Electric Vehicle Adoption: A TPB-Based Conceptual Framework With ESG and Policy Insights From Slovakia

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This paper develops a theory-driven conceptual framework based on the Theory of Planned Behaviour (TPB) to explain individual consumer adoption of electric vehicles (EVs) within the context of sustainability, ESG considerations, and public policy. Drawing on a structured review of high-quality academic literature, the study examines how attitudes, subjective norms, and perceived behavioural control influence EV adoption decisions, with particular emphasis on environmental and sustainability-related factors. The paper does not present original empirical data; instead, it proposes an extended TPB-based model tailored to EV adoption, integrating psychological, economic, infrastructural, and ESG-related dimensions. In addition, policy-relevant factors–such as financial incentives, regulatory support, and charging infrastructure–are incorporated to reflect their role in shaping consumer perceptions and behavioural control. To enhance practical applicability, the framework is operationalised through the development of measurement items for each construct, providing a foundation for future empirical research. The Slovak market is used as a contextual reference to illustrate the relevance of policy and market-specific conditions. The study contributes by linking consumer behaviour theory with ESG and policy perspectives, offering an integrated and operationalizable framework to better understand and support the transition toward sustainable mobility.

Keywords:
electric vehicles, theory of planned behaviour, ESG, consumer behaviour, public policy

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1 Introduction

The transition toward sustainable mobility has positioned electric vehicles (EVs) as a central component of environmental, energy, and transport policies across Europe. Road transport remains a major contributor to greenhouse gas emissions within the European Union, prompting policymakers to promote EVs as a key solution for reducing emissions and achieving climate neutrality goals (European Environment Agency, 2024; International Energy Agency, 2022). Beyond their environmental benefits, EVs are increasingly embedded within Environmental, Social, and Governance (ESG) frameworks, reflecting a broader shift toward integrating sustainability into both policy and market systems.

The concept of ESG emerged from global institutional developments in the early 2000s, particularly the *Who Cares Wins* initiative led by the United Nations Global Compact, which formalized the integration of environmental, social, and governance considerations into financial decision-making (Wang & Phillips-Fein, 2023). Since then, ESG has evolved into a dominant framework guiding corporate strategies, investment practices, and public policy. In the context of EVs, ESG considerations extend beyond environmental performance to include social acceptance, institutional trust, and governance quality, all of which influence the adoption of sustainable technologies.

Despite strong policy support and technological advancements, EV adoption remains uneven across European countries. Slovakia represents a particularly illustrative case. While the country is one of Europe's leading automotive producers in terms of vehicles manufactured per capita, domestic EV adoption continues to lag behind the European Union average (ACEA, 2023). Recent evidence shows that battery electric vehicles accounted for only 2.2% of newly registered passenger cars in Slovakia in 2024, compared to 19.1% in the EU overall (Cvacho & Madleňák, 2026). This discrepancy highlights a structural gap between production capacity and consumer uptake, suggesting that supply-side developments alone are insufficient to drive the transition toward sustainable mobility.

Existing research indicates that EV adoption is a complex decision-making process influenced by economic, behavioural, social, and infrastructural factors. Financial barriers, such as high upfront costs and perceived risks, remain significant

constraints (Rezvani et al., 2015). At the same time, behavioural determinants–including attitudes, subjective norms, and perceived behavioural control–play a critical role in shaping adoption intentions, as conceptualized by the Theory of Planned Behaviour (TPB) (Ajzen, 1991; Egbue & Long, 2012). These factors are further shaped by contextual conditions such as charging infrastructure, government incentives, and institutional trust (Fang et al., 2020). More recently, ESG-related perceptions–such as environmental concern, social responsibility, and trust in governance–have emerged as additional influences on consumer behaviour.

While TPB provides a robust framework for explaining individual decision-making, it does not explicitly incorporate broader ESG dimensions. At the same time, existing ESG research has primarily focused on firm-level performance and sustainable business development, with limited attention to its role in shaping individual consumer behaviour (Hsu, 2024). This creates a gap in the literature, particularly in the context of EV adoption, where behavioural and sustainability perspectives remain insufficiently integrated.

Against this background, the present study develops a conceptual framework of EV adoption based on the Theory of Planned Behaviour, extended with ESG and contextual factors. Focusing on Slovakia, the study adopts a literature-based approach to integrate behavioural, economic, infrastructural, and sustainability-related determinants into a unified model. In addition, it proposes measurement items to operationalize the constructs, providing a foundation for future empirical research. By bridging TPB with ESG considerations, the study aims to contribute to a more comprehensive understanding of EV adoption and to offer insights for policymakers and practitioners seeking to accelerate sustainable mobility transitions.

2 Theoretical Background

Building on the Theory of Planned Behaviour (TPB) and prior research on sustainable consumption and electric vehicle (EV) adoption, this study proposes a conceptual model integrating behavioural, contextual, and sustainability-related determinants. According to the European Alternative Fuels Observatory, Slovakia's 2025 incentive framework offers no direct BEV purchase subsidies but provides tax-based benefits (reduced registration tax, full annual road tax exemption), company-related tax reductions (0.5% benefit-in-kind rate), and municipal perks like

preferential parking. This evolving policy landscape offers a relevant empirical context for examining how TPB constructs interact with real-world incentives to shape EV adoption intentions.

Consumer behaviour research provides a strong theoretical foundation for explaining EV adoption decisions. Among the most influential frameworks is the TPB (Ajzen, 1991), which posits that behavioural intention is determined by three core components: attitudes toward the behaviour, subjective norms, and perceived behavioural control (PBC). PBC in TPB parallels perceived ease of use in the Technology Acceptance Model (TAM), though TPB is a general framework applicable to sustainable consumption choices such as EV adoption (Ajzen, 2020). A substantial body of literature confirms TPB's explanatory power in the EV context. Positive attitudes toward EVs–driven by environmental awareness, cost savings, and technological novelty–significantly enhance purchase intention (Rezvani et al., 2015). These sustainability-oriented motivations can also be contextualized within the Environmental, Social, and Governance (ESG) framework, which emphasizes the interconnection of environmental stewardship, social responsibility, and governance practices (Meiden & Silaban, 2023; Estevez-Mendoza & Infante, 2025).

PBC plays a decisive role in EV adoption. Factors such as charging availability, driving range, and perceived ease of use strongly influence consumers' sense of control (Egbue & Long, 2012; Skippon & Garwood, 2011). ESG-aligned governance measures–such as incentives and infrastructure investment–can enhance PBC by reducing practical barriers (Meiden & Silaban, 2023). Subjective norms, referring to perceived social pressure from family and peers, also shape adoption intentions, particularly in early diffusion stages where consumers rely on social validation (Rogers, 2003; Jansson et al., 2017). Beyond TPB, perceived risk theory explains consumer resistance toward EVs. Financial risk, battery lifespan concerns, and resale value anxiety are major adoption barriers (Lin & Wu, 2018). Innovation resistance theory highlights how habitual reliance on internal combustion engine vehicles delays acceptance (Ram & Sheth, 1989). ESG-oriented policies can mitigate such barriers through regulatory guidance and green innovation incentives.

PBC is heavily influenced by access to charging infrastructure. Dedicated infrastructure, such as Level 2 and DC fast chargers, enhances consumer confidence and perceived control over vehicle usage (Hardman et al., 2021). Value-based perspectives, including Value–Belief–Norm theory, suggest that individuals with strong ecological values exhibit higher willingness to adopt EVs (Nordlund & Garvill, 2003; Rezvani et al., 2018). Recent research adopts integrated models combining TPB with perceived risk, moral norms, and contextual variables to improve explanatory power (Hardman et al., 2021). These hybrid approaches demonstrate that EV adoption is shaped by the interplay of psychological, economic, infrastructural, and sustainability-oriented factors, with ESG considerations serving as a critical contextual layer.

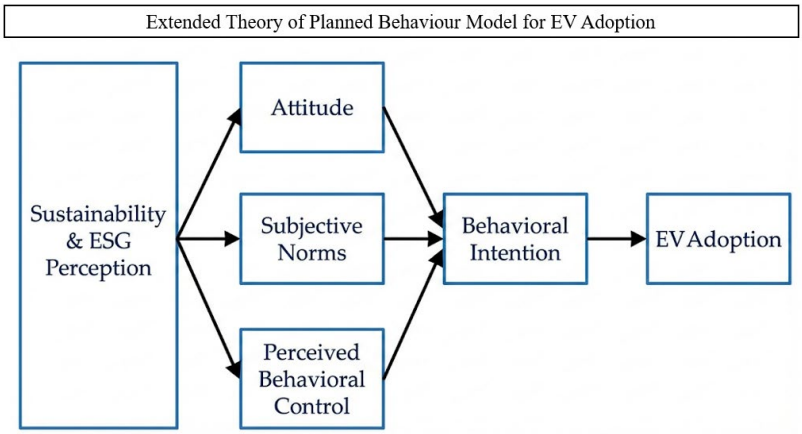

Figure 1: Extended Theory of Planned Behaviour model for electric vehicle adoption.
Source: Adapted from Ajzen (1991, 2020) and enriched with sustainability (ESG)-related determinants based on prior literature.

In the Slovak context, infrastructure availability and financial incentives have been identified as key barriers to BEV adoption, directly influencing consumers' PBC and purchase intentions (Cvacho & Madleňák, 2026). According to SEVA (2025), as of March 31, 2025, there were 17,430 BEVs registered on Slovak roads, with BEVs accounting for 4.7% of new registrations versus the EU average of 15.3%. Annual registration data reveal fluctuating trends: 2,505 in 2022, 3,470 in 2023 (a 38.5% increase), followed by a decline to 3,073 in 2024 (an 11.4% decrease) (Ministerstvo vnútra SR, 2025). These variations suggest that EV adoption in Slovakia remains

sensitive to changing incentives, economic conditions, and consumer perceptions, indicating evolving but still cautious acceptance among Slovak consumers. Overall, the literature confirms that while TPB remains a robust framework, its explanatory strength is enhanced when complemented by risk-related, normative, and ESG-aligned perspectives. As shown in Figure 1, the model is grounded in TPB (Ajzen, 1991, 2020) while incorporating additional determinants such as environmental concern, infrastructure, and policy-related factors.

3 Methodology

This study employs a qualitative, literature-based research design to develop a Theory of Planned Behaviour (TPB)-based conceptual framework for electric vehicle (EV) adoption, enriched with ESG and policy perspectives, with a particular focus on Slovakia. The approach is suitable for emerging research domains where theoretical integration is required prior to large-scale empirical validation.

A structured narrative literature review was conducted to synthesise existing academic knowledge on EV adoption from a consumer behaviour perspective. The review included peer-reviewed journal articles, academic books, and selected policy and industry reports. The methodological approach follows established guidelines for qualitative evidence synthesis and conceptual research development (Tranfield et al., 2003; Snyder, 2019). This enables systematic integration of fragmented findings across disciplines such as marketing, environmental psychology, and sustainable transport studies.

Literature was identified through Scopus, Web of Science, and Google Scholar using targeted keywords, including "electric vehicle adoption", "consumer behaviour", "Theory of Planned Behaviour", "charging infrastructure", and "sustainability". The selection process prioritised high-impact, peer-reviewed studies with clear theoretical grounding and empirical rigor. Special emphasis was placed on European contexts, particularly where evidence relevant to Slovakia or comparable Central and Eastern European markets was available. Policy documents and institutional reports were included selectively to contextualise regulatory and infrastructural developments.

Data analysis was conducted using thematic synthesis, enabling the systematic coding and aggregation of findings across heterogeneous sources (Braun & Clarke, 2006; Thomas & Harden, 2008). Extracted determinants were organised into four analytical dimensions aligned with the conceptual framework: (1) psychological factors (attitudes, subjective norms, perceived behavioural control), (2) financial factors (purchase cost, incentives, perceived economic risk), (3) infrastructural factors (charging availability, accessibility, and reliability), and (4) sustainability- and ESG-related factors (environmental concern and ethical considerations).

This structured synthesis supports the development of an integrated TPB-based framework that extends traditional behavioural models by incorporating contextual and sustainability-related determinants relevant to EV adoption. While the study does not involve primary data collection, the systematic and theory-driven approach ensures conceptual rigor and provides a strong foundation for future empirical testing, particularly in the Slovak market context.

4 Results

This study synthesizes findings from a structured review of academic literature on electric vehicle (EV) adoption, with particular focus on consumer behaviour through the Theory of Planned Behaviour (TPB), as well as ESG-related considerations and policy developments in Slovakia and comparable European contexts. The results are organized around the core TPB constructs–attitude, subjective norms, and perceived behavioural control–followed by additional themes related to infrastructure, cost perception, environmental awareness, and policy influence.

4.1 TPB Constructs and EV Adoption Behaviour

Across the reviewed literature, attitude toward EVs emerges as the most consistent and influential determinant of adoption intention. Consumers generally associate EVs with environmental benefits, lower operating costs, and technological progress. However, these positive perceptions are often weakened by concerns regarding high purchase prices and charging convenience.

Subjective norms also contribute to adoption intention, particularly in socially interconnected European contexts. Individuals are more likely to consider EV adoption when peers, family members, or social groups view EVs positively. This effect is stronger in early adoption phases, where visibility of EV ownership remains limited but socially influential.

Perceived behavioural control (PBC) is identified as a key limiting factor. Consumers' perceived ability to adopt EVs is strongly shaped by external conditions such as charging infrastructure availability, driving range limitations, and access to home charging. PBC often restricts adoption even when attitudes are favourable.

4.2 ESG-Related Motivations

Environmental and sustainability concerns reinforce EV adoption intentions. EVs are increasingly associated with reduced emissions and alignment with ESG values. However, the strength of this effect varies, with younger and environmentally conscious consumers showing higher responsiveness. Corporate sustainability strategies and ESG reporting also indirectly influence perceptions by shaping legitimacy and trust in EV technology.

4.3 Policy and Economic Context

Policy frameworks play a decisive role in shaping EV adoption. In many European countries, subsidies, tax exemptions, and infrastructure investments significantly support uptake. In Slovakia, however, support is more limited, with emphasis on tax-based incentives and gradual infrastructure development. As a result, adoption is more dependent on consumer financial capacity and private sector readiness.

4.4 Emerging Barriers

Key barriers include high upfront costs, insufficient charging infrastructure, range anxiety, and a limited second-hand EV market, all of which reduce affordability and usability.

4.5 Summary of Key Patterns

Overall, EV adoption is a multidimensional process driven by both psychological and structural factors. While TPB provides a strong explanatory foundation, ESG and policy conditions act as important moderators. In Slovakia, structural constraints remain the dominant limiting factor for widespread adoption.

5 Discussion and Recommendations

The findings confirm that electric vehicle (EV) adoption is shaped by a combination of psychological, social, and structural factors consistent with the Theory of Planned Behaviour (TPB). However, TPB alone is insufficient to fully explain adoption, as external constraints such as infrastructure, cost, and policy support play a decisive role in translating intention into actual behaviour.

Among TPB constructs, attitude toward EVs is the strongest positive driver. Consumers generally associate EVs with environmental benefits, lower operating costs, and technological progress. Despite this, a clear gap remains between positive attitudes and actual purchase behaviour, indicating that favourable perception does not automatically lead to adoption.

Subjective norms have a weaker and context-dependent influence. In Slovakia, limited EV penetration reduces visibility and social pressure, which restricts the impact of social influence. This suggests that normative effects are still developing and may strengthen as EV adoption becomes more widespread.

Perceived behavioural control (PBC) is the most significant barrier. High upfront costs, insufficient charging infrastructure, and range anxiety reduce consumers' perceived ability to adopt EVs. Even with positive attitudes, low PBC limits adoption, highlighting the dominance of structural constraints in the Slovak context. Beyond TPB, ESG-related motivations reinforce positive attitudes, particularly among environmentally conscious consumers, but are not strong enough to overcome financial and infrastructural limitations. ESG factors mainly support long-term behavioural change rather than immediate adoption.

The policy environment in Slovakia further shapes these dynamics, as limited direct subsidies and gradual infrastructure development reduce adoption momentum compared to more advanced EU markets.

To accelerate EV adoption, policy efforts should focus on expanding charging infrastructure and improving accessibility to strengthen perceived behavioural control. Financial incentives such as purchase subsidies or tax reductions are also necessary to address cost barriers. In addition, awareness campaigns highlighting both environmental and practical benefits can strengthen consumer attitudes. Finally, integrating ESG principles into public and corporate strategies can support long-term market development.

6 Conclusions

This study examined electric vehicle (EV) adoption through a TPB-based conceptual framework, extended with ESG considerations and policy insights focused on Slovakia. The findings show that EV adoption is shaped by a combination of psychological intentions and external structural conditions.

Within the Theory of Planned Behaviour, attitude toward EVs is generally positive, driven by environmental benefits, cost efficiency, and technological appeal. However, this positive attitude does not consistently lead to actual purchase decisions, indicating a clear intention–behaviour gap. Subjective norms have a limited influence in the Slovak context due to relatively low EV visibility and early-stage market development. Perceived behavioural control is identified as the strongest determinant, with infrastructure limitations, high upfront costs, and range concerns significantly constraining adoption.

ESG-related factors strengthen positive attitudes, particularly among environmentally conscious consumers, but mainly act as supporting rather than primary drivers. Their influence is long-term and dependent on broader market maturity. The Slovak policy environment, characterized by limited direct purchase incentives and gradual infrastructure development, further slows adoption dynamics compared to more advanced European markets.

Overall, EV adoption in Slovakia is primarily constrained by structural and economic barriers rather than consumer resistance. While intention exists, enabling conditions remain insufficient for widespread adoption.

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