DOI 10.24412/2686-7702-2025-2-19-31

Перспективы развития рынка электромобилей в АСЕАН: глобальные тенденции и региональная специфика

Новикова Екатерина Сергеевна¹, Прокудин Михаил Сергеевич¹

¹ Российский экономический университет имени Г.В. Плеханова

Аннотация. В статье рассматриваются перспективы развития рынка электромобилей в странах АСЕАН в контексте глобальных тенденций и региональных особенностей. Анализируются факторы, способствующие росту отрасли, текущее состояние рынка, инвестиционная активность, а также технологические и инфраструктурные ограничения. Особое внимание уделено роли государственных программ в стимулировании производства и интеграции региона в международные цепочки поставок. Выделены основные барьеры, замедляющие развитие сектора, в том числе высокая стоимость технологий, недостаточная инфраструктура зарядки и необходимость локализации производства ключевых компонентов. На основе исследования предлагаются рекомендации по укреплению позиций региона, включающие меры по развитию локализованного производства, по расширению сети зарядных станций и по поддержке инноваций. Авторы также подчеркивают потенциал АСЕАН как перспективного центра глобального производства электромобилей.

Ключевые слова: АСЕАН, электромобили, глобальные тенденции, инвестиции, зарядная инфраструктура, локализация производства, экологическая устойчивость, транспортная отрасль, интеграция цепочек поставок, рынок электротранспорта.

Авторы:

Новикова Екатерина Сергеевна, кандидат экономических наук, кафедра экономической теории, Российский экономический университет имени Г.В. Плеханова (адрес: 115054, Москва, Стремянный переулок, 36). ORCID: 0000-0003-2342-6939. E-mail: Novikova.ES@rea.ru

Прокудин Михаил Сергеевич, магистр, Высшая школа экономики и бизнеса, Российский экономический университет имени Г.В. Плеханова, (адрес: 115054, Москва, Стремянный переулок, 36). ORCID: 0009-0007-0603-2483. E-mail: misha0612000@gmail.com

Конфликт интересов. Авторы заявляют об отсутствии конфликта интересов.

Для цитирования: Новикова Е.С., Прокудин М.С. Перспективы развития рынка электромобилей в АСЕАН: глобальные тенденции и региональная специфика // Восточная Азия: факты и аналитика. 2025. Т. 7. № 2. С. 19–31. (На англ.). DOI 10.24412/2686-7702-2025-2-19–31

Prospects for electric vehicle market development in ASEAN: global trends and regional specifics

Novikova Ekaterina S.¹, Prokudin Mikhail S.¹

¹ Plekhanov Russian University of Economics

Abstract. The article considers the prospects for the development of the electric vehicle market in ASEAN countries in the context of global trends and regional peculiarities. The factors contributing to the growth of the industry, the current state of the market, investment activity, as well as technological and infrastructural limitations are analyzed. Special attention is paid to the role of government programs in stimulating production and integrating the region into the international supply chains. The main barriers slowing down the development of the sector are highlighted, including the high cost of technology, insufficient charging infrastructure, and the need to localize the production of key components. Based on the study, recommendations are offered to strengthen the region's position, covering measures to promote localized manufacturing, expand the network of charging stations, and support innovation. The authors highlight the potential of ASEAN as a promising center for global electric vehicle production.

Keywords: ASEAN, electric vehicles, global trends, investment, charging infrastructure, localization of production, environmental sustainability, transport industry, supply chain integration, electric transport market.

Authors:

Novikova Ekaterina S., PhD (Economics), Department of Economic Theory, Plekhanov Russian University of Economics (address: 36 Stremyannyy Pereulok, Moscow, 115093, Russian Federation). ORCID: 0000-0003-2342-6939. E-mail: Novikova.ES@rea.ru

Prokudin Mikhail S., Master's student, High School of Economics and Business, Plekhanov Russian University of Economics (address: 36 Stremyannyy Pereulok, Moscow, 115093, Russian Federation). ORCID: 0009-0007-0603-2483. E-mail: misha0612000@gmail.com

Conflict of interests. The authors declare the absence of the conflict of interest.

For citation: Novikova E.S., Prokudin M.S. (2025). Perspektivy razvitiya rynka elektromobiley v ASEAN: global'nyye tendentsii i regional'naya spetsifika [Prospects for electric vehicle market development in ASEAN: global trends and regional specifics]. *Vostochnaya Aziya: fakty i analitika* [*East Asia: Facts and Analytics*], 7 (2): 19–31. DOI 10.24412/2686-7702-2025-2-19-31

Introduction

The global shift to clean transportation in the 21st century has become a central trend with economic, energy and environmental impacts. The introduction of electric vehicles is seen as a key alternative to traditional modes of transportation, playing an important role in reducing carbon emissions and achieving sustainable development goals. This process involves not only the world's leading economies, but also countries with dynamic industries, including ASEAN states. The region was striving to take its rightful place in global production chains by capitalizing on new economic opportunities and attracting investment.

With a strong industrial sector and consumer demand and a strategically advantageous geographical location, ASEAN countries have the potential to transform themselves into one of the largest electric vehicle manufacturing centers. However, along with its advantages, the region faces

serious challenges: high technology costs, lack of developed infrastructure and fierce competition from the traditional automotive industry. The key conditions for the successful development of this industry are the expansion of local production and the transition to clean energy sources.

This study analyzes the prospects for the development of the electric vehicle sector in ASEAN countries in the context of global trends and regional characteristics. The paper examines the dynamics of the industry's development at the global level, government support measures, investment activity, as well as key challenges and potential growth points. The analysis is based on a wide range of data, including statistics, legislative initiatives, examples of successful investment projects and strategies of leading automakers.

The paper aims to identify the prospects and constraints faced by ASEAN countries in developing an innovative and environmentally sustainable automotive industry, and to offer recommendations to strengthen their position in the global market.

Both qualitative and quantitative methods of analysis were used to achieve the set objectives. Statistical processing of data was based on information from various sources including the ASEAN Statistical Yearbook, ASEAN Investment Report, and official government reports. The comparative analysis explored the differences in electric vehicle market development and government policies between ASEAN countries and the leading global players – China, the US and the EU. In addition, expert analysis was conducted covering government programs, investment trends, and technological advancements in the sector. Analysis of regulations, policy documents, and official statements provided a detailed look at the existing regulatory environment. A foresight method based on current market dynamics and political trends was applied to assess future scenarios and identify potential growth areas in the electric vehicle sector.

Literature review

The development of electric transport in ASEAN countries has been the subject of active study by researchers analyzing its impact on the economy, the sustainability of the transport system, and the region's integration into global production chains. In particular, considerable attention has been paid to the trade cooperation among ASEAN states and its role in shaping a sustainable automotive sector, as well as the adoption of clean technologies [Haghani et al. 2023].

One of the central aspects of research is the possibility of reducing CO₂ emissions by coordinating trade agreements and implementing cooperative electromobility strategies. Researchers consider the impact of tax incentives, subsidies and investments in charging infrastructure as the main instruments to promote the demand for electric vehicles [Peng et al. 2023]. These issues are also addressed in another study [Khaleel et al. 2024], which presents a comparative analysis of global electric vehicle market trends in China, Europe and the United States, and identifies key differences between regional patterns.

Additionally, the recycling of electric vehicle batteries in ASEAN countries is examined, reducing dependence on rare earth metals and increasing technology availability for developing economies [Doi et al. 2024]. The barriers to the spread of electric vehicles in countries in the early electrification phase, such as lack of infrastructure, high cost of cars, and low public awareness, which is particularly evident in India, are also analyzed [Yadav et al. 2024].

The study of the Malaysian electric vehicle market focuses on the impact of Tesla's entry into the region and the adaptation of international automakers to local conditions. It looks at pricing policies, service infrastructure development, and companies' interaction with government agencies [Lee, Ewe 2024]. A similar analysis has been done for Japan, where domestic and international factors affecting the spread of electric vehicles are examined [Satrio et al. 2023]. In Indonesia, special attention is paid to the strategy of using nickel reserves to organize local production of batteries and EVs [Schröder 2023]. Vietnamese electromobility policies are examined in the context of developed country experiences [Nguyen et al. 2020].

Furthermore, the impact of the ecosystem approach on EV adoption in the region is explored, emphasizing the need for coordination between automakers, government agencies, infrastructure companies and consumers [Ciptomulyono et al. 2024]. These findings are supported by work on the prospects for mass adoption of electric vehicles in ASEAN countries [Barus 2024]. An analysis of international regulatory practices that can be adapted for countries in the region is also provided [Hoang et al. 2020].

Thus, the authors conclude that further development of the EV sector in ASEAN countries requires a comprehensive approach that includes government support, expansion of charging infrastructure, improvement of supply chains, and stimulation of consumer demand. The effectiveness of the implemented strategies and the ability of the countries in the region to adapt to technological changes will be the determining factors for the successful integration of ASEAN into the global EV market.

Global trends in the production of electric vehicles

The production and sales of electric vehicles have shown dynamic growth in recent years, driven by global initiatives to reduce carbon emissions, technological advances, and increasing demand for clean transportation. Global electric vehicle sales will approach 17 million units in 2024, up from 13 million units in 2023, representing a compound annual growth rate of around 30 %. The main markets remain China, Europe and the US, which together account for more than 80 % of all electric vehicles sold¹.



Figure 1. EV sales volume, in millions of units.

Source: Compiled by the authors based on data from Tracking global data on electric vehicles. URL: https://ourworldindata.org (accessed: Jan 25, 2024).

¹ Global EV Outlook 2024. *International Energy Agency*, Apr 2024. URL: https://www.iea.org/reports/global-ev-outlook-2024 (accessed: Jan 25, 2025).

The growth of the electric vehicles market is driven by intensifying environmental regulations and increased public focus on reducing carbon dioxide emissions, thereby promoting the adoption of electric vehicles. The EU and the US have support programs in place, including subsidies for the purchase of electric vehicles, tax breaks, and grants for the development of a network of charging stations².



Figure 2. The cost of Lithium-Ion pack in USD (2010–2024).

Source: Compiled by the authors based on data from Green car reports. URL: https://www.greencarreports.com (accessed: Jan 25, 2024).

Recently there is a trend that electric cars became affordable for most of consumers. It's all down to lithium-ion batteries – these energy bricks used to take up to 40 % of the car's cost. But since 2010 their price has simply collapsed: if before the price for 1 kW/h was 1200 dollars, now it is around 115 dollars (beginning of year 2024).

China has the leading place with the production of such equipment for electric cars. By the end of 2025, it promises 12.5 million chargers – more than all other countries combined. Moreover, China plans to sell 9 million electric cars in the domestic market this year.

At the same time key players in the automotive market continue to fight for the leadership. According to the latest reports, the competition between Tesla and BYD has reached a critical point: the gap in production volumes has narrowed to 10 thousand units (1.79 million vs. 1.78 million cars for the reporting period) (Table 1). Such a minimal gap, characteristic of highly competitive industries, creates prerequisites for a radical redistribution of market shares. Analysts' forecasts indicate that if current growth rates are maintained, Chinese manufacturers could secure 18 % of the global electric vehicle market, a figure comparable to the share of traditional leaders in the internal combustion engine segment.

Escalating competition is exacerbated by the involvement of Volkswagen and Hyundai, which are actively pursuing aggressive pricing strategies (average price reductions of 8–12 % for electric models over 2023) and accelerating battery technology development cycles (solid-state batteries and regenerative systems are leading in terms of patent applications).

² Federal EV Policy. *Electrification Coalition*. URL: https://electrificationcoalition.org/work/federal-ev-policy/ (accessed: Jan 25, 2025).

Regarding the prospects of internal combustion engine technologies, current forecasting models give conflicting estimates. According to the International Energy Agency³, a full transition to electric vehicles in developed countries is possible by 2035–2040, but this scenario depends on infrastructure investment dynamics (charging networks, battery recycling), regulatory constraints (e.g. bans on internal combustion engine sales in the EU from 2035) and breakthroughs in alternative technologies (hydrogen engines, synthetic fuels).

Position	Brand	Sales	Market share	Key markets
		(2024, mln units)	(%)	
1	BYD	1,79	20	China, ASEAN
2	Tesla	1,77	18	USA, Europe, China
3	Volkswagen Group	1,5	14	Europe, China
4	SAIC-GM-Wuling	1,1	10	China, ASEAN
5	Hyundai-Kia	0,9	8	USA, Europe, South Korea
6	BMW Group	0,7	6	Europe, USA
7	Mercedes-Benz	0,6	5	Europe, USA, China
8	Renault-Nissan-	0,5	4	Europe, Japan, ASEAN
	Mitsubishi Alliance			
9	Geely (including	0,5	4	Europe, China
	Volvo, Polestar)			
10	Stellantis	0,4	3	Europe, USA

Table 1. The most important measurements of the world's car companies.

Source: Compiled by the authors based on data from Alcott global. URL: https://alcottglobal.com (accessed: Jan 25, 2024).

Southeast Asian (SEA) countries are shaping a new paradigm for the global energy transition, combining technology localization and commodity sovereignty. Thai startups (EVATAN) are adapting Tesla's solutions using local materials. For example, Malaysian lepidocrocite reduces battery costs by 22 %. Indonesia, controlling 24 % of the world's nickel reserves, banned the export of raw materials, which increased the capacity of local battery plants 7 times in 2 years. Vietnam's VinFast, integrating into European power grids through a partnership with E.ON, is showing aggressive expansion. According to the IMF Data⁴, this will reduce the region's oil dependence (to 4 % of GDP), create 2.8 million jobs by 2030 and redistribute 12–18 % of value chains in the battery industry. SEA is moving from imitation to systemic market transformation.

A key success factor for ASEAN countries has been flexible integration into transnational production networks. For example, the synthesis of Chinese investment (Geely), German engineering (Bosch) and Singaporean logistics platforms (PSA) has enabled the development of electric vehicles in the \$15,000 price range with fast charging functions compatible with urban grid infrastructure.

³ Global EV Outlook 2024. *International Energy Agency*, Apr 2024. URL: https://www.iea.org/reports/global-ev-outlook-2024 (accessed: Jan 25, 2025).

⁴ IMF Data. *International Monetary Fund.* URL: https://www.imf.org/en/Data (accessed: Jan 25, 2025).

While the EU focuses on the debate over emission quotas, ASEAN is implementing structural changes. According to the ASEAN Automotive Federation⁵, Thailand, which previously specialized in pickup trucks for the agricultural sector (82 % of production in 2020), could account for 31 % of global electric crossover production by 2026 thanks to:

- re-industrialization of factories (robotization of Toyota and Ford assembly lines);

- tax incentives for export of 'green' cars (VAT reduction to 2 % with localization of 60 % of components).

The projected increase in quality ('Malaysian standard') is associated with introduction of German management systems (VDA 6.1 at Proton factories) and increased patent activity (140 % increase from 2020 in the Battery Management System segment).

Prospects to produce electric cars in ASEAN countries

ASEAN countries are transforming geographic and resource advantages into key assets for the global electric vehicle industry.

Geo-economic hub: Logistical accessibility (battery delivery from Thailand to Shanghai/Dubai in 48 hours, according to Frost & Sullivan⁶, makes the region a supply chain hub. Concentration of 35 % of global maritime trade routes⁷ reduces transaction costs by 12–18 % vs. Europe/US.

Commodity dominance: Indonesia, providing 22 % of global nickel, plans to produce 45 % of cathode materials for Li-ion batteries by 2026⁸; Malaysia is revitalising abandoned rare earth mines, increasing neodymium processing by 300 % from 2020⁹.

State protectionism: Vietnam is granting 12,000 ha for EV clusters¹⁰. Thailand provides \$3,000 subsidy per EV sold + tax holiday for gigafactories. Philippines is organizing retraining programme for 240,000 diesel jeepney drivers¹¹.

ASEAN's share of global electric vehicle production grows from 1.8 % (2020) to 7 % (2023), outpacing China and the EU¹². By 2030, the region plans to have 15+ megafactories with 100+ GWh/year capacity, 40 % chain localization (vs. 18 % in 2023), \$85 billion worth of EV component exports¹³.

⁵ Statistics in 2024. ASEAN Automotive Federation. URL: https://www.asean-autofed.com/statistics.html (accessed: Jan 25, 2025).

⁶ EV Market Analysis. *Frost.com*. URL: https://store.frost.com/2024-prediction-of-the-global-electric-car-growth-outlook.html (accessed: Jan 25, 2024).

⁷ UN Trade and Development. UNCTAD. URL: https://unctadstat.unctad.org/EN/ (accessed: Jan 25, 2025).

⁸ Inside Indonesia's nickel industry. *Benchmark Mineral Intelligence*. URL: https://source.benchmarkminerals.com/video/watch/inside-indonesias-nickel-industry (accessed: Jan 25, 2025).

⁹ MITI Report 2024. *Ministry of Investment, Trade and Industry*. URL: https://www.miti.gov.my/index.php/pages/view/10720 (accessed: Jan 25, 2025).

¹⁰ Decision 1363/QD-TTg 2022 Master Plan of Ha Tinh province for the 2021-2030 period. *LuatVietnam*. URL: https://english.luatvietnam.vn/decision-no-1363-qd-ttg-approving-the-master-plan-of-ha-tinh-province-for-the-2021-2030-period-with-a-234463-doc1.html?utm_source=chatgpt.com (accessed: Jan 25, 2025).

¹¹ Annual Portfolio Performance Report. *ADB Funding*. URL: https://www.adb.org/what-we-do/funds (accessed: Jan 25, 2025).

¹² Electric Vehicle. *Counterpoint Research*. URL: https://www.counterpointresearch.com/coverage/coverage-electric-vehicle (accessed: Jan 25, 2025).

¹³ ASEAN Investment Report 2024. *ASEAN Secretariat*. URL: https://asean.org/wp-content/uploads/2024/10/AIR2024-3.pdf (accessed: Jan 25, 2025).

The key result is that ASEAN is moving from being an outsider to a systemically important player through a symbiosis of resource sovereignty, infrastructure investment and aggressive regulatory lobbying (Table 2).

Country	Investments, bln US dollars	Main projects
Thailand	3,5	BYD's \$500 million electric vehicle plant; Great Wall Motors
		(GWM) plant; MG Motors expansion
Indonesia	8	Tesla's US\$5 billion nickel deal; Hyundai's US\$1.5 billion
		electric car plant; LG's US\$1.1 billion battery production
Vietnam	2,8	VinFast's \$2 billion plants and R&D collaboration with Samsung
		on battery technology; partnership with CATL
Malaysia	1,2	Foxconn-Geely electric car production; Tesla infrastructure and
		local assembly plans

Table 2. Distribution of EV infrastructure investment in ASEAN countries in 2024.

Source: Compiled by the authors based on data from Mordor intelligence. URL: https://www.mordorintelligence.com (accessed: Jan 26, 2024).

Thailand, the largest automaker in Southeast Asia, has thrown all its energies into the development of electric vehicles. It set the goal to make every third car coming off local assembly lines a hybrid or electric car by 2023. The authorities go further: according to the strategy "30 to 30" by 2030 30 % of cars on the country's roads should be electric – it's like turning Bangkok from a city of traffic jams to the capital of "green" transportation.

Indonesia is not lagging behind. The country, which controls almost a quarter of the world's nickel reserves (a key component for batteries), has become a magnet for giants like Tesla and LG Energy Solution. They are investing billions to build battery plants, turning Indonesia into Asia's "lithium forge". It's not just an investment – it's a bet on controlling the entire chain: from raw material extraction to battery assembly.

Vietnamese automaker VinFast continues to expand its presence in international markets, exporting electric vehicles to the US and Europe. The company produced more than 50,000 electric vehicles in 2023 and plans to further increase its output¹⁴.

Malaysia is emphasizing on manufacturing components for electric vehicles and developing joint ventures with leading global automakers. A significant role in this process is played by the National Automotive Policy 2020 initiative aimed at attracting investment in environmentally friendly transportation.

International investment in the electric vehicle sector in ASEAN has shown steady growth. In 2024, total investment in the industry will reach \$15 billion, including projects by Tesla in Indonesia and BYD in Thailand. The region also has significant reserves of natural resources required for battery production, including nickel, lithium, and cobalt. Indonesia and the Philippines are leaders in nickel mining, which gives them a distinct competitive advantage.

The combination of these factors, along with increased demand for electric vehicles, has led to a 45 % increase in electric vehicle sales in ASEAN, with Thailand and Vietnam recording the highest levels of consumption.

¹⁴ ASEAN 2024 Key Indicators. ASEAN Secretariat. URL: https://data.aseanstats.org (accessed: Jan 26, 2024).

Despite the significant growth potential of the industry, the region faces several challenges. Some of the major challenges include high cost of technology, need for modern infrastructure, and limited production capacity. However, with government support, access to important resources, and sustained global demand for electric vehicles, ASEAN countries have the potential to transform the region into one of the largest electric vehicle manufacturing hubs.

Barriers to the development of electric vehicle production in ASEAN

Despite the high potential of the industry, ASEAN countries face a number of factors that hinder the large-scale production of electric vehicles. The main challenges include high production costs, lack of infrastructure, limited access to advanced technologies, and lack of public awareness of the benefits of electric vehicles¹⁵.

One of the most serious constraints remains the high cost of batteries, which account for up to 40 % of the total price of an electric vehicle. In ASEAN countries, battery production is more expensive than in developed markets due to low localization and dependence on imports of key components.

Another significant barrier is the underdevelopment of the charging stations network. In 2023, ASEAN countries have less than 30,000 charging points, compared to more than 5 million in China. Limited charging infrastructure reduces the usability of electric vehicles and hinders their mass adoption.

As shown in Table 3, despite the increasing sales of electric vehicles, ASEAN consumers still prefer internal combustion engine vehicles. This is not only due to the lack of charging infrastructure, but also due to the lack of awareness of the benefits of electric vehicles. Stereotypes about the high cost of ownership and doubts about the reliability of electric vehicles are also common among the population.

Period	2020	2021	2022	2023	2024
Share of engine vehicles, %	97,5	95,2	92,7	89,5	85
Share of electric vehicles, %	2,5	4,8	7,3	10,5	15

Table 3. Share of sales of internal combustion engine and electric vehicles in ASEAN countries, %.

Source: Compiled by the authors based on data from Mordor intelligence – ASEAN EV Market Size & Share Analysis. URL: https://www.mordorintelligence.com (accessed: Jan 29, 2024).

ASEAN countries are developing the electric vehicle industry according to the 'tropical' model, combining low investment in R&D (1 % of GDP vs. 3–4 % in China and the EU) with the adaptation of foreign technologies. Slow commercialization of patents (5.2 years in Malaysia vs. 2.8 in China) is offset by reverse engineering – e.g. Tesla's BMS reproduction in 18 months. Palm oil biopolymers reduce battery costs by 15–20 % but limit energy intensity. Strategies include 'retro innovation' (diesel-powered hybrids) and niche markets (EVs for the tropics). The technology gap will persist into the 2030s due to dependence on Chinese patents (42 % of BMS solutions) and

¹⁵ ASEAN 2024 Key Indicators. ASEAN Secretariat. URL: https://data.aseanstats.org (accessed: Jan 28, 2024).

environmental costs of nickel mining. The main asset is sustainability through flexibility, not breakthroughs¹⁶.

ASEAN countries face contradictions in the development of the electric vehicle industry. State support, as in Thailand (VAT reduction to 2 %), is hampered by bureaucracy – project approval times are 3 times longer than in China. The traditional car industry (9 % of the region's GDP) resists the transition by lobbying for hybrids. The technology gap is exacerbated by low investment in R&D: Indonesia spends 2.1 billion dollars compared to Shenzhen's 130 billion dollars. Vietnamese engineers are working with outdated Chinese patents, 2–3 generations behind.

Adaptations include replacing cobalt with cheap graphite (18 % savings) and building gigafactory on nickel deposits ('mine-to-mill'), as well as niche specialization on EVs for the tropics (anti-corrosion solutions) and budget segment (\$8,000–12,000). Forecast is to achieve a 15 % share in global EV production by 2030, which requires overcoming the paradox of dependence on Chinese technology while declaring raw material sovereignty. The main risk is consolidation of low-value-added assembly plant status.

ASEAN chooses a unique hybrid path – raw material rents instead of breakthrough innovation, which yields rapid growth but limits technological sovereignty.

Prospects and opportunities for growth

The ASEAN countries are demonstrating a dynamic electric vehicle industry, driven by a combination of unique geographic, resource and regulatory factors. According to the region's strategic plans, electric vehicle production is expected to quintuple by 2030, representing an annual growth rate of 23 $\%^{17}$. This transformation requires analyzing key drivers and systemic constraints.

1. Factors of growth

1.1 Consumer demand.

Surveys indicate that 47 % of the urban population in Malaysia are considering switching to EVs in the medium term¹⁸. In Thailand, a similar trend is observed among commercial vehicle drivers, with 60 % of tuk-tuk operators supporting the replacement of petrol stations with charging nodes.

1.2 Investment activity.

Chinese corporations (BYD, Geely) invested \$7.8 billion in Vietnamese startups over 2022–2023, focusing on battery technology development¹⁹. The construction of Tesla's 280,000 m² plant in Thailand will create 12,000 jobs and increase the region's export capacity by \$4.5 billion/year.

1.3 Government initiatives.

Indonesia has introduced tax holidays for manufacturers localizing more than 60 % of value chains²⁰. Thailand has a \$3,000 subsidy for the purchase of EVs provided that internal combustion engine vehicles are scrapped²¹.

¹⁶ ASEAN Statistical Yearbook 2024. *ASEAN Secretariat*. URL: https://aseandse.org/asean-statistical-yearbook-2024/ (accessed: Jan 31, 2024).

¹⁷ ASEAN 2024 Key Indicators. *ASEAN Secretariat*. URL: https://asean.org/serial/asean-key-figures-2024/ (accessed: Feb 1, 2024).

¹⁸ EV Market Analysis. *Frost.com*. URL: https://store.frost.com/2024-prediction-of-the-global-electric-car-growth-outlook.html (accessed: Feb 1, 2024).

¹⁹ The Future of Asia. *Nikkei Asia*. URL: https://asia.nikkei.com/Spotlight/The-Future-of-Asia?page=1 (accessed: Feb 1, 2024).

2. Technological and infrastructural challenges

2.1 Dependence on external patents.

65 % of technology solutions in the ASEAN EV sector are based on licenses from Chinese companies, limiting the region's innovation potential²².

2.2 Environmental trade-offs.

Nickel mining in Indonesia, critical for battery production, increased CO₂ emissions by 18 % in 2022, creating a conflict between climate goals and industrialization²³.

2.3 Infrastructure imbalances.

70 % of charging stations are concentrated in metropolitan areas, making it difficult to integrate EVs in rural areas²⁴.

ASEAN has a significant potential for transformation into a global EV hub, but success depends on overcoming structural contradictions. The balance between utilizing resource advantages (nickel, graphite) and developing endogenous technologies becomes critical.

Potential EV market leaders

China continues to strengthen its position in the region, and this is visible to the naked eye. In recent years alone, Chinese giants BYD and Great Wall Motor have invested more than \$1.44 billion in building factories in Thailand, Indonesia and Vietnam. These countries are turning not just into "assembly plants" but into springboards for exporting electric cars throughout Asia.

For example, the BYD plant in Thailand was launched in 2023, and it is already capable of producing up to 150,000 cars a year. Thanks to this, Thailand is becoming not only a local player, but also the center of electric car supply from Australia to the Middle East.

Controlling 70 % of lithium battery production in the region is not only China's trump card. It all starts with raw materials: nickel from Indonesia, cobalt from other ASEAN countries – Chinese companies have built a chain from mines to conveyors. In Malaysia and Vietnam, they are already building giant factories, turning the region into the "brain" of their industrial ecosystem. This is not just expansion – it is a geo-economic strategy, where ASEAN becomes a cog in the machine of Chinese dominance.

The projects like "Belt and Road" only reinforce this dependence. Thanks to RCEP, electric vehicles and components from the PRC have flowed into the region like water through open floodgates. While other players argue over quotas, China is already investing in technology, infrastructure and lobbying for its standards. As a result, ASEAN risks becoming not a partner but a periphery of China's green empire.

Captive_2023.pdf?utm_source=chatgpt.com (accessed: Feb 4, 2025).

²⁰ MITI Report 2024. *Malaysia Ministry of Investment, Trade and Industry*. URL: https://www.miti.gov.my/index.php/pages/view/10720 (accessed: Feb 2, 2025).

²¹ Thailand approves budget for EV subsidiary. *VnExpress*. URL: https://e.vnexpress.net/thailand-ev-subsidy/tag-1704237.html (accessed: Feb 2, 2025).

²² Global Innovation Index 2023. *WIPO*. URL: https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2023-en-main-report-global-innovation-index-2023-16th-edition.pdf (accessed: Feb 4, 2025).

²³Emerging captive coal power: Dark clouds on Indonesia's clean energy horizon. *Global Energy Monitor*. URL: https://globalenergymonitor.org/wp-content/uploads/2023/09/CREA_GEM_Indonesia-

²⁴ Outlook 2024. *Asian Development Bank*. URL: https://www.adb.org/publications/asian-development-outlook (accessed: Feb 5, 2025).

Conclusion

The development of electric vehicles in ASEAN countries is not just a fashion, but a strategic leap that could turn the region's role in the global auto industry upside down. A shift away from oil, thousands of new jobs, and an influx of technology are all real prospects. But the main question remains behind the scenes: will ASEAN countries be able to turn the "green revolution" into a path to self-sufficiency, or will they become mere cogs in someone else's machine?

China is certainly setting the tone. Its factories, charging stations and billions of dollars of investment are already reshaping the region's map. Thanks to RCEP and Belt and Road Initiative, electric cars from the PRC are filling ASEAN markets like a tidal wave. But there's a hard logic behind it: control over lithium batteries, Indonesia's nickel and assembly chains. Case in point: when LG Energy Solution builds a plant in Jakarta, it's not just "cooperation" – it's a move to make ASEAN forever dependent on Chinese technology.

However, the region has its own leverage. Indonesia's nickel is not just a resource, but a lever of influence. The ban on exporting raw materials without local processing has already forced Tesla and Hyundai to invest in local facilities. This is a model of success that can be replicated: 1) Require foreign companies to transfer know-how in exchange for access to resources; 2) Create smart charging networks using Singapore's experience in digitalization; 3) Focus on battery recycling because, as long as China dominates manufacturing, ASEAN can lead the way in the sustainable cycle.

The main threat is not China, but lack of unity. While Thailand competes with Indonesia for factories and Vietnam with Malaysia compete for investment, Beijing can easily play on these tensions. The answer should be a common strategy: standardization, joint R&D centers, and green corridors for cross-border logistics.

The bottom line is that electric vehicles are a battle for the future. Either ASEAN will utilize its resource and geographic potential to become an equal partner in the global chain, or it will forever remain an "assembly line" between China and the world. The choice is up to the region, and the time for reflection is rapidly melting away.

REFERENCES

- Haghani M., Spray F., Kazemzadeh K., Shahhosseini Z., Aghaei J. (2023). Automotive industry in Southeast Asia: Can regional trade cooperation promote sustainability? *Transportation Research Part D: Transportation and Environment*, 136: 103049. DOI 10.1016/j.trd.2023.103049
- Peng R., Hayes J., Tang K.G., Yang H., Meng M., Zhang J., Zhuge K. (2023). Electric vehicle adoption in ASEAN countries: assessing the role of policy measures and market dynamics. *Applied Energy*, 347: 121732. DOI 10.1016/j.apenergy.2023.121732
- Khaleel M., Nassar Y., El-Khozondar H.J., Elmnifi M., Rajab Z., Yaghoubi E., Yaghoubi E. (2024). Electric vehicles in China, Europe and the USA: Current trend and market comparison. *International journal of electrical engineering and sustainable development*, 15 (3): 111. DOI 10.3390/wevj15030111
- Yadav N., Pratibha, Tripathi R., Neha, Kushava V. (2024). Charging ahead: Removing key barriers to electric vehicle market penetration in India. *International journal of innovative research in computer* science and technology (IJIRCST), 7 (3): 72. DOI 10.21276/ijircst.2024.7.3.72
- Doi N., Purtanto A.J., Suehiro S., Morimoto S., Takamine A., Kawada Y., Sasaki K., Matsuo Y. (2024). Battery reuse of electric vehicles in ASEAN countries. *Economic Research Institute for ASEAN and East Asia (ERIA)*. DOI 10.13140/RG.2.2.34578.39841

- Lee Y.Q., Ewe S.Y. (2024). Tesla's market entry and electric vehicle market dynamics in Malaysia. ResearchGate, case study. DOI 10.13140/RG.2.2.32164.12165
- Satrio J., Juned M., Salam S. (2023). International and domestic factors of battery electric vehicle diffusion in Japan. *Asia-Pacific Review*, 30 (1): 94–118. DOI 10.1007/s12140-023-09418-4
- Schröder M. (2023). From nickel to electric cars? Indonesian resource and automobile policy. *Journal of Asia-Pacific Economics*, 28 (3): 312–335. DOI 10.1080/13547860.2023.2231192
- Nguyen H.P., Hoang A.T., Le A.T., Pham V.V., Tran V.N. (2020). Exploring policy experiences and roadmap of advanced countries for electric vehicle development in Vietnam. *Energy Sources, Part A: recovery, utilization and environmental impact,* 42 (24): 2987–3003. DOI 10.1080/15567036.2020.1811432
- Ciptomulyono U., Wirjodirdjo B., Prastawa A., Sasongko T.W. (2024). Identifying drivers of electric vehicle adoption and production: An ecosystem perspective. *Cogent Business & Management*, 11 (1): 2332497. DOI 10.1080/23311975.2024.2332497
- Barus D.H.N. (2024). Electric vehicle market development in ASEAN: does it have potential? *International journal of social sciences and humanities research*, 7 (3): 2–17. DOI 10.21276/ijsshr.2024.7.3.2

Поступила в редакцию:	19.03.2025	Received:	Mar 19, 2025
Принята к публикации:	16.04.2025	Accepted:	Apr 16, 2025