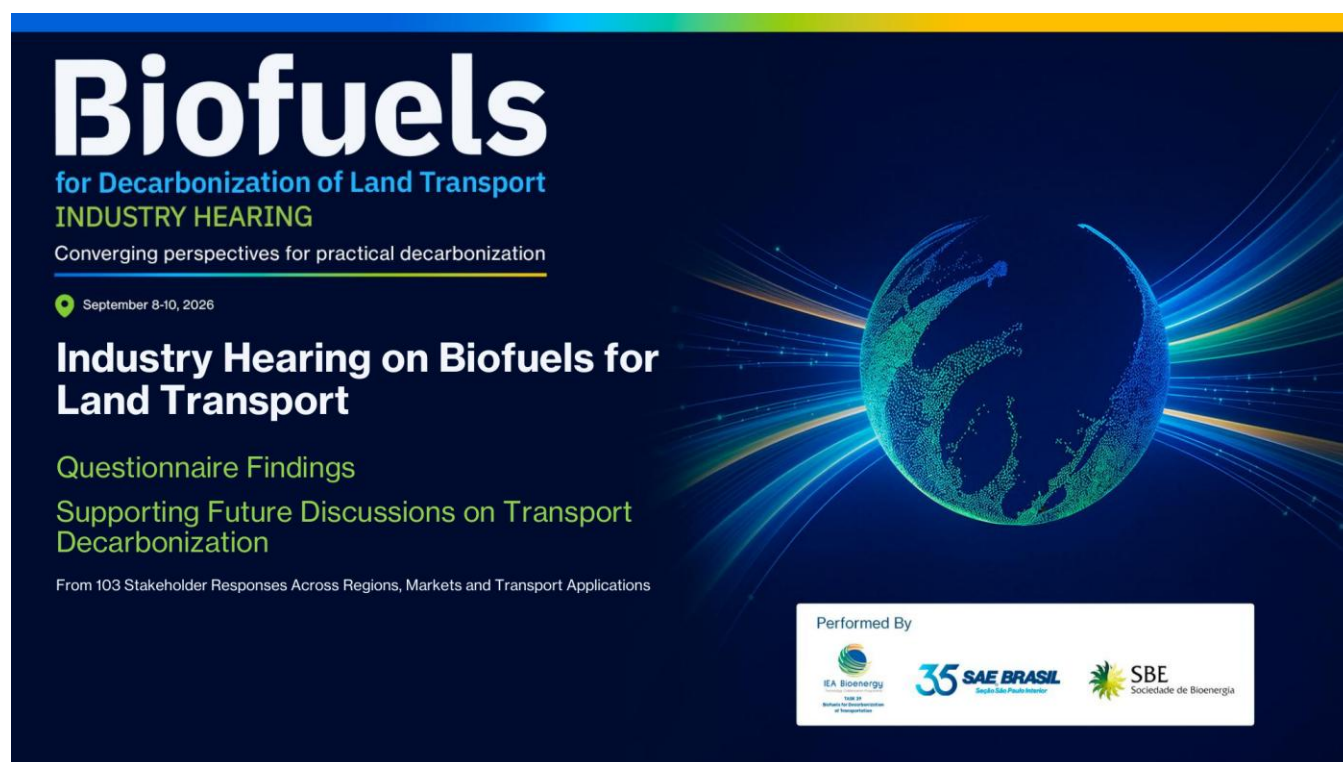




ANALYTICAL REPORT

Questionnaire Findings Supporting Future Discussions on Transport Decarbonization

Based on 103 stakeholder responses across regions, markets and transport applications

Prepared as a consolidated analytical report for IEA Bioenergy Task 39, SAE BRASIL and SBE discussions

Final consolidated document

Executive Summary

The decarbonization of land transport remains one of the most complex challenges in the global energy transition. Unlike aviation and maritime sectors, land transport continues to be characterized by diverse regional realities, multiple technology pathways and different approaches to deployment. Within this context, the Industry Hearing on Biofuels for Land Transport was organized by IEA Bioenergy Task 39, SAE BRASIL and SBE to identify areas of convergence and divergence regarding the role of sustainable biofuels in future transport decarbonization strategies.

This report analyzes 103 completed responses collected through an international consultation involving experts, industry representatives, researchers and policy stakeholders. The questionnaire combined structured questions with open-comment fields and was designed to capture technical, operational, regulatory and strategic perspectives rather than produce a statistically representative market forecast. The findings therefore constitute structured stakeholder evidence intended to support discussion and analysis.

The results indicate broad recognition that sustainable biofuels can contribute meaningfully to transport decarbonization. Ethanol, biodiesel, renewable diesel/HVO and biomethane were all perceived by significant shares of respondents as technically ready for deployment. However, perceptions of readiness vary markedly across regions and contexts, reinforcing the view that no single pathway can be universally applied across all transport segments and geographies. Respondents generally favor a diversified portfolio rather than a single-solution hierarchy.

Most respondents position biofuels as complementary to electrification, while a substantial minority identify a primary role for biofuels in existing vehicle fleets. The findings suggest that future decarbonization strategies will depend on combinations of technologies adapted to local conditions, infrastructure availability, fleet characteristics and energy-system realities. Electrification and biofuels are therefore widely viewed as complementary pathways rather than competing alternatives.

The consultation also reveals that the principal challenges are increasingly associated with deployment rather than technology readiness alone. Fuel quality, durability validation, availability, distribution infrastructure, production scale, certification requirements and long-term demand signals emerge as factors influencing the feasibility and extent of market deployment. Regulatory clarity, robust emissions accounting, aligned standards, OEM participation and practical implementation frameworks are consistently identified by respondents as important conditions affecting deployment.

From a policy perspective, respondents favor instruments capable of creating predictable demand and improving investment confidence. Mandates, blending mandates and tax incentives emerge as the most widely supported mechanisms, while carbon-intensity standards, credit-trading systems and public procurement schemes provide complementary approaches. Beyond greenhouse-gas mitigation, respondents highlight energy security, rural development, job creation, air-quality improvement and existing-infrastructure utilization as important policy co-benefits.

The consultation demonstrates strong support for lifecycle-based emissions accounting. Most respondents favor well-to-wheel (WTW) or lifecycle approaches over exclusive reliance on tailpipe emissions. Governance, trust and methodological alignment emerge as key prerequisites for certification recognition and international comparability, suggesting that technical standards and institutional arrangements must evolve together.

Across the consultation, stakeholders repeatedly converge on a common set of enabling principles: technology neutrality, lifecycle accountability, policy stability, infrastructure readiness, existing-fleet utilization and practical deployment experience. Differences remain regarding specific technology pathways, market mechanisms, policy instruments and implementation strategies, but broad agreement exists regarding conditions that respondents associate with the feasibility, credibility and scale of decarbonization efforts. These findings provide a structured evidence base for future Task 39 discussions, development of the White Paper and international dialogue leading toward COP31.

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Executive Orientation

This report provides a comprehensive analytical assessment of the Industry Hearing questionnaire findings. It consolidates the respondent evidence, methodological considerations, regional comparisons, conceptual frameworks and strategic insights, transforming the collected responses into a structured technical document to support future discussions on transport decarbonization.

The report is organized around the principal themes emerging from the questionnaire findings, including respondent profile, technology readiness, deployment constraints, near-term deployment perspectives, policy priorities, standards, MRV frameworks, and the synthesis of shared views and differing perspectives. The analysis is intended to capture and interpret stakeholder perspectives, providing insights into current opportunities and challenges for transport decarbonization rather than a statistically representative forecast of global market developments.

Analytical block	Main purpose	Chapters
Foundation	Explain the origin, purpose and analytical approach.	1–2
Evidence base	Characterize respondents, regions, market maturity and assessment boundaries.	3
Deployment assessment	Assess readiness, barriers, risk-reduction models and practical conditions affecting deployment.	4–6
Policy and governance	Connect biofuels to NDCs, public policy, lifecycle accounting, standards, MRV and certification.	7–8
Synthesis	Identify shared views, differing perspectives and implications for future work.	9–10

1. Introduction

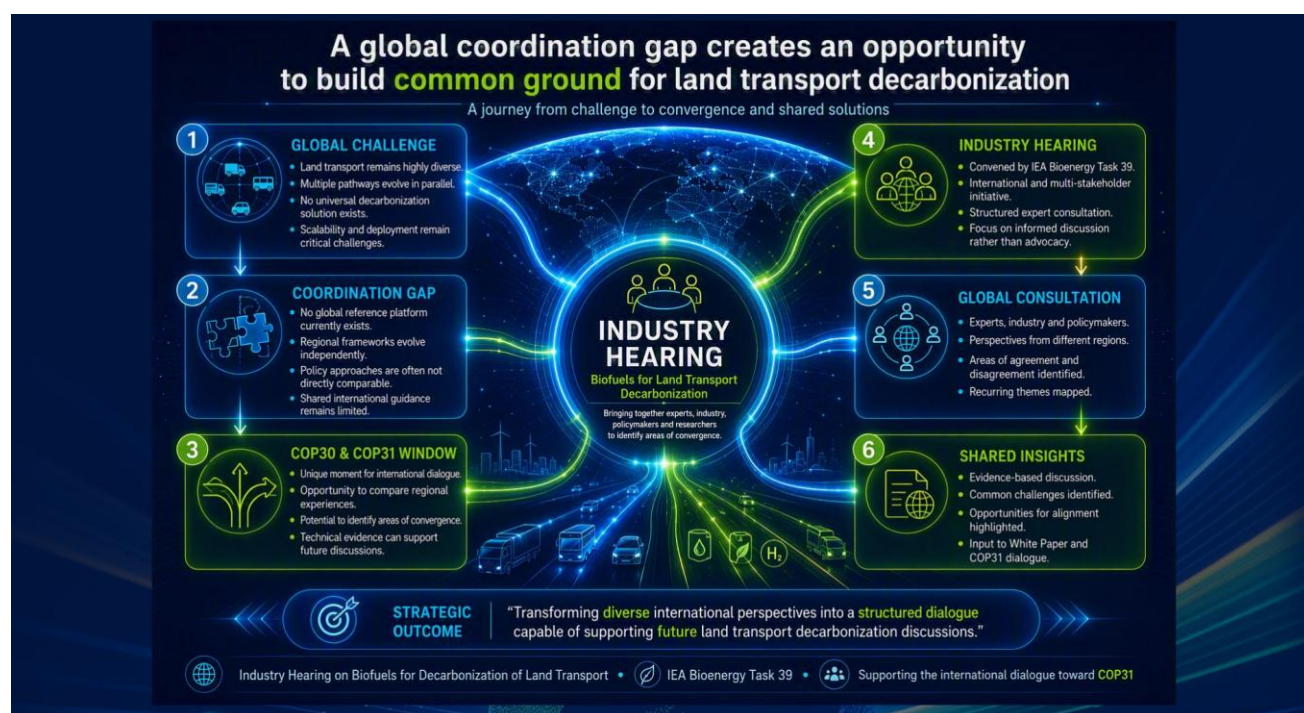
1.1 Origin and Purpose of the Industry Hearing

Land transport decarbonization is a global systems challenge. It involves established vehicle fleets, extensive fuel and charging infrastructure, integrated supply chains, different levels of market maturity and multiple technology pathways progressing simultaneously. As a result, reducing greenhouse-gas emissions from transport increasingly requires consideration not only of technology performance, but also of scalability, economic viability, energy security, infrastructure readiness, resource availability and speed of deployment.

Unlike aviation and maritime transport, land transport currently lacks a broadly recognized international coordination platform capable of comparing regional experiences, identifying common ground and supporting structured discussions across different decarbonization pathways. Policy frameworks, technology priorities and deployment strategies often evolve independently, reflecting legitimate regional circumstances but not always generating directly comparable perspectives or internationally shared reference points.

The Industry Hearing on Biofuels for Land Transport emerged from this recognition. The initiative was conceived as a structured international consultation designed to bring together experts, industry representatives, researchers, policymakers and international organizations to better understand how different stakeholders perceive the opportunities, challenges and priorities associated with transport decarbonization.

Figure 1. From the global coordination gap to a structured Industry Hearing and shared insights.



The framework presented in Figure 1 illustrates the rationale behind the Industry Hearing. The process begins with the global decarbonization challenge, acknowledges the existing coordination gap in land transport, recognizes the strategic opportunity represented by the COP30–COP31 period, and culminates in a structured international consultation intended to transform diverse perspectives into shared evidence and actionable insights.

The COP30–COP31 period provides a particularly relevant window for evaluating regional experiences, identifying transferable lessons and exploring areas of convergence among different mitigation strategies. In this context, evidence-based technical discussion becomes increasingly important to support future dialogue on transport decarbonization, sustainable development, energy security and transport-system resilience.

Within this effort, IEA Bioenergy Task 39 acted as both technical facilitator and international convener. The objective was not to advocate for a specific technology pathway, but rather to create the conditions necessary for different perspectives to be gathered, compared and analyzed in a transparent and structured manner.

The findings presented in this report should therefore be interpreted as a structured snapshot of the current international discussion surrounding the role of biofuels in land transport decarbonization. More than a compilation of individual responses, the consultation reveals broader patterns of perception, areas of convergence, areas of disagreement and topics requiring further technical, scientific and policy development.

1.2 Purpose of this Report

This report provides a stand-alone analysis of the Industry Hearing questionnaire findings. Its purpose is to document the respondent base, explain the analytical boundaries, interpret technology-readiness perceptions, map deployment barriers, identify near-term scale-up pathways, examine policy and governance priorities, and consolidate shared views and differing perspectives.

The report does not treat the questionnaire as a universal vote on technology. It treats the findings as structured evidence derived from stakeholder perspectives. Percentages describe the valid response base for each question, and results from multiple-selection questions may sum to more than 100 percent.

The analysis does not presume that increased biofuel deployment is appropriate in every market or transport segment; rather, it examines stakeholder views regarding where different pathways may contribute, the conditions affecting their deployment, and the circumstances in which alternative decarbonization options may be more appropriate.

1.3 Central Analytical Proposition

The questionnaire findings indicate a transition in the debate: several biofuel pathways are perceived by respondents as technically ready, while the decisive questions increasingly concern deployment confidence, market access, fuel quality, regulatory clarity, infrastructure, lifecycle accountability and institutional credibility. This report develops that proposition across the following chapters.

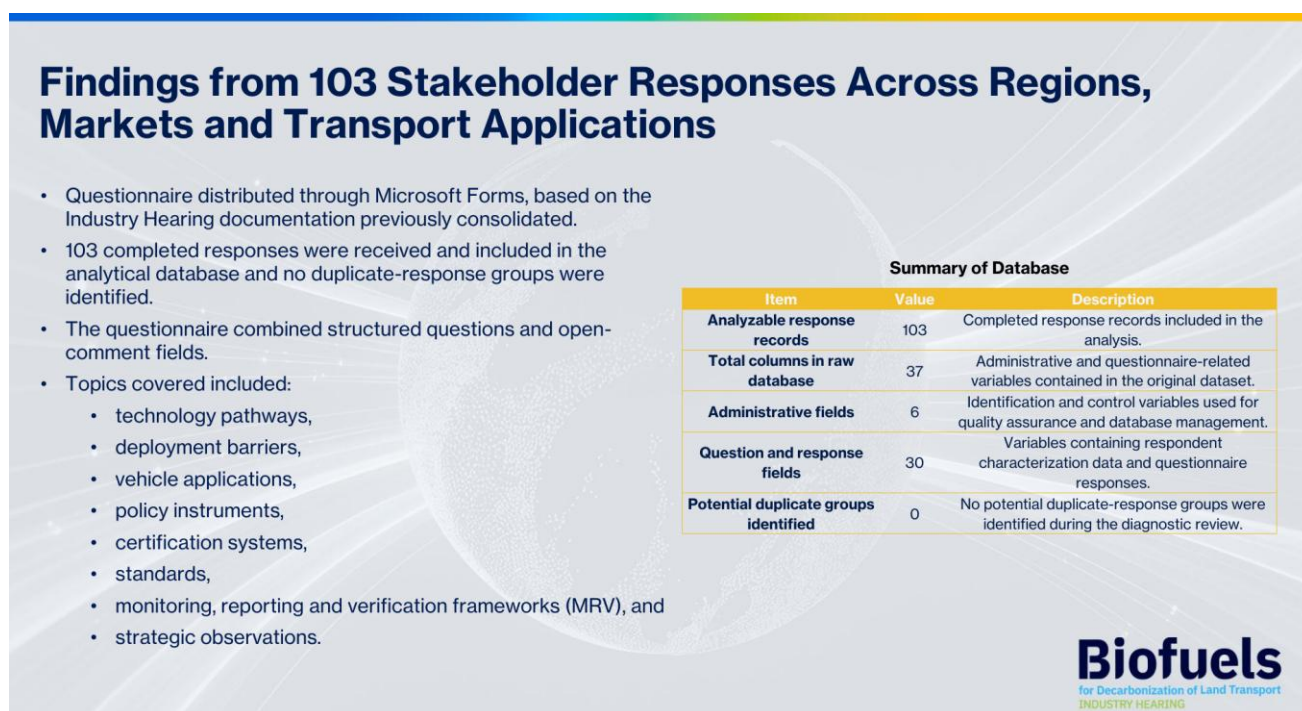
2. Consultation Framework and Analytical Approach

2.1 Questionnaire Structure and Response Base

KEY FINDINGS

- 103 completed responses were included in the analytical database.
- No duplicate-response groups were identified in the diagnostic review.
- The questionnaire combined structured questions with open-comment fields.
- The database covered technology, deployment, vehicle, policy, certification, standards, MRV and strategic topics.

Figure 2. Consultation scope and summary of the analytical database.



The final database contained 37 columns: six administrative fields and 30 question-and-response fields, together with the response records used for analysis. The administrative fields supported identification, control and quality assurance, while the substantive fields supported respondent characterization and thematic analysis.

The questionnaire combined structured questions and open-comment fields, allowing respondents to provide both quantitative assessments and qualitative observations regarding transport decarbonization pathways. The survey was intentionally designed to capture perspectives extending beyond individual technologies, incorporating technical, operational, regulatory and strategic dimensions relevant to future discussions on sustainable transport fuels.

2.2 Interpretation Rules

Results are reported against the valid N displayed for each question. Questions answered by all completed respondents use N=103; other topics use smaller valid bases where respondents did not provide an answer or where the question applied to a subset. Multiple-selection questions are interpreted by the share of valid respondents selecting each option and therefore are not additive distributions.

The survey was intentionally designed to move beyond a simple opinion poll. By combining structured responses and open-ended questions, the consultation sought to capture not only stakeholder preferences but also the reasoning, practical experience and strategic considerations supporting those perspectives.

Regional cross-tabulations focus on the European Union and Brazil, the two regional groups with sufficient response bases for individual comparison in this report. Smaller regional groups remain visible in the overall geographic profile but are not used as stand-alone comparative groups in the principal regional matrices.

As a result, the consultation generated both quantitative indicators and qualitative observations that contribute to a broader understanding of current discussions surrounding sustainable transport fuels. The findings should therefore be interpreted as structured stakeholder evidence intended to support analysis and discussion rather than as statistically representative forecasts or prescriptive recommendations.

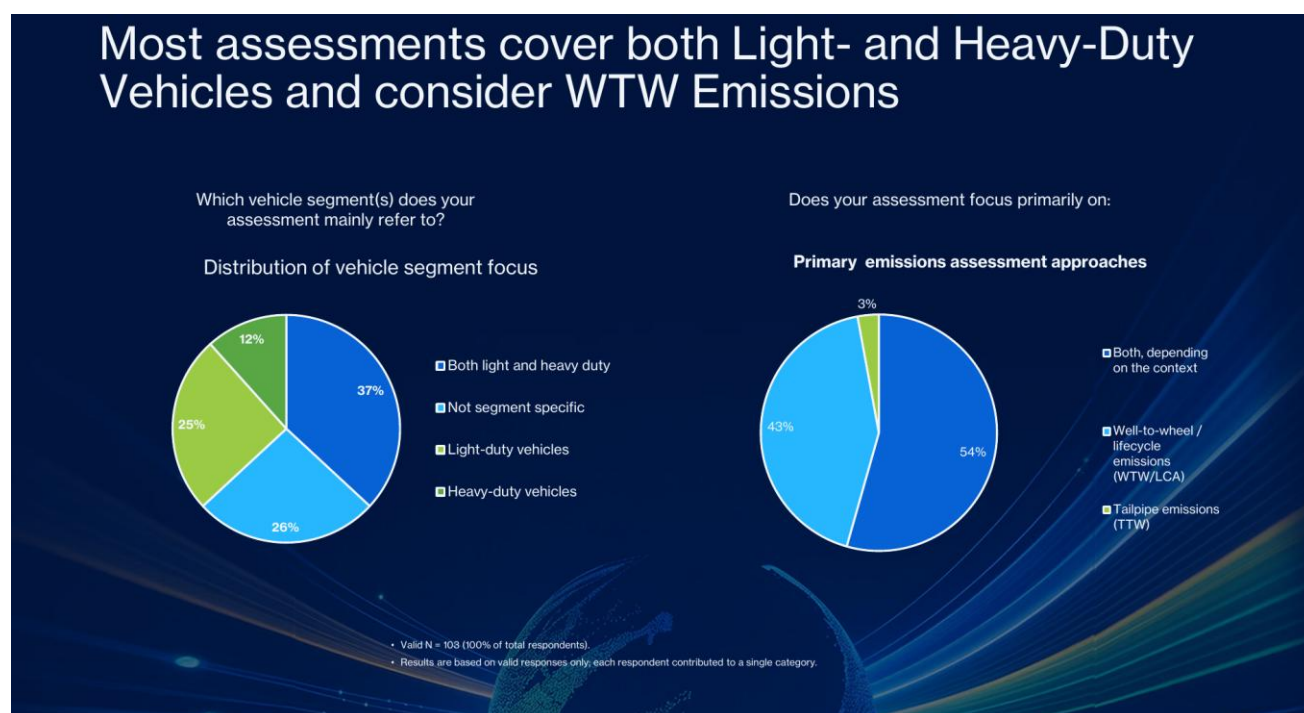
3. Respondent Profile and Assessment Context

3.1 Vehicle Segments and Emissions Boundaries

KEY FINDINGS

- 37% of respondents considered both light- and heavy-duty vehicles.
- 26% were not segment specific, 25% focused on light-duty vehicles and 12% on heavy-duty vehicles.
- 54% used a context-dependent emissions boundary and 43% reported WTW/LCA as the primary approach.
- TTW-only assessment represented 3% of responses.

Figure 3. Vehicle-segment focus and primary emissions assessment approaches.



The response base is predominantly system oriented. Nearly two thirds of respondents either considered both light- and heavy-duty vehicles or did not limit the assessment to a particular segment. This broad scope supports a cross-application interpretation of biofuel readiness and deployment conditions, while the smaller dedicated light- and heavy-duty groups retain segment-specific perspectives.

Emissions assessment follows a similarly broad pattern. Most respondents either adapt the boundary to the context or use WTW/LCA as the principal basis. The small TTW-only share indicates that direct vehicle emissions are generally viewed within a wider fuel-production and supply-chain context.

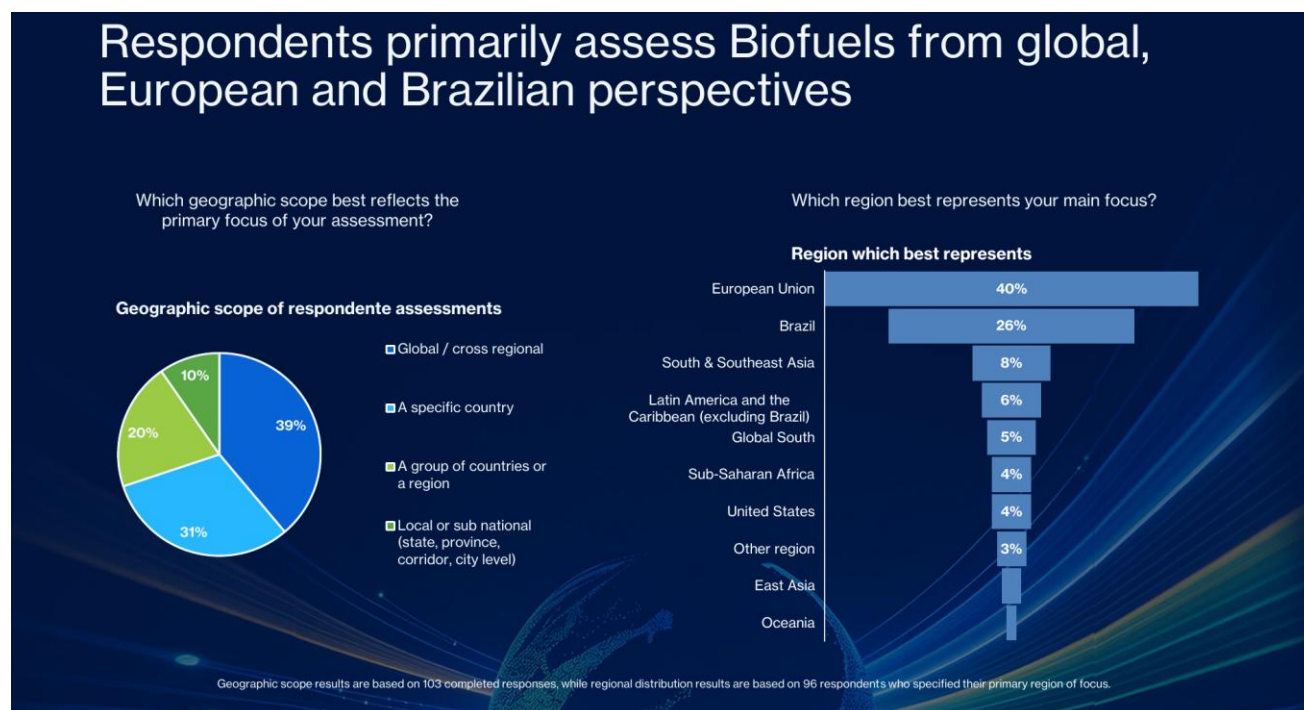
3.2 Geographic Scope and Regional Focus

KEY FINDINGS

- 39% of assessments were global or cross-regional.
- 31% focused on a specific country and 20% on a group of countries or a region.

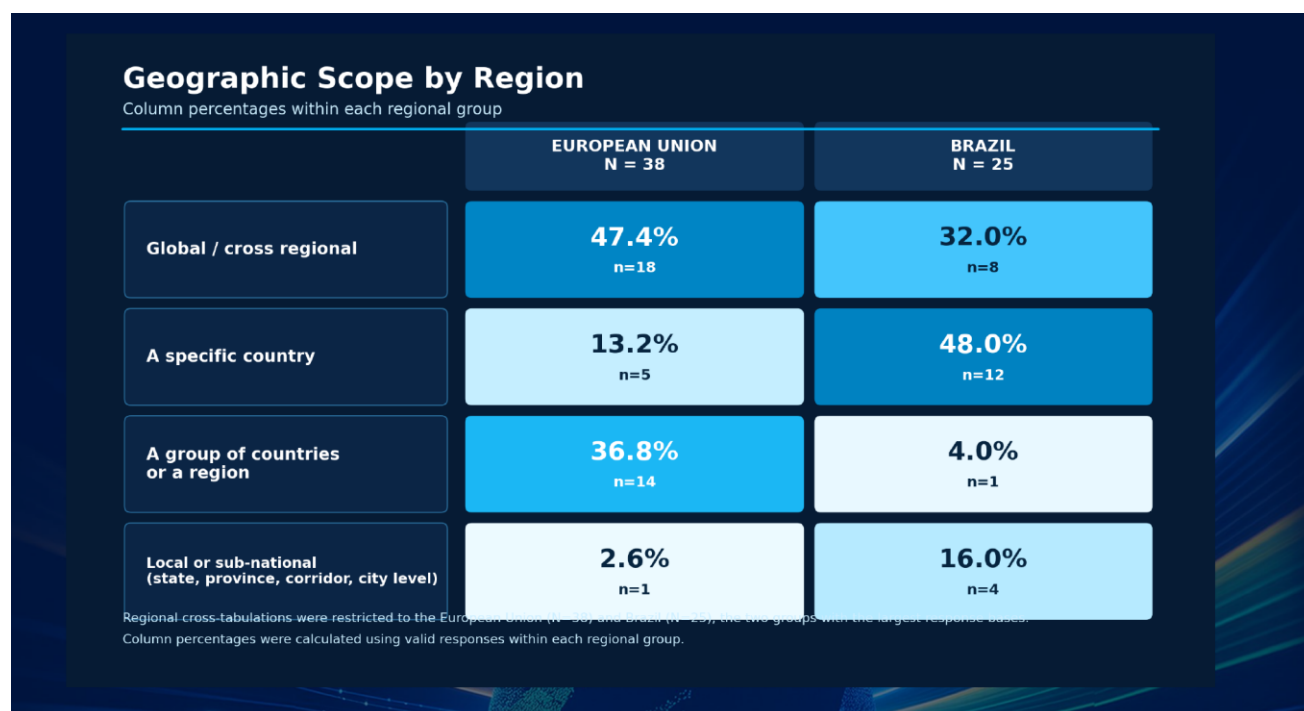
- The European Union and Brazil were the largest specified regional groups.
- Regional interpretation must reflect differences in market maturity, policy and infrastructure.

Figure 4. Geographic scope and principal regional focus of respondents.



The consultation combines global, national, regional and subnational viewpoints. This diversity broadens the evidence base and reflects the variety of contexts in which transport decarbonization is being assessed. Although multiple regions are represented, the respondent profile is predominantly shaped by perspectives associated with the European Union and Brazil, which constitute the largest regional response groups and provide the primary basis for the comparative analyses presented in this report.

Figure 5. Geographic scope within the European Union and Brazilian respondent groups.



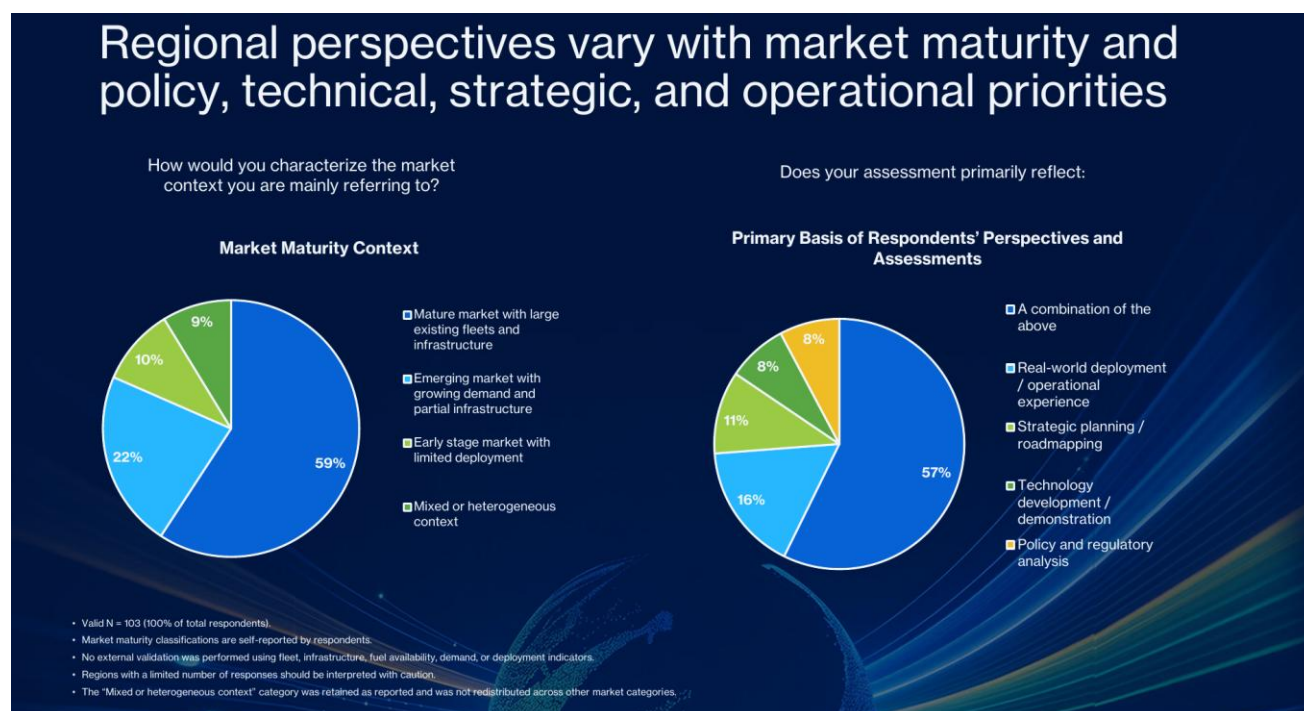
The regional matrix shows distinct assessment frames. European Union respondents more frequently adopted global or cross-regional perspectives and regional-group perspectives, while Brazilian respondents more frequently focused on a specific country. The comparison indicates different vantage points rather than different decarbonization objectives.

3.3 Market Maturity and Basis of Assessment

KEY FINDINGS

- 59% referred to mature markets with large fleets and established infrastructure.
- 22% referred to emerging markets with growing demand and partial infrastructure.
- 57% combined operational, strategic, technical and policy perspectives.
- Market maturity was self-reported and was not externally validated.

Figure 6. Market-maturity context and primary basis of respondents' assessments.



Most respondents characterized the markets they assessed as mature, although this overall result reflects marked regional differences. Mature-market assessments were predominant among respondents focused on the European Union, whereas Brazilian responses were distributed more broadly across mature, emerging, early-stage and heterogeneous contexts. Emerging-market assessments represented a substantially larger share of the Brazilian response group, reflecting perceptions of growing demand combined with partial infrastructure development. Early-stage responses referred to contexts with limited deployment, while the mixed or heterogeneous category captured the coexistence of different market conditions rather than a distinct level of maturity. As these classifications were self-reported, they should be interpreted as respondents' contextual assessments and were not externally validated against fleet, infrastructure, fuel availability, demand or deployment indicators.

The respondent base is also multidisciplinary. Most assessments combined several forms of experience, with additional contributions grounded in real-world deployment, strategic planning, technology development and policy analysis. This breadth strengthens the contextual value of the evidence while reinforcing the need to interpret the results as stakeholder perspectives rather than standardized technical evaluations.

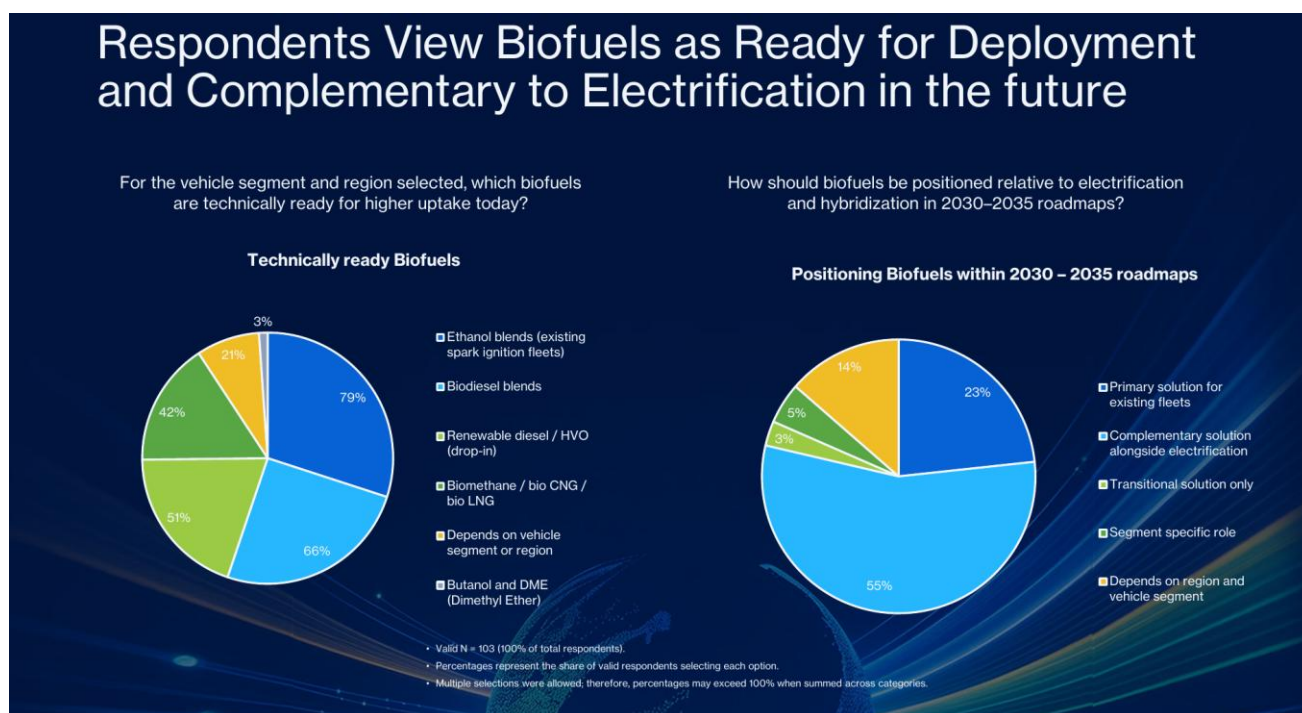
4. Technology Readiness and Deployment Challenges

4.1 Biofuel Pathways Perceived as Ready Today

KEY FINDINGS

- Ethanol blends were selected by 79% of valid respondents.
- Biodiesel blends were selected by 66%, renewable diesel/HVO by 51% and biomethane pathways by 42%.
- 55% positioned biofuels as complementary to electrification in 2030–2035 roadmaps.
- 23% positioned biofuels as the primary solution for existing fleets.

Figure 7. Perceived technical readiness and positioning of biofuels in 2030–2035 roadmaps.

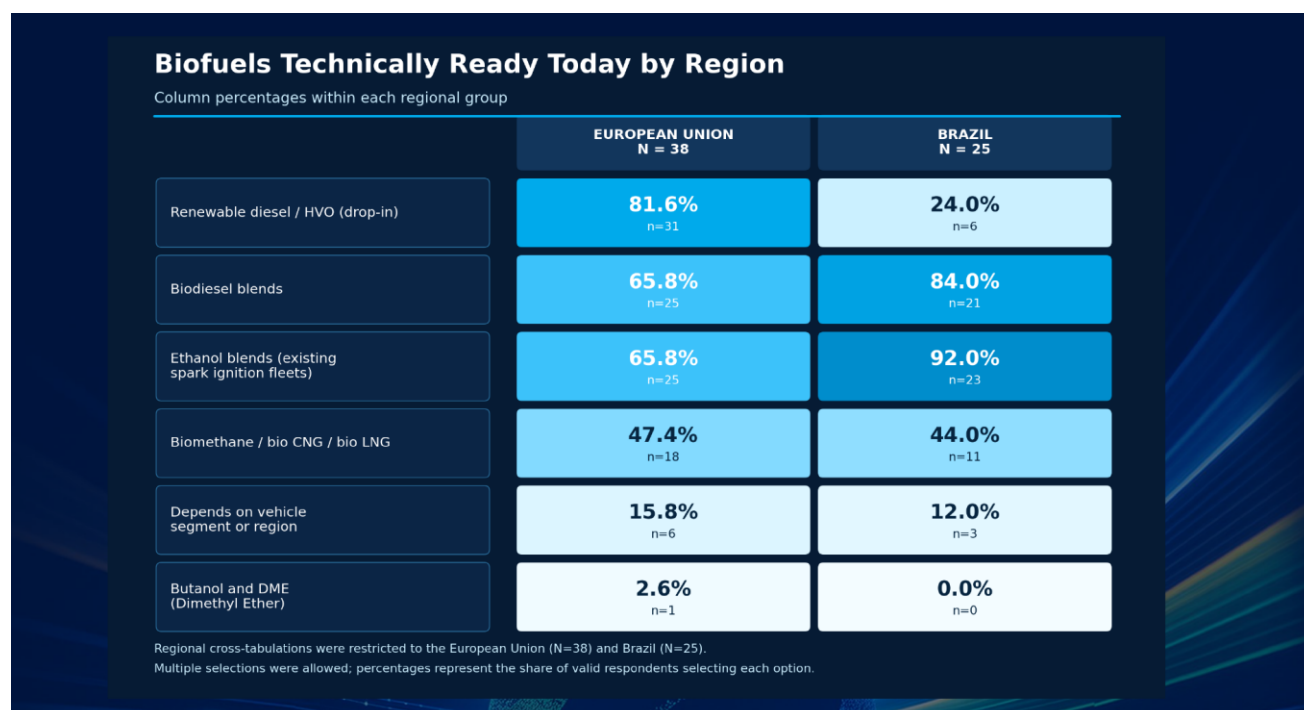


The results indicate that several biofuel pathways are perceived by respondents as technically ready for deployment. Ethanol and biodiesel lead the responses, followed by renewable diesel/HVO and biomethane. The findings support a diversified portfolio rather than a single-fuel hierarchy applicable to every market or vehicle segment.

Roadmap positioning is similarly plural. A majority sees biofuels as complementary to electrification, while almost one quarter identifies a primary role in existing fleets. Smaller shares describe a transitional or segment-specific role, or condition the answer on region and vehicle segment.

4.2 Regional Variation in Readiness

Figure 8. Biofuel pathways perceived as technically ready in the European Union and Brazil.



The regional comparison reveals material differences in route familiarity and perceived readiness. Renewable diesel/HVO was selected by 81.6% of European Union respondents and 24.0% of Brazilian respondents. Ethanol blends were selected by 65.8% in the European Union and 92.0% in Brazil, while biodiesel blends were selected by 65.8% and 84.0%, respectively. Biomethane responses were closer, at 47.4% and 44.0%.

These differences are consistent with the consultation's central premise that readiness is context dependent. The matrix does not establish technical superiority; it documents how regional market experience, policy frameworks and fuel availability shape stakeholder perceptions. The findings also suggest that perceptions of readiness are influenced by the different market conditions represented in each regional group, reinforcing the importance of evaluating deployment pathways within their specific economic, regulatory and infrastructure contexts.

4.3 Readiness by Market Context

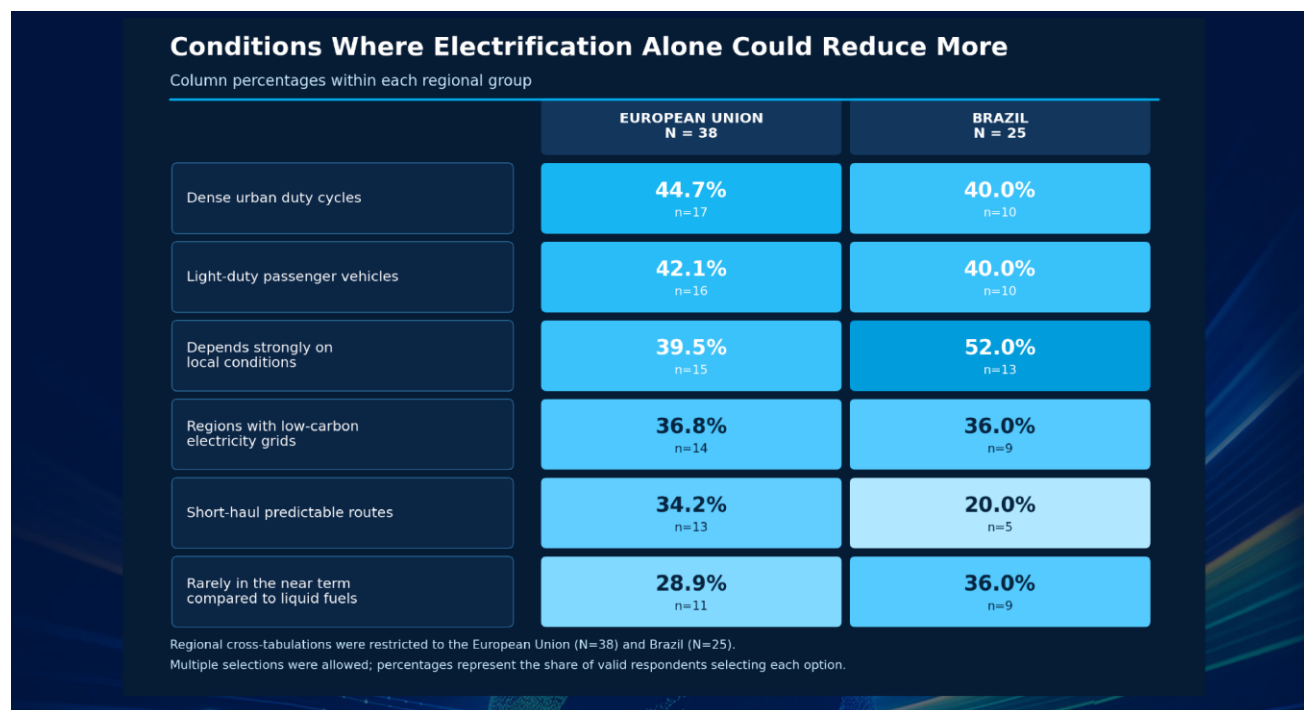
Figure 9. Biofuel pathways perceived as technically ready by market-maturity context.



Across market contexts, ethanol and biodiesel remain broadly represented, but the relative position of renewable diesel/HVO, biomethane and context-dependent answers changes. The matrix shows that the portfolio of pathways perceived as ready varies across market contexts and reinforces the importance of avoiding universal deployment prescriptions.

4.4 Conditions Favoring Electrification

Figure 10. Conditions in which electrification alone may provide greater near-term reduction.



Respondents associated stronger electrification potential with specific operating conditions: dense urban duty cycles, light-duty passenger vehicles, depot strategies in local conditions, low-carbon electricity grids, predictable short-haul routes and selected heavy- or rural-transport conditions. The regional comparison shows broad similarity on several options and divergence on others.

The finding supports differentiated pathway selection. Electrification and biofuels are interpreted as complementary tools whose relative contribution depends on duty cycle, grid characteristics, infrastructure, fleet turnover and regional deployment conditions.

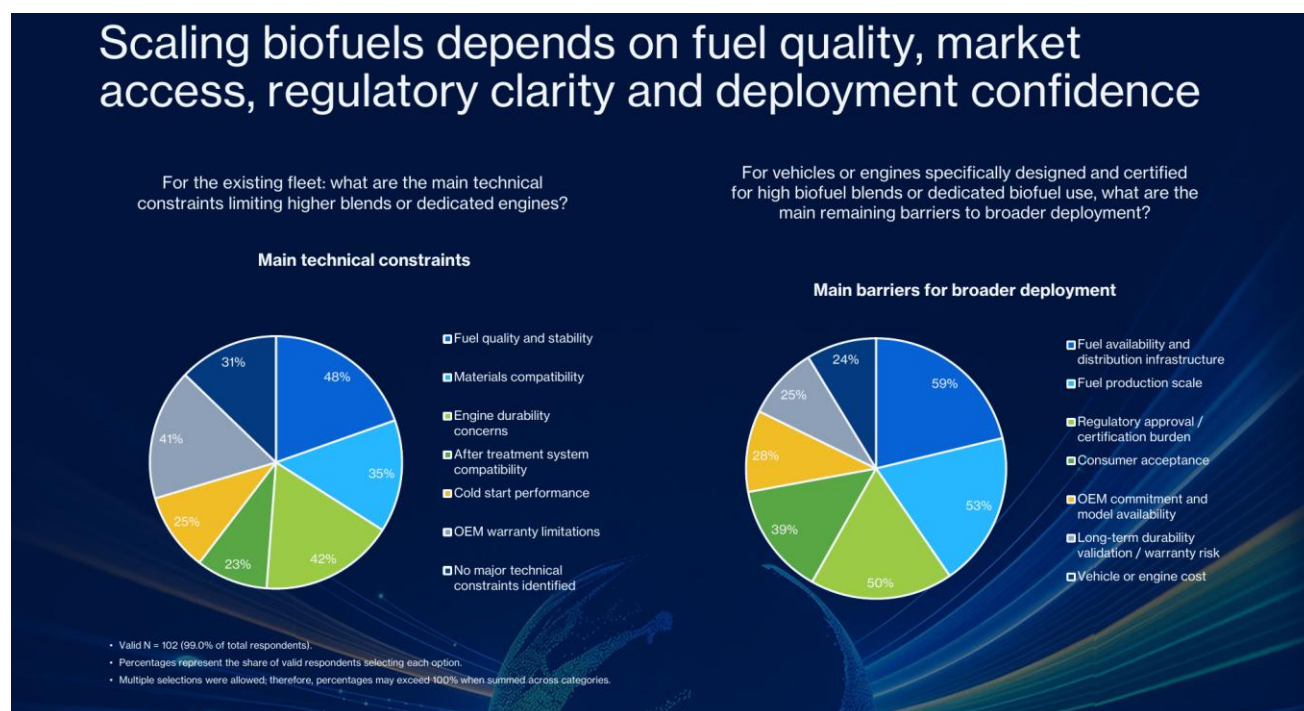
5. Stakeholder-Identified Deployment Constraints

5.1 Technical Constraints and Broader Deployment Barriers

KEY FINDINGS

- Fuel quality and stability was the most selected technical constraint, at 48%.
- Engine durability and OEM warranty limitations were selected by approximately 42% and 41%.
- Fuel availability and distribution infrastructure led broader deployment barriers at 59%.
- Production scale and regulatory approval or certification followed at 53% and 50%.

Figure 11. Technical constraints in existing fleets and barriers to broader deployment.



Technical confidence in existing fleets is shaped by fuel quality, durability, warranty, materials compatibility, cold-start behavior and aftertreatment compatibility. At the same time, 31% identified no major technical constraints, showing that stakeholder experience and application context remain heterogeneous.

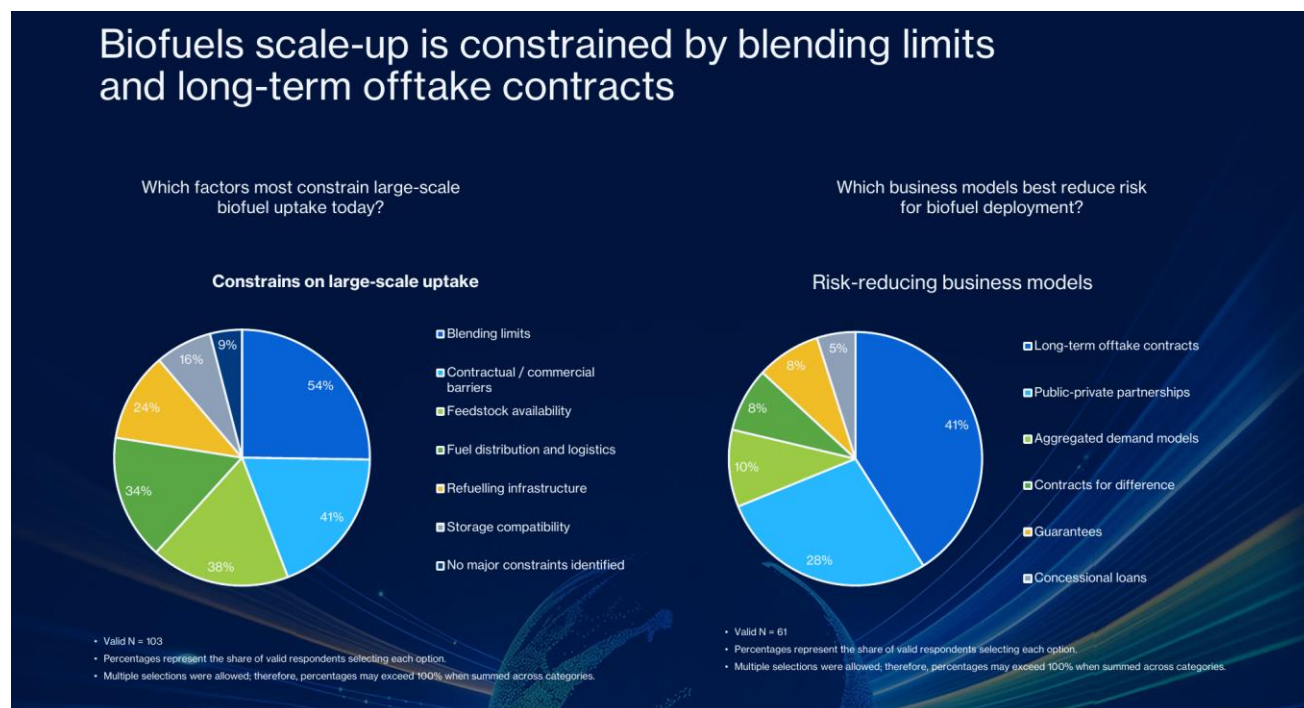
For vehicles or engines designed and certified for higher biofuel use, the leading barriers are increasingly external to the powertrain. Fuel availability, distribution, production scale and regulatory or certification requirements form the principal deployment cluster, with consumer acceptance, OEM commitment, durability validation and vehicle cost also contributing.

5.2 Perceptions of Large-Scale Deployment Conditions and Risk-Reduction Models

KEY FINDINGS

- Blending limits were selected by 54% as a constraint on large-scale uptake.
- Contractual and commercial barriers were selected by 41%.
- Feedstock availability and distribution logistics were selected by 38% and 34%.
- Long-term offtake contracts led the risk-reduction models, at 41% of the valid N=61 base.

Figure 12. Constraints identified by respondents for large-scale deployment and business models that may reduce deployment risk.

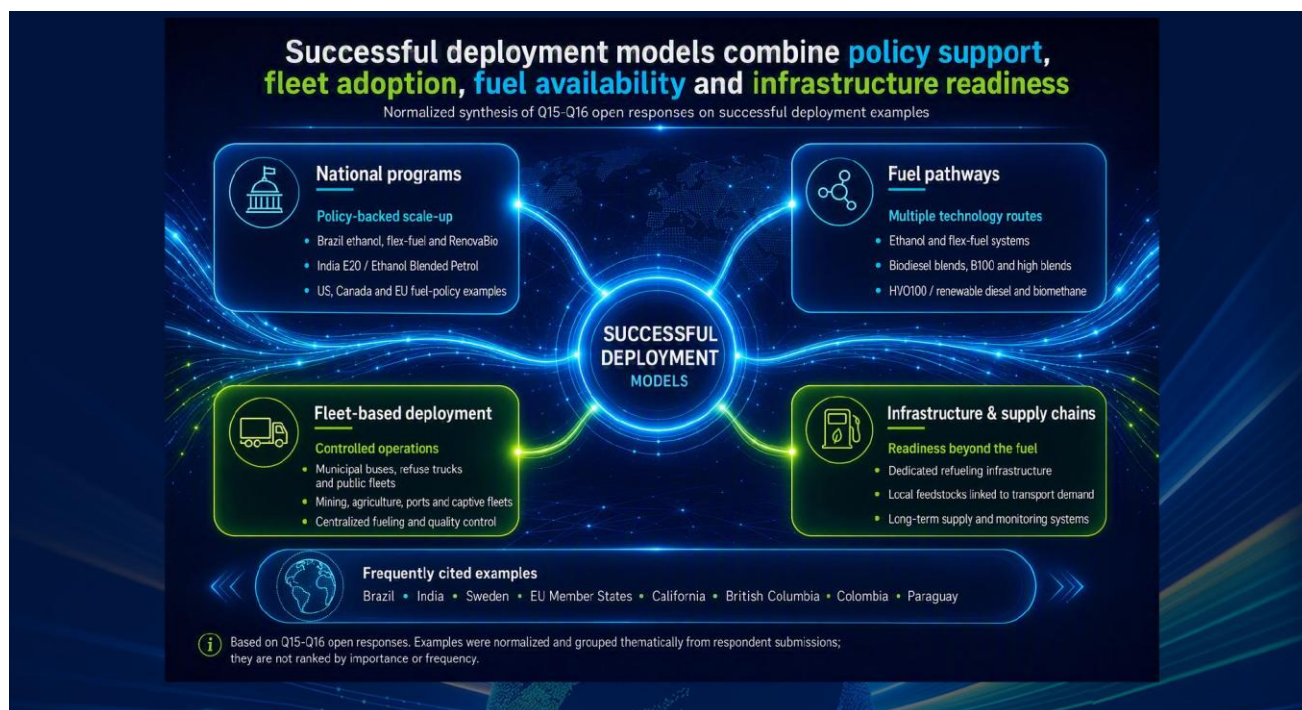


The deployment challenge extends across regulation, commercial arrangements, feedstock, logistics, storage and refuelling infrastructure. Blending limits are the leading constraint, indicating that technically usable fuels may still face regulatory or market ceilings that may affect the volumes at which technically usable fuels can be deployed. The results suggest that the principal obstacles identified by respondents are increasingly associated with market access, regulatory frameworks and supply-chain conditions rather than with fuel performance itself.

Risk-reduction preferences emphasize durable demand signals. Long-term offtake contracts lead the responses, followed by public-private partnerships. Aggregated demand, contracts for difference, guarantees and concessional loans appear as additional mechanisms, but with smaller shares in the valid response base.

5.3 Integrated Deployment Model

Figure 13. Integrated model connecting policy, fleet adoption, fuel pathways and infrastructure readiness.



Deployment examples reported by respondents converge around four mutually reinforcing domains: national programs, fuel pathways, fleet-based deployment, and infrastructure and supply chains. The framework indicates that deployment is associated with coordinated progress across these domains rather than with isolated technology validation.

National programs create direction and confidence; fuel pathways connect available molecules to fleet applications; fleet-based deployment concentrates demand and operational learning; infrastructure and supply chains provide repeatable access, storage, distribution and refuelling. Practical examples reported by respondents illustrate how these elements can be combined in real deployment settings.

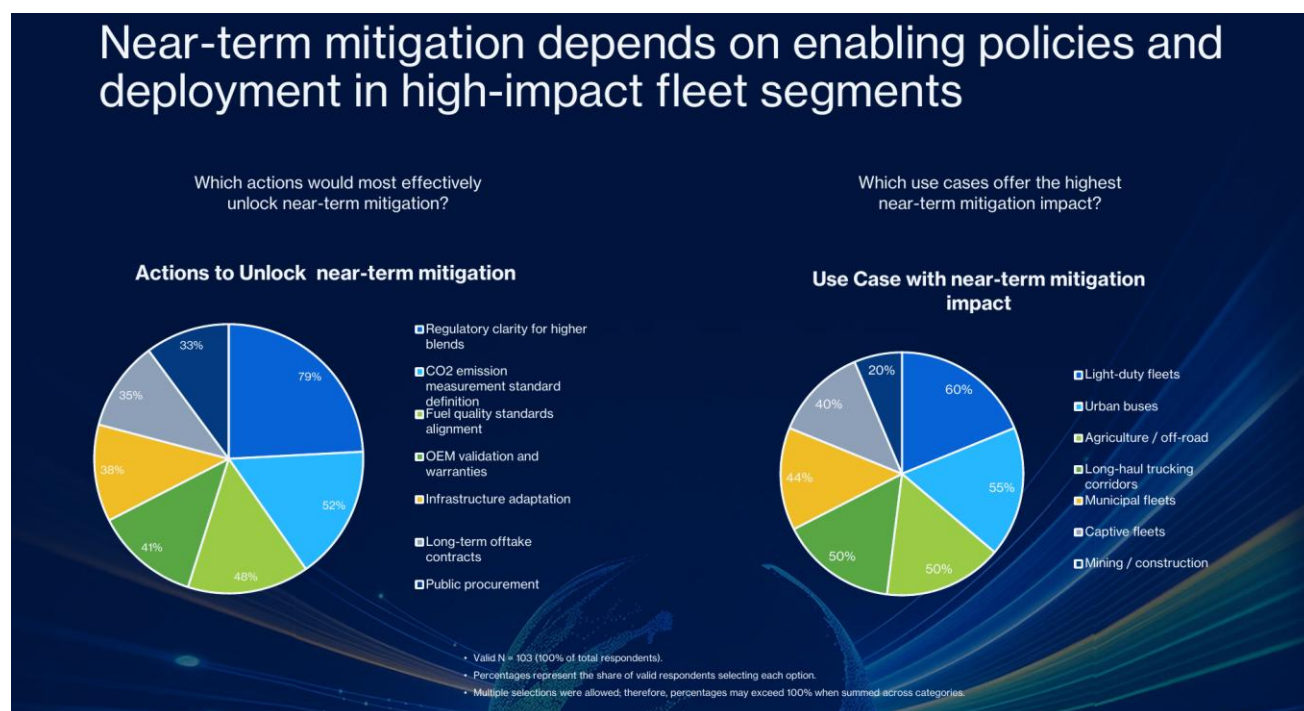
6. Stakeholder Perspectives on Near-Term Deployment

6.1 Reported Enabling Conditions and Potential Use Cases

KEY FINDINGS

- Regulatory clarity for higher blends led enabling actions at 79%.
- CO₂ measurement standards and aligned fuel quality standards followed at 52% and 48%.
- Light-duty fleets led use cases at 60%, followed by urban buses at 55%.
- Agriculture/off-road and long-haul corridors each received approximately 50%.

Figure 14. Reported enabling conditions and high-impact fleet segments identified for near-term mitigation.



Near-term mitigation is described by respondents as requiring a bridge between technical availability and repeatable deployment. Regulatory clarity for higher blends is the most frequently selected condition, followed by emissions-measurement standards, fuel-quality alignment, OEM validation and warranties, infrastructure adaptation, long-term offtake and public procurement.

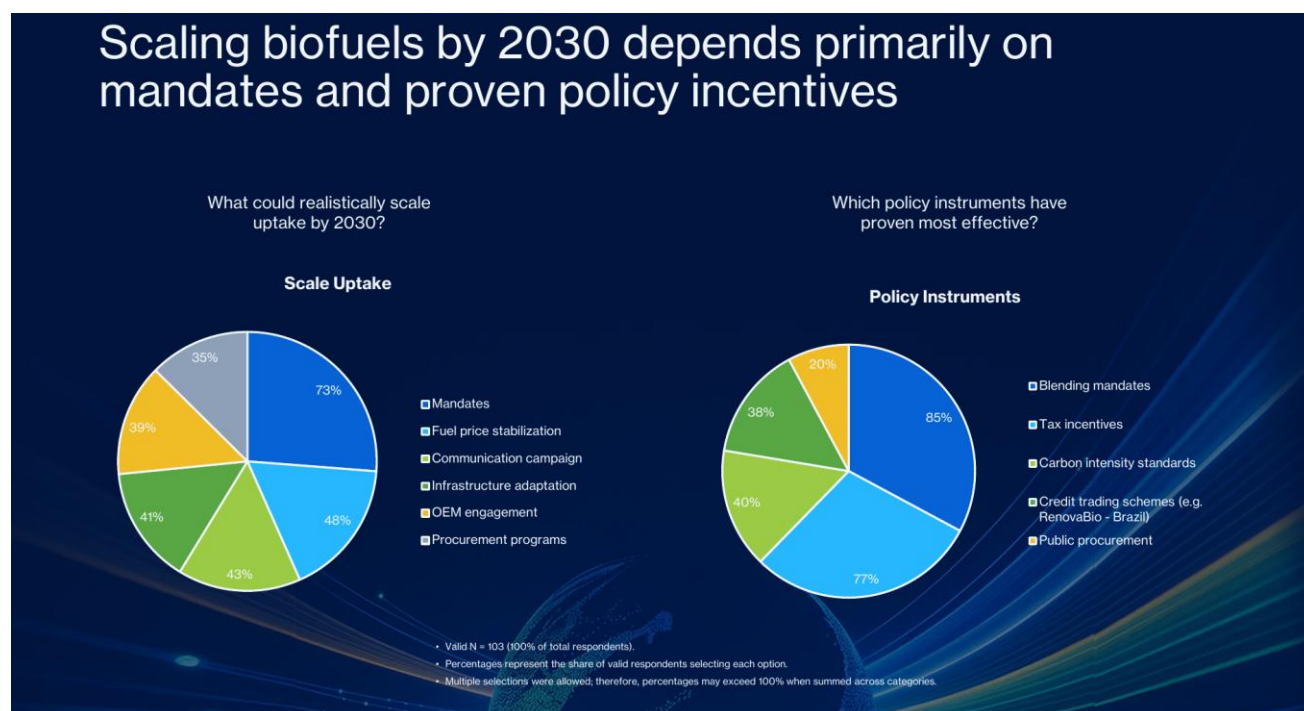
Priority use cases span light-duty fleets, urban buses, agriculture and off-road applications, long-haul trucking corridors, municipal fleets, captive fleets and mining or construction. The breadth of responses indicates that the near-term opportunity is distributed across several operational environments rather than concentrated in one segment.

6.2 Conditions Identified for Deployment through 2030

KEY FINDINGS

- Mandates were selected by 73% as a realistic deployment condition through 2030.
- Blending mandates were selected by 85% as an effective policy instrument.
- Tax incentives followed at 77%.
- Infrastructure, OEM engagement, price stabilization and procurement complement the principal instruments.

Figure 15. Conditions and policy instruments identified by respondents as affecting deployment through 2030.



Respondents favored instruments that create predictable demand and improve economic confidence. Mandates were selected as leading deployment conditions through 2030, while blending mandates and tax incentives led the policy-instrument assessment. Carbon-intensity standards, credit-trading schemes and public procurement were identified as complementary approaches.

The two charts together show that policy direction alone is insufficient. Fuel-price stabilization, communication, infrastructure adaptation, OEM engagement and procurement programs shape the conditions under which mandates and incentives may be associated with operational deployment.

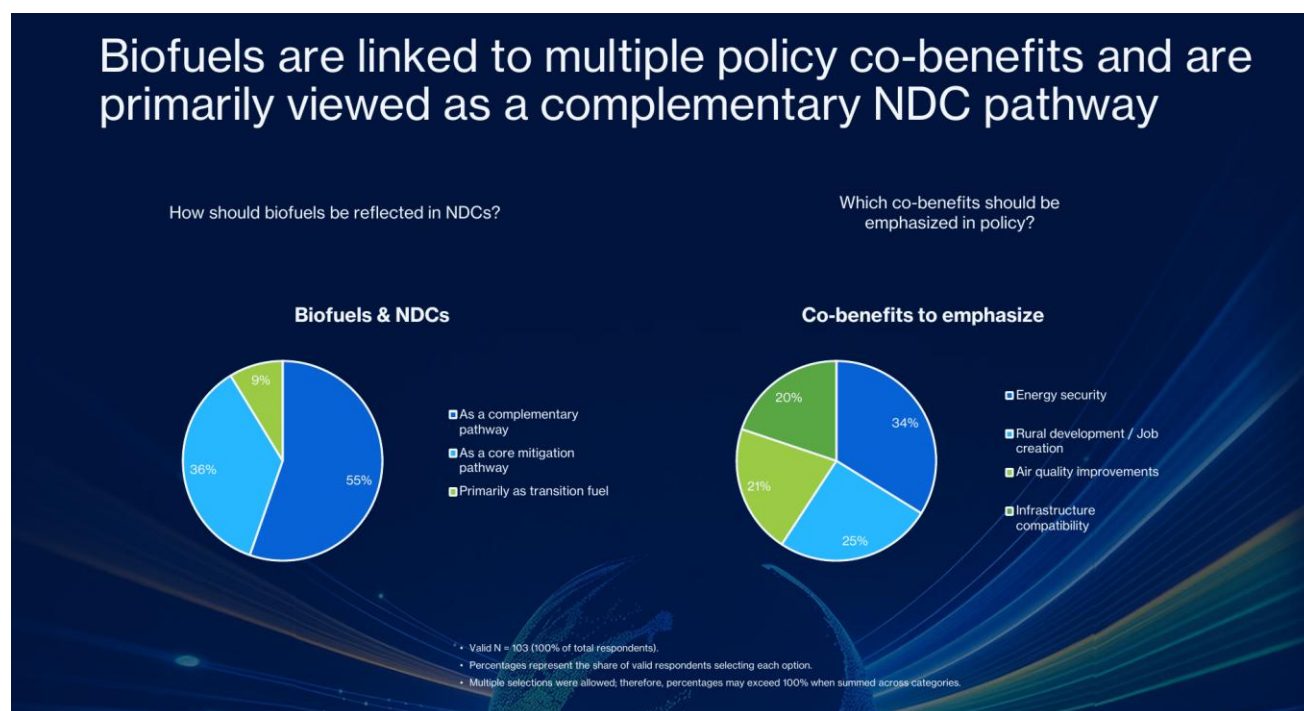
7. Public Policies, NDCs and National Decarbonization Strategies

7.1 Positioning within NDCs and Policy Co-Benefits

KEY FINDINGS

- 55% positioned biofuels as a complementary NDC pathway.
- 36% positioned biofuels as a core mitigation pathway.
- Energy security was the leading co-benefit.
- Rural development, job creation, air quality and infrastructure compatibility broaden the policy rationale.

Figure 16. Biofuel positioning in NDCs and policy co-benefits.



The NDC results show broad respondent support for considering biofuels within national climate strategies. Most respondents favored a complementary role, while more than one third identified a core mitigation role. Only a small share primarily characterized biofuels as transition fuels.

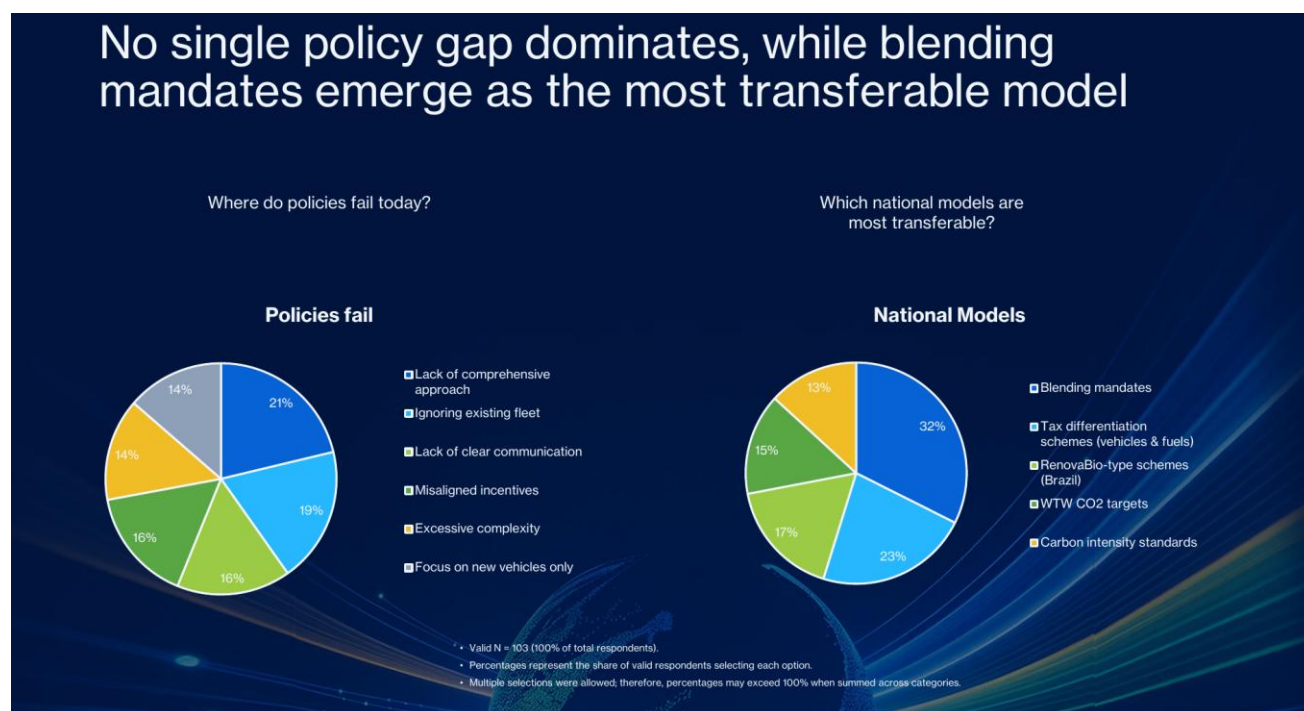
The policy rationale extends beyond greenhouse-gas reduction. Energy security is the strongest co-benefit in the underlying response data, followed by rural development and job creation, air-quality improvement and compatibility with existing infrastructure. These dimensions connect climate policy to resilience, development and asset utilization.

7.2 Policy Gaps and Transferable Models

KEY FINDINGS

- No single policy gap accounts for the full implementation challenge.
- Lack of a comprehensive approach and insufficient treatment of existing fleets lead the identified gaps.
- Blending mandates are the most frequently selected transferable national model.
- Tax differentiation, RenovaBio-type schemes, WTW targets and carbon-intensity standards also appear as references.

Figure 17. Current policy gaps and national models perceived as transferable.



Respondents identify a cluster of policy weaknesses: fragmented approaches, limited attention to existing fleets, unclear communication, misaligned incentives, excessive complexity and focus on new vehicles. The distribution indicates that implementation quality depends on the coherence of the policy architecture rather than on solving a single isolated gap.

Blending mandates lead the transferable models, followed by tax differentiation. RenovaBio-type credit systems, WTW CO₂ targets and carbon-intensity standards receive additional support. Transferability therefore appears linked to instruments that combine practical implementation experience with measurable market or emissions outcomes.

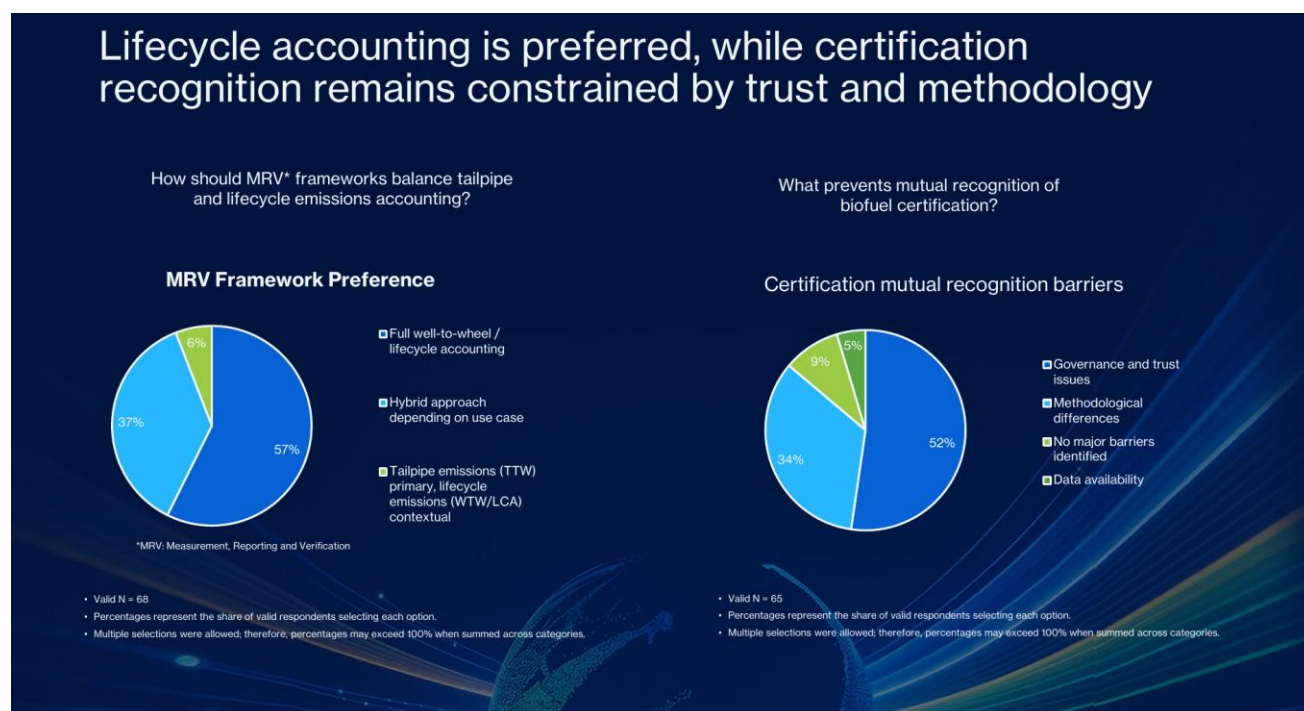
8. Standards, MRV, Certification and International Governance

8.1 Lifecycle Accounting and Certification Recognition

KEY FINDINGS

- 57% preferred full WTW/lifecycle accounting in the valid N=68 base.
- 37% preferred a hybrid approach depending on use case.
- Only 6% favored TTW as primary with WTW/LCA contextual.
- Governance and trust issues led barriers to mutual recognition in the valid N=65 base.

Figure 18. MRV accounting preferences and barriers to mutual recognition of certification.



The MRV findings strongly favor system boundaries that extend beyond tailpipe emissions. Full WTW or lifecycle accounting leads the responses, while a substantial group supports hybrid approaches adapted to use case. Exclusive reliance on TTW as the primary basis receives limited support.

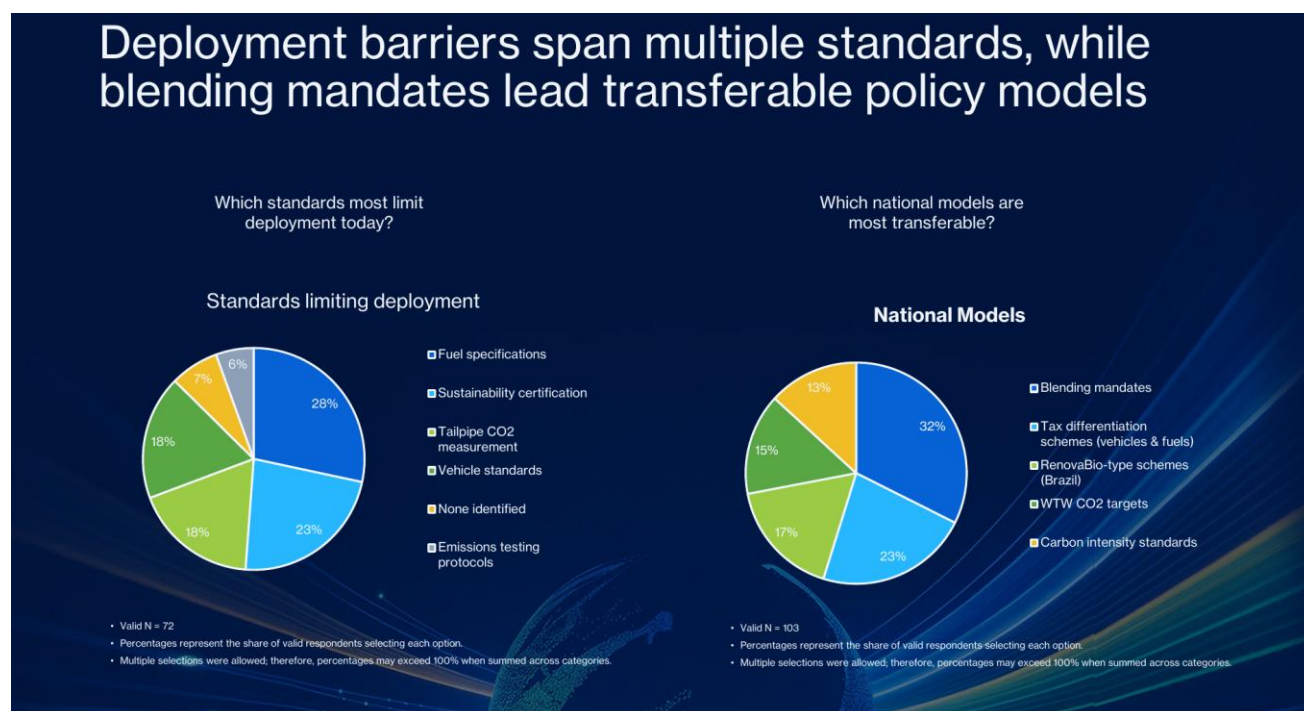
Mutual recognition of certification is constrained principally by governance and trust, followed by methodological differences. Data availability and the absence of major barriers account for smaller shares. The results indicate that interoperability depends on institutional confidence as well as technical comparability.

8.2 Standards Limiting Deployment

KEY FINDINGS

- Fuel specifications led the standards-related deployment barriers.
- Sustainability certification was the second most selected category.
- Tailpipe CO₂ measurement and vehicle standards also received substantial attention.
- The standards agenda and transferable-policy agenda must evolve together.

Figure 19. Standards limiting deployment and national models perceived as transferable.

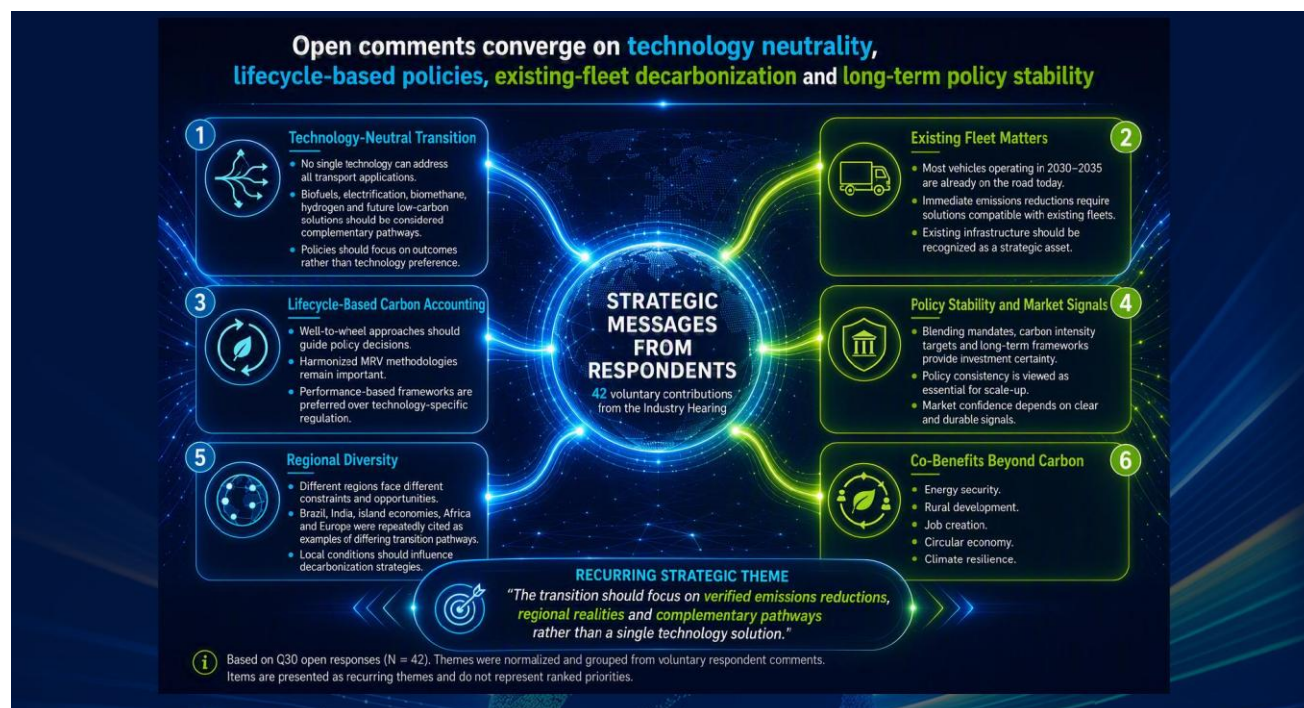


Fuel specifications and sustainability certification are the principal standards-related barriers in the valid response base. Tailpipe CO₂ measurement, vehicle standards and emissions-testing protocols also appear, while a minority identifies no limiting standard.

The results indicate that deployment challenges extend beyond policy instruments alone. While blending mandates emerge as the most transferable national model, respondents also highlight the importance of fuel specifications, certification systems, measurement approaches and vehicle standards. Together, these elements influence how fuels, vehicles and emissions claims can be implemented and recognized across different applications and jurisdictions.

8.3 Governance Framework

Figure 20. Recurring strategic themes emerging from respondents' open comments.



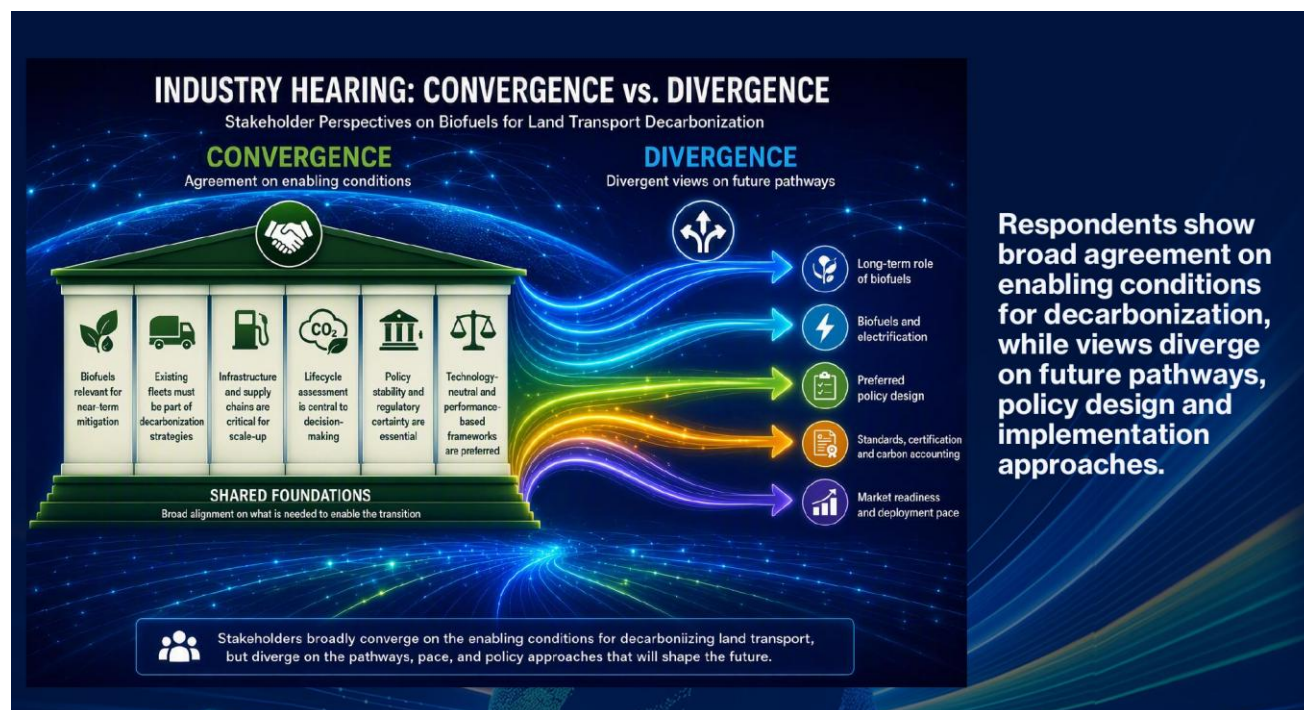
Open comments converge around a set of recurring strategic themes. Respondents consistently emphasize technology neutrality, lifecycle-based emissions accounting, the importance of existing fleets, long-term policy stability, regional diversity and the broader societal benefits associated with transport decarbonization.

Together, these themes suggest a preference among respondents for outcome-oriented approaches focused on verified emissions reductions, complementary technology pathways and deployment strategies adapted to regional conditions. The responses reinforce the importance of stable policy frameworks, recognition of existing assets and lifecycle-based assessment methods as conditions associated with large-scale decarbonization.

9. Shared Views, Differing Perspectives and Strategic Findings

9.1 Overall Synthesis

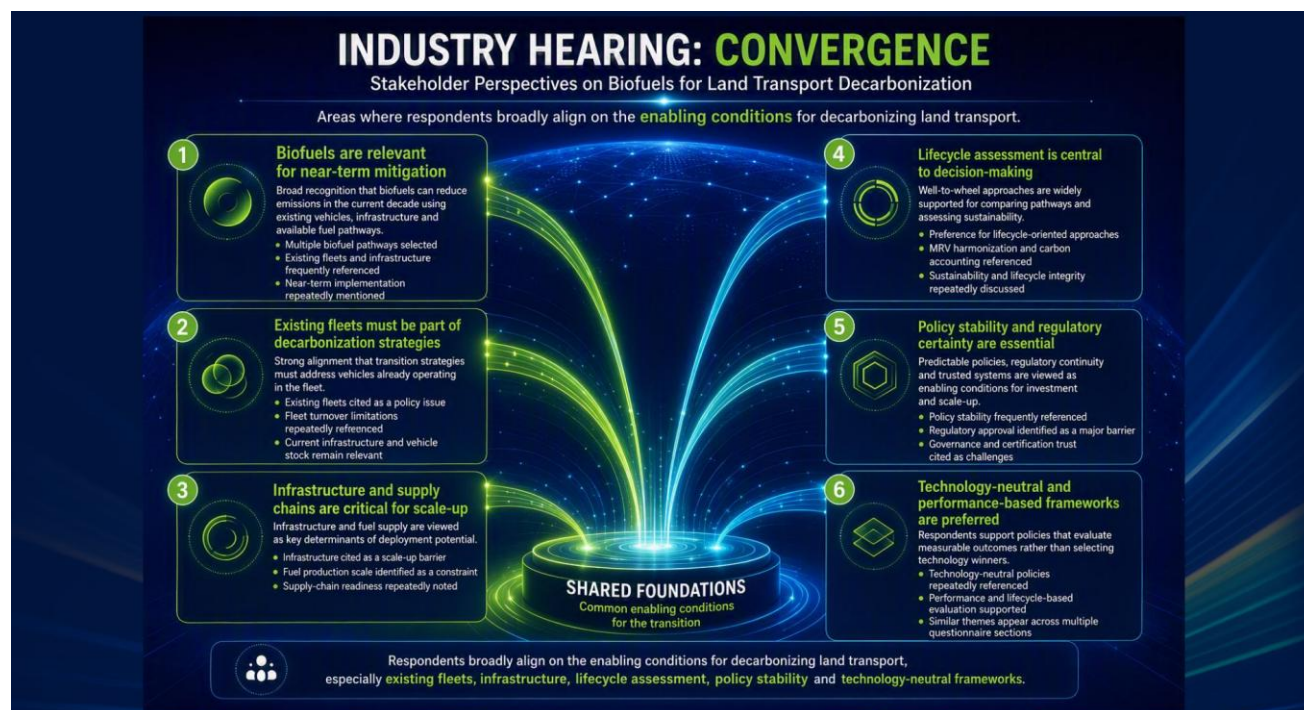
Figure 21. Overall balance between shared enabling conditions and differing implementation perspectives.



The consultation reveals broad agreement on conditions that respondents associate with practical decarbonization and continued divergence on future pathways, policy design and implementation. This distinction is central: stakeholders share many enabling principles even when they differ on the relative role, pace or geography of particular technologies.

9.2 Shared Views

Figure 22. Areas of convergence across the consultation.



KEY FINDINGS

- Biofuels are relevant contributors to transport decarbonization.
- Existing fleets remain essential to practical transition strategies.
- Infrastructure and supply-chain readiness are decisive.
- Lifecycle accountability, policy stability and regulatory certainty support credibility.
- Technology-neutral and performance-oriented approaches provide common ground.

The areas of convergence form a practical foundation for future technical and policy work. Respondents repeatedly converge on the importance of existing fleets, infrastructure and supply-chain readiness, lifecycle assessment, policy stability and technology-neutral frameworks as enabling conditions for transport decarbonization. This shared foundation supports cooperation across regions while allowing different technology pathways and implementation strategies to coexist.

9.3 Differing Perspectives

Figure 23. Areas in which stakeholder perspectives continue to diverge.



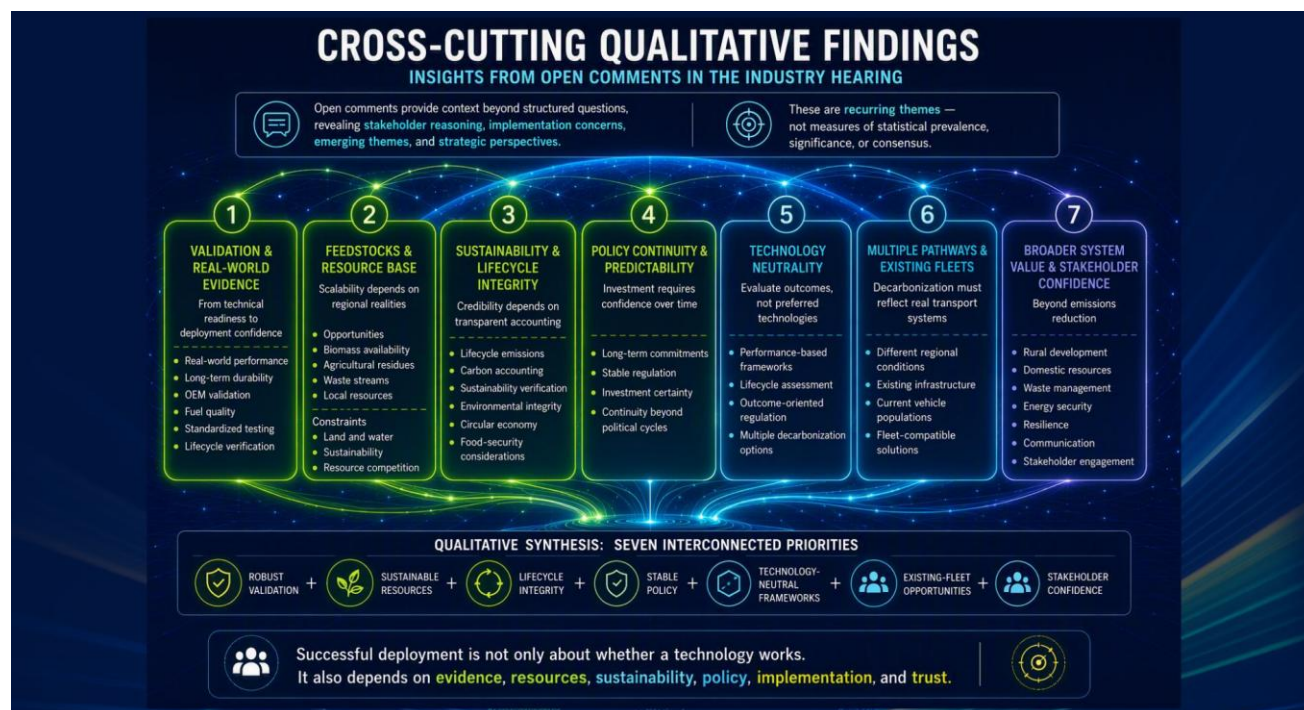
KEY FINDINGS

- The long-term role of biofuels remains contested.
- The pace and scope of electrification vary by region and application.
- Preferences differ across mandates, incentives and market mechanisms.
- Accounting, standardization and readiness assumptions remain heterogeneous.

The divergences concern implementation pathways more than the underlying objective of emissions reduction. Regional resources, electricity systems, fleet structures, policy traditions and market conditions influence how respondents rank technology roles and policy instruments. Divergences also extend to standards, certification approaches, carbon-accounting methodologies and broader assumptions regarding deployment readiness, highlighting the importance of maintaining space for legitimate methodological disagreement within future discussions.

9.4 Cross-Cutting Strategic Findings

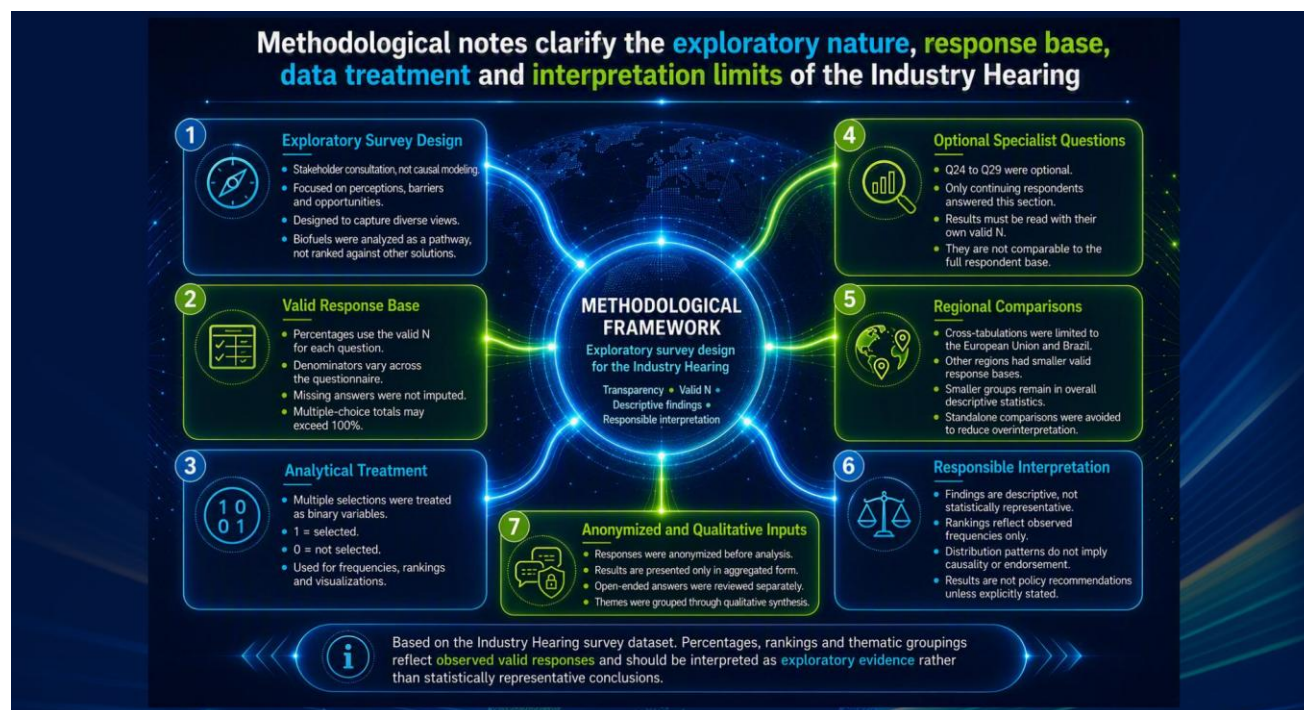
Figure 24. Cross-cutting strategic findings emerging from the questionnaire.



Across the thematic blocks, the consultation favors deployment-oriented analysis. Recurring themes include validation through real-world evidence, sustainable feedstock availability, lifecycle integrity, policy continuity, technology-neutral frameworks, existing-fleet opportunities and stakeholder confidence. Together, these findings suggest that deployment is associated not only with technical performance, but also with the broader combination of evidence, resources, sustainability, policy stability, implementation capacity and trust that respondents associate with the feasibility, credibility and scale of decarbonization efforts.

9.5 Methodological Considerations and Interpretation Limits

Figure 25. Methodological framework, data treatment and interpretation boundaries of the Industry Hearing.



The methodological framework emphasizes the exploratory nature of the Industry Hearing and the importance of transparent and responsible interpretation. The consultation was designed to capture stakeholder perceptions, barriers, opportunities and strategic perspectives rather than to produce statistically representative conclusions.

Results are reported using valid response bases, multiple-selection responses are treated accordingly, and regional comparisons are limited to groups with sufficient response coverage. The findings should therefore be interpreted as exploratory stakeholder evidence that provides valuable insights into perceptions and priorities, while avoiding overinterpretation of frequencies, rankings or thematic patterns.

10. Conclusion

10.1 Executive Synthesis

The final questionnaire findings present sustainable biofuels as a technically relevant and operationally diverse component of land transport decarbonization. Ethanol, biodiesel, renewable diesel/HVO and biomethane are all perceived by meaningful shares of respondents as technically ready for deployment, but their relative position varies by region, market context and vehicle application.

The principal challenge has shifted toward deployment conditions. Fuel quality, durability, warranties, availability, distribution, production scale, regulatory approval, certification, commercial arrangements, infrastructure and long-term demand signals influence whether technical readiness is associated with repeatable market deployment.

Near-term deployment is associated by respondents with regulatory clarity, robust CO₂ measurement, aligned fuel-quality standards, OEM engagement, infrastructure, offtake and public procurement. Mandates and tax incentives were identified as leading policy mechanisms, while carbon-intensity standards, credit systems and procurement complement the reported policy architecture.

Lifecycle accounting occupies a central position in the credibility of decarbonization claims. Mutual recognition of certification depends on governance, trust and methodological compatibility, demonstrating that technical standards and institutional arrangements must advance together.

10.2 Message to the Industry Hearing

The strongest consolidated message is that land transport decarbonization requires multiple pathways adapted to different conditions. The questionnaire supports a portfolio perspective in which biofuels, electrification and other solutions contribute according to fleet characteristics, infrastructure, energy systems, market maturity and policy frameworks.

A second message concerns timing. Existing fleets and current infrastructure remain central to near-term mitigation, particularly where fleet turnover is gradual and renewable fuels can be deployed through established assets. Long-term transformation and immediate reduction therefore need to be managed as connected parts of the same transition.

A third message concerns confidence. Respondents associated deployment confidence with mutually reinforcing technical evidence, predictable regulation, credible accounting, recognized certification, secure supply and durable commercial arrangements. Confidence is therefore presented by the consultation as a system output rather than a single technical attribute.

10.3 Contribution to the International Debate

The Industry Hearing provides a structured evidence base for international dialogue on biofuels and land transport. It identifies substantive common ground, documents legitimate regional differences and clarifies conditions that respondents repeatedly associate with deployment decisions.

The findings can support the IEA Bioenergy Task 39 White Paper by organizing future analysis around technology readiness, existing fleets, lifecycle emissions, infrastructure, policy instruments, certification, governance and regional context. They can also inform wider discussions leading toward COP31 and subsequent work on sustainable transport pathways.

Appendix A. Figure and Evidence Map

Final presentation slide	Report section	Evidence role
2	1.1	Global coordination framework
3	2.1	Database and questionnaire scope
5–8	3	Respondent profile and context
10–13	4	Readiness and pathway positioning
14–16	5	Barriers and deployment model
18–19	6	Near-term deployment perspectives
21–22	7	NDCs, co-benefits and policy
24–26	8	MRV, certification and standards
28–32	9	Convergence, divergence and implications

Appendix B. Methodological Reading Notes

- Percentages are interpreted against the valid N shown for each question.
- Multiple-selection percentages may exceed 100% when summed.
- Market-maturity categories are self-reported.
- Regional comparisons focus on the European Union and Brazil; smaller regional groups are retained in aggregate context only.
- The questionnaire captures informed stakeholder perceptions and should not be interpreted as a statistically representative global market forecast.
- Counts and percentages are retained as presented in the final PowerPoint source.

Appendix C. Abbreviations

Abbreviation	Meaning
CO ₂	Carbon Dioxide
COP30	30th United Nations Climate Change Conference of the Parties

Abbreviation	Meaning
COP31	31st United Nations Climate Change Conference of the Parties
GHG	Greenhouse Gas
HVO	Hydrotreated Vegetable Oil
IEA	International Energy Agency
LCA	Life Cycle Assessment
MRV	Monitoring, Reporting and Verification
NDC	Nationally Determined Contribution
OEM	Original Equipment Manufacturer
SAE BRASIL	Brazilian Society of Mobility Engineering
SBE	Brazilian Bioenergy Society
TTW	Tank-to-Wheel
WTW	Well-to-Wheel

Appendix D.

Questionnaire Lead Contributors

Camilo Abduch Adas
Camilo Abduch Adas is a Mechanical Engineer with more than four decades of professional experience in the mobility, energy and industrial sectors. A member of the Board of Advisors of SAE BRASIL, he is actively engaged in national and international initiatives focused on transport decarbonization, sustainable fuels and low-carbon hydrogen. Throughout his career, he has held leadership positions in engineering, product development, business strategy and institutional affairs, including more than three decades with Daimler Trucks. Through SAE BRASIL, Camilo has contributed to collaborative networks coordinated by the Brazilian Ministry of Development, Industry, Trade and Services (Ministério do Desenvolvimento, Indústria, Comércio e Serviços – MDIC), particularly in discussions related to hydrogen mobility and maritime decarbonization. He is also a Guest Professor at Fundação Dom Cabral and author of SAE International Edge Reports addressing global pathways for transport decarbonization, low-carbon hydrogen and sustainable mobility. His work emphasizes the integration of engineering, public policy, market development and international cooperation to accelerate scalable decarbonization solutions. For the Industry Hearing, Camilo played a central role in the conception and development of the initiative, including the analytical framework, content curation, questionnaire design, stakeholder engagement, data analysis and consolidation of

findings. His contribution helped transform diverse expert perspectives into a structured evidence base capable of supporting future discussions on land transport decarbonization.

Glaucia Mendes Souza

Dr. Glaucia Mendes Souza is a Full Professor at the Institute of Chemistry of the University of São Paulo (USP) and Leader of the Biofuels for the Decarbonization of Transport Task Force (Task 39) of the International Energy Agency (IEA Bioenergy). She coordinates international studies on the role of biofuels in the energy transition and in the decarbonization of transport, with special attention to the potential of sugarcane and other tropical crops in emerging economies.

She is a Commander of the Order of Rio Branco, Eisenhower Fellow, and a member of the Board of the Scientific Committee on Problems of the Environment (SCOPE), the World Bioenergy Association (WBA) and the Brazilian Bioenergy Society (SBE). She is a member of the Brazilian Delegation at IMO. She also participates in the Bioindustry Committee of FIESP (COMSAÚDE), the External Advisory Board of Embrapa Agroenergy and the Climate Action Agenda of the UNFCCC. At FAPESP, she served from 2008 to 2025 as Coordinator of the Bioenergy Research Program – BIOEN.

She is the author of two books, more than 70 scientific articles, 15 book chapters, 11 international reports and 11 patents, consolidating a career dedicated to uniting basic science, technological innovation and public policies in favor of bioenergy and sustainability.

Roberto Matarazzo Braun

Roberto Matarazzo Braun is a senior executive in the automotive sector with extensive experience in technology, sustainability and low-carbon mobility strategies. Throughout his career, he has worked at the interface between vehicle technology, energy transition and public policy, contributing to discussions on future mobility pathways and the role of renewable fuels in transport decarbonization.

Based in São Paulo, Brazil, Roberto Braun has actively participated in industry discussions related to sustainable mobility and transport decarbonization, including initiatives involving biofuels, vehicle technologies and climate-transition strategies. He has been engaged in dialogues that connect automotive manufacturers, policymakers, researchers and energy stakeholders, helping bridge technical and market perspectives.

For the Industry Hearing, Roberto contributed an automotive and industry perspective to the discussion, supporting the integration of vehicle-technology considerations, deployment realities and market experience into the broader assessment of sustainable fuels for land transport decarbonization.

Industry Hearing Contributors

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