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5. Beyond E20 Fuel – Environment

The Union Government has taken a decisive step toward accelerating India's ethanol transition by exempting higher ethanol-petrol blends — in the 22%–30% ethanol range — from central excise duty and proposing amendments to the Central Motor Vehicles Rules to formally recognise E85 and E100 fuels. In June 2026, India introduced E85 fuel for flex-fuel vehicles — marking the beginning of a new chapter in which India moves decisively beyond the E20 milestone achieved in 2025 and positions itself for a future in which much higher ethanol concentrations, and ultimately E100, become commercially viable options.

1.Understanding Ethanol: Production and Chemistry

Ethanol is 99.9% pure alcohol — chemically, it is the same compound as the alcohol in beverages, but produced industrially for fuel applications. It can be produced from a range of agricultural feedstocks with high starch or sugar content: sugarcane, maize, wheat, sugar beet, damaged food grains, and surplus rice. The production process involves the **fermentation of sugars using yeast**. In the case of sugarcane juice or molasses, the sugar is present as sucrose, which yeast enzymes break down into glucose and fructose — which are then fermented into ethanol and carbon dioxide.

Ethanol Blending Programme: The Journey from 1.5% to 20%

India's ethanol blending journey is one of the most dramatic policy success stories in India's energy sector. In 2014, the country blended a mere 1.5% ethanol in petrol — a negligible share reflecting the early infancy of the programme. The **National Policy on Biofuels, 2018** set an indicative target of 20% ethanol blending by 2030, subsequently advanced to 2025–26 with sustained policy support. The **20% target was achieved in 2025** — five years ahead of the original schedule — through a combination of expanded feedstock eligibility, government procurement pricing certainty, interest subvention for distillery capacity expansion, and strong supply from the sugarcane and maize sectors. The cumulative impact of the programme has been substantial: approximately Rs 1.13 lakh crore in foreign exchange savings and a reduction of nearly 544 lakh metric tonnes of CO₂ emissions — making it one of India's most impactful single-programme contributions to both macroeconomic resilience and environmental sustainability.

2.Why India is Pushing Higher Ethanol Blends

1. **Energy security:** India imports approximately 88.5% of its crude oil requirements — one of the highest import dependency ratios among major economies. Every percentage point increase in ethanol blending reduces this dependency, conserves foreign exchange, and improves macroeconomic resilience against global oil price shocks.
2. **Supporting farmers:** Ethanol production creates an additional assured market for sugarcane, maize, and surplus food grains — providing income support particularly to farmers in Uttar Pradesh and Maharashtra, the two largest sugarcane-producing states. Annual ethanol procurement price notifications by the government provide investment certainty to distilleries and price stability to farmers.
3. **Environmental benefits:** Ethanol is a renewable, bio-based fuel that emits significantly fewer particulate pollutants than conventional petrol. Higher blending ratios contribute measurably to

reduced urban air pollution and lower net carbon emissions — supporting India's commitments under the Paris Agreement.

4. **Rural industrialisation:** The expansion of distillery capacity has stimulated rural infrastructure development, generated non-farm employment in processing and logistics, and helped diversify rural economic activity beyond primary agriculture.
5. **Global biofuel leadership:** India is a founding member of the **Global Biofuel Alliance**, launched during the G20 Summit, which India chaired in 2023. The Alliance positions India as a global leader in sustainable biofuels — a role that carries both diplomatic and commercial advantages.

3. Government Policy Instruments

1. **National Policy on Biofuels, 2018 (amended 2022):** Expanded eligible feedstocks to include maize, damaged food grains, sugar beet, and surplus rice — diversifying the ethanol supply base and reducing over-dependence on sugarcane, which is vulnerable to monsoon variability.
2. **Ethanol Procurement Pricing:** Annual price notifications for ethanol sold to Oil Marketing Companies (OMCs) provide the investment certainty that distilleries need to commit capital to capacity expansion.
3. **Interest Subvention Scheme:** Provides subsidised credit for establishing and expanding distillery capacity, lowering the cost of capital for this critical infrastructure.
4. **Flex-Fuel Vehicle Initiative:** The Ministry of Road Transport and Highways has been encouraging manufacturers to develop flex-fuel vehicles capable of operating on varying ethanol blends — a prerequisite for commercially viable E85 and E100 deployment.
5. **E85 launch in 2026:** Rolled out across 48 Public Sector OMC retail outlets, E85 fuel is now accessible to flex-fuel vehicle users, beginning the commercial transition beyond E20.

4. Concerns and Challenges

1. **Vehicle compatibility:** Ethanol is highly **hygroscopic** — it actively absorbs moisture from the atmosphere. At higher blend concentrations, ethanol can damage engine components, fuel lines, rubber seals, and metal parts in vehicles not specifically engineered for high-ethanol fuels. This makes the pace of flex-fuel vehicle adoption a critical bottleneck for higher blend deployment.
2. **Mileage penalty:** Ethanol contains lower energy per litre than petrol — approximately 66% of petrol's energy density. Customers have already flagged a drop in fuel efficiency following the transition from E10 to E20. Higher blends will exacerbate this mileage penalty unless engine optimisation compensates.
3. **Feedstock volatility:** India's sugarcane production remains heavily monsoon-dependent. Drought years — which are becoming more frequent under climate change — can sharply disrupt ethanol supply, jeopardising blending targets and creating fuel availability uncertainty.
4. **Food versus fuel debate:** Diversion of rice and maize toward ethanol production can tighten domestic food grain supply and exert upward pressure on food prices — a concern that requires careful feedstock balancing, particularly in years of below-normal agricultural production.
5. **Blending compliance:** Ensuring uniform blending standards across thousands of urban and rural fuel retail outlets remains a significant logistical and enforcement challenge.

5. Brazil's Ethanol Programme: The Global Benchmark

Brazil launched its ethanol programme in the **1970s in response to the 1973 oil crisis** — and has sustained it for over five decades through consistent policy commitment across multiple governments and political cycles. Brazil's model offers four key lessons for India: the importance of long-term policy commitment irrespective of electoral cycles; phased implementation that does not create sudden

compatibility shocks for existing vehicle owners; consumer choice between petrol-ethanol blends and E100 at most fuel stations; and large-scale promotion of flex-fuel vehicles through supportive industrial and tax policies. At most Brazilian fuel stations, consumers can choose between petrol blended with 27–32% ethanol and pure hydrous E100 — a level of flexibility that India aspires to replicate over the coming decade.

6.Way Forward

1. India should adopt a **gradual and evidence-based transition** to higher blends, with timelines tied to the actual pace of flex-fuel vehicle adoption in the fleet.
2. **Vehicle compatibility and consumer communication** must be proactively addressed — including clear labelling, warranty clarity, and industry-government coordination to accelerate FFV market penetration.
3. **Alternative feedstocks** including agricultural residues, cellulosic biomass, and second-generation biofuels must be developed to reduce dependence on food-competing primary crops for ethanol supply.
4. India should leverage its **Global Biofuel Alliance** leadership to build export markets for ethanol and biofuel technology, creating additional revenue streams and reinforcing its role as a global clean energy leader.

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