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EU STRATEGY FOR THE ELECTRIC MOBILITY DEVELOPMENT IN THE CONTEXT OF THE GREEN ECONOMY TRANSITION

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The global automotive industry is undergoing a profound transformation, driven by the urgent need for decarbonization, energy security, and technological advancements. Electric vehicle (EV) production has become a central element of this transformation, emerging not only as a technological challenge but also as a critical arena for international industrial competition. This article examines the European Union's strategy for electric mobility development within the context of the green economy transition, particularly focusing on the challenges and opportunities that lie ahead for EV production in the EU. The goal of this study is to define the EU's current position in the global electric mobility landscape, identify key policy gaps, and develop scientifically grounded recommendations for enhancing EV production. The methodological framework of this study is built upon a qualitative approach, emphasizing comparative and structural analysis of key factors influencing the development of electric mobility within the EU. The research employs systems analysis and contextual evaluation to understand how innovative technologies are integrated into EU transportation policies and the broader context of the green economy transition. The findings reveal that, despite long-term regulatory frameworks like the 2035 internal combustion engine (ICE) phase-out and the Alternative Fuels Infrastructure Regulation (AFIR), short-term policy volatility and market fragmentation persist as significant challenges. The slowdown in battery electric vehicle (BEV) market share, particularly in Germany, underscores the need for continued and stable policy incentives to maintain adoption momentum. The success of the EU's electric mobility transition will depend on three critical dimensions: sustained policy coherence, equitable infrastructure development, and maintaining industrial competitiveness in a shifting global market. The article identifies the main challenges and opportunities related to the integration of green energy technologies into the EU's transport system and their impact on shaping a sustainable future of mobility. It highlights the role of electric vehicle production as a central component of the EU's green economy transition, addressing both technological and strategic aspects in the context of decarbonization and energy security. The study proposes scientific and practical recommendations for enhancing electric vehicle production within the EU, focusing on the development of policies that ensure long-term stability and effective implementation of green energy technologies. These recommendations aim to overcome the challenges associated with market fragmentation and policy volatility, which threaten the adoption of EVs, especially in the face of a slowdown in the BEV market share, particularly in Germany. The practical implication of this research lies in providing a robust framework for EU policymakers to accelerate the integration of green technologies into the transport sector, thereby boosting the competitiveness of Europe in the global electric vehicle market. The results offer insights into necessary interventions for achieving climate neutrality and securing technological sovereignty within the EU, while also promoting economic growth and job creation in a low-carbon future. Governments must engage in active, long-term policy interventions to foster industrial ecosystems that support clean mobility, economic competitiveness, and technological sovereignty. The proposed recommendations provide a framework for government action that, if successfully implemented, will not only accelerate the transition to electric mobility but also contribute to the EU's broader goals of climate neutrality, technological innovation, and inclusive economic growth. Future research should focus on further refining the strategies

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for cross-border collaboration, the integration of renewable energy into EV infrastructure, and the evolution of consumer behavior in response to policy measures. Ultimately, the EU's strategy for electric mobility development will determine its ability to lead in the global transition to sustainable transportation.

Keywords: *electric vehicle, electric mobility, decarbonization, green economy transition, green energy technologies, transportation policy, sustainable transportation.*

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Formulation of the problem. The transport sector is one of the primary sources of greenhouse gas emissions in the European Union (EU), making it a critical component of the strategy to achieve climate neutrality by 2050. In response to global climate challenges, the EU has developed comprehensive initiatives aimed at decarbonising transport, including legislative measures, infrastructure investments, and the promotion of innovations in sustainable electric mobility.

Technological innovations play a pivotal role in the transition to sustainable mobility, serving as the foundation for reducing greenhouse gas emissions, improving air quality, and enhancing energy efficiency in the transport sector [12, 25]. The European Union actively supports research and development in these areas through programs like Horizon Europe and other initiatives designed to encourage the adoption of advanced technologies and innovative solutions.

Between 2021 and 2024, the EU allocated over €830 million to research and innovation projects under Horizon Europe, focusing on cleaner and more competitive road transport systems. These projects, implemented by the European Climate, Infrastructure and Environment Executive Agency (CINEA), aim to accelerate the development and deployment of low- and zero-emission mobility solutions [24, 29].

The EU's commitment to decarbonising transport is further reflected in its legislative framework, such as the "Fit for 55" package, which sets ambitious targets for reducing emissions across various transport modes. For instance, the Alternative Fuels Infrastructure Regulation mandates the installation of recharging and refuelling stations across Europe to promote the use of alternative fuels [14].

The EU's strategic approach to decarbonising the transport sector encompasses substantial investments in technological innovation, supportive legislation, and infrastructure development. Through these efforts, the EU aims to transition towards a sustainable and climate-neutral transport system by 2050.

Analysis of recent researches. The development of the electric vehicle (EV) market within the European Union has become a focal point of academic and policy-driven research due to its significance in meeting the EU's climate targets and fostering industrial transformation. Recent literature explores various dimensions of this development, including market dynamics, policy effectiveness, economic impact, and social equity.

One of the most significant barriers to the widespread adoption of EVs in the EU is the lack of sufficient charging infrastructure. Many studies, such as Nour M., Chaves Ávila J. P., Magdy G., Sánchez Miralles Á., Nutkani H. Toole, Fernando N., Andrew, L. P. C., Bethoux O., Cui Xiaotian, Das H. S., Rahman M. M., Li, S., Tan C. W., and others , have highlighted the critical role that charging networks play in the decision-making process of potential EV buyers [3, 5, 6, 26, 27]. Dovgal O., Goncharenko N., Honcharenko V., Shuba T., Babenko V., Reshetnyak,O., Dovgal G., Danko N., Shuba T., KarpV., Revyakin G., Shapoval V., and others argue that government programs must go beyond subsidies for vehicle purchase and include public investment in charging infrastructure [7, 8, 9, 10, 24]. Without widespread access to charging stations, the range anxiety and convenience concerns of consumers will persist, hindering the growth of the EV market.

Despite the growing interest in electric mobility within the European Union and the substantial amount of research dedicated to both the economic and environmental aspects of this transition, there are significant gaps in the academic literature. These gaps not only limit the completeness of academic understanding but also hinder the effectiveness of policy-making at both the European and national levels.

One of the most significant gaps in government programs aimed at supporting the EV market is the **disconnect between national and EU-level policies**. While the EU has set ambitious targets for reducing carbon emissions and boosting the uptake of electric vehicles, national governments often have differing priorities, funding mechanisms, and strategies to achieve these goals. This results in **policy fragmentation** across the EU, where some countries are much more successful in supporting EV adoption than others.

For example, countries like the Netherlands and Norway have rapidly increased EV adoption due to comprehensive national policies, such as tax incentives, subsidies, and investments in charging infrastructure. On the other hand, in countries with less coordinated national strategies, such as parts of Eastern Europe, EV adoption has been significantly slower. **The lack of synergy** between national and EU-wide programs creates **implementation inefficiencies** and limits the potential success of EU-wide climate goals.

The aim of the article is to define the EU's current position in the global electric mobility landscape, identify key policy gaps, and develop scientifically grounded recommendations for enhancing EV production.

Summary of the basic research material. In 2019, the European Commission introduced the European Green Deal, aiming to transform the EU into a climate-neutral economy by 2050. As part of this initiative, a Sustainable and Smart Mobility Strategy was developed, targeting a 90% reduction in greenhouse gas emissions from the transport sector by 2050 [16].

The development of electric vehicles is a priority in the EU's strategy for decarbonizing transport. Electric vehicles contribute significantly to reducing CO2 emissions, especially when powered by renewable energy sources. A key milestone within this strategy is the goal of having 30 million electric vehicles on EU roads by 2030 [16].

In 2021, the EU introduced the "Fit for 55" package, aiming to reduce net greenhouse gas emissions by 55% by 2030 compared to 1990 levels. This package proposed measures to tighten CO2 emission standards for passenger and commercial vehicles, promoting the transition to electric mobility [14].

The EU has also developed legislation to support the development of infrastructure for alternative fuels, including electric charging stations and hydrogen refueling stations. This legislation sets requirements for deploying infrastructure along the Trans-European Transport Network, facilitating the creation of a unified market for electric vehicles.

In 2024, new car registrations in the European Union increased by 0.8% to approximately 10.6 million units. Battery-electric vehicles (BEVs) accounted for 13.6% of the total market share, while plug-in hybrid electric vehicles (PHEVs) represented 8.3%. This indicates a slight decline in BEV market share compared to previous years, where BEVs had a 14.6% share in 2023 [4, 15].

Notably, in December 2024, BEVs achieved a 15.9% market share, surpassing diesel vehicles, which had an 11.9% share. This marks a significant milestone in the transition towards electric mobility in Europe [2, 15].

The adoption of battery electric vehicles across European nations continues to reflect significant regional variation, influenced by national policies, market conditions, and consumer behavior. In 2024, this heterogeneity became particularly pronounced in key markets such as Germany, the United Kingdom, and Norway, offering important insights into the dynamics of the EU's electric mobility transition. Germany, traditionally one of Europe's largest automotive markets, experienced a notable downturn in BEV adoption. Specifically, BEV registrations fell by 27% compared to the previous year, translating to over 140,000 fewer units sold.

This contraction can be attributed to a confluence of factors, including persistent supply chain disruptions – particularly in the sourcing of semiconductors and battery materials – as well as evolving consumer preferences amidst macroeconomic uncertainty. Additionally, the reduction or phase-out of certain government incentives may have further dampened market growth, underscoring the sensitivity of BEV uptake to policy support mechanisms. Conversely, the United Kingdom emerged as a major driver of BEV growth in 2024, registering a 20% year-on-year increase in electric vehicle sales [1, 2, 15, 28]. This surge positioned the UK as the largest electric car market in Europe for the year.

The acceleration in adoption has been closely linked to comprehensive government support measures, including tax exemptions, grants for low-emission vehicles, and investments in charging infrastructure. Furthermore, increasing public awareness of environmental issues and heightened fuel price volatility have catalyzed a consumer shift toward electric mobility, reinforcing the impact of both regulatory and market-based drivers.

Norway continues to exemplify best practices in EV policy and market development. In 2024, battery electric vehicles accounted for a record 88.9% of all new car registrations, maintaining the country's global leadership in electric mobility [15, 28]. This unprecedented level of penetration reflects Norway's sustained policy commitment, including full exemption from import taxes and VAT for electric vehicles, access to bus lanes, and a well-developed national charging network. Such measures have created a conducive environment for zero-emission transport, demonstrating the efficacy of long-term strategic planning and consistent policy implementation.

These regional dynamics highlight the complex interplay of economic, political, and social factors shaping the trajectory of electric mobility across Europe. While some countries, like Norway and the UK, are advancing rapidly toward full electrification, others such as Germany are facing transitional setbacks. Understanding these divergences is essential for developing adaptive, country-specific strategies that align with the EU's overarching climate and energy goals.

Advancements in battery technology have been pivotal in the growth of the EV market. The global EV battery manufacturing capacity exceeded demand in 2023, reaching 2.2 terawatt-hours, while demand stood

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at 750 gigawatt-hours [13, 25]. Projections indicate that by 2035, battery demand could increase sevenfold in the Stated Policies Scenario and ninefold in the Announced Pledges Scenario, necessitating substantial investments in battery production.

The European Commission's projections suggest that under current policies, electric light-duty vehicle sales could reach 40% of total sales by 2030 and nearly 55% by 2035. In the Announced Pledges Scenario, sales could rise to 47 million in 2030 and 75 million in 2035, representing two-thirds of total light-duty vehicle sales [15, 21].

To achieve the EU's decarbonization targets for the transport sector, significant financial investments are required. According to the environmental organization Transport & Environment (T&E), annual investments of €39 billion are necessary to meet the net-zero emissions goal by 2050 [30, 31]. This includes establishing a €25 billion fund to support battery production in Europe and modernizing energy grids.

As part of the EU's Sustainable Mobility Strategy, considerable attention is being given to reallocating public investments from traditional transport infrastructure to green technologies. This encompasses support for battery manufacturing, development of charging infrastructure, implementation of green fuels, and modernization of energy networks [30, 31].

Furthermore, the EU is actively working to create conditions that attract private investments into the sustainable mobility sector. With public initiatives such as social leasing of electric vehicles and loan guarantees for clean fuel production, annual private investments are projected to reach €271 billion by 2030. The total volume of private and public investments in green transport technologies could amount to €507 billion per year by 2040.

The Horizon Europe programme is the EU's primary instrument for funding research and innovation from 2021 to 2027. With a budget of approximately €95.5 billion, it aims to address global challenges such as climate change, transition to clean energy, and sustainable mobility. One of the programme's key areas is supporting the development of technologies that facilitate the decarbonization of the transport sector, including through European partnerships.

In 2024, the European Commission announced a €100 million reduction in the Horizon Europe budget, raising concerns among stakeholders. In response, CLEPA and 11 other organizations urged the Commission to maintain funding levels, emphasizing the importance of stable financing for developing a competitive and innovative battery supply chain in the EU [20].

As part of Horizon Europe, projects are being funded to enhance battery performance, improve charging infrastructure efficiency, and develop new business models to stimulate demand for electric vehicles. A notable example of successful project implementation is the establishment of a network of EV charging stations under the Connecting Europe Facility program. In 2025, the EU allocated €422 million to support 39 innovative projects aimed at deploying alternative fuel infrastructure, including charging stations for light and heavy-duty EVs, hydrogen refueling stations, and electrification of airports and ports [11, 17, 19].

Hydrogen is considered a promising energy source for the transport sector, particularly for heavy-duty vehicles and public transport. Under Horizon Europe, projects are being implemented to develop hydrogen production, storage, and utilization technologies, as well as to establish hydrogen refueling infrastructure.

In 2025, the Clean Hydrogen Partnership announced a €184.5 million call for proposals to fund projects on renewable hydrogen production, efficient hydrogen storage systems, and reliable fuel cells for heavy-duty vehicles and maritime transport [22].

However, despite significant investments, the European Court of Auditors noted that the EU's current hydrogen targets, including the plan to produce 10 million tonnes of renewable hydrogen by 2030, may be unrealistic without additional efforts and support from member states.

The development of alternative fuel infrastructure, including liquefied natural gas (LNG), liquefied petroleum gas (LPG), and synthetic fuels, is a crucial component of the EU's strategy to reduce emissions in the transport sector. In 2025, the EU allocated €422 million to support 39 projects aimed at deploying alternative fuel infrastructure, encompassing charging stations for electric vehicles, hydrogen refueling stations, and facilities supplying alternative fuels to ports and airports [18].

These projects contribute to the establishment of a unified network of charging and refueling stations across Europe, ensuring the availability of alternative fuels for various types of vehicles and promoting the transition to more environmentally friendly transportation.

Additionally, the European Commission and the European Investment Bank announced a new partnership to support investments in the EU's battery manufacturing sector. This partnership includes an additional €200 million guarantee for the InvestEU programme and €1 billion in grants to support electric vehicle battery cell production projects. Under this partnership, the European Investment Bank plans to invest an additional €1.8 billion in the broader battery supply chain, totaling €3 billion in public support to develop a competitive and sustainable European battery industry [18].

Complementing these financial commitments, the EU is also advancing its strategic research and innovation agenda through dedicated partnerships. One key initiative in this context is the European Partnership BATT4EU, a co-programmed effort under

Horizon Europe aimed at fostering a competitive and sustainable European battery value chain for electric mobility and stationary applications. This partnership brings together the European Commission and the Batteries European Partnership Association (BEPA), encompassing all stakeholders from the European research community involved in battery technologies.

The specific objectives include supporting the development of differentiating technologies in battery materials, cell design and manufacturing, as well as battery recycling. In addition, BATT4EU contributes to accelerating the development and deployment of sustainable and affordable battery solutions for clean mobility and the integration of renewable energy sources into the energy system.

By 2030, the initiative aims to significantly advance battery technologies and their integration into sustainable energy systems. Key objectives include achieving a 60% increase in battery energy density compared to 2019 levels and improving power density and charging rates to meet the demands of future mobility. The cycle lifetime of batteries is targeted to double relative to the 2019 state-of-the-art, while costs are expected to decrease by 60% over the same period.

Ensuring high safety standards across all application sectors remains a top priority. The initiative also focuses on the adoption of best available technologies in both manufacturing and recycling processes. Finally, sustainability across the battery supply chain will be enhanced by reducing the carbon footprint from raw material extraction to end-of-life recycling.

BATT4EU has developed a Strategic Research and Innovation Agenda (SRIA) to guide its research priorities. The SRIA outlines six key areas:

1. Raw Materials and Recycling: Focus on sustainable sourcing and efficient recycling methods.

2. Advanced Materials and Manufacturing: Develop innovative materials and manufacturing techniques.

3. Battery End-Uses and Applications: Enhance battery performance in various applications.

4. Safety: Ensure high safety standards in battery technologies.

5. Sustainability: Promote environmentally friendly practices throughout the battery lifecycle.

6. Coordination: Facilitate collaboration among stakeholders to avoid research duplication and gaps.

The SRIA serves as a roadmap for aligning research efforts and funding, ensuring that Europe remains at the forefront of battery innovation.

BATT4EU actively collaborates with other European initiatives to enhance the development of battery technologies. Notably, it works closely with the European Battery Alliance (EBA) to establish a robust battery supply chain in Europe. This collaboration includes efforts to develop and implement technologies for battery production, recycling, and access to critical raw materials.

Thus, BATT4EU is a pivotal partnership under Horizon Europe, driving the development of a sustainable and competitive battery industry in Europe. Through its strategic objectives and collaborative efforts, BATT4EU aims to position Europe as a global leader in battery innovation, supporting the transition to a carbon-neutral society.

Building on such strategic initiatives, the European Union has also ramped up its financial support for clean technologies. In 2024, it allocated €4.6 billion to support net-zero technologies, including electric vehicle battery cell manufacturing and renewable hydrogen projects. This funding was provided through the Innovation Fund, which utilizes revenues from the EU Emissions Trading System (ETS) [19].

The Connecting Europe Facility (CEF) also played a significant role in advancing sustainable mobility. In 2024, CEF's Alternative Fuels Infrastructure Facility (AFIF) invested over €424 million in 42 projects aimed at deploying alternative fuels infrastructure across Europe. These projects focused on installing electric recharging points, hydrogen refuelling stations, and electrifying airport ground operations [18].

Additionally, the European Innovation Council (EIC), part of the Horizon Europe programme, continued to support startups and small and medium-sized enterprises (SMEs) in the sustainable mobility sector. In 2024, the UK received approximately £500 million in grants from Horizon Europe, with recipients including leading research institutions such as the University of Oxford, University of Cambridge, University College London, and Imperial College London. Their projects encompassed areas like medical robotics, sustainable fuels, and food biotechnology. These investments reflect the EU's commitment to fostering innovation and accelerating the transition to a sustainable and decarbonized transport sector.

Despite significant progress, the European Union faces several challenges in advancing innovation and technology in sustainable mobility:

1. Competition from Asian Manufacturers: European electric vehicle manufacturers are under pressure from Chinese companies like CATL, which offer lower-cost batteries and vehicles. The EU has responded by imposing tariffs of up to 35.3% on Chinese EVs to protect local industries and stimulate domestic production. However, these measures may lead to trade disputes and increased prices for consumers.

2. Need for Standardization: The lack of unified standards for charging stations, hydrogen refuelling points, and other infrastructure components hinders the efficient deployment of alternative fuel networks. Without standardized protocols, market fragmentation occurs, complicating the integration of various technologies.

3. Supply Chain Dependencies on Critical Materials: The production of EV batteries and fuel cells relies heavily on rare and critical materials such as lithium,

cobalt, and nickel. Europe is nearly 100% dependent on imports for these materials, making it vulnerable to supply chain disruptions. The EU's Critical Raw Materials Act aims to address this by promoting domestic sourcing and processing, but challenges persist [23].

4. Funding and Investment Gaps: While the EU has allocated substantial funds to support clean technologies, there is still a significant shortfall in financing to meet all planned projects. To achieve decarbonization goals, additional investments from the private sector and international partners are essential.

Addressing these issues is crucial for the EU to maintain competitiveness and achieve its sustainable mobility objectives.

To successfully implement the EU's green transport strategy, a combination of substantial public investments, effective redistribution of existing subsidies, and active mobilisation of private capital is essential. Only through such a comprehensive approach can the set goals for sustainable electric mobility and climate neutrality be achieved.

The future of sustainable mobility in the EU hinges on the successful implementation of current initiatives and overcoming existing challenges. Key development areas include:

– Integration of Various Transport Modes: Establishing multimodal transport systems that ensure seamless travel for passengers and efficient interaction between different transport modes.

– Development of Alternative Fuels Infrastructure: Installing charging stations for electric vehicles, hydrogen refueling stations, and other facilities to ensure the availability of alternative fuels across the EU.

– Support for Innovations and Technologies: Investing in research and development in sustainable electric mobility, including the creation of new materials, development of efficient energy storage systems, and optimization of transport processes.

– Education and Awareness: Conducting information campaigns and educational programs to raise public awareness about the benefits of sustainable electric mobility and stimulate demand for environmentally friendly vehicles.

Only through a comprehensive approach that includes technological innovations, investments, standardization, and educational initiatives can the EU achieve its decarbonization goals for the transport sector and ensure a sustainable future for its citizens.

To achieve these decarbonization goals and secure a sustainable future, a structured and integrated strategy is essential. The strategic program we propose is designed around interdependent foundations: industrial capacity, technological innovation, regulatory alignment, and strategic priorities. These core pillars are further strengthened by cross-cutting objectives focused on economic competitiveness, environmental sustainability, and geopolitical resilience.

1. Industrial Capacity as National Infrastructure

EV production should be treated not merely as a commercial activity, but as a form of national infrastructure — essential for economic security and industrial autonomy. This reclassification justifies public investment in gigafactories, battery production lines, and logistics hubs. The scaling of production must be designed to reach critical thresholds that enable economies of scale, attract private capital, and sustain long-term cost competitiveness.

2. Innovation as Strategic Differentiation

Technological leadership is the only durable source of competitive advantage in the EV sector. This requires public support for innovation across the full technological readiness spectrum – from laboratory research to commercialization. Particular emphasis must be placed on next-generation battery technologies (e.g. solid-state, sodium-ion), lightweight materials, and intelligent vehicle systems. Moreover, innovation must be diffused across the industrial ecosystem, including small and medium-sized enterprises (SMEs), which often serve as suppliers or integrators.

3. Regulatory Stability and Policy Credibility

One of the most underappreciated factors in global competition is regulatory certainty. Inconsistent or abrupt policy shifts undermine investor confidence and delay private-sector response. Therefore, long-term regulatory roadmaps are essential – including vehicle emissions standards, charging infrastructure planning, and public procurement targets. Furthermore, domestic regulations must be harmonized with global standards to ensure compatibility, reduce compliance costs, and facilitate exports.

4. Strategic Priorities in the Context of Global Competition

The expansion of EV production must be guided by clear strategic priorities that align with the broader goals of industrial competitiveness and sustainable development.

A. Supply Chain Sovereignty

The COVID-19 pandemic and the war in Ukraine have demonstrated the fragility of global supply chains. In the context of EV production, this is particularly evident in the battery value chain. Without strategic control over raw materials and cell production, EV manufacturing becomes highly vulnerable to geopolitical disruptions. Therefore, the strategic program should includ a policy mix of raw material diplomacy, domestic extraction under environmental safeguards, and mandatory recycling of end-of-life batteries.

B. Talent and Labour Market Transformation

The automotive labour force is undergoing a structural shift, as traditional skills related to internal combustion engines become obsolete. The EV sector demands new competencies in electronics, software, data systems, and chemical engineering. This transformation must be addressed through anticipatory

labour policy, including requalification programs, dual education systems, and industrial apprenticeships focused on electromobility.

C. International Positioning and Export Competitiveness

EV industry in the EU cannot be sustained solely by internal demand. Therefore, export orientation is a core element of the strategic program. This involves not only trade diplomacy, but also active participation in global value chains, targeted export financing, and branding initiatives to position domestic EVs as premium or technologically superior products.

5. Program Implementation and Monitoring

The successful implementation of this strategic program requires coordinated action across government, industry, and research institutions. A central coordinating body – such as a National EV Competitiveness Task Force – should be established to align funding, regulatory frameworks, and industrial targets. Regular monitoring using defined performance indicators (e.g., domestic EV output, gigafactory capacity, R&D investment levels, battery recycling rates) will ensure policy accountability and adaptability.

Furthermore, international benchmarking should be institutionalized. Continuous comparison with leading EV-producing countries (e.g., China, USA, South Korea) will help assess strategic positioning and identify policy gaps.

Institutionalizing international benchmarking is not an end in itself, but a necessary step toward designing more effective policy responses. The insights gained from global comparisons must be translated into concrete, evidence-based strategies. The transition to electric mobility represents one of the most transformative shifts in modern industrial policy. While market forces are crucial, the scale, speed, and complexity of this transformation require active and coordinated government intervention. Based on comparative policy analysis, and theoretical frameworks in innovation economics and industrial policy, we have developed the scientifically grounded recommendations to enhance electric vehicle production in the context of global competition.

1. Establish Long-Term Industrial Policy Frameworks for EV Production

Governments should adopt comprehensive, long-term industrial strategies that integrate EV production into broader economic, environmental, and energy policies. These frameworks should provide strategic direction through clearly defined targets, funding mechanisms, and regulatory roadmaps extending at least 10–15 years.

2. Incentivize Domestic Battery and Component Manufacturing

Government support should prioritize domestic production of batteries, power electronics, and electric drivetrains – the highest value-added segments of the EV value chain. This includes financial incentives for gigafactory development, tax breaks for local suppliers, and conditional state aid based on localization and technology transfer.

3. Strengthen Supply Chain Resilience and Raw Material Security

Governments must ensure reliable access to critical raw materials such as lithium, cobalt, nickel, and rare earth elements. This can be achieved through (a) international resource diplomacy, (b) development of environmentally regulated domestic extraction, and (c) investments in recycling infrastructure and circular economy systems.

4. Fund Research, Development, and Innovation (RDI) in EV Technologies

Public R&D investment should target emerging EV technologies, including solid-state batteries, hydrogen-electric hybrids, and advanced energy management systems. Governments should also facilitate university–industry collaborations and create public innovation hubs for prototyping and commercialization.

5. Implement Targeted Workforce Development and Training Programs

Governments should anticipate labour market shifts by investing in vocational training, re-skilling programs, and university curricula tailored to EV engineering, battery technology, and EV-specific software development.

6. Support SMEs and Regional EV Clusters

Specialized support should be provided to small and medium-sized enterprises (SMEs) within the EV supply chain. This includes access to finance, innovation vouchers, and participation in public procurement. Governments should also promote the development of regional EV industry clusters for knowledge spillovers and economies of agglomeration.

7. Design Smart Subsidy and Tax Incentive Systems

While consumer-side incentives (e.g., purchase subsidies, tax rebates) stimulate demand, production-side subsidies should reward innovation, localization, and sustainability. Governments must design “smart” incentives that avoid long-term market distortion and ensure value-for-money through performance-based conditions.

8. Harmonize Regulatory Standards and Accelerate Homologation

Governments should streamline vehicle certification processes, align safety and emissions regulations with international standards, and reduce bureaucratic delays in product approval. Digitalization of regulatory compliance procedures can further reduce administrative burdens for manufacturers.

9. Public Procurement as a Strategic Market-Shaping Tool

Governments can act as lead customers by committing to electrify public fleets (buses, police cars, municipal vehicles). This creates predictable demand

and enables domestic producers to scale production before commercial market saturation.

10. Foster International Collaboration and Strategic Alliances

Governments should actively participate in multilateral EV initiatives, standardization forums, and joint R&D projects with like-minded countries. Strategic partnerships for shared battery supply chains, infrastructure deployment, and market access are vital in the face of increasingly protectionist industrial policies.

Thus, scientific evidence supports the role of governments in shaping this transition through coherent, targeted, and long-term interventions. Governments around the world are no longer passive observers of market trends but active participants in shaping industrial ecosystems. The developed and proposed by us recommendations outlined above provide a structured and evidence-based framework for policy action. Their successful implementation will not only accelerate the transition to clean mobility but also secure technological sovereignty, economic competitiveness, and employment in a low-carbon future.

Conclusion. The global automotive industry is undergoing a profound structural transformation driven by decarbonization imperatives, energy security considerations, and rapid advances in technology. In this context, electric vehicle (EV) production is no longer simply an environmental or technological issue, but a defining arena of international industrial competition.

The electric vehicle market in the European Union in 2024 stands at a crossroads. The slowdown in BEV market share – especially in Germany – signals that policy incentives remain crucial in maintaining adoption momentum. While long-term regulatory frameworks such as the 2035 ICE phase-out and the AFIR provide structure and direction, short-term policy volatility and market fragmentation present persistent challenges.

The enhancement of electric vehicle production is not merely a technological imperative, but a strategic necessity in a rapidly evolving global industrial landscape. The Horizon Europe programme and the BATT4EU partnership play a pivotal role in supporting the development of technologies that facilitate the decarbonisation of the EU's transport sector. They provide the necessary funding and coordination of efforts between the public and private sectors, contributing to the establishment of a competitive and sustainable battery industry in Europe. However, to attain the established objectives, it is crucial to ensure stable and adequate funding and to continue efforts to create synergies with other initiatives and partners.

The success of the EV transition in Europe will hinge on three key dimensions: (1) sustained policy coherence at both EU and national levels, (2) equitable infrastructure development, and (3) industrial competitiveness in the face of global market shifts. Addressing these factors holistically will be essential to ensuring that electrification not only supports climate goals but also drives inclusive economic growth and technological innovation in EU.

EU Strategy for the Electric Mobility Development represent a comprehensive approach that includes legislative measures, infrastructure investments, and support for innovation. The successful implementation of these strategies requires coordination at the EU and national government levels, as well as active participation from the private sector and civil society. Only through joint efforts can the goals of climate neutrality be achieved and a sustainable future for the transport sector in Europe be ensured.

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СТРАТЕГІЯ ЄС ЩОДО РОЗВИТКУ ЕЛЕКТРОМОБІЛЬНОСТІ В КОНТЕКСТІ ПЕРЕХОДУ ДО ЗЕЛЕНОЇ ЕКОНОМІКИ

Дана стаття присвячена дослідженню стратегії ЄС щодо розвитку електромобільності в контексті переходу до зеленої економіки. Метою дослідження є оцінка поточної позиції ЄС у глобальному ландшафті електромобільності, ідентифікація основних політичних прогалин та розробка науково обґрунтованих рекомендацій щодо активізації виробництва електромобілів. Методологічна основа дослідження базується на якісному підході з акцентом на порівняльному та структурному аналізі ключових чинників, що впливають на розвиток електромобільності в Європейському Союзі. Дослідження використовує системний аналіз і контекстну оцінку для з'ясування того, яким чином інноваційні технології інтегруються в транспортну політику ЄС та ширший процес зеленої трансформації економіки.-Результати дослідження свідчать, що успіх електромобільного переходу в ЄС залежатиме від трьох критичних чинників: збереження політичної послідовності, справедливого розвитку інфраструктури та підтримки промислової конкурентоспроможності в умовах змін глобального ринку. У статті ідентифіковано основні виклики та можливості, пов'язані з інтеграцією зелених енергетичних технологій у транспортну систему ЄС, а також проаналізовано їхній вплив на формування сталого майбутнього мобільності. Дослідження пропонує науково-практичні рекомендації щодо посилення виробництва електромобілів у ЄС із фокусом на формуванні політик, які забезпечать довгострокову стабільність та ефективне впровадження зелених енергетичних технологій. Практична цінність цього дослідження полягає у формуванні ґрунтовної основи для політиків ЄС щодо прискорення інтеграції зелених технологій у транспортний сектор, що, у свою чергу, підвищить конкурентоспроможність Європи на глобальному ринку електромобілів.

Ключові слова: *електромобільність, декарбонізація економіки і транспорту, перехід до зеленої економіки, зелені енергетичні технології, транспортна політика ЄС, сталий транспорт.*

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