apr. 26, 2000), issued under § 3 of the Essential Commodities Act, 1955, https://food.rajasthan.gov.in/Docs/22.pdf.
[5] *Rajasthan Cylinders & Containers Ltd. v. Union of India*, (2020) 16 SCC 615, ¶ 88(vi) (India) (decided Oct. 1, 2018).
[6] *Id.* ¶ 88(v).
[7] INDIA CONST. arts. 21, 47, 48A, 51A(g).
[8] *Subhash Kumar v. State of Bihar*, (1991) 1 SCC 598, 604 (India).

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supply chains associated with the conflict in West Asia and the interruption of flows through the Strait of Hormuz.[9] India's exposure was particularly significant because a substantial share of its LPG supply chain depends on international maritime movement.

The Government's response was multi-layered. Domestic LPG was prioritised; refinery production was increased; commercial allocation was rationalised; booking intervals were lengthened; smaller 5-kg cylinders were promoted for specific users; States were directed to strengthen monitoring; and the OMCs intensified supply-chain coordination.[10]

The Government also used the ECA framework to require domestic and SEZ refineries and petrochemical complexes to maximise the C3 and C4 streams for LPG production and to make them available to the three public-sector OMCs for domestic LPG. The order prohibited the diversion of those streams to petrochemical or other downstream uses.[11]

The intervention is legally and administratively significant because it shows the State moving from market allocation to emergency social allocation.

The restoration of non-domestic packed LPG supplies to pre-crisis levels in June 2026, together with a reduction in the diversion of C3/C4 streams as indigenous production improved and imported cargoes were expected to become available, demonstrates another important resilience characteristic: exit from emergency controls when the underlying supply position improves.[12]

The response therefore displayed three elements of resilience: absorption, in domestic production and stock management; adaptation, in allocation and demand-management measures; and recovery, in the restoration of commercial supplies and the reduction of extraordinary interventions.

What remains less institutionalised is the fourth element, learning: the conversion of crisis experience into a permanent resilience architecture.

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[9] Laura Cozzi, Marina Petrelli & Arthur Roge, *Energy Crisis Threatens World's Most Vulnerable as Cooking Fuel Shortages Grow*, INT'L ENERGY AGENCY (May 13, 2026), https://www.iea.org/commentaries/energy-crisis-threatens-worlds-most-vulnerable-as-cooking-fuel-shortages-grow.

[10] MINISTRY OF PETROLEUM & NATURAL GAS, GOVERNMENT OF INDIA, *Updates on Key Sectors in View of Developments in West Asia*, PRESS INFO. BUREAU (Apr. 5, 2026), https://www.pib.gov.in/PressReleasePage.aspx?PRID=2249118.

[11] MINISTRY OF PETROLEUM & NATURAL GAS, GOVERNMENT OF INDIA, Revised Order Prioritising LPG Production, No. M-13017(11)/1/2026-LPG-PNG (Mar. 9, 2026) (issued under cls. 3 and 5 of the Petroleum Products (Maintenance of Production, Storage and Supply) Order, 1999, G.S.R. 272(E), Gazette of India, Extraordinary, pt. II, sec. 3(i) (Apr. 16, 1999), read with § 3 of the Essential Commodities Act, 1955), https://mopng.gov.in/files/Whatsnew/Revised_Order_lpg.pdf; *see also* MINISTRY OF PETROLEUM & NATURAL GAS, GOVERNMENT OF INDIA, *Inter-Ministerial Briefing on Recent Developments in West Asia*, PRESS INFO. BUREAU (Mar. 12, 2026), https://www.pib.gov.in/PressReleasePage.aspx?PRID=2239172.

[12] MINISTRY OF PETROLEUM & NATURAL GAS, GOVERNMENT OF INDIA, *Government Restores Non-Domestic Packed LPG Supplies to Pre-Crisis Levels; Sectoral Supply Restrictions Withdrawn*, PRESS INFO. BUREAU (June 25, 2026), https://www.pib.gov.in/PressReleasePage.aspx?PRID=2277925.

IV. THE JUDICIARY: RESILIENCE THROUGH REGULATORY BOUNDARIES

The judiciary did not, and should not ordinarily, operate India's LPG allocation system during the crisis. Its contribution was instead to define the legal boundaries within which executive and OMC decisions must operate.

The 2026 judicial record is particularly revealing.

In *All India LPG Distributors Federation (Kerala Circle) v. Union of India*, the Kerala High Court considered a challenge to the OMCs' customer-transfer policy. The Court emphasised that LPG distribution is a public-utility service and that consumer interest and prompt supply are central considerations. Following earlier Division Bench authority, it upheld the OMCs' power to restructure distributor markets and to transfer customers from one distributor to another to maintain effective service.[13]

Similarly, in *Vikramaditya Gas Agencies v. Union of India*, a Division Bench of the Allahabad High Court in August 2026 held that the distributor's business efficacy could not displace the interests of consumers of a public utility. Adopting the Kerala High Court's reasoning, it recognised the OMCs' authority to redistribute customers where required to improve service and to avoid monopolistic or inefficient distribution structures.[14]

At the other end of the regulatory spectrum, the Madhya Pradesh High Court in *Sunil Kushwaha v. State of Madhya Pradesh*, deciding in June 2026 a challenge to a 2023 prosecution for decanting LPG, showed why enforcement, in an emergency or otherwise, must remain legally disciplined. The Court held that a prosecution under Sections 3 and 7 of the ECA could not rest on a bare reference to the Act: the specific Control Order provision allegedly violated had to be identified, and the statutory requirements governing search and seizure under the LPG Control Order had to be respected.[15]

Together these decisions establish an important resilience principle: a resilient regulatory state requires both effective intervention and enforceable procedural limits.

Emergency conditions may justify strong executive action; they do not eliminate legality.

V. OMCS, DISTRIBUTORS AND THE LAST-MILE STATE

India's clean-cooking system ultimately succeeds or fails at the distributor level.

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[13] *All India LPG Distributors Federation (Kerala Circle) v. Union of India*, W.P.(C) Nos. 15265 of 2025 & 5556 of 2026, 2026:KER:20906, ¶¶ 13–15 (Ker. H.C. Mar. 10, 2026) (India).

[14] *Vikramaditya Gas Agencies v. Union of India*, Writ-C No. 11195 of 2025 & connected matters, 2026:AHC:166335-DB, ¶¶ 52–55, 101–04 (All. H.C. Aug. 10, 2026) (India).

[15] *Sunil Kushwaha v. State of Madhya Pradesh*, M.Cr.C. No. 40637 of 2023, 2026:MPHC-JBP:53836, ¶¶ 17–19 (M.P. H.C. June 24, 2026) (India).

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During the 2026 disruption, the Government reported that domestic LPG supply had been given the highest priority, that no dry-outs had been reported at LPG distributorships, and that States had been asked to coordinate with the OMCs on enforcement and distribution.[16] Official advisories also asked consumers to book refills digitally and to avoid visiting distributorships unless necessary.[17]

Enforcement formed another layer. On April 15, 2026, the Government reported that more than 2,100 raids against hoarding and black marketing had been conducted across the country on the previous day, and that the OMCs had imposed penalties on 237 LPG distributorships and suspended 58.[18]

These are more than enforcement statistics. They demonstrate that distributors are institutional nodes of national energy resilience.

A supply chain may have sufficient LPG at the refinery level and still fail at the last mile because of inadequate distributor storage, transport constraints, diversion, inaccurate demand forecasting, weak consumer communication, failures of delivery authentication or uneven local administrative coordination.

The resilience of the national system is therefore constrained by its weakest local node.

VI. Digital Governance: From Delivery Control to Accountability

The 2026 response also transformed digital infrastructure into an instrument of physical energy governance.

Deliveries authenticated through the Delivery Authentication Code (DAC) increased from approximately 53% in February 2026 to around 90% by early April, and subsequently to approximately 96% during the crisis period.[19] The DAC is sent to the consumer's registered mobile number, and the system was explicitly used to prevent diversion.

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[16] Ministry of Petroleum & Natural Gas, Government of India, *Updates on Key Sectors in View of Developments in West Asia*, *supra* note 10.

[17] Ministry of Petroleum & Natural Gas, Government of India, *Inter-Ministerial Briefing on Recent Developments in West Asia*, Press Info. Bureau (May 8, 2026), https://www.pib.gov.in/PressReleasePage.aspx?PRID=2259146&reg=3&lang=1; *see also* Ministry of Petroleum & Natural Gas, Government of India, *Updates on Key Sectors in View of Developments in West Asia*, *supra* note 10.

[18] Ministry of Petroleum & Natural Gas, Government of India, *Inter-Ministerial Briefing on Recent Developments in West Asia*, Press Info. Bureau (Apr. 15, 2026), https://www.pib.gov.in/PressReleasePage.aspx?PRID=2252308.

[19] Ministry of Petroleum & Natural Gas, Government of India, *Updates on Key Sectors in View of Developments in West Asia*, *supra* note 10 (53% in February 2026 to 90%); Ministry of Petroleum & Natural Gas, Government of India, *Inter-Ministerial Briefing on Recent Developments in West Asia*, Press Info. Bureau (May 21, 2026), https://www.pib.gov.in/PressReleasePage.aspx?PRID=2263762 (about 96%).

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As on September 19, 2026, the Government reported that 27.43 crore active domestic LPG consumers, a coverage of 89.9%, had completed biometric Aadhaar authentication (BAA). From October 1, 2026, BAA became a precondition for booking domestic LPG refills at the regulated retail selling price with subsidy, while several authentication channels were retained, including at the time of delivery, at the distributor's premises and through the OMCs' mobile applications.[20] This demonstrates the movement from physical distribution governance to socio-technical governance.

But digital resilience carries a corresponding risk: exclusion.

Authentication can reduce duplication, diversion and subsidy leakage, but a system that cannot accommodate elderly consumers, poor connectivity, device failure, biometric difficulty or digital illiteracy may transfer the burden of system efficiency onto the most vulnerable consumers.

Accountability must therefore mean both authentication against diversion and access despite authentication barriers.

VII. Fiscal resilience

Physical availability is not sufficient if the household cannot afford the refill.

Academic evidence has long established that LPG affordability influences sustained use and that owning a connection does not by itself guarantee a transition away from biomass.[21] The 2026 fiscal architecture makes this issue particularly visible.

The Government reported that domestic LPG was being sold below cost, with an implicit subsidy of approximately Rs. 210 per 14.2-kg cylinder in September 2026 and substantially higher levels during the crisis. It further reported compensation paid by the Government to the OMCs, and accumulated under-recoveries of the public-sector OMCs on domestic LPG exceeding Rs. 62,000 crore as on August 31, 2026.[22]

This produces a three-way resilience problem: consumer affordability, the financial sustainability of the OMCs, and fiscal sustainability. A system that maintains low consumer prices by indefinitely transferring losses to the OMCs may protect short-term access but weaken long-term institutional resilience.

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[20] Ministry of Petroleum & Natural Gas, Government of India, *Biometric Aadhaar Authentication Mandatory for Subsidised Domestic LPG Refills from 1 October 2026*, Press Info. Bureau (Sept. 19, 2026), https://www.pib.gov.in/PressReleasePage.aspx?PRID=2312532.

[21] Mani et al., *supra* note 2, at 450–57.

[22] Ministry of Petroleum & Natural Gas, Government of India, *Biometric Aadhaar Authentication Mandatory for Subsidised Domestic LPG Refills from 1 October 2026*, *supra* note 20.

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Fiscal resilience should therefore become an explicit component of clean-cooking policy.

VIII. Infrastructure Diversification

Perhaps the most strategically significant post-shock development is the acceleration of PNG.

During 2026, the Government offered States and Union Territories additional commercial LPG allocation linked to reforms supporting the long-term transition from LPG to PNG.[23] The Petroleum and Natural Gas Regulatory Board's (PNGRB) PNG Drive 2.0, implemented from January 1 to June 30, 2026, reported 15.31 lakh PNG registrations, 12.10 lakh PNG connections, 32 new districts connected to city gas distribution supply and 23 new geographical areas connected to the natural-gas pipeline network.[24]

The Petroleum Planning & Analysis Cell (PPAC) reported approximately 17.55 million domestic PNG connections as on July 31, 2026.[25]

PNG should not, however, be treated as a simple replacement for LPG. It introduces another infrastructure dependency: pipeline connectivity and the availability of natural gas.

The appropriate concept is therefore redundancy rather than substitution. A resilient clean-cooking portfolio should permit different regions and households to rely, where technically and economically appropriate, on LPG, PNG, electricity, biogas or compressed biogas (CBG), or other clean technologies.

The objective is not to eliminate every dependency. It is to prevent a single dependency from becoming a single point of failure.

IX. The Clean Cooking Resilience Framework

Building on the preceding legal, institutional and empirical analysis, this Article proposes the Clean Cooking Resilience Framework. Its first three dimensions, access, affordability and availability, constitute the foundation of clean-cooking security. On that foundation the framework builds three further dimensions, and it culminates in a seventh, autonomy.

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[23] Ministry of Petroleum & Natural Gas, Government of India, *Updates on Key Sectors in View of Developments in West Asia*, Press Info. Bureau (Mar. 29, 2026), https://www.pib.gov.in/PressReleasePage.aspx?PRID=2246647; *see also* Natural Gas and Petroleum Products Distribution (Through Laying, Building, Operation and Expansion of Pipelines and Other Facilities) Order, 2026 (Mar. 24, 2026) (issued under the Essential Commodities Act, 1955); Ministry of Petroleum & Natural Gas, Government of India, *Government Notifies Landmark Order to Strengthen Natural Gas Infrastructure and Improve Ease of Doing Business*, Press Info. Bureau (Mar. 24, 2026), https://www.pib.gov.in/PressReleasePage.aspx?PRID=2244760.

[24] Petroleum & Natural Gas Regulatory Board, *PNG Drive 2.0 Concludes with Valedictory Session at PNGRB* (July 7, 2026), https://pngrb.gov.in/eng-web/20260707_gallery_PngDrive.html.

[25] Petroleum Planning & Analysis Cell, Ministry of Petroleum & Natural Gas, Government of India, *PPAC Tracker: Domestic PNG Connections* (as on July 31, 2026) (source: PNGRB).

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A. Adaptability

Adaptability is secured through strategic storage buffers, supply diversification, route diversification, domestic production and demand management. It must operate within a framework of accountability.

B. Accountability

Accountability is secured through legal authorisation, digital governance, BAA, DAC, subsidy targeting, transparent emergency allocation and judicial review. Finally, the system requires alternatives.

C. Alternatives

Alternatives take the form of a diversified portfolio of LPG, PNG, electricity, biogas and CBG. The framework culminates in autonomy: the capacity to withstand external shocks without abandoning household energy security.

This framework is deliberately broader than energy self-sufficiency. Resilience is not autarky. It is the capacity to absorb, adapt, recover and continue serving consumers despite external disruption.

X. Regulatory and Institutional Outlook

Five reforms follow from the analysis.

First, India should institutionalise a Clean-Cooking Resilience Dashboard. It should monitor import dependence, supplier and route concentration, storage days, domestic production, refill affordability, distributor-level availability, PNG penetration and digital authentication.

Second, emergency ECA powers should be accompanied by clearer trigger, review and sunset mechanisms. The objective is not to weaken emergency administration but to make it legally predictable.

Third, storage resilience should be measured in days of consumption rather than merely in physical capacity. India's 2026 crisis response demonstrated the importance of stocks, while government reporting identified substantial rolling LPG stock available during the crisis.[26]

Fourth, distributor resilience should become a formal regulatory objective. Distributor viability, storage, transport capacity, service area, customer density and emergency delivery capability

[26] Ministry of Defence, Government of India, *Key Takeaways of 5th IGoM on West Asia Chaired by RM: No Shortage of Any Petroleum Product, India Has 60 Days of Crude Oil, 60 Days of Natural Gas & 45 Days of LPG Rolling Stock*, Press Info. Bureau (May 11, 2026), https://www.pib.gov.in/PressReleasePage.aspx?PRID=2259798.

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should be assessed together. The public-utility character of LPG distribution makes last-mile capacity a matter of consumer protection, not merely of private business efficiency.

Fifth, clean-cooking policy should become technology-neutral but resilience-oriented. LPG should remain a major component of India's clean-cooking system while PNG, electricity, biogas and CBG are developed as complementary pathways according to regional feasibility.

XI. Conclusion

The 2026 geopolitical and supply-chain disruption did not demonstrate the failure of India's clean-cooking system. Nor did it establish that the system is fully resilient.

It demonstrated something more useful: India possesses significant adaptive administrative capacity, but its resilience architecture is still developing.

The Union Government demonstrated the ability to mobilise statutory powers, prioritise domestic LPG, manage demand, coordinate the OMCs and the States, strengthen enforcement, expand digital authentication and accelerate alternative infrastructure. The judiciary, for its part, maintained the legal boundaries of regulation and upheld the principle that public-utility distribution must ultimately serve consumers.

Yet the disruption also exposed the structural limits of an LPG-centred model: international supply exposure, maritime-route concentration, affordability pressures, the fiscal exposure of the OMCs and last-mile vulnerability.

The appropriate policy response is therefore a more resilient clean-cooking system.

The proposed framework of access, affordability, availability, adaptability, accountability, alternatives and autonomy recasts clean cooking as a system of public infrastructure rather than a single-fuel programme.

The ultimate test of clean-cooking governance should therefore change from "How many households have an LPG connection?" to "Can every household continue to cook cleanly, affordably and safely when the energy system is under stress?"

That is the institutional transition from energy access to energy resilience.

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