A Short Paper Submitted to the NBM Conference 2024

Sustainable Business Models for Advancing the Electric Vehicle Industry in Kazakhstan: A Review

Timur Kogabayev[1,*,2], Baldyrgan Alibekova[3]

[1]M. Narikbayev KAZGUU University; [2]University of Tartu; [3]Tallinn University

*kogabayev@kazguu.kz

Abstract

The EV industry offers promise for environmental mitigation and reduced fossil fuel dependency. In Kazakhstan, sustainable business models are vital for EV sector growth, aligning economic progress with environmental concerns. This study reviews literature on EV sustainable models and sustainable business models, assessing their applicability and potential in Kazakhstan's development.

Keywords

Sustainable business models, Electric vehicle industry, Kazakhstan, Sustainable development, Transition strategies

Main text

Introduction

The increasing global demand for environmentally friendly transportation highlights the pivotal role that electric vehicles (EVs) play in reducing greenhouse gas emissions and dependence on fossil fuels. A range of studies have explored the potential for sustainable business models in the EV industry. Reinhardt (2019) and Nanjundaswamy (2023) both highlight the potential for EV battery second use and the use of EVs in business processes

to reduce costs and contribute to sustainable development. Yix (2014) and Shiiki (2012) focus on the economic aspects of these models, with Yix emphasizing the importance of factors such as charging time and market-penetration, and Shiiki proposing the development of open source businesses in the EV industry. These studies collectively suggest that sustainable business models in the EV industry can be achieved through a combination of economic, social, and environmental considerations. Kazakhstan, with its abundant natural resources, is poised to capitalize on this trend by establishing sustainable business models (SBMs) for the EV industry. Strategically located between Europe and Asia, Kazakhstan's advantageous geography provides a unique opportunity for the nation to become a prominent player in the automotive sector. Recent efforts to manufacture and construct EVs aim to position Kazakhstan as a significant competitor in the global export market, thereby broadening the economy and reducing reliance on fossil fuels, which are a major contributor to greenhouse gas emissions (Sarsembayev et al., 2023). This initiative not only demonstrates Kazakhstan's commitment to sustainable technology but also attracts foreign investment and creates job opportunities, thereby fostering the nation's economic growth and progress.

The growing popularity of EVs can be attributed to several advantages, including:

1. Reduced greenhouse gas emissions: Studies by Requia et al. (2018) and Ellingsen et al. (2016) demonstrate significantly lower emissions compared to fossil fuel vehicles.

2. Less reliance on imported oil: As highlighted by Carlsson and Johansson-Stenman (2003), EVs decrease dependence on foreign oil sources.

3. Improved air quality: Soret et al. (2014) point out the positive impact of EVs on air quality, particularly in urban areas.

4. Cost-effective operation: Ayodele and Mustapa (2020) note that lower electricity costs and simpler mechanics make EVs cheaper to run than gasoline cars.

To accelerate the adoption of EVs, policymakers are implementing various initiatives, including:

1. Financial incentives: Tax breaks and subsidies, as studied by Wang et al. (2019) and Breetz and Salon (2018), encourage individuals to purchase EVs.

2. Stricter regulations: Emissions standards and bans on gasoline vehicles, as discussed by Kosov et al. (2017), pressure manufacturers to shift towards EVs.

Falchetta and Noussan (2019) have predicted that a confluence of variables will lead to the swift expansion of the EV market in Kazakhstan. Nevertheless, the industry encounters numerous obstacles that necessitate resolution in order to promote extensive acceptance. The establishment of enough charging stations continues to be a major obstacle in the progress of infrastructure development. Furthermore, it is necessary to simplify legal and

regulatory obstacles in order to enhance the efficiency of cross-border trade. Kazakhstan's energy system achievements have been acknowledged by international specialists, especially in comparison to other Central Asian countries (Aldayarov et al., 2017). However, the industry is confronted with difficulties stemming from the decrease in global commodity prices, the drop in industrial production, and the decreasing demand for electricity. Primary concerns encompass the elevated energy intensity, inadequate power generation, investment requirements, regulatory inefficiencies, and setbacks in industry transformation. Despite these obstacles, electric vehicles present a hopeful pathway towards a more environmentally friendly and enduring future. In order to promote its acceptance and use, it is crucial to have progress in technology, infrastructure, and policies.

This study utilised a comprehensive methodology to thoroughly examine sustainable business models (SBMs) for the EV market in Kazakhstan. The study aimed to answer following research questions: 1) What are the key elements and characteristics of sustainable business models that have been implemented or proposed to advance the electric vehicle industry in Kazakhstan, and how do these models contribute to environmental sustainability, economic development, and societal well-being? 2) What are the challenges and opportunities associated with the adoption and implementation of sustainable business models in the electric vehicle industry in Kazakhstan, and what strategies can be recommended to overcome barriers and leverage opportunities for further advancement?

A comprehensive analysis of scholarly literature, industry papers, and regulatory documents pertaining to sustainable business models in the EV industry was undertaken. This entailed comprehensive searches of academic databases and scrutiny of reports from credible institutions. The objective of the literature research was to ascertain worldwide patterns, significant topics, and optimal strategies in SBMs for electric EVs. This analysis yielded valuable perspectives on the various techniques employed globally to encourage EV adoption and tackle sustainability issues.

Data pertaining to the adoption rates of EVs, government incentives, and other pertinent elements in Kazakhstan were methodically gathered from diverse sources, encompassing official organisations and industry reports. Subsequent to that, statistical analysis methods were utilised to evaluate the present state of the electric vehicle industry in Kazakhstan and reveal emerging patterns. The study intended to analyse the data in order to acquire insights into the elements that influence EV adoption in Kazakhstan.

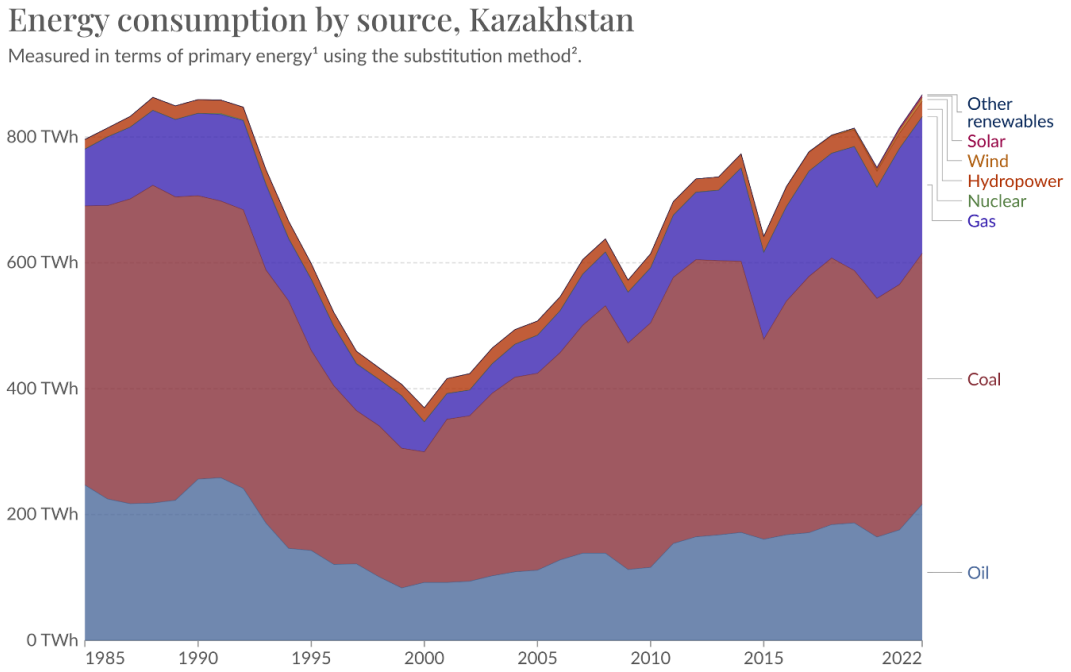
Literature review

Kazakhstan Energy profile

Kazakhstan, endowed with abundant non-renewable (oil, gas, coal, uranium) and renewable (wind, solar, biomass, hydro, geothermal) energy resources, stands as one of the foremost energy producers in Central Asia (International Energy Agency, 2015). The

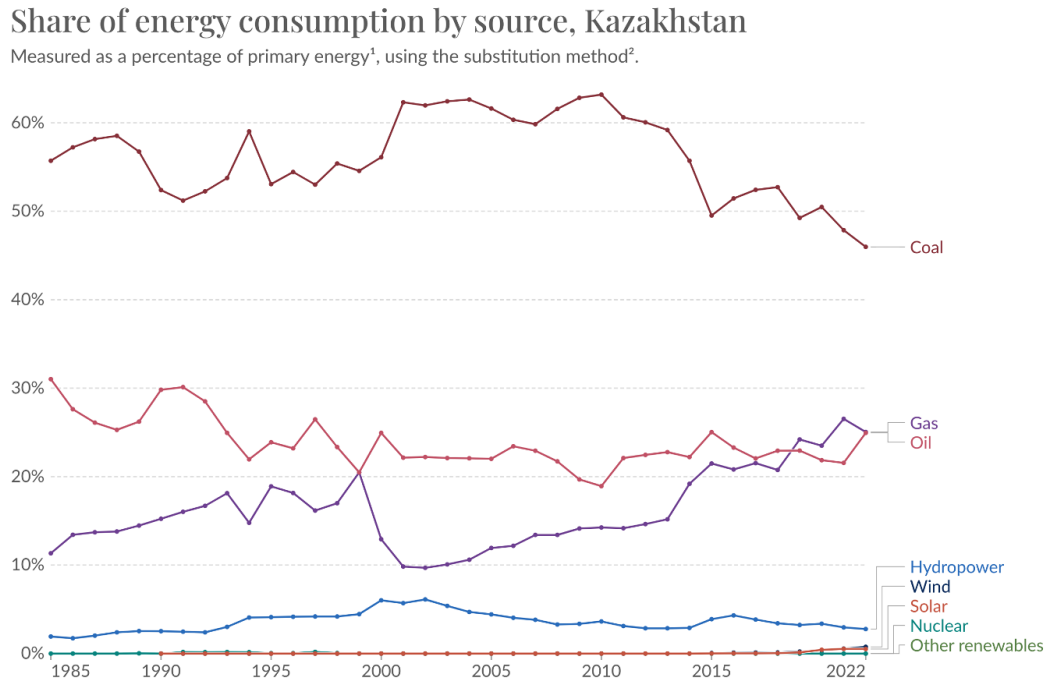
nation boasts considerable potential in harnessing renewable energy sources (RES), estimated at over 1 trillion kWh/year, with wind and solar power generation recognized as both technically and economically feasible options (Energy Charter Secretariat, 2013; REEEP, 2014). However, as depicted in Figure 1, fossil fuels largely dominate the country's energy consumption. While the Figure 2 shows the percentage of total energy supplied by each source.

Figure 1. Kazakhstan energy consumption by source



Source: Energy Institute - Statistical Review of World Energy (2023) – with major processing by Our World in Data

Figure 2. Share of energy consumption by source, Kazakhstan



Source: Energy Institute - Statistical Review of World Energy (2023) – with major processing by Our World in Data

Electricity stands as a commodity of substantial significance, conferring immense utility to contemporary existence, spanning from the provision of illumination during nocturnal hours to facilitating diverse tasks such as laundering garments, culinary pursuits, mechanized operations, and fostering global connectivity. A prevalent viewpoint posits electricity as indispensable for poverty mitigation, fostering economic expansion, and enhancing overall quality of life (Panos et al., 2016).

In efforts to mitigate CO_2 emissions and diminish exposure to localized air pollutants, there is a concerted aim to shift electricity generation from fossil fuels to low-carbon alternatives.

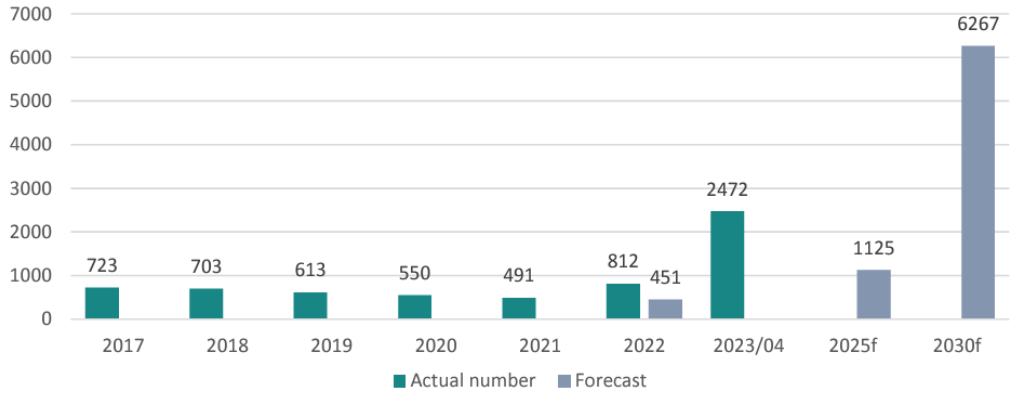
Within the context of Kazakhstan, recent years have witnessed a notable surge in the proliferation of EVs, albeit the proportion of electrically fueled vehicles remains marginal, constituting less than 1% of the total fleet. On one front, diverse initiatives are being implemented to incentivize the transition toward eco-friendly transportation, including exemptions from vehicular taxes and recycling levies. Conversely, persisting barriers such as the substantial upfront cost associated with purchasing an electric vehicle and the nascent state of infrastructure, encompassing charging stations and specialized services, continue to impede widespread adoption.

Electric Vehicles in Kazakhstan

According to data from the Bureau of National Statistics of Kazakhstan, as of May 1, 2023, the total number of registered vehicles in the country stood at 4,730,661 units (AIFC, 2023). Among these, cars accounted for 87.6%, trucks for 10.3%, and buses for 2.1%. Regarding fuel types, gasoline was used by 82.3% of registered vehicles, followed by mixed fuel vehicles at 7.6%, diesel fuel at 7.4%, gas at 0.2%, and electricity at 0.06%. For over 2.44% of vehicles, the fuel type was not specified. Among cars specifically, 87.5% ran on gasoline, 1.9% on diesel fuel, 0.1% on gas, 8.3% on mixed fuel, and 0.06% on electricity, with the fuel type unspecified for 2.14% of cars (AIFC, 2023).

Based on the statistics provided, the majority of vehicles in Kazakhstan are older than 20 years, comprising 49.1% of the total fleet. Vehicles aged between 10 and 20 years account for 22.4%, while those between 7 and 10 years make up 13.5%. Only a small percentage, 8.7%, consists of vehicles less than three years old, and 0.2% were manufactured within the past year (AIFC, 2023). The data indicates a notable rise in the number of EVs within the country in 2023. Comparing figures, while there were 812 EVs in 2022, this number surged to 2,790 EVs as of May 1, 2023. Among the 2,790 electric vehicles, cars constitute the majority at 88.6% (2,472 units), followed by trucks at 6.6% (183 units), and buses at 4.8% (135 units). By the end of 2022, the actual count of passenger EVs surpassed the forecast initially published on the website of the Ministry of Energy of Kazakhstan for the same year by nearly double (812 cars instead of 451). Moreover, by April 2023, the actual count exceeded the forecast for 2025 by more than twice the amount (see figure below).

Figure 3. Number of registered electric cars in Kazakhstan, units



Source: Bureau of National Statistics of Kazakhstan, www.finprom.kz, Ministry of Energy of Kazakhstan

Similarly, according to projections, approximately 6,267 electric EVs were forecasted to be operational by 2030, with the figure expected to rise to around 40,000 EVs by 2035 (AIFC, 2023). However, given the current trend of actual data surpassing forecasts, there may be a need to revise these projections upward. With the increasing number of EVs, there will be a corresponding rise in electricity demand. According to calculations by the Ministry of

Energy of Kazakhstan, an average electric car consumes 3,400 kWh per year. Therefore, the annual electricity consumption in the electric car sector is projected to reach 136 million kWh by 2035. These projections are based on the average growth rates of car units per year (AIFC, 2023).

Table 1. Electricity consumption forecast for Evs

Year	Number of EVs, units	Consumed electricity per year, kWh
2025	1 125	3 825 526
2030	6 267	21 309 406
2035	40 173	136 587 624

Source: Ministry of Energy of Kazakhstan

In Kazakhstan, the cost per kilometer of travel for an electric car with specifications including a range of 500 km, power output of 350 kW, and battery capacity of 86 kWh (such as a Zeekr 001 version) is estimated at KZT 8.5 or 0.017 EUR (in urban driving conditions). By contrast, for a Toyota Camry (XV70) 2.5, with a fuel tank capacity of 60 liters, the cost per kilometer is KZT 19.06 or 0.036 EUR (based on fuel consumption of 9.3 liters per 100 km in urban driving conditions, using AI-92 gasoline priced at KZT 205 or 0.42 EUR per liter). Considering the average annual mileage in Kazakhstan to be 20,000 kilometers, the annual cost of recharging an electric car is projected to be KZT 170,000 or 349.21 EUR, factoring in a tariff of KZT 506 or 1.04 EUR per kWh. This is approximately 2.7 times cheaper than the annual cost of owning a car with an internal combustion engine (AIFC, 2023).

SBM in EV industry

The concept of SBMs integrates environmental management concerns with economic and social changes in the EV industry (Reinhardt, et al., 2019). In this context, Boons and Lüdeke-Freund (2013) contend that SBMs have the potential to address economic, environmental, and social challenges concurrently. Notwithstanding the increasing attention being given to the study of SBM, there continues to be a dearth of clarity regarding the exact meaning and underlying theoretical framework of the concept. Yang et al. (2017a) notes that current research endeavors in the realm of sustainable business models are still evolving, emphasizing that there is "...a lack of consensus on sustainable business model concepts and insufficient exploration of approaches to achieve them in the literature" (p. 1796).

Per Rana et al. (2017) echo the sentiment regarding the insufficiency of research and existing literature on SBMs and modeling methodologies, emphasizing that current frameworks often exhibit limitations in their research breadth. They advocate for a more comprehensive approach that encompasses all three dimensions of sustainability—environment, society, and economy. While SBM research is gradually gaining traction, the practical understanding of the concept remains ambiguous, particularly in the realm of theory development, which is still nascent (Dentchev et al., 2018). In a recent examination

of advancements in SBM scholarship and application, Lüdeke-Freund and Dembek (2017) evaluated whether SBM research constitutes an emerging field or a subset of pre-existing theories and concepts. Their assessment confirms that SBM research indeed represents an emerging domain. However, there is a notable scarcity of studies assessing EV industry dynamics from a business model perspective, indicating a demand for subsequent investigations to gauge the added value of sustainability regarding EV batteries and EV advancement (Jiao and Evans, 2017).

Scholars and experts are increasingly delving into the potential of adapted or entirely innovative business models to enhance economic returns by either significantly reducing negative environmental and social impacts or fostering positive outcomes for both the environment and society (Boons and Lüdeke-Freund, 2013; Schaltegger et al., 2012; Stubbs and Cocklin, 2008). This exploration underscores the evolving dynamics within the industrial system (Lüdeke-Freund, 2010). This transformative shift necessitates a comprehensive approach capable of addressing the complexities of a sustainable future by integrating responses to environmental shifts alongside economic and social transformations, ultimately paving the way for the development of more SBMs (Bocken et al., 2014).

Methodology

For this study, a systematic literature review was chosen, which Kitchenham (2007) describes as a process that can be repeated and captures all relevant studies on a particular topic or research question. This systematic literature review focuses on identifying the factors that influence the SBM in EV industry.

The data was gathered from reliable sources such as peer-reviewed literature, as well as from grey literature (e.g. company releases) and news and press releases, given the early stages of two emerging research areas. Additionally, a range of criteria for including and excluding literature and documents in the search was determined and implemented (Table 2). It was essential to carry out a cross-disciplinary examination of business and science databases in order to fulfill the review requirements. We explored academic databases like Science Direct, Scopus, Web of Science, SpringerLink, Web search engines such as Google Scholar, and available to a certain extent news/press releases. The entered keyword search involved using phrases like "sustaianable business models", "electric vehicle", "business model innovation electric vehicles", "business models for sustainability", and "sustainable business model innovation". The terms were continuously reviewed until data saturation was achieved, along with the use of the snowball sampling method to identify relevant literature in the research being reviewed. The manual coding, synthesis, and analysis of data were conducted in alignment with the specified research questions, following the applicable inclusion and exclusion criteria.

Table 2. Inclusion and exclusion criteria for literature search

Included	Excluded
Qualitative studies with an emphasis on:	Quantitative studies with an emphasis on
- innovative sustainable business model theory, tools, frameworks and case studies - electric vehicle and sustainable business model perspectives	- electric vehicle use environmental and techno-economic assessments with no implications for (sustainable) business model evolution in the electric vehicle sector
Type of study: peer reviewed journal articles, conference papers and book chapters Non-peer reviewed: news/press releases on recent SBM and EV industry	Research studies on sustainable business model sub-categories and themes (e.g. circular economy, closed loop system, remanufacturing) Type of study: non-peer reviewed journal articles, theses/dissertations

Furthermore, to analyze the impact of the SBM the sustainable business model canvas tool was chosen. Tools for business models can help sustainability by using either outside-in or inside-out methods (Baden-Fuller, 1995; Simanis and Hart, 2009; Chesbrough and Garman, 2009). The Sustainable Business Model Canvas (SBMC) supports the development of an idea into a viable business model. It follows a holistic approach regarding the relationships within and outside the business. Besides economic criteria it focusses on ecological and social consequences of the activity. It aims at maximizing positive and avoiding negative impact on society and nature.

By integrating these methodological components, this study aims to provide a comprehensive understanding of the challenges and opportunities for sustainable business model development in the Kazakhstani EV industry, ultimately contributing to the advancement of sustainable mobility in the region.

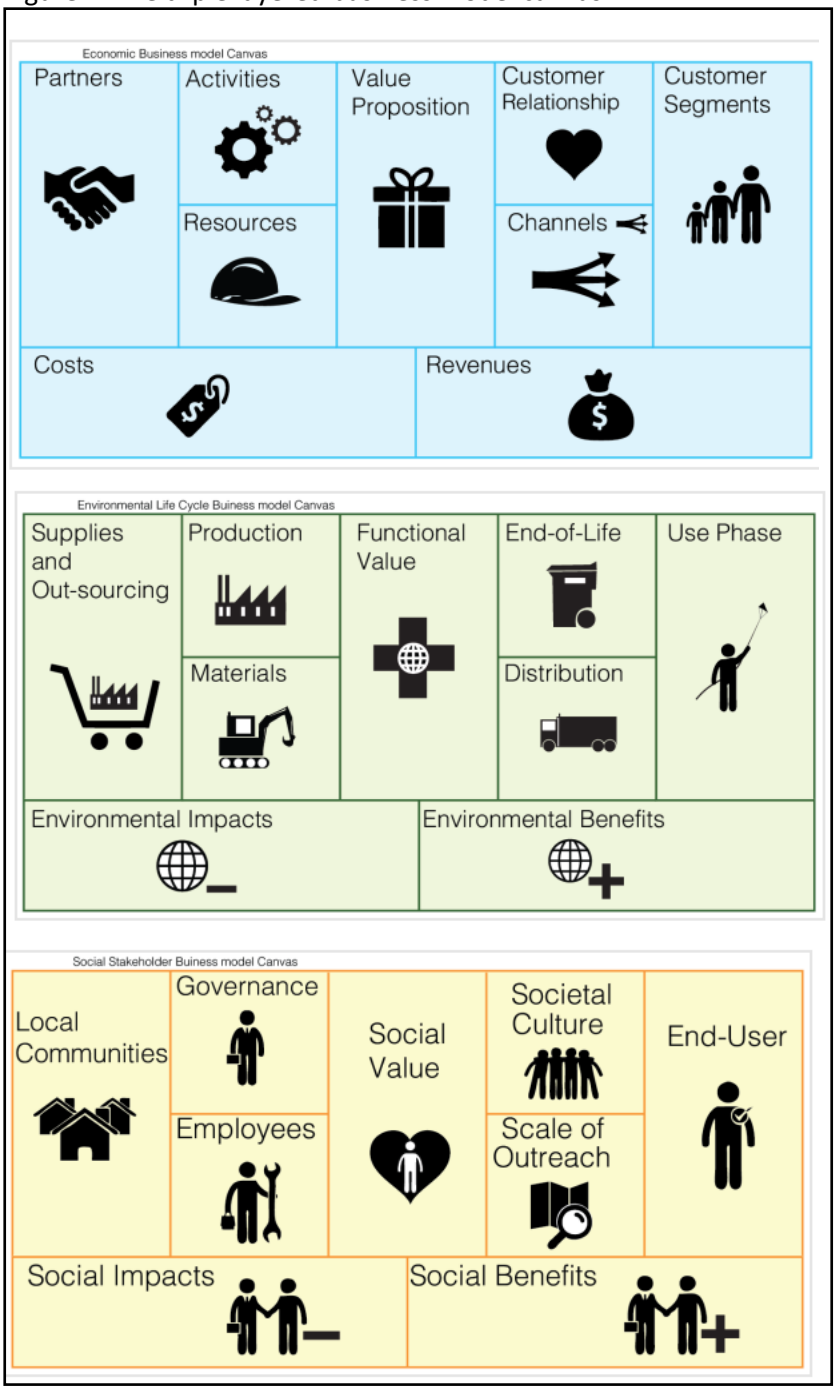
Results and Conclusions

The business model canvas, developed by Osterwalder and Pigneur (2010), condenses a company's business model into nine interrelated elements such as customer value proposition, segments, customer relationships, channels, key resources, key activities, partners, costs, and revenues. Although it can assist in aligning profit with purpose for sustainability-driven value creation (Osterwalder and Pigneur, 2011), the emphasis in

practice is on prioritizing economic value over environmental and social value on the canvas (Upward, 2013; Coes, 2014). Critics argue that creating business models with a focus on sustainability may need either a skilled facilitator or a new tool altogether for support (Bocken et al., 2013; Marrewijk and Werre, 2003). A different tool would have to be more advanced. Incorporate economic, environmental, and social value into a comprehensive perspective on corporate sustainability. The triple layered business model canvas (TLBMC) provides users with the chance to specifically focus on a triple bottom line by dedicating each canvas layer to this concept. one dimension alone, and when combined they offer a way to merge the connections and effects between different levels.

The perspective of the triple bottom line (TBL) is beneficial in that it encourages organizations to consider and include their economic, environmental, and social impacts (Figure 4) in a formal manner (Savitz, 2012). Despite being criticized for oversimplifying the complexity of sustainability (Norman and MacDonald, 2004; Vanclay, 2004; Mitchell, 2007), numerous organizations have embraced the concept of TBL thinking, either explicitly or implicitly, by engaging in corporate social responsibility reporting and participating in initiatives like the Global Report Initiative, Carbon Disclosure Project, and similar efforts. Despite having some possible drawbacks, TBL is generally a well-recognized approach for evaluating an organization's financial, ecological, and societal impacts and for creating business models that encourage more sustainable practices. The creation of sustainable business models involves the development of new models that encompass economic, environmental, and social value rather than focusing solely on economic aspects (Bocken et al., 2013; Willard, 2012). Hence, the design of the tool helps in comprehending and coordinating an organization's efforts towards sustainability on a strategic business model scale.

Figure 4. The triple layered business model canvas



Source: Adapted by Joyce & Pacquin (2016) from Osterwalder & Pigneur (economic layer) (2010) original business model canvas

The TLBMC is a tool designed to assist in the creative exploration of sustainable business models and innovation focused on sustainability. The TLBMC enhances and expands on Osterwalder and Pigneur's (2010) initial business model canvas focusing on economics by

introducing additional canvas elements that delve into environmental and social value generation. These extra layers complement the original business model canvas by emphasizing the connections that underpin environmental and social impacts individually, and expand it by linking the three layers together to promote a comprehensive organizational impact perspective (Glaser, 2006; Hubbard, 2009; Sherman, 2012). Put simply, the TLBMC ensures consistency within each layer of the canvas for examining economic, environmental, and social value separately and across the layers, aiding in a better comprehension of an organization's value creation (Lozano, 2008). Therefore, the TLBMC is suggested to innovatively delve into sustainability-focused product, process, and business model innovation to help organizations effectively tackle sustainability challenges. Since Osterwalder and Pigneur (2010) already extensively discuss the original business model canvas, the following section will concentrate on developing a sustainable business model canvas specifically for the electric vehicle industry in Kazakhstan.

Table 3. Proposed business model canvas for the EV industry in Kazakhstan (economic layer)

Key Partnerships	Key Activities	Value Propositions	Customer Relationship	Customer Segments
Suppliers **Energy providers** **Government agencies**	**Research and Developments** **Manufacturing** **Infrastructure Development**	**Environmental Sustainability** **Cost Savings** **Convenience**	**Direct Sales Channels** **Fleet Management Solutions** **Government Partnership**	**Individual Consumers** **Commercial Fleet Operators** **Public Sector**
Key Resources		Channels		
Sustainable EV Technology **Manufacturing Facilities** **Charging Infrastructure**		**Direct Sales** **Fleet Management Solutions** **Government Engagement**		
Cost Structure				Revenue stream
R&D **Manufacturing costs** **Infrastructure investments**				**Vehicle sales** **Charging services** **Government incentives**

Source: Own analysis

Table 4. Proposed business model canvas for the EV industry in Kazakhstan (environmental layer)

Supplies and Out-sourcing	Production	Functional Value	End-of-Life	Use phase
Collaboration with local and international suppliers **Establish partnerships with outsourcing companies**	**Sustainable production practices (energy-efficient manufacturing)** **Investing in advanced production technologies**	**Advanced features, performance and quality of EV** **Customization options**	**Strategies for responsible disposal, recycling of the EV at the end of their lifecycle** **Collaboration with recycling facilities**	**Customer support (maintenance, repair, charging infrastructure report)** **Educational programs**
Materials		Distribution		
Source sustainable eco-friendly materials for EV manufacturing **Invest in R&D (materials and technology)**		**Efficient distribution network across regions** **Partner with logistics companies**		
Environmental Impacts				Environmental Benefits
Environmental assessment and mitigation of the potential environmental risks				**Contribution to the SDG's** **Transparency on the environmental performance**

Source: Own analysis

Table 5. Proposed business model canvas for the EV industry in Kazakhstan (social layer)

Local Communities	Governance	Social Value	Societal culture	End-User
Community engagement programs **Local events and workshops** **Collaboration with local organizations**	**Regulatory compliance** **Government practices** **Advocacy and lobbying**	**Value proposition communication** **Education and awareness** **Partnerships with local organizations**	**Cultural events and festivals** **Cultural sensitivity and training** **Tailored marketing campaigns**	**Customer support** **User communities** **User-centric product design**

Employees **Employee engagement programs** **Training and development** **Employee feedback mechanisms**	Scale of outreach **Multi-channel marketing** **Strategic partnerships** **Community collaborations**		
Social Impacts **Impact measurement and reporting** **Stakeholder engagement** **Continuous improvement**			Social Benefits **Benefit communication** **Collaboration with social organizations** **Public recognition and awards**

Source: Own analysis

The TLBMC offers a comprehensive method to assist individuals in comprehending current business models and generating sustainable business model innovations.

The TLBMC tool assists users in developing innovative sustainable business models in various ways. Initially, based on the popular business model canvas by Osterwalder and Pigneur (2011), the TLBMC offers a user-friendly, improved canvas for integrated exploration and innovation in creating economic, environmental, and social value. While not the sole instrument for driving sustainability-focused innovation by altering business models, the TLBMC adopts an inside-out method where users utilize their knowledge of their organization's current business model to uncover innovation possibilities, instead of trying to adapt external concepts for their business. The TLBMC also offers a clear visual representation of the structure and generation of value that can stimulate discussions about specific changes within a company.

Conclusions

This paper adds to the current research on sustainable business models by introducing the TLBMC as a framework to incorporate economic, environmental, and social impact into business models. The TLBMC enhances the traditional business model with environmental and social layers, incorporating lifecycle and stakeholder viewpoints to create a more comprehensive business model canvas. This broader canvas enables the exploration of stronger and more comprehensive views on innovation in business models focused on sustainability. The TLBMC has the capability to assist individuals looking to make organizations more sustainable.

Additionally, this study on sustainable business models for advancing the electric vehicle industry in Kazakhstan found that SBMs have the potential to address economic, environmental, and social challenges concurrently. The proposed business model canvas for the EV industry in Kazakhstan includes key partnerships with suppliers, energy providers, and government agencies, offering value propositions such as environmental sustainability, cost savings, and convenience.

By addressing key challenges and leveraging opportunities, Kazakhstan can accelerate the transition to electric mobility, contributing to environmental sustainability and economic development. Preliminary analysis suggests that a holistic approach, integrating policy support, infrastructure investment, and stakeholder engagement, will be essential for achieving sustainable mobility goals in Kazakhstan. Anticipated legislative reforms in the EV Industry are underway in Kazakhstan. Currently, the Mazhilis (Lower House of the Parliament) of the Parliament of Kazakhstan, in collaboration with KazAutoProm, is drafting a law titled "On amendments and additions to certain legislative acts of the Republic of Kazakhstan on the promotion of environmentally friendly transport and infrastructure development for EVs." This draft law encompasses several initiatives, including the introduction of a Green Car Loan program with cashback incentives through Kazakhstani private banks.

“Bank CenterCredit has partnered with the European Bank for Reconstruction and Development (EBRD) under the Green Economy Financing Facility (GEFF) program, aimed at financing green technologies” (AIFC, 2023). The GEFF program seeks to facilitate the energy-efficient modernization of business and residential facilities in Kazakhstan, making environmentally friendly materials and technologies more accessible. Notably, the program extends financing to energy-efficient solutions, technologies, and transport, including certain brands of EVs. An advantage of the program is the opportunity for borrowers to receive cashback compensation from the Global Environment Facility, calculated as a percentage of the loan amount or investment in energy-efficient modernization.

Additionally, “Halyk Bank, one of the country's largest banks, announced plans to introduce a "green" car loan for EV purchases during the Astana Finance Days financial conference held by the Astana International Financial Centre (AIFC) on June 7, 2023” (AIFC, 2023). This loan is expected to offer a one percent lower interest rate than standard loans and will be available digitally for periods ranging from 6 to 84 months, applicable to both new and used electric vehicles.

The proposed law encompasses key provisions such as defining EVs and mandating spaces for charging stations in road designs. It establishes a state-owned entity to promote electric transport and proposes a ban on internal combustion engine vehicles in protected areas.

Overall, the bill aims to enhance EV infrastructure and increase adoption, but further incentives are needed for widespread popularity and domestic production.

Furthermore, the study highlighted initiatives in Kazakhstan, such as the introduction of "green" car loans by Halyk Bank to incentivize EV purchases and proposed legislation to enhance EV infrastructure and adoption. The research also underscored the need for a comprehensive approach that integrates environmental, social, and economic dimensions of sustainability in business models.

Overall, the findings suggest that sustainable business models can play a crucial role in advancing the electric vehicle industry in Kazakhstan by addressing various challenges and leveraging partnerships and value propositions to drive sustainability and innovation.

References

AIFC. (2023) EVs: in the world and in Kazakhstan, and their role in reducing greenhouse gas emissions. Available from: http://aifc.kz. [Accessed 5th February 2024].

Aldayarov, M., Dobozi, I., & Nikolakakis, T. (2017). *Stuck in transition: Reform experiences and challenges ahead in the Kazakhstan power sector*. World Bank Publications.

Ayodele, B. V., & Mustapa, S. I. (2020). Life cycle cost assessment of electric vehicles: A review and bibliometric analysis. *Sustainability*, *12*(6), 2387.

Baden-Fuller, C. (1995). Strategic Innovation, Corporate Entrepreneurship and Matching Outside-in to Inside-out Approaches to Strategy Research 1. British Journal of Management, 6, S3-S16.

Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of cleaner production*, *65*, 42-56.

Bocken, N., Short, S., Rana, P., & Evans, S. (2013). A value mapping tool for sustainable business modelling. Corporate governance, 13(5), 482-497.

Boons, F., & Lüdeke-Freund, F. (2013). Business models for sustainable innovation: state-of-the-art and steps towards a research agenda. *Journal of Cleaner production*, *45*, 9-19.

Breetz, H. L., & Salon, D. (2018). Do electric vehicles need subsidies? Ownership costs for conventional, hybrid, and electric vehicles in 14 US cities. Energy Policy, 120, 238-249.

Bureau of National Statistics of Kazakhstan. (no date). Available from: http:// https://stat.gov.kz/en/. [Accessed 5th February 2024].

Carlsson, F., & Johansson-Stenman, O. (2003). Costs and benefits of electric vehicles. *Journal of Transport Economics and Policy (JTEP)*, *37*(1), 1-28.

Chesbrough, H. W., & Garman, A. R. (2009). How open innovation can help you cope in lean times. Harvard business review, 87(12), 68-76.

Coes, D. H. (2014). Critically assessing the strengths and limitations of the Business Model Canvas (Master's thesis, University of Twente).

Dentchev, N., Rauter, R., Jóhannsdóttir, L., Snihur, Y., Rosano, M., Baumgartner, R., ... & Jonker, J. (2018). Embracing the variety of sustainable business models: A prolific field of research and a future research agenda. *Journal of cleaner production*, 194, 695-703.

Dyussembekova, G., Bayandina, G., Zakirova, D., & Sartova, R. (2019). The electric energy sector of Kazakhstan: State and vision for the country taking into account the international trends.

Ellingsen, L. A. W., Singh, B., & Strømman, A. H. (2016). The size and range effect: lifecycle greenhouse gas emissions of electric vehicles. *Environmental Research Letters*, *11*(5), 054010.

Energy Charter Secretariat (2013). Available: //https://www.energycharter.org/fileadmin/DocumentsMedia/CCDECS/CCDEC201316.pdf. [Accessed: 8th February 2024].

Energy Institute - Statistical Review of World Energy (2023) – with major processing by Our World in Data. "Other renewables (including geothermal and biomass)" [dataset]. Energy Institute, "Statistical Review of World Energy" [original data].

Falchetta, G., & Noussan, M. (2021). Electric vehicle charging network in Europe: An accessibility and deployment trends analysis. Transportation Research Part D: *Transport and Environment*, 94, 102813.

Finprom (no date). Available at: http://www.finprom.kz/ [Accessed: 08 February 2024].

Glaser, J. A. (2006). Corporate responsibility and the triple bottom line. Clean Technologies and Environmental Policy, 8, 225-228.

Hubbard, G. (2009). Measuring organizational performance: beyond the triple bottom line. Business strategy and the environment, 18(3), 177-191.

International Energy Agency (2015). Available: https://www.iea.org/reports/world-energy-outlook-2015. [Accessed: 8th February 2024].

Jiao, N., & Evans, S. (2016). Secondary use of electric vehicle batteries and potential impacts on business models. *Journal of Industrial and Production Engineering*, 33(5), 348-354.

Joyce, A., & Paquin, R. L. (2016). The triple layered business model canvas: A tool to design more sustainable business models. Journal of cleaner production, 135, 1474-1486.

Kitchenham, B. (2007). Guidelines for performing Systematic Literature Reviews in Software Engineering.

Kosov, M. E., Akhmadeev, R. G., Smirnov, V. M., Popkov, S. Y., & Rycova, I. N. (2017). Hydrocarbon market in countries with developing economy: Development scenario. *International Journal of Energy Economics and Policy*, *7*(6), 128.

Koulouri, A., & Mouraviev, N. (2018). Governance of the clean energy sector in Kazakhstan: impediments to investment. International *Journal of Technology Intelligence and Planning,* 12(1), 6-23.

Lozano, R. (2008). Envisioning sustainability three-dimensionally. Journal of cleaner production, 16(17), 1838-1846.

Lüdeke-Freund, F. (2010). Towards a conceptual framework of'business models for sustainability'. *Knowledge collaboration & learning for sustainable innovation, R. Wever, J. Quist, A. Tukker, J. Woudstra, F. Boons, N. Beute, eds., Delft*, 25-29.

Lüdeke-Freund, F., & Dembek, K. (2017). Sustainable business model research and practice: Emerging field or passing fancy?. *Journal of Cleaner Production*, 168, 1668-1678.

Ministry of Energy of Kazakhstan (no date.) Available at :https://www.gov.kz/memleket/entities/energo?lang=en [Accessed: 8th February 2024].

Mitchell, M., Curtis, A., & Davidson, P. (2007). Can the 'triple bottom line'concept help organisations respond to sustainability issues?. In Australian Stream Management Conference (pp. 270-275). Charles Sturt University.

Nanjundaswamy, A., Kulal, A., Dinesh, S., & Divyashree, M. S. (2023). Electric vehicles in the business processes and sustainable development. Management Matters, 20(1), 95-113.

Norman, W., & MacDonald, C. (2004). Getting to the bottom of "triple bottom line". Business ethics quarterly, 14(2), 243-262.

Osterwalder, A., & Pigneur, Y. (2010). Business model generation: a handbook for visionaries, game changers, and challengers (Vol. 1). John Wiley & Sons.

Osterwalder, A., & Pigneur, Y. (2011). Aligning profit and purpose through business model innovation. Responsible management practices for the 21st century, 61-76.

Panos, E., Densing, M., & Volkart, K. (2016). Access to electricity in the World Energy Council's global energy scenarios: An outlook for developing regions until 2030. *Energy Strategy Reviews*, 9, 28-49.

Rana, P., Short, S. W., Evans, S., & Granados, M. H. (2017). Sustainable business models: theoretical reflections. *Value Networks in Manufacturing: Sustainability and Performance Excellence*, 95-109.

REEEP (2014). Available: https://reeep.org/reports_documents/reeep-annual-report-2014-2015/. [Accessed: 8th February 2024].

Reinhardt, R., Christodoulou, I., Gassó-Domingo, S., & García, B. A. (2019). Towards sustainable business models for electric vehicle battery second use: A critical review. *Journal of environmental management*, 245, 432-446.

Requia, W. J., Mohamed, M., Higgins, C. D., Arain, A., & Ferguson, M. (2018). How clean are electric vehicles? Evidence-based review of the effects of electric mobility on air pollutants, greenhouse gas emissions and human health. *Atmospheric Environment*, *185*, 64-77.

Sarsembayev, M. A., Karazhan, B. S., & Yelegen, A. Y. (2023). Solving legal problems of digitalization in production and export of Kazakhstan electric vehicles and agricultural machines. benefits.

Savitz, A. (2013). The triple bottom line: how today's best-run companies are achieving economic, social and environmental success-and how you can too. John Wiley & Sons.

Schaltegger, S., Lüdeke-Freund, F., & Hansen, E. G. (2012). Business cases for sustainability: the role of business model innovation for corporate sustainability. *International journal of innovation and sustainable development*, 6(2), 95-119.

Sherman, W. R. (2012). The triple bottom line: The reporting of doing well & doing good. Journal of Applied Business Research (JABR), 28(4), 673-682.

Shiiki, M., & Shimizu, H. (2012). The Future Prospects for Open Source Business Models In the World of Electric Vehicles. World Electric Vehicle Journal, 5, 881-885.

Simanis, E., & Hart, S. (2009). Innovation from the inside out. MIT Sloan management review.

Soret, A., Guevara, M., & Baldasano, J. M. (2014). The potential impacts of electric vehicles on air quality in the urban areas of Barcelona and Madrid (Spain). *Atmospheric environment*, *99*, 51-63.

Stubbs, W., & Cocklin, C. (2008). Conceptualizing a "sustainability business model". *Organization & environment*, *21*(2), 103-127.

Upward, A. (2013). Towards an ontology and canvas for strongly sustainable business models: A systemic design science exploration.

Van Marrewijk, M., & Werre, M. (2003). Multiple levels of corporate sustainability. Journal of Business ethics, 44(2), 107-119.

Vanclay, F. (2004). Impact assessment and the triple bottom line: competing pathways to sustainability. Sustainability and Social Science Round Table Proceedings, 2003, 27-39.

Wang, N., Tang, L., Zhang, W., & Guo, J. (2019). How to face the challenges caused by the abolishment of subsidies for electric vehicles in China?. *Energy*, *166*, 359-372.

Willard, B. (2012). The new sustainability advantage: seven business case benefits of a triple bottom line. New Society Publishers.

Yang, M., Evans, S., Vladimirova, D., & Rana, P. (2017). Value uncaptured perspective for sustainable business model innovation. *Journal of Cleaner Production*, *140*, 1794-1804.

Yix, X. (2014). Research on Business Model Innovations for Electric Vehicles: From the Perspective of Value Network. Science of Science and Management of S.& T.