

5. LPG & Biogas - Geography

The ongoing geopolitical tensions in West Asia, particularly disruptions in the Strait of Hormuz, have exposed India's high vulnerability to Liquefied Petroleum Gas (LPG) shortages. As a result, there is a renewed national focus on Biogas and other decentralized, renewable cooking fuels to ensure long-term energy security.

1. Background

Liquefied Petroleum Gas (LPG)

LPG is a flammable mixture of hydrocarbon gases used as fuel in heating appliances, cooking equipment, and vehicles.

Composition- Primarily Propane (C_3H_8) and Butane (C_4H_{10}).

Physical State- It is a gas at atmospheric pressure but is liquefied under moderate pressure for ease of transport and storage.

Origin- It is extracted during the refining of petroleum (crude oil) or "touched off" from natural gas streams.

Biogas

Biogas is a renewable energy source produced through the Anaerobic Digestion (decomposition in the absence of oxygen) of organic matter.

Sources- Cattle dung (Gobar), food waste, sewage, green waste, and agricultural residues.

Composition- Mainly Methane (50–75%) and Carbon Dioxide (25–50%), with traces of hydrogen sulfide and moisture.

2. Comparison- LPG vs. Biogas

Feature	Liquefied Petroleum Gas (LPG)	Biogas
Source	Fossil Fuel (Non-renewable).	Organic Waste (Renewable).
Primary Component	Propane and Butane.	Methane (CH_4).
Production	Centralized (Refineries).	Decentralized (Household/Community).
Environmental Impact	Low carbon, but still a fossil fuel.	Carbon neutral; reduces methane leaks.
Supply Chain	High import dependence (65%).	100% Domestic/Local.
By-products	None.	Organic Manure (Slurry).

3. Key Concerns Regarding India's LPG Dependency

India's reliance on LPG faces structural and geopolitical risks that threaten the "kitchen security" of millions-

Geopolitical Vulnerability- The Strait of Hormuz is a chokepoint between the Persian Gulf and the Gulf of Oman. Since a vast majority of India's LPG imports pass through this narrow strip, West Asian conflicts lead to immediate supply chain chokepoints.

Import Dependence- India currently imports approximately 65% of its total LPG requirement. This makes the national economy sensitive to international diplomatic shifts.

Price Volatility- Global crude oil price fluctuations directly impact the domestic price of LPG cylinders, increasing the government's subsidy burden and the "out-of-pocket" expenditure for households.

Storage Constraints- Unlike strategic crude oil reserves, India has limited storage capacity for LPG, often sufficing for only a few days of national consumption.

4. The Biogas Advantage- A Structural Alternative

The transition toward Biogas offers a multi-dimensional solution to India's energy crisis-

Energy Security & Circular Economy

Decentralization- Biogas can be produced in rural backyards or urban community centers, eliminating the need for complex pipeline or cylinder logistics.

Waste Management- It converts "wealth from waste" by utilizing agricultural stubble (preventing stubble burning) and municipal solid waste.

Economic and Agricultural Benefits

Dual Output- Apart from gas for cooking, the process produces enriched organic manure (slurry), which reduces the farmer's dependence on expensive chemical fertilizers.

Cost Stability- Since the "fuel" (waste) is locally sourced, the cost of biogas remains insulated from global oil price shocks.

5. Way Forward- Strengthening India's Energy Mix

To insulate India from future disruptions in the Strait of Hormuz, the following strategic steps are essential-

Diversification of the Cooking Mix- Shift toward a "Multi-Fuel" model including Electric Cooking (e-cooking), Biogas, and Solar-induction systems to reduce the singular load on LPG.

Expansion of SATAT Scheme- The *Sustainable Alternative Towards Affordable Transportation (SATAT)* initiative should be aggressively scaled to promote Compressed Bio-Gas (CBG) for both domestic and automotive use.

Strategic Storage Infrastructure- Build massive underground or coastal LPG storage facilities to hold at least 30-45 days of buffer stock.

Incentivizing Decentralized Units- Provide direct subsidies or "Carbon Credits" to rural households and Cooperative Societies that set up community-scale biogas plants.

Policy Support for NAMs and Innovation- (Contextual Link) Just as Biopharma SHAKTI supports innovation, a dedicated "Cooking SHAKTI" mission could fund R&D for more efficient biogas burners and portable biogas cylinders.

6. Conclusion

The current West Asia conflict serves as a wake-up call for India's energy planners. While LPG remains a clean transition fuel, true Atmanirbhar (Self-reliant) energy security lies in leveraging India's massive biomass potential. By integrating biogas into the mainstream energy grid, India can transform a geopolitical threat into an opportunity for rural empowerment and environmental sustainability.

Source- <https://www.downtoearth.org.in/energy/lpg-shortages-spur-biogas-revival-and-alternative-fuels-across-parts-of-india>