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**STRATEGIC PATHWAYS FOR EV AND BATTERY
PRODUCTION IN SERBIA**

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Strategic Pathways for EV and Battery Production in Serbia¹

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Abstract

This paper presents a comprehensive strategic framework for advancing the production of electric vehicles (EVs), including the production of EV batteries in Serbia. It first provides a brief overview of the importance of the automotive industry in the Serbian economy, before highlighting the goals of the national strategies, government incentives for EV and battery production, and the adoption and diffusion of EVs. The paper also offers an overview of the use of EU funds to promote the production and use of EVs and analyzes the implementation progress in Serbia so far.

JEL: L62, O25, Q01, Q58

Keywords: automotive industry, development policy, battery production, mining

1. The Role of the Automotive Industry in Serbia's Economic Landscape

The automotive industry in Serbia has a tradition spanning more than 70 years, which has been further revitalized by the process of privatization that began in 2000. Its roots go back to 1939 when Zastava, the Serbian motor vehicle manufacturer, started producing cars under a license from Fiat. Zastava's suppliers adhered to high-quality production standards, allowing them to collaborate with leading Western car manufacturers such as Mercedes, Ford, PSA, and Opel. Today, the automotive sector stands as one of Serbia's

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most prominent industries, attracting significant foreign investment due to its expertise and history.

Major foreign investors come from Italy (Fiat, Proma-MA, Magneti Marelli, Sigit), France (Michelin, Le Belier), Germany (Bosch, Leoni, Dräxlmaier), the United States (Cooper, Johnson Controls), and South Korea (Yura), among others. The Serbian automotive industry supplies nearly all major European car manufacturers and some in Asia. The sector is particularly strong in producing vehicle chassis system parts, especially tires and suspension components, alongside electrical system components such as car batteries and wiring installations. The production of engine parts, including cast, forged, and machined components like camshafts, brake discs, valves, and flywheels, is also significant.

One of the largest and most crucial investments in the Serbian automotive industry is the FIAT project, which has not only brought high-value investment but also attracted numerous automotive component manufacturers to Serbia. FCA (Fiat Chrysler Automobiles) produces over 100,000 units of the 500L model annually, with the majority being exported to the US and EU markets, reinforcing the sector's pivotal role in Serbia's economy and its integration into global supply chains.

According to Bloomberg Adria (2024), foreign direct investments, which reached approximately €4.5 billion in 2023 and consistently contributed around 7% to Serbia's GDP, have played a crucial role in boosting exports and increasing employment across the country. However, they have not significantly contributed to the growth of the advanced industrial sector, which typically brings high-tech products and adds greater value. Despite multiple global crises and a continuous decline in new orders, Serbia's exports have remained resilient. In 2023, the manufacturing sector, which accounts for the largest share of total merchandise exports (86.2%), achieved exports worth €24.68 billion, reflecting a year-on-year increase of 5.4%. Notably, the sector producing parts for motor vehicles and engines recorded one of the highest import-to-export ratios, with exports covering 502.7% of imports. The production of vehicle components alone generated €2.55 billion in exports, making it one of six manufacturing branches that surpassed €1 billion in export value last year.

2. Overview of trends in the Serbian EV market

Serbia has one of the largest lithium deposits in the world and has the potential to become one of the three largest European producers of this important raw material for EVs. As the green transition drives up demand for lithium, Serbia is keen to capitalize on the opportunities in the EV market.

The Anglo-Australian mining group Rio Tinto has committed to invest USD 2.4 billion in the Jadar lithium borate project in Serbia, where lithium carbonate, boric acid and sodium sulfate are to be extracted from the mineral jadarite. Serbian battery developer ElevenEs plans to invest EUR 1 billion in the construction of a 16 GWh factory for the production and recycling of EV batteries in Subotica, in northern Serbia. ElevenEs has developed LFP technology for EVs and energy storage systems. This technology offers affordability, durability, sustainability and safety without relying on hard-to-source minerals such as cobalt and nickel. The investment from EIT InnoEnergy, a key player in successful battery gigafactory projects such as Northvolt and Verkor, further supports the industrial spin-out of ElevenEs. EIT InnoEnergy is leading the European Battery Alliance, an initiative of the European Commission to strengthen the European battery industry.

The Slovakian battery manufacturer InoBat has signed a Memorandum of Understanding (MoU) with the Serbian Ministry of Finance and the city authorities of Čuprija for the construction of a plant for the production and recycling of batteries for EVs. In 2021, Rio Tinto announced its intention to support the construction of a gigafactory by InoBat in Serbia. However, the Serbian government's decision in January 2022 to revoke Rio Tinto's licenses for the Jadar lithium mine project followed widespread protests from environmentalists across the country.

Japanese manufacturer Nidec has built two new factories in Novi Sad, Republic of Serbia, to meet the growing demand for EV components in Europe. Nidec joins a number of manufacturers and suppliers attracted by the country's strategic location close to the main Central European vehicle and component production hubs. Despite the delays in the Jadar project, Serbia is making progress in the production of EVs. Stellantis, the owner of a large automotive factory in Kragujevac, is gearing up for the production of EVs. In addition, the US-based EV manufacturer Rivian has set up a technological center in Belgrade.

Continental is expanding its operations in Serbia, with significant ongoing investments in its Novi Sad facilities. The separation of the auto parts division from the German Continental group is not expected to impact the company’s Serbian branch, which has committed €165 million to expand its factory and plans to increase its workforce. At Continental’s Research and Development Center in Novi Sad, over 1,000 engineers are working on advanced automotive technologies. In Kać, where Continental launched a large-scale factory a year and a half ago, the first phase saw an investment of €140 million. Now, in response to rising project needs and further expansion goals, the company is investing an additional €165 million to expand its production capacity and upgrade equipment. Key industry trends, including autonomous driving, electric vehicles, connectivity, and software-defined vehicles, are shaping Continental’s approach, as these advanced vehicles demand complex, high-value electronics and software. Continental’s automotive division, which includes the Novi Sad operations, provides a comprehensive range of both software and hardware solutions to meet the needs of the future automotive industry.

Table 1. Foreign companies in the EV market in Serbia

Company	Activity	Location	Investment value	Status of activity/investment
Rio Tinto	Jadar lithium borate project	Loznica	USD 2.55 billion	Delayed
ElevenEs	Construction of a 16 GWh factory for the production and recycling of EV batteries	Subotica	EURO 1 billion	Planned
InoBat	Construction of a plant for the production and recycling of EV batteries	Ćuprija	n/a	MoU signed
Nidec	Two factories for EV components	Novi Sad	n/a	Established
Stellantis	EV manufacturing	Kragujevac	n/a	Planned
Rivian	Technological center in Belgrade	Belgrade	n/a	Established
Continental	Factory for innovative solutions for automotive electronics	Novi Sad	EURO 140 million	Realized

Source: Authors’ summary

3. Goals of the national regulatory and strategic framework

The Industrial Policy Strategy of the Republic of Serbia from 2021 to 2030 focuses on raising the competitiveness of the country's industry. One of its specific objectives is to enhance the technological structure of exports. A key measure supporting this objective is a support programme for industrial companies to enter the supplier chains of multinational corporations. This measure provides financial assistance to companies from selected sectors, including the automotive industry, machinery, metal processing, rubber and plastics, and electronics. The aim is to develop their capacities and align with international quality standards, enabling them to integrate into global value chains and thus drive innovation and export growth.

Serbia does not have a specific national strategy solely focused on EV and battery production and adoption. However, there are initiatives and efforts aimed at promoting electromobility and sustainable transportation in the country. These include regulations for the subsidized purchase of new EVs and participation in international agreements, such as the Paris Agreement on climate change. In addition, organizations such as the National Association of Autonomous and Electrical Vehicles in Serbia and engineering associations have developed guidelines and strategies for the development of electromobility in Serbia.

Serbia's strategic documents for promoting electromobility and sustainable transport align with international commitments and EU standards including:

- *The Paris Agreement on climate change*
- *The United Nations' 2030 Sustainable Development Program*
- *The Sofia Declaration on the Green Agenda for the Western Balkans (2020)*, committing to carbon-neutral transport by 2050 and emphasizing climate policy reform and sustainable urban mobility plans
- *The European Strategy for Low Emission Mobility*
- *Nationally Determined Contributions (NDCs)*

The following national and local documents deal directly or indirectly with the production and introduction of EVs and underline Serbia's commitment to reducing emissions,

improving infrastructure and promoting sustainable mobility in line with international standards and EU policy:

- *The Transport Strategy of the Republic of Serbia 2016-2025 and the Strategy for the Road Sector in Serbia 2017-2025*, focusing on infrastructure development and electromobility integration.
- *Guidelines for the Development of Electromobility in the Republic of Serbia 2019-2025*, aiming to create conditions for the Serbia e-Mobility Strategy.
- *The Sustainable Urban Mobility Plan of Belgrade*, which promotes cleaner transport options and electromobility incentives.
- *The Industrial Policy Strategy 2021-2030*, addressing industrial promotion and circular economy integration to foster sustainable industrial growth.

The objectives of the national regulatory and strategic framework in Serbia regarding electromobility can be outlined as follows:

1. **Alignment with International Commitments:** Develop policies and strategies that align with international agreements and commitments such as the Paris Agreement on climate change and the United Nations' 2030 Sustainable Development Program.
2. **Integration with EU Transport Policy:** Ensure alignment of Serbia's transport policy with that of the European Union to support economic and social development and facilitate the country's path toward EU membership.
3. **Promotion of Low-Emission Mobility:** Implement measures to promote low-emission mobility, including the adoption of EVs, as a key component of transitioning to a low-emission economy.
4. **Reduction of Greenhouse Gas Emissions:** Work towards reducing greenhouse gas emissions in the transportation sector, in line with Serbia's commitments under the Paris Agreement and its Nationally Determined Contributions (NDCs).
5. **Strengthening of Regulatory Framework:** Enhance the regulatory framework to support the development and deployment of EVs, including the establishment of standards and incentives for their adoption.

6. Infrastructure Development: Prioritize the development of charging infrastructure for EVs to support their widespread adoption across the country.
7. Collaboration and Stakeholder Engagement: Foster collaboration between relevant authorities, stakeholders, and organizations involved in the planning and development of road infrastructure and transportation systems to ensure effective implementation of electromobility initiatives.
8. Research and Innovation: Encourage research and innovation in the field of electromobility to drive technological advancements and support the growth of the EV industry in Serbia.
9. Capacity Building: Invest in capacity building and education initiatives to raise awareness about the benefits of electromobility and to equip relevant stakeholders with the necessary skills and knowledge to support its implementation.
10. Promotion of Sustainable Urban Mobility: Promote sustainable urban mobility solutions, including the expansion of public transport and the use of alternative drive systems, to reduce congestion and improve air quality in urban areas.

The document titled "Guidelines for the Development of Electromobility in the Republic of Serbia for the Period from 2019 to 2025" is a collaborative effort between the National Association of Autonomous and Electric Vehicles (NAAEV), the Academy of Engineering Sciences of Serbia (AIS), and the Association of Electrical Engineers of Serbia (IES). It serves as a comprehensive roadmap aimed at fostering the advancement of electromobility within Serbia. One of the primary objectives outlined in this document is the formulation of the "Serbia e-Mobility Strategy" spanning the years 2019 to 2025. The overarching goal is to lay down the groundwork necessary for the growth and development of the EV industry in Serbia during this timeframe. It emphasizes research and innovation to stimulate advancements in electromobility technology, fostering an innovative environment to drive EV industry growth in Serbia.

These goals are intended to guide the development of policies, strategies, and initiatives that will facilitate the widespread adoption of EVs and contribute to Serbia's transition towards a more sustainable and environmentally friendly transportation system.

4. Government incentives

The Serbian government has issued a regulation on the granting of subsidies for the purchase of new EVs and provided a total of 170 million dinars (equivalent to approximately USD 1.6 million or EUR 1.5 million). The amount of the subsidies varies between 250 euros and 5,000 euros, depending on the type of vehicle purchased.

The Serbian Ministry of Finance and the Municipality of Ćuprija in the central region have collaborated with the Slovakian battery manufacturer InoBat to build a plant for the production and recycling of batteries for EVs. This strategic partnership, formalized through a MoU, aims not only to produce energy storage solutions and EV batteries, but also to establish recycling facilities in line with InoBat's C2C platform to promote a circular value chain. The initiative, which is supported by the International Finance Corporation (IFC), is significantly promoted by the Serbian government, which has provided a financing package of EUR 419 million for its realization.

There are announcements that the government will enable lower toll payments on roads in Serbia for drivers of electric vehicles. However, this has not yet been officially introduced.

5. Utilization of EU Aid

At the Summit in Tirana on December 6, 2022, the European Union and the Western Balkans leaders announced a comprehensive support package, including a new initiative to support the region in the energy sector worth EUR 1 billion. Serbia is set to receive EUR 165 million directly from the EU budget support package, the largest share compared to the other Western Balkan partners. This financial agreement legally enables the transfer of funds to the Serbian budget earmarked for the implementation of the energy roadmap presented by the Serbian government.

Numerous initiatives and projects aimed at fostering the green transition, particularly the realization of the Green Agenda, have either been realized or are currently in progress, largely facilitated by access to EU funds and other financial resources:

1) Title: "Electric Vehicles Manufacturing Serbia"

Description: Initiated in March 2024, the project entails significant investments at the Kragujevac plant in Serbia. The objectives include modernizing the facility to accommodate advanced manufacturing technologies for EV production, installing PV equipment for sustainable energy generation, and enhancing workforce skills through training initiatives. Commencing in 2022, the investments will primarily occur between 2023 and 2024. This initiative contributes to the advancement of EV technology, promoting affordability, efficiency, and market adoption, while addressing environmental concerns. It aligns with the EIB's objectives for innovation, digitalization, and human capital, as well as economic and social cohesion, particularly in EU candidate countries like Serbia. Moreover, the project supports climate action and environmental sustainability, qualifying for EIB financing under the Pre-Accession Facility. With an estimated EIB finance of EUR 110 million, the total project cost is approximately EUR 221 million, offering a substantial impact on Serbia's economic growth, job creation, and sustainable development, in line with UN Sustainable Development Goals.

Source: European Investment Bank

2) Title: "EU for Green Agenda in Serbia"

Description: Spanning from January 2022 to December 2026, the project aims to significantly contribute to decarbonization efforts and the achievement of the goals outlined in the Paris Climate Agreement. It seeks to address environmental challenges by reducing pollution in air, land, and water, while aligning with the European Union's *acquis* in all five key areas covered by the Green Agenda. Funded by the European Union with a donation of EUR 7.2 million, the project also received financial support from other partners. In 2022, the Government of Switzerland contributed an additional USD 7.1 million, the Government of Sweden provided \$1.58 million, and the Government of the Republic of Serbia allocated USD 0.8 million towards this initiative.

Source: United Nations Development Programme

3) Title: "EU4Green: Greening the Western Balkans"

Description: Spanning from June 2023 to December 2025, the project is dedicated to supporting the countries of the Western Balkans in their transition towards a greener

and more sustainable future. With a primary focus on enhancing environmental protection and promoting green practices, the project aims to strengthen the economies of these countries and reinforce their capacity to safeguard the environment. Funded by the European Union with a donation of EUR 10 million, the project aims to facilitate the region's integration into the European Union, as environmental sustainability is a fundamental aspect of EU membership.

Source: EU4Green

4) Title: "EU PPF Programme: Enhancing Infrastructure and Institutional Capacities in Serbia"

Description: The Programme focuses on preparing technical and tender documentation for infrastructure projects in Serbia's energy, environment, and transport sectors. It also conducts over 70 capacity-building trainings for local and national institution representatives. With EU PPF's support, technical documentation for 15 major projects in these sectors is underway, with a potential total investment exceeding EUR 900 million. Additionally, the Programme assists in updating the Document on Needs of the Republic of Serbia for International Assistance and developing a new Needs Assessment Document for Serbia 2020 – 2025 to structure foreign assistance requirements.

Source: EU projects in Serbia

5) Title: "EU for Better Environment: Enhancing Environmental Protection in Serbia"

Description: The project aims to develop a national strategy and program for ambient air protection, aligning with EU directives. It involves drafting specific plans for executing EU directives on air protection and chemical management. The initiative enhances the Ministry of Environmental Protection's long-term investment plan, prioritizing environmental initiatives. End users include the Ministry of Environmental Protection, the Republic Geodetic Authority, and Negotiation Group 27. Project outcomes will aid Serbia's EU accession negotiations, improve air quality and citizen health, and establish a comprehensive environmental information system. Implemented from January 2019 to October 2021 under Negotiating Chapter 27, the project receives a EUR 2 million donation from the EU.

Source: EU projects in Serbia

6) Title: "Further Development of Energy Planning Capacity: Strengthening Serbia's Commitment to Climate Action"

Description: The project aligns with Serbia's commitments under the Paris Agreement and its goals for renewables, energy efficiency, and greenhouse gas emissions reduction by 2030. Like EU Member States, Serbia, as an Energy Community Contracting Party, is committed to monitoring and reporting progress in these areas. Activities include public consultations and discussions on the Draft Integrated National Energy and Climate Plan (INECP) and the Strategic Environmental Impact Assessment Report. Implemented from February 2021 to December 2023 under Negotiating Chapter 15 - Energy, the project receives a EUR 1.35 million donation from the EU.

Source: EU projects in Serbia

6. Serbia's implementation steps taken so far

The global demand for lithium batteries for EVs has led to a remarkable shift in production from Asia to Europe. In Central and Eastern Europe, an investment revolution in batteries and EVs is underway as Asian countries shift their production to the old continent. Serbia has the opportunity to ride this wave, even if it is hampered by not being part of the European market, which is driving companies to other countries. Despite this obstacle, Serbia has made progress in improving the business environment for the production of EVs and batteries, which is attracting investment in this sector.

This commitment is reflected in the interest of prominent companies such as the Anglo-Australian mining group Rio Tinto, which has committed to invest USD 2.4 billion in the Jadar lithium borate project in Serbia. In addition, the Serbian battery developer ElevenEs is planning to invest EUR 1 billion in the construction of a factory. Slovakian battery manufacturer InoBat is also building a plant for the production and recycling of EV batteries, while Japanese manufacturer Nidec has built two new factories in Novi Sad. In addition, Stellantis, owner of a large automotive factory in Kragujevac, is actively preparing for the production of EVs, which underlines Serbia's attractiveness as an investment location in this industry.

Despite Serbia's potential, the lack of integration into the European market remains a major obstacle. Although efforts have been made to attract investment in EV and battery production, there is still a lack of a coherent national strategy in this area.

7. Lithium mining in Serbia – current situation and prospects

Rio Tinto discovered Jadarite, a mineral rich in lithium and boron, in 2004. The Jadar deposit is situated near the Jadar River, close to the town of Loznica in Western Serbia (Rio Tinto Serbia, 2024). The Jadar deposit contains two minerals: jadarite ($\text{LiNaSiB}_3\text{O}_7(\text{OH})$) and searlesite ($\text{Na}(\text{H}_2\text{BSi}_2\text{O}_7)$). These minerals have a significantly higher silicon dioxide content than other boron-containing minerals. The absence of these minerals in other known deposits indicates that the Jadar deposit was formed by atypical mineralization processes (Natural History Museum, 2024).

According to the U.S. Geological Survey (2024), the five countries with the highest proportion of lithium reserves are: Bolivia (21.89% with 23 million tons), Argentina (20.94% with 22 million tons), the United States (13.32% with 14 million tons), Chile (10.47% with 11 million tons), and Australia (8.28% with 8.7 million tons). Serbia, on the other hand, ranks 12th in the world with a share of 1.14% and a total of 1.2 million tons of lithium reserves. Even if Serbia is not at the top, it still occupies a significant position in terms of global lithium reserves, especially if only the European reserves are considered.

Although the exact timeline for the completion of the project is still uncertain, it is believed that the Jadar mine could potentially be operational as early as 2028. If successful, this project could introduce Serbia to the lithium market. The planned project includes the production of three main products: borates, lithium carbonate, and sodium sulphate. It is estimated that 90% of the employees during the operation of the mine will be from Serbia. The project has an allocated budget of USD 2.55 billion for implementation and is expected to create 1,300 skilled jobs (Rio Tinto Serbia, 2024).

The Jadar project, which includes an underground mine, a processing plant, and an industrial waste landfill, has caused debate and uncertainty. Despite the revocation of licenses in 2022, an earlier decree that had halted the project was overturned in July 2024

by a ruling of the Serbian Constitutional Court, allowing Rio Tinto to proceed with its plans to develop the lithium mine (Todorović, 2024a).

Rio Tinto has outlined plans to address environmental issues such as water contamination, air pollution, and waste management. The company is committed to minimizing the impact on local ecosystems and has announced that it will conduct several Environmental Impact Assessment (EIAs) studies (Rio Tinto Serbia, 2024):

- An EIA for the underground mine
- An EIA for the ore processing plant
- An EIA for the industrial waste landfill

In addition, Rio Tinto has worked with local communities to strike a balance between economic development and environmental protection. However, the lack of completed environmental impact assessments remains a critical issue. These assessments are necessary to obtain further approvals and address concerns regarding biodiversity, water resources, and land use. Until the studies are completed, the future of the Jadar project remains uncertain, despite efforts to advocate for sustainable development and responsible mining practices.

Public opposition to the mine is present. There have been multiple protests in which many people have taken part. The opposition goes to the extent that a member of the Serbian Parliament has accused the government of selling Serbia's natural resources to foreign interests (Todorović, 2022), and a protest has been organized in front of the Constitutional Court against Rio Tinto's plans (Todorović, 2024b).

On the environmental front, the research by Đorđević et al. (2024) indicates that the exploratory drilling has already caused some damage. Contaminated water with high boron concentrations has leaked from exploratory boreholes, damaging crops. Higher concentrations of boron, arsenic, and lithium have been detected in rivers downstream of the site, and soil samples have consistently exceeded remediation limits. If the mine continues, concerns about tailings ponds, wastewater, noise, air pollution, and light pollution are likely to increase (Đorđević et al., 2024).

On the other hand, the project offers considerable economic benefits. According to the Ergo Strategy Group (2023), the Jadar project represents an investment of at least USD

2.55 billion, which corresponds to around 4% of Serbia's total GDP. It is expected to contribute an additional 695 million euros annually to the country's GDP, which is about 1% of the total. The project is also expected to generate significant tax revenues, create numerous jobs for skilled workers, and promote the development of a local supply chain involving domestic companies (Ergo Strategy Group, 2023).

In summary, the Jadar project presents a complex situation, with environmental concerns and public opposition on the one hand and potential economic benefits for Serbia on the other. Apart from the direct economic impact, the project holds significant potential for Serbia's role in the global battery production supply chain. The lithium extracted from the Jadar mine could be a key resource for the production of lithium-ion batteries, which are essential for electric vehicles and renewable energy storage. This strategic resource could enable Serbia to play a more prominent role in the growing clean energy sector.

8. Concluding remarks

Serbia is strategically positioned to become a significant player in the production of EVs and EV batteries, driven by its strong automotive sector and substantial foreign direct investments. The country's rich lithium deposits, among the largest in Europe, offer a unique advantage, providing a crucial resource for EV battery production. This could enable Serbia to play a pivotal role in the global transition to clean energy, with the potential to supply key materials for EVs and renewable energy storage.

The projected growth of the EV market, with revenues expected to reach €16.2 billion in 2024 and a compound annual growth rate of 12.61% through 2028, signals strong demand and a promising future for the sector. This growth is supported by government incentives, expanding charging infrastructure, and increasing EV adoption. Serbia's focus on integrating into global supply chains is further emphasized by major investments, including Rio Tinto's USD2.4 billion commitment to the Jadar lithium project, and plans from companies like ElevenEs and InoBat to develop battery production facilities.

However, despite these promising developments, Serbia lacks a comprehensive national strategy solely dedicated to the production and adoption of EVs and batteries.

While initiatives exist, such as subsidies for EV purchases and efforts to align with international agreements like the Paris Agreement, a more focused and coordinated approach could accelerate progress in this area. Additionally, environmental concerns, particularly surrounding the Jadar project, must be carefully managed to balance economic benefits with sustainability.

Serbia's vast lithium reserves, growing EV market, and increasing foreign investments provide a solid foundation for the country to emerge as a key player in the European EV and battery production industries. With the right strategic focus, Serbia has the potential to become a leading force in the region's green transition and a contributor to the global EV supply chain.

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