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BEYOND POLICY MANDATES: EXPLORING CONSUMER PERCEPTION AND ACCEPTANCE OF ETHANOL-BLENDED PETROL AS A SUSTAINABLE FUEL IN INDIA

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ABSTRACT
India's Ethanol Blending Programme (EBP) has moved from roughly 1.5% blending in 2014 to 19.24% in Ethanol Supply Year (ESY) 2024-25, and nationwide supply of 20% ethanol-blended petrol (E20) from ESY 2025-26, five years ahead of the original 2030 target. Policy success has been measured almost entirely on the supply side: blending percentages, foreign-exchange savings, avoided carbon emissions and payments to farmers. The demand side, namely how motorists perceive, evaluate and accept a fuel they are now required to buy, has received little systematic scholarly attention. This paper argues that a mandate secures use, not acceptance, and that the difference between the two is a policy variable in its own right. Drawing on the Theory of Planned Behaviour, Diffusion of Innovations, Prospect Theory and the social-acceptance literature on renewable energy, and triangulating official statistics (NITI Aayog, Ministry of Petroleum and Natural Gas, Lok Sabha replies) with large-sample national consumer surveys (LocalCircles, 2026; more than 42,000 to 50,000 respondents across 300+ districts), the study develops a Compliance–Acceptance Framework (CAF). The framework identifies six perception dimensions: perceived environmental and national benefit, perceived vehicle-compatibility risk, perceived economic cost and price fairness, institutional trust, information clarity and labelling, and social norms and sustainability identity. Secondary evidence reveals a pronounced perception gap: engineering estimates place E20 fuel-economy loss at 1–7% depending on vehicle calibration, whereas 66% of owners of pre-2023 vehicles report losses above 10%, and 55% say they would revert to lower-ethanol petrol if it were offered. The paper advances six testable propositions, a validated 28-item measurement instrument for Exploratory Factor Analysis, and policy recommendations on choice architecture, labelling, price signalling and trust repair. It concludes that the long-run legitimacy of India's biofuel transition, including the planned move beyond E20, depends on converting resigned compliance into voluntary acceptance.

KEYWORDS: *Ethanol-Blended Petrol; E20; Consumer Perception; Technology Acceptance; Sustainable Fuel; Theory of Planned Behaviour; Compliance–Acceptance Gap; India; Energy Transition*

1. INTRODUCTION

The transition to low-carbon transport fuels is among the most consequential sustainability choices facing emerging economies. India, the world's third-largest consumer of crude oil and a country that imports the large majority of its requirement, has adopted biofuel blending as a central instrument of energy security, rural income support and emissions reduction. Under the National Policy on Biofuels (2018, amended 2022), the Government advanced the target of 20% ethanol blending in petrol from 2030 to 2025-26 (NITI Aayog & MoPNG, 2021). The programme has delivered on that supply-side goal with unusual speed: blending rose from about 1.5% in 2014 to 10% in ESY 2021-22, 12.06% in 2022-23, approximately 14.6% in 2023-24 (Lok Sabha, 2024) and 19.24% in 2024-25 (Biofuels Digest, 2025). The Government reports cumulative foreign-exchange savings of about ₹1.36 lakh crore, avoided carbon-dioxide emissions of about 698 lakh tonnes and payments of about ₹1.18 lakh crore to farmers (BioEnergy Times, 2025).

Yet the public conversation around E20 has been notably contentious. Motorists, particularly owners of vehicles manufactured before the E20-compatible generation, have reported lower mileage, higher maintenance costs and concerns about component wear. A public-interest litigation seeking the continued availability of ethanol-free petrol and mandatory pump labelling was dismissed by the Supreme Court of India in September 2025 (LiveLaw, 2025), and by August 2026 the Government had begun preliminary discussions on reintroducing E10 alongside E20 for older vehicles (DriveSpark, 2026). These developments signal that a policy can be technically successful and socially unsettled at the same time.

This paper addresses that tension. Its central claim is that consumer *use* of ethanol-blended petrol under a mandate is not evidence of consumer *acceptance*. Where the motorist has no choice at the pump, the observed behaviour is compliance; acceptance is an attitudinal state that may or may not accompany it. The distance between the two, which this paper terms the **compliance–acceptance gap**, matters because it shapes trust in public institutions, the political feasibility of further blending (E27, E30 and flex-fuel), and the willingness of consumers to purchase compatible vehicles. Prior work in this author's research programme on investor

behaviour (Hrushikesh et al., 2026) showed that regulatory trust, information channels and operational convenience emerge as distinct latent drivers of financial choice; this study carries that perception-centred, factor-analytic logic into the domain of sustainable fuel.

The study pursues four objectives: (i) to synthesise the theoretical foundations of consumer acceptance of sustainable fuels; (ii) to document, from official and large-sample secondary data, the gap between policy-side benefits and consumer-side perceptions of E20 in India; (iii) to develop a Compliance–Acceptance Framework with testable propositions; and (iv) to provide a validated measurement instrument and analysis plan for subsequent empirical work. The remainder of the paper is structured as follows. Section 2 presents the theoretical framework and literature review. Section 3 describes the research design. Section 4 presents the analysis of secondary evidence and the proposed framework. Section 5 discusses implications, and Section 6 concludes with limitations and directions for future research.

2. THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE

2.1 Behavioural Theories of Sustainable Technology Acceptance: The Theory of Planned Behaviour (Ajzen, 1991) holds that behavioural intention is shaped by attitude toward the behaviour, subjective norms and perceived behavioural control. Applied to fuel, attitude captures the motorist's evaluation of blended petrol's benefits and costs; subjective norms capture the influence of family, peers, mechanics and public discourse; and perceived behavioural control captures whether the consumer believes a choice exists at all. Under a universal mandate, perceived behavioural control collapses, and theory predicts that unfavourable attitudes will express themselves not in non-use but in dissatisfaction, complaint and diminished institutional trust. The Value-Belief-Norm theory (Stern, 2000) adds that pro-environmental support depends on whether individuals believe a measure actually reduces environmental harm and whether they feel personally responsible for acting. Diffusion of Innovations theory (Rogers, 2003) identifies relative advantage, compatibility, complexity, trialability and observability as determinants of adoption; for E20, compatibility with the existing vehicle stock is the attribute most visibly in question.

Prospect Theory (Kahneman & Tversky, 1979) is especially relevant because the gains from blending (national energy security, lower aggregate emissions, farmer incomes) are diffuse and collective, while the perceived losses (mileage, repair costs) are concentrated and personal. Loss aversion predicts that a modest, salient personal loss will weigh more heavily than a larger but abstract social gain. Status-quo bias (Samuelson & Zeckhauser, 1988) further predicts resistance to any change in a familiar consumption routine; this author's earlier work showed how economic constraints entrench the status quo and suppress adaptive problem-solving (Sastry & Mallya, 2025), a mechanism that applies with equal force to a household facing an unexpected rise in running costs.

2.2 Social Acceptance of Renewable Energy and Biofuels: Wüstenhagen, Wolsink and Bürer (2007) distinguish three dimensions of social acceptance of renewable-energy innovation: socio-political acceptance (by policy actors and the general public), community acceptance (by those directly affected) and market acceptance (by consumers and investors). The E20 case shows high socio-political acceptance at the level of government and industry, but contested market acceptance among a specific consumer segment. Huijts, Molin and Steg (2012) synthesise the psychological drivers of sustainable energy-technology acceptance into a model in which trust, perceived costs, risks and benefits, procedural and distributive fairness, and affect jointly shape attitude and acceptance. Studies of biofuels specifically find that public support is conditional: Savvanidou, Zervas and Tsagarakis (2010) report that Greek citizens' acceptance depended on knowledge of biofuels and concern about environmental and price effects, while Delshad, Raymond, Sawicki and Wegener (2010) show that support for biofuel policy is shaped by perceived personal economic impact and political framing.

2.3 International Evidence on Consumer Choice of Ethanol Fuels: Evidence from markets where consumers can choose between ethanol and petrol is instructive for India, where such choice is now absent. In Brazil, where flex-fuel vehicles allow motorists to switch freely, Salvo and Huse (2013) find that fuel choice responds strongly to relative prices but that a meaningful share of drivers choose on non-price grounds, indicating that perceived performance, habit and environmental attitudes also matter. Pacini and Silveira (2011) compare Brazil and Sweden and show that consumer demand for high-ethanol fuels is fragile: when the price advantage of ethanol narrowed, Swedish consumers moved back to petrol, so that policy-built infrastructure alone did not sustain demand. In the United States, contingent-valuation evidence shows that consumers attach lower willingness to pay to high-ethanol blends than to low blends (Petrolia, Bhattacharjee, Hudson & Herndon, 2010). Engineering reviews confirm that ethanol's lower energy content per litre produces a measurable fuel-economy penalty, partially offset in engines optimised for higher-octane blends (Thakur, Kaviti, Mehra & Mer, 2017), which is precisely the vehicle-calibration distinction at the centre of the Indian debate.

2.4 Social Influence, Information and Trust: Fuel perception is formed socially. Mechanics, online owner communities and social media amplify individual experiences, and herd-like information cascades can make a perceived problem salient far beyond its measured incidence. This author's work on the FOMO economy in India documents how social signalling and fear of missing out shape consumption decisions (Sastry, 2026), and the reverse dynamic, a shared fear of loss, is visible in the E20 discourse. In the companion study on investor behaviour, regulatory trust and institutional credibility emerged as an independent factor explaining

13.82% of variance in investment choices (Hrushikesh et al., 2026); trust in the Government, oil marketing companies (OMCs) and vehicle manufacturers (OEMs) is expected to play an analogous role for a mandated fuel.

2.5 Research Gap and Positioning of the Current Study: Three gaps emerge. First, Indian research on ethanol blending is dominated by engineering, agricultural-feedstock and macroeconomic perspectives; the consumer is largely absent. Second, the international acceptance literature studies contexts where consumers can choose; it has not theorised acceptance under a universal mandate, where use and acceptance decouple. Third, no validated instrument exists to measure perception of mandated blended fuels in an emerging-market setting. This study addresses all three by proposing the Compliance–Acceptance Framework, grounding it in national secondary evidence, and offering a ready-to-administer instrument.

3. RESEARCH METHODOLOGY

3.1 Research Design: The study adopts a conceptual and evidence-synthesis design suited to an emerging policy phenomenon where primary longitudinal data are not yet available. It combines (a) an integrative review of theory and empirical literature on sustainable-fuel acceptance; (b) a structured analysis of official secondary data from NITI Aayog, the Ministry of Petroleum and Natural Gas (MoPNG) and Parliamentary replies; and (c) secondary analysis of published results from large national consumer surveys conducted by LocalCircles in 2026. No primary respondent data are reported or simulated; all quantitative figures are drawn from cited public sources.

3.2 Data Sources and Triangulation: Official sources provide the supply-side trajectory and the Government's estimates of fuel-economy impact; consumer surveys provide the demand-side perception data. Triangulation between the two allows the perception gap to be documented without overstating either. Survey figures are self-reported and reflect respondents' perceptions; they are therefore treated as evidence of perception, which is the construct of interest, rather than as measurements of engine performance.

3.3 Framework Development and Instrument Design: Constructs were derived deductively from the theories reviewed in Section 2 and inductively from the concerns recorded in the secondary evidence (mileage, maintenance, labelling, choice and price). A 28-item instrument across six dimensions was then drafted on a five-point Likert scale, following the same item-to-factor design and validation standards (KMO, Bartlett's test, Varimax rotation, loadings ≥ 0.70, Cronbach's $\alpha \geq 0.70$) used in the author's companion factor-analytic study (Hrushikesh et al., 2026; Hair, Black, Babin & Anderson, 2019).

4. RESULTS AND ANALYSIS OF SECONDARY EVIDENCE

4.1 Policy Trajectory: Table 1 and Figure 1 summarise the policy milestones and the blending trajectory. The programme's acceleration after 2021 is striking: blending almost doubled between ESY 2021-22 and 2024-25. This pace compressed the transition period for the in-use vehicle stock; industry estimates cited in the national press suggest that close to 80% of vehicles sold in the preceding fifteen years were designed for E5 or E10 blends (Business Today, 2026a).

Table 1: Key Milestones in India's Ethanol Blending Programme

Year	Milestone	Source
2014	Blending at about 1.5%; ethanol production about 38 crore litres	BioEnergy Times (2025)
2018 / 2022	National Policy on Biofuels; 2022 amendment advances E20 target to ESY 2025-26	NITI Aayog & MoPNG (2021)
2021	Roadmap for Ethanol Blending 2020-25; estimates E20 mileage loss of 6–7% (E10-era four-wheelers), 3–4% (two-wheelers), 1–2% (E20-calibrated vehicles)	NITI Aayog & MoPNG (2021)
ESY 2021-22	10% blending achieved by public-sector OMCs (June 2022)	Lok Sabha (2024)
ESY 2022-23 / 2023-24	12.06% and about 14.6% blending respectively	Lok Sabha (2024)
ESY 2024-25	19.24% average blending; October 2025 at 19.97%	Biofuels Digest (2025)
Sept 2025	Supreme Court dismisses PIL seeking E0 availability and pump labelling	LiveLaw (2025)
Aug 2026	Government opens preliminary talks on offering E10 alongside E20 for older vehicles; no decision taken	DriveSpark (2026)

Source: Compiled by the author from official and published sources (2024–2026)

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Figure 1: India's Ethanol Blending Trajectory, 2014 to ESY 2025-26

Source: Lok Sabha (2024); Biofuels Digest (2025); BioEnergy Times (2025)

4.2 The Two Ledgers: Policy Benefits and Consumer-Perceived Costs: Table 2 sets the Government's benefit ledger beside the consumer's perceived-cost ledger. The two are not contradictory; they are measured at different levels. Benefits accrue to the nation, the exchequer and the farmer; costs are perceived by the individual vehicle owner. Prospect Theory predicts that, absent compensating mechanisms, the concentrated personal ledger will dominate individual attitudes.

Table 2: Policy-Side Benefits versus Consumer-Side Perceptions

Policy-side benefit (official)	Value	Consumer-side perception (survey)	Value
Cumulative forex savings (to mid-2025)	₹1.36 lakh crore	Older-vehicle owners reporting mileage drop in previous 9 months	50%
CO_2 emissions avoided	698 lakh tonnes	Owners reporting mileage loss above 10%	66%
Payments to farmers	₹1.18 lakh crore	Owners reporting higher maintenance / wear and tear	55%
Crude oil substituted (10 years to Sept 2024)	185 lakh MT	Owners reporting additional spend of ₹5,000–₹25,000+	52%
Ethanol production (2014 → June 2025)	38 → 661.1 crore litres	Owners reporting unusual wear or repair needs (engine, fuel line)	29%

Source: BioEnergy Times (2025); Lok Sabha (2024); LocalCircles survey results as reported by Business Today (2026a, 2026b) and Moneylife (2026)

Figure 2 visualises the consumer-side indicators. Every indicator except reported repairs is reported by half or more of older-vehicle owners, showing that dissatisfaction is a majority experience in this segment rather than a fringe complaint.

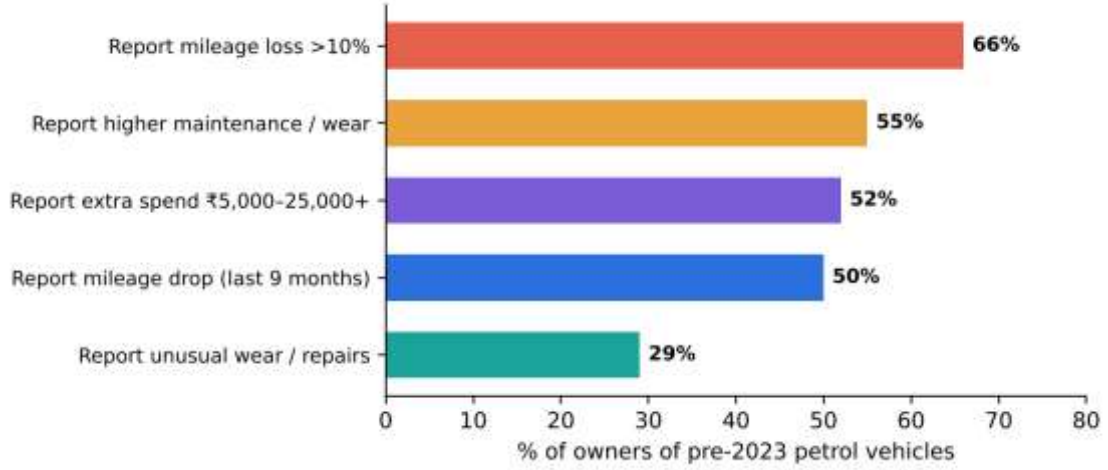


Figure 2: Consumer-Reported Experience of E20 among Owners of Pre-2023 Petrol Vehicles

Source: LocalCircles (2026) as reported by Business Today (2026a, 2026b) and Moneylife (2026); separate survey waves

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4.3 The Perception Gap: Figure 3 contrasts the Government's own engineering estimates with consumer-reported mileage loss. Even the highest official estimate for E10-era four-wheelers (6–7%) lies well below the threshold of more than 10% reported by two-thirds of older-vehicle owners. Several mechanisms can explain the gap without dismissing either source: perceived losses include driving-condition variation and price changes; negative experiences are more memorable and more widely shared than neutral ones; and the absence of labelling at the pump removes any reference point against which consumers can calibrate expectations. For acceptance research, the perceived figure is the behaviourally relevant one, because it is the figure on which attitudes, complaints and future vehicle purchases are based.

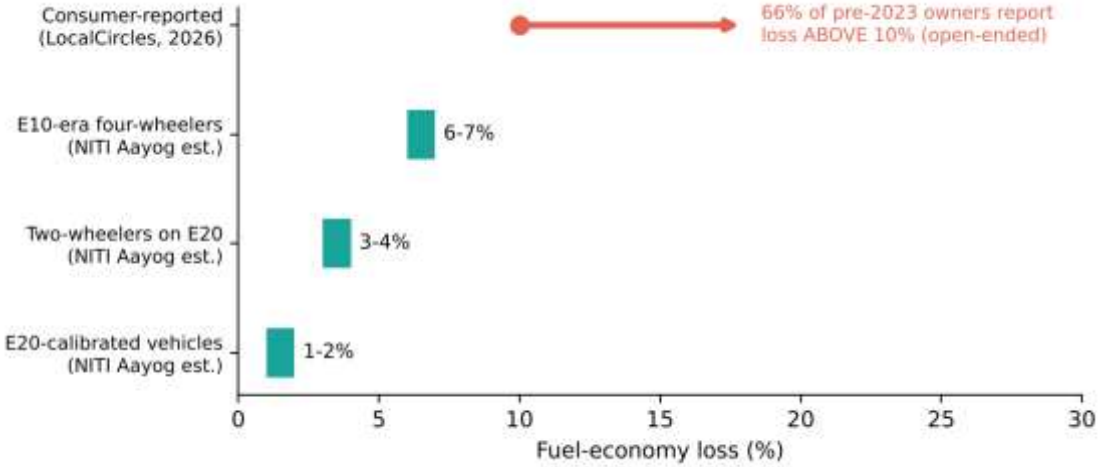


Figure 3: Engineering Estimates versus Consumer-Perceived Mileage Loss
Source: NITI Aayog & MoPNG (2021) as reported in Business Today (2026c); LocalCircles via Moneylife (2026)

4.4 Revealed Preference under a Hypothetical Choice: The clearest indicator of the compliance–acceptance gap is what consumers say they would do if the mandate were relaxed. In a LocalCircles survey of more than 42,000 owners of pre-2023 petrol vehicles across 316 districts, 31% said they would switch to E0 or E10 immediately even at a higher price, and a further 24% would switch if the price were similar to E20 (Figure 4). Only 12% would continue with E20 exclusively, while 23% said they needed more information, a segment that is persuadable through clear communication. Taken together, at least 55% of this segment is currently complying without accepting.

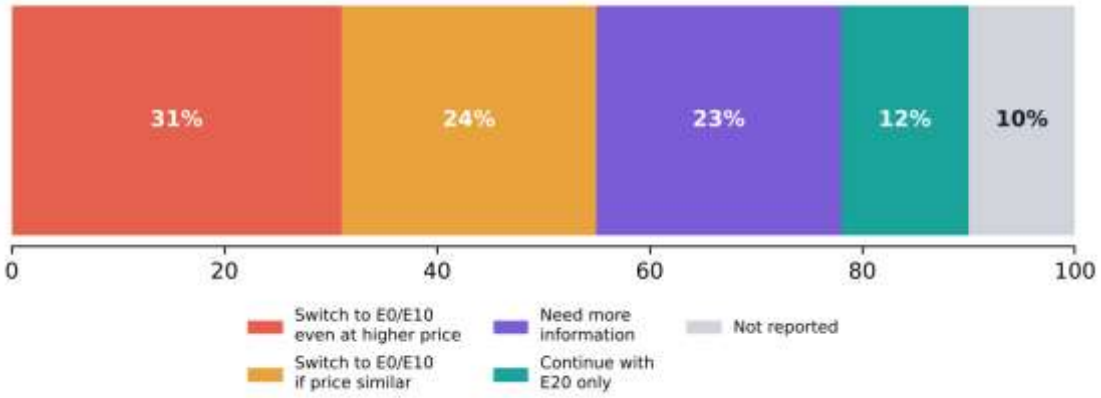


Figure 4: Fuel Preference of Pre-2023 Vehicle Owners if Lower Blends Were Available
Source: LocalCircles (2026) as reported by Business Today (2026b); 10% of responses not reported in the published summary

4.5 International Comparison: Table 3 places India's approach alongside markets with a longer biofuel history. India is distinctive in combining a high blend level with the absence of consumer choice at the pump and without differentiated price signalling.

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Table 3: Comparative Consumer-Choice Architecture for Ethanol Fuels

Country	Choice architecture	Consumer-behaviour evidence	Lesson for India
Brazil	Flex-fuel fleet; pure ethanol and blended gasoline sold side by side	Choice tracks relative price, but a meaningful share chooses on non-price grounds (Salvo & Huse, 2013)	Choice plus price transparency builds durable acceptance
Sweden	E85 promoted through incentives and pump obligations	Demand fell back when ethanol's price advantage narrowed (Pacini & Silveira, 2011)	Infrastructure alone does not sustain demand
United States	E10 standard; higher blends optional and labelled	Lower willingness to pay for high-ethanol blends (Petrolia et al., 2010)	Labelling and optionality reduce perceived risk
India	Near-universal E20; no E0/E10 at most pumps; no price differential	55% of older-vehicle owners would revert if offered (LocalCircles, 2026)	Mandate secures use; acceptance must be built separately

Source: Compiled by the author from cited literature

4.6 The Compliance–Acceptance Framework (CAF): Synthesising the theory and evidence, Figure 5 presents the CAF. Six perception dimensions (F1–F6) shape the motorist's attitude toward ethanol-blended petrol. Under a mandate, attitude does not determine whether the fuel is used; instead it determines which of two states the user occupies: *voluntary acceptance*, in which the consumer endorses the fuel and would choose it freely, or *resigned compliance*, in which the consumer uses it only because no alternative exists. The proportion of consumers in the second state is the compliance–acceptance gap. Vehicle vintage, usage intensity and region or city tier moderate the strength of the relationships.

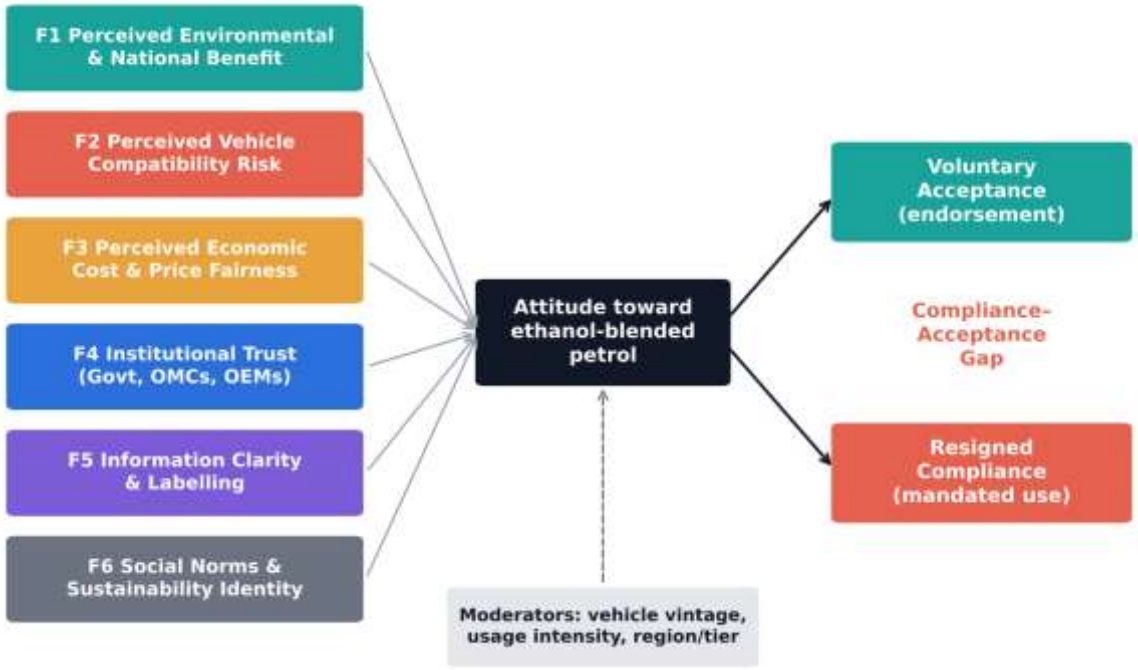


Figure 5: Proposed Compliance–Acceptance Framework (CAF)

Source: Developed by the author

4.7 Proposed Measurement Instrument: Table 4 operationalises the six dimensions as a 28-item instrument for Exploratory Factor Analysis, mirroring the 28-item, six-factor structure validated in the author's companion study (Hrushikesh et al., 2026). Items are measured on a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Two outcome scales, Voluntary Acceptance (3 items) and Resigned Compliance (3 items), are administered separately for subsequent structural modelling.

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Table 4: Proposed Constructs and Measurement Items (28 items, six factors)

Factor	Items (illustrative wording)	Theoretical anchor
F1 Environmental & National Benefit (5)	E20 reduces air pollution in cities; blending reduces India's oil imports; ethanol supports farmers' incomes; using E20 contributes to climate goals; E20 strengthens national energy security	VBN theory (Stern, 2000); Rogers (2003) relative advantage
F2 Vehicle Compatibility Risk (5)	E20 reduces my vehicle's mileage; E20 may damage engine or fuel-line parts; I am unsure whether my vehicle is E20-compatible; manufacturers' warranties may not cover E20 damage; older vehicles are unfairly affected	Perceived risk; Prospect Theory (Kahneman & Tversky, 1979)
F3 Economic Cost & Price Fairness (5)	E20 raises my running cost per km; E20 should be priced lower than conventional petrol; savings from blending should be passed to consumers; maintenance costs have risen since E20; the cost burden is shared fairly	Huijts et al. (2012) distributive fairness
F4 Institutional Trust (5)	I trust the Government's claims about E20; OMCs ensure consistent fuel quality; vehicle manufacturers give honest guidance; official mileage estimates are credible; my concerns would be heard by authorities	Huijts et al. (2012); Hrushikesh et al. (2026)
F5 Information Clarity & Labelling (4)	Pumps clearly display the blend being sold; I know my vehicle's compatible blend; information on E20 is easy to understand; I would like a choice of blend at the pump	TPB perceived behavioural control (Ajzen, 1991)
F6 Social Norms & Sustainability Identity (4)	People important to me support cleaner fuels; my mechanic's opinion influences my view of E20; online owner groups shape my view of E20; I see myself as an environmentally responsible consumer	TPB subjective norms; Sastry (2026)

Note: Retain items with loadings ≥ 0.70; review cross-loadings ≥ 0.40; KMO ≥ 0.70 and significant Bartlett's test required (Hair et al., 2019)

4.8 Research Propositions: Table 5 states six propositions for empirical testing.

Table 5: Research Propositions Derived from the CAF

No.	Proposition	Suggested test
P1	Under a universal fuel mandate, consumer attitude predicts the split between voluntary acceptance and resigned compliance rather than usage itself.	Multinomial / SEM on acceptance-state outcome
P2	Perceived vehicle-compatibility risk (F2) has a stronger negative effect on acceptance than perceived environmental and national benefit (F1) has a positive effect, consistent with loss aversion.	Comparison of standardised path coefficients
P3	Vehicle vintage moderates P2: the risk effect is strongest for owners of pre-2023 vehicles and weakest for owners of E20-calibrated vehicles.	Multi-group SEM by vehicle vintage
P4	Institutional trust (F4) and information clarity (F5) attenuate the effect of perceived cost (F3) on resigned compliance.	Moderation / interaction analysis
P5	Offering visible choice at the pump (E10 alongside E20) increases voluntary acceptance of E20 among compatible-vehicle owners, even if few switch away.	Choice experiment / pre–post field study
P6	Social influence (F6) through mechanics and online owner communities amplifies perceived mileage loss beyond measured loss.	Perceived vs logged fuel-economy comparison

Source: Developed by the author

5. DISCUSSION

The evidence assembled here points to a policy that has succeeded on its own terms while leaving its end-users largely unpersuaded. Four insights follow.

First, a mandate converts an acceptance problem into a trust problem. Where consumers cannot choose, dissatisfaction cannot be expressed through demand and is expressed instead through complaint, litigation and loss of confidence in official estimates. The persistence of the issue after the Supreme Court's dismissal of the 2025 PIL, and the Government's subsequent exploration of an E10 option, illustrate how unresolved perception problems return to the policy agenda.

Second, the perception gap is itself a policy variable. The difference between the 1–7% engineering estimate and the more-than-10% loss perceived by two-thirds of older-vehicle owners will not be closed by repeating the official figure. Independent, vehicle-specific testing, published in accessible form, and a simple compatibility look-up by registration number would give consumers a reference point that they currently lack.

Third, choice architecture matters more than choice volume. International experience suggests that the availability of an alternative, even one that few people use, can raise acceptance of the default by restoring perceived behavioural control. Clear pump labelling, a differentiated E10 grade for older vehicles where logistics allow, and price signalling that reflects ethanol's lower energy content would align the programme with established consumer-protection norms and with the experience of Brazil and the United States.

Fourth, the next phase depends on today's acceptance. The Government has begun considering blends beyond E20, while the Chief Economic Adviser has flagged food, land and water implications of moving to E27 or E30 (DriveSpark, 2026). Every further step will face a consumer base whose expectations were shaped by the E20 experience. Building acceptance now through compensation or warranty clarity for older vehicles, transparent communication and accessible grievance channels is therefore an investment in the feasibility of future policy.

6. CONCLUSION, LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

India's ethanol blending programme is a notable supply-side achievement, but this study shows that supply-side success does not settle the question of consumer acceptance. By distinguishing compliance from acceptance, the Compliance–Acceptance Framework offers a lens through which policymakers, OMCs and vehicle manufacturers can measure what the blending percentage cannot: whether motorists regard ethanol-blended petrol as a fuel they would choose. The secondary evidence suggests that, among owners of older vehicles, a majority currently would not, and that a substantial further segment is undecided and open to persuasion.

The study has limitations. It relies on secondary data, and the consumer surveys analysed are online, self-reported and weighted toward urban, digitally active vehicle owners; their percentages describe perceptions, not measured engine outcomes. Separate survey waves are compared, so indicators should not be summed across sources. The propositions and instrument have not yet been empirically validated, which defines the agenda set out below.

6.1 Scope for Future Research

The Compliance–Acceptance Framework opens a multi-stage research agenda. Figure 6 arranges it as a roadmap, and Table 6 links each research stream to the propositions it tests, the method it requires and the stakeholder who would benefit. Three directions deserve particular emphasis.

Measuring the gap directly. The most immediate need is primary validation of the 28-item instrument across metropolitan, Tier-II and Tier-III cities, followed by Confirmatory Factor Analysis and structural modelling. Pairing survey responses with logged fuel-economy data from the same vehicles would, for the first time, separate the engineering component of the mileage complaint from its perceptual and social components (P6).

Testing interventions, not only attitudes. Field experiments on pump labelling, message framing (national benefit versus personal benefit) and compatibility look-up tools can show which levers convert resigned compliance into acceptance. Discrete-choice experiments can estimate how much consumers value the mere availability of choice at the pump (P5), a quantity central to the current E10 policy debate.

Preparing for the next transition. As India considers blends beyond E20 and promotes flex-fuel vehicles, longitudinal panels can track whether acceptance rises naturally as the fleet turns over, or whether the E20 experience leaves a lasting trust deficit. Cross-country comparison with Brazil, the United States and the European Union, and extension of the framework to electric-vehicle and green-hydrogen adoption, would test whether the compliance–acceptance distinction generalises across mandated sustainability transitions. Interdisciplinary work linking consumer acceptance to food, land and water trade-offs of ethanol feedstock would place the consumer within the wider sustainability ledger.

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Figure 6: Future Research Roadmap for Consumer Acceptance of Ethanol-Blended Fuels
Source: Developed by the author

Table 6: Future Research Scope: Streams, Methods and Beneficiaries

Research stream	Key question	Method	Links to	Primary beneficiary
Scale validation	Does the six-factor CAF structure hold across city tiers?	EFA, CFA, reliability and validity tests	All	Researchers
Perception gap	How much of reported mileage loss is measured vs perceived?	Paired survey + fuel-log data	P2, P6	MoPNG, OEMs
Choice architecture	Does pump choice and labelling raise E20 acceptance?	Field / discrete-choice experiments	P5	OMCs, regulators
Trust and communication	Which messages repair institutional trust?	Randomised message-framing trials	P4	Government, OMCs
Segment heterogeneity	Who is most affected: by vintage, tier, two- vs four-wheeler?	Multi-group SEM	P3	Policy designers
Beyond E20	Will consumers accept E27/E30 and flex-fuel vehicles?	Longitudinal panel	P1	NITI Aayog, OEMs
Cross-transition	Does the compliance–acceptance gap apply to EVs and green hydrogen?	Comparative, cross-country studies	P1, P4	Academia, policy

Source: Developed by the author

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