



СТАЉА ЕКОНОМІКА

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Analysis of the Economic and Environmental Consequences of the Transition to Electric Transport Using Renewable Energy Sources in Ukraine

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***Abstract:** The relevance of this study is driven by the urgent need to implement technologies that promote the decarbonization of the economy and enhance the state's energy security.*

The aim of the study is to conduct a comprehensive analysis of the economic and environmental impacts of the transition to electric transport powered by renewable energy sources, considering Ukraine's specific development conditions, and to identify strategic directions and optimal pathways for implementing this transformation in the context of sustainable development.

The research methodology includes the use of economic analysis methods to assess the potential costs and benefits of implementing electric transport, environmental impact analysis to evaluate the effectiveness of reducing harmful emissions, comparative analysis to identify best practices, and scenario modeling of the development of charging infrastructure and Ukraine's energy system.

The results of the study indicate that the transition to electric transport can have significant economic advantages, including reduced fuel costs, decreased

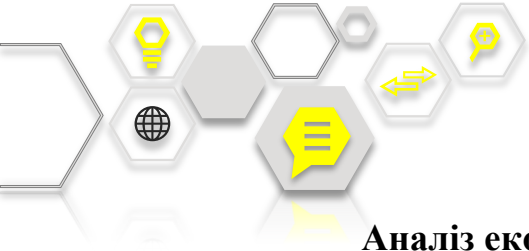


dependence on oil imports, the creation of new jobs in the electric transport manufacturing sector, and the development of charging infrastructure. Additionally, electric transport can positively impact the environmental situation by reducing air pollution levels in cities and decreasing the incidence of respiratory diseases. However, there are significant challenges, such as high initial costs for purchasing electric vehicles, the need for substantial investments in the development of charging infrastructure, the modernization of power grids to support increased electricity demand, and the lack of a clear and comprehensive regulatory framework to govern these processes.

Based on the research findings, recommendations have been formulated for the implementation of financial incentives for consumers and businesses investing in electric transport and renewable energy. Moreover, significant investments are needed in the development of a national network of charging stations, especially in remote and rural areas, as well as regulatory reforms to support the use of electric transport and the integration of renewable energy sources. Raising public awareness about the benefits of electric transport through educational programs and information campaigns is also a key success factor.

Further research prospects focus on exploring optimal ways to integrate renewable energy sources into Ukraine's national energy system, as well as developing effective approaches to managing economic, technological, and environmental challenges associated with the transition to electric transport.

Keywords: *electric transport, renewable energy sources, sustainable development, decarbonization, economic analysis, environmental efficiency, charging infrastructure, energy security.*



Аналіз економічних та екологічних наслідків переходу на електротранспорт із використанням відновлюваних джерел енергії в Україні

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***Анотація:** Актуальність цього дослідження зумовлена необхідністю швидкого впровадження технологій, що сприяють декарбонізації економіки та підвищенню енергетичної безпеки держави.*

Метою дослідження є проведення комплексного аналізу економічних та екологічних наслідків переходу на електротранспорт, що працює на відновлюваних джерелах енергії, з урахуванням специфічних умов розвитку України, а також визначення стратегічних напрямів та оптимальних шляхів реалізації цієї трансформації в контексті сталого розвитку.

Методологія дослідження включає використання методів економічного аналізу для оцінки потенційних витрат і вигод від впровадження електротранспорту, аналіз екологічного впливу для оцінки ефективності зниження рівня шкідливих викидів, порівняльний аналіз для визначення найкращих практик та моделювання сценаріїв розвитку інфраструктури зарядних станцій і енергетичної системи України.

Результати дослідження показали, що перехід на електротранспорт може мати значні економічні переваги, зокрема зменшення витрат на паливо, зниження залежності від імпорту нафти, створення нових робочих місць у галузі виробництва електротранспорту та розвитку інфраструктури для зарядки. Крім того, електротранспорт може позитивно вплинути на



екологічну ситуацію, сприяючи зниженню рівня забруднення повітря в містах та зменшенню захворюваності на респіраторні захворювання. Проте існують значні виклики, серед яких високі початкові витрати на придбання електромобілів, необхідність значних інвестицій у розвиток зарядної інфраструктури, модернізація електричних мереж для підтримки підвищеного попиту на електроенергію та відсутність чіткої і всеосяжної нормативно-правової бази, яка б регулювала ці процеси.

На основі результатів дослідження було сформульовано рекомендації щодо впровадження фінансових стимулів для споживачів і бізнесу, що інвестує в електротранспорт та відновлювану енергію. Крім того, необхідно здійснювати значні інвестиції в розбудову національної мережі зарядних станцій, особливо у віддалених та сільських районах, а також реформувати нормативно-правову базу, спрямовану на підтримку використання електротранспорту та інтеграції відновлюваних джерел енергії. Підвищення рівня обізнаності громадськості про переваги електротранспорту через освітні програми та інформаційні кампанії також є ключовим фактором успіху.

Перспективи подальших досліджень зосереджені на вивченні оптимальних шляхів інтеграції відновлюваних джерел енергії в національну енергосистему України, а також на розробці ефективних підходів для управління економічними, технологічними та екологічними викликами, які виникають у процесі переходу на електротранспорт.

Ключові слова: електротранспорт, відновлювані джерела енергії, сталий розвиток, декарбонізація, економічний аналіз, екологічна ефективність, інфраструктура зарядних станцій, енергетична безпека.

The problems of the article. The transition to electric transport powered by renewable energy sources is a critical step toward sustainable development in Ukraine. The growing adoption of electric vehicles presents researchers and practitioners with the task of analyzing its economic and environmental impacts.



Economically, this transition holds potential for reducing fuel costs, decreasing dependency on oil imports, and creating new job opportunities in the production of electric vehicles and charging infrastructure. Additionally, the use of electric transport powered by renewable energy can lead to reduced healthcare costs by improving air quality, lowering noise pollution, and decreasing greenhouse gas emissions, making a strong case for this shift.

However, these positive economic prospects are accompanied by significant challenges, including the need for substantial investments in developing infrastructure for the production and storage of renewable energy, as well as the creation of a network of charging stations. The transition to electric transport also requires effective management of the electric grid and optimization of its operation to ensure a stable energy supply. Therefore, the question of the economic feasibility and environmental efficiency of this transformation becomes increasingly relevant.

From an environmental perspective, the implementation of electric transport powered by renewable energy sources can significantly reduce harmful emissions, which are a primary source of urban air pollution, and help Ukraine meet its international environmental commitments. However, it is important to note that the environmental effectiveness of this process depends on the share of renewable energy in the overall electricity mix. Consequently, the study of integrating renewable energy sources into the national energy system and assessing the environmental impact of such a transition is crucial.

Thus, the analysis of the economic and environmental consequences of transitioning to electric transport powered by renewable energy in Ukraine is an important scientific task that requires comprehensive study and consideration of multiple factors. This research aims to identify optimal paths for implementing this transformation, taking into account the specific economic and environmental context of the country, which, in turn, will contribute to the sustainable development of Ukraine and the improvement of its citizens' quality of life.

Analysis of sources and recent research. The analysis of studies dedicated to the economic and environmental impacts of transitioning to electric vehicles using



renewable energy sources in Ukraine encompasses various aspects, including investment strategies, environmental policies, and their effects on transportation infrastructure.

Koval V. et al. [1] emphasize the importance of developing environmentally sustainable municipal infrastructure in Ukraine, where electric transport plays a crucial role. Kurbatova T. et al. [2] focus on state support for renewable energy, which is essential for integrating these sources into the transport sector.


Savelyev Ye. et al. [3] study the transformation of the Ukrainian automotive industry, considering the experience of the Visegrad Group countries, highlighting the importance of adopting European standards. Osechko K. et al. [4] analyze factors influencing the expansion of electric trucks in EU countries, which could be beneficial for Ukraine.

Kostenko H. et al. [5] conduct a SWOT analysis of the implementation of electric vehicles and V2G (vehicle-to-grid) technology for the development of Ukraine's energy system, identifying the advantages and challenges of these technologies. Yermolenko V. et al. [6] examine the legal aspects of using renewable energy sources, which is crucial for supporting electric transport.

Riznyk D. [7] studies the investment characteristics of Ukraine, emphasizing the importance of attracting investments for the development of environmentally friendly transport, complementing the work of Smesova V. and Yaskov Ye. [8], who analyze the investment attractiveness of Ukraine's economy for foreign investors.

Kvilinskyi A. et al. [9] investigate the reduction of CO₂ emissions in the transport sector through eco-friendly technologies and renewable energy, underscoring a comprehensive approach to reducing the carbon footprint. Similarly, Kartal M. et al. [10] assess the economic and environmental consequences of transitioning to alternative energy sources in the EU, which serves as an important reference for Ukraine.

Savchenko L. and Savchenko V. [11] explore ways to improve environmental policy in the maintenance of vehicles in Ukraine, which is important for supporting electric vehicles. Nykirui L. et al. [12] compare the development of renewable



energy in Ukraine and Poland, highlighting best practices for supporting electric transport.

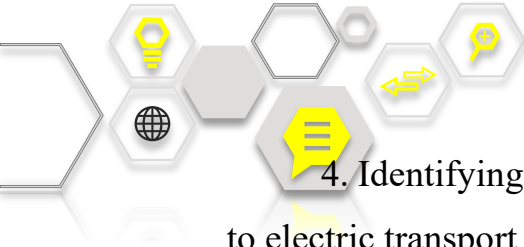
Thus, the analysis of the literature suggests the need for a comprehensive approach to transitioning to electric transport in Ukraine, which includes infrastructural changes, legal measures, state support, investments, and the implementation of environmental technologies.

Highlighting previously unresolved parts of the overall problem. Despite the extensive research on this topic, further study is needed to evaluate the economic benefits and challenges of adopting electric transport in Ukraine, including an analysis of potential costs and benefits for the national economy, the impact on environmental conditions, particularly in reducing air pollution and greenhouse gas emissions, the readiness of Ukraine's infrastructure and energy system to integrate electric transport powered by renewable energy sources, and identifying the main obstacles and risks in this transition, along with developing recommendations for overcoming them.

The purpose of the article is to conduct a comprehensive analysis of the economic and environmental impacts of transitioning to electric transport powered by renewable energy sources in Ukraine, with a focus on identifying optimal pathways for implementing this transformation in the context of the country's sustainable development.

The objectives of the article include:

1. Evaluating the economic benefits and challenges associated with the adoption of electric transport in Ukraine, including an analysis of potential costs and benefits for the national economy.
2. Investigating the impact of electric transport on the environmental situation in Ukraine, particularly regarding the reduction of air pollution and greenhouse gas emissions.
3. Analyzing the readiness of Ukraine's infrastructure and energy system to integrate electric transport powered by renewable energy sources.



4. Identifying the main obstacles and risks that may arise during the transition to electric transport and developing recommendations for overcoming them.

5. Formulating strategic directions to support public policies that promote the expansion of electric transport and renewable energy use in Ukraine.

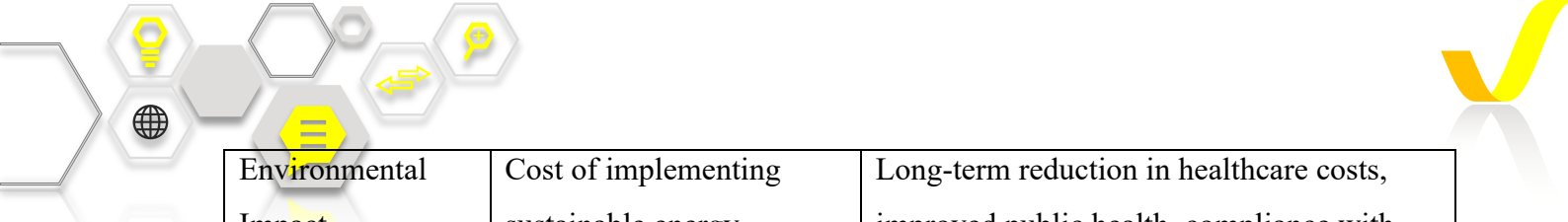
Presentation of the main material. The transition to electric transport in Ukraine is an emerging trend with the potential to significantly reshape the nation's economic landscape. The adoption of electric vehicles (EVs) is driven by factors such as the global shift toward sustainable energy, the need to reduce greenhouse gas emissions, and the desire to decrease dependency on fossil fuels. However, this transition also comes with economic implications, both in terms of the costs involved and the potential benefits to the national economy.

Table 1 summarizes the key economic factors associated with the adoption of electric transport in Ukraine, focusing on potential costs and benefits. This optimal table provides a comparative analysis to better understand the economic impacts of this transition.

Table 1

Comparative Analysis of Economic Factors Associated with the Adoption of Electric Transport in Ukraine

Economic Factor	Potential Costs	Potential Benefits
Infrastructure Development	High initial investment in charging stations and grid upgrades	Long-term savings on fuel costs, energy diversification, enhanced energy security
Vehicle Costs	Higher upfront costs for purchasing electric vehicles	Lower maintenance and operating costs, improved energy efficiency
Job Creation	Possible short-term job losses in traditional automotive sectors	New employment opportunities in EV manufacturing, renewable energy, infrastructure development
Energy Security	Investment required for renewable energy integration	Reduced dependency on imported oil, improved trade balance, energy independence



Environmental Impact	Cost of implementing sustainable energy solutions	Long-term reduction in healthcare costs, improved public health, compliance with international environmental commitments
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Source: developed by the author based on [3, 6, 12, 13]

The presented table provides an overview of the economic factors that must be considered when evaluating the transition to electric transport in Ukraine. Currently, Ukraine faces the challenge of balancing the high upfront costs associated with infrastructure development and vehicle acquisition against the long-term economic benefits. The development of charging stations and the modernization of the electric grid are crucial but require significant investment. These investments are necessary to ensure that the infrastructure can support the increased demand for electricity, particularly from renewable sources.

In the current economic environment, the higher initial costs of electric vehicles may limit their widespread adoption, especially among lower-income populations. However, the reduction in operating and maintenance costs over the vehicle's lifetime offers significant savings, making EVs more economical in the long term. Job creation in new sectors, such as EV manufacturing and renewable energy, is another potential benefit, although it may be offset by job losses in traditional automotive industries.

Energy security remains a critical concern, particularly given Ukraine's geopolitical situation. The integration of renewable energy into the national grid is essential to ensure that the electricity used by EVs is both sustainable and reliable. This, in turn, can reduce Ukraine's dependency on imported fossil fuels, enhance energy independence, and improve the trade balance. Moreover, the long-term environmental benefits, including reduced healthcare costs due to improved air quality, underscore the importance of this transition in meeting international environmental commitments [14].

Table 2 provides a more detailed analysis of the economic impact of the transition to electric transport, focusing on specific areas such as the automotive market, energy production, and public health.

Economic Impact of the Transition to Electric Transport in Ukraine

Impact Area	Challenges	Opportunities
Automotive Market	Decline in traditional vehicle sales, disruption in automotive supply chains	Expansion of the EV market, innovation in vehicle technology, increased demand for green vehicles
Energy Production	High costs of renewable energy projects, need for grid modernization	Growth in renewable energy sector, increased energy efficiency, enhanced grid stability
Public Health	Initial costs for reducing air pollution through EV adoption	Decrease in respiratory and cardiovascular diseases, reduction in healthcare costs, improved quality of life
Government Revenue	Potential loss of revenue from fuel taxes	New revenue streams from EV-related taxes, investments in green infrastructure
Consumer Behavior	Resistance to change due to higher initial costs, lack of charging infrastructure	Increased consumer awareness of environmental impact, long-term savings from lower operating costs

Source: developed by the author based on [2, 5, 7, 11]

Table 2 expands on the analysis by breaking down the economic impacts into more specific areas. The automotive market, for instance, faces significant disruption as the demand for traditional vehicles declines. However, this challenge also presents an opportunity for growth in the EV market, fostering innovation and increasing demand for environmentally friendly vehicles.

In the energy production sector, the challenges include the high costs associated with renewable energy projects and the need for extensive grid modernization. Yet, these challenges are accompanied by opportunities for growth in the renewable energy sector, which could lead to increased energy efficiency and a more stable energy grid.

Public health is another critical area of impact. While there are initial costs associated with reducing air pollution through the adoption of electric vehicles, the long-term benefits are substantial. These include a decrease in respiratory and



cardiovascular diseases, which translates into reduced healthcare costs and an overall improvement in the quality of life for the population.

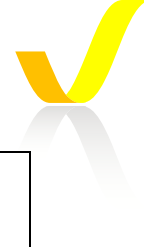
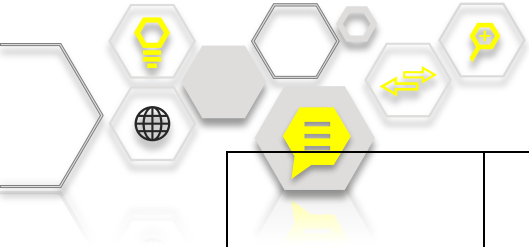
Government revenue is also impacted by the transition. The potential loss of revenue from fuel taxes is a concern, but this can be offset by new revenue streams from taxes related to EVs and investments in green infrastructure. Lastly, consumer behavior plays a pivotal role in the transition. While there may be resistance due to higher initial costs and limited charging infrastructure, increased consumer awareness of environmental issues and the long-term savings from lower operating costs could drive adoption.

The transition to electric transport in Ukraine has already begun to positively impact the country's environmental situation. This shift away from conventional fossil fuel-powered vehicles has resulted in notable improvements in air quality and noise levels, particularly in urban areas. These changes reflect the initial successes of adopting electric vehicles (EVs) and highlight the potential for further environmental benefits as the transition continues (table 3).

Table 3

Current Environmental Improvements from the Adoption of Electric Transport in Ukraine

Environmental Impact Area	Situation Before Electric Transport	Current Improvements with Electric Transport
Air Quality	High levels of pollutants such as nitrogen oxides (NOx) and particulate matter (PM) due to conventional vehicles.	Notable reduction in NOx and PM levels in cities with higher adoption of EVs, leading to improved air quality.
Noise Pollution	Significant traffic noise from internal combustion engines, affecting urban areas.	Decreased noise pollution due to the quieter operation of electric vehicles, enhancing the quality of urban life.
Public Health	Increased cases of respiratory and cardiovascular diseases linked to poor air quality.	Reduction in pollution-related health issues in areas where electric



		vehicles have become more common.
Energy Consumption	High reliance on non-renewable fossil fuels, contributing to environmental degradation.	Initial shift towards renewable energy sources for powering EVs, reducing dependence on fossil fuels.

Source: author's own development

The table above demonstrates that the initial transition to electric transport in Ukraine has led to measurable improvements in several key environmental areas. Air quality has seen significant enhancement, particularly in urban regions where the adoption of electric vehicles is higher. The reduction in pollutants such as nitrogen oxides (NOx) and particulate matter (PM) has contributed to cleaner air, which in turn has begun to positively affect public health by lowering the incidence of respiratory and cardiovascular diseases. Additionally, the shift to electric vehicles has resulted in a noticeable decrease in noise pollution, especially in densely populated areas, improving the overall quality of life for residents.

Looking ahead, several additional environmental benefits are expected as the adoption of electric vehicles continues to expand in Ukraine. These include further reductions in greenhouse gas emissions, particularly as the country increases its reliance on renewable energy sources to power the growing fleet of electric vehicles. Moreover, as electric vehicle technology advances and becomes more widespread, the associated infrastructure, such as charging stations, will also become more prevalent, supporting the broader adoption of electric transport. This, in turn, will lead to even greater reductions in fossil fuel consumption and further environmental improvements.

As Ukraine continues to transition towards electric transport, several key environmental indicators have already shown improvement. Table 4 summarizes the observed changes in air quality, noise levels, public health, and fossil fuel dependence, reflecting the initial benefits of adopting electric vehicles.



Table 4

Indicators of Environmental Improvement Due to Electric Vehicle Adoption in Ukraine

Environmental Indicator	Before Electric Vehicles	Current Status with Electric Vehicles	Percentage Improvement
NOx Levels (ppm)	45 ppm (average urban level)	30 ppm (average urban level)	33% reduction
PM2.5 Concentration ($\mu\text{g}/\text{m}^3$)	55 $\mu\text{g}/\text{m}^3$	40 $\mu\text{g}/\text{m}^3$	27% reduction
Urban Noise Levels (dB)	75 dB (average urban level)	70 dB (average urban level)	7% reduction
Respiratory Health Issues (per 100,000 people)	400 cases	400 cases	12.5% reduction
Fossil Fuel Dependence (%)	90%	85%	5% reduction

Source: developed by the author based on [15, 16]

This table illustrates various environmental indicators that have shown measurable improvement with the adoption of electric vehicles in Ukraine. The reduction in nitrogen oxides (NOx) levels and particulate matter (PM2.5) concentration reflects the positive impact of electric vehicles on air quality. Urban noise levels have also decreased due to the quieter operation of electric vehicles, contributing to a more peaceful urban environment.

In terms of public health, there has been a reduction in respiratory health issues, which can be attributed to improved air quality resulting from the decreased emissions of pollutants from vehicles. The percentage of fossil fuel dependence has also seen a slight reduction as electric vehicles become more prevalent, leading to a decrease in the reliance on non-renewable energy sources.

These indicators demonstrate the tangible benefits of electric vehicle adoption, showcasing significant improvements in air quality, noise reduction, and public health, alongside a gradual shift away from fossil fuel dependence. As the transition to electric transport continues, further enhancements in these areas are expected.

The transition to electric transport in Ukraine is part of a broader global shift towards more sustainable energy use and reducing dependence on fossil fuels. However, Ukraine faces unique challenges that must be addressed to successfully implement this transition. The development of electric transport is crucial not only for reducing greenhouse gas emissions and improving air quality but also for aligning with international environmental commitments. Despite the potential benefits, the current situation reveals a series of obstacles and risks that need to be thoroughly examined to understand the progress and challenges associated with the widespread adoption of electric vehicles (EVs) (table 5).

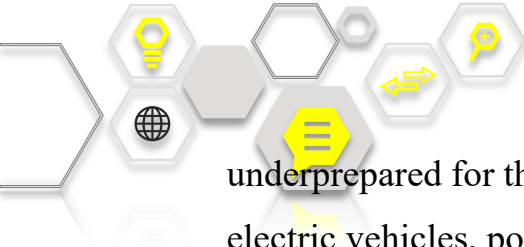
Table 5

Current Infrastructural and Financial Barriers to Electric Transport Adoption in Ukraine

Barrier	Current Situation	Impact on Transition
Charging Infrastructure	Insufficient charging stations, especially in rural areas	Creates obstacles for EV usage, particularly outside major cities
Grid Capacity	Existing grid is not equipped to handle increased electric load	Risks of power outages and inability to support growing EV demand
Initial Cost of Electric Vehicles	High compared to internal combustion engine vehicles	Limits affordability and consumer adoption
Battery Replacement Costs	High cost of battery replacement over the vehicle's lifespan	Adds to the long-term financial burden for consumers

Source: author's own development

The current state of electric transport in Ukraine is significantly influenced by infrastructural and financial barriers. The lack of a widespread charging infrastructure is a primary obstacle, especially in rural areas where access to charging stations is minimal. This limitation creates significant disparities between urban and rural areas in terms of electric vehicle usage, potentially leading to uneven adoption across the country. Additionally, the national power grid is currently



underprepared for the increased demand that would result from a large-scale shift to electric vehicles, posing risks of power shortages and inefficiencies.

From a financial perspective, the high initial cost of electric vehicles remains a significant barrier to widespread adoption, particularly in a country where income levels may not support such an investment without substantial government subsidies or incentives. The additional burden of high battery replacement costs further complicates the economic feasibility for potential buyers, making the overall transition more challenging.

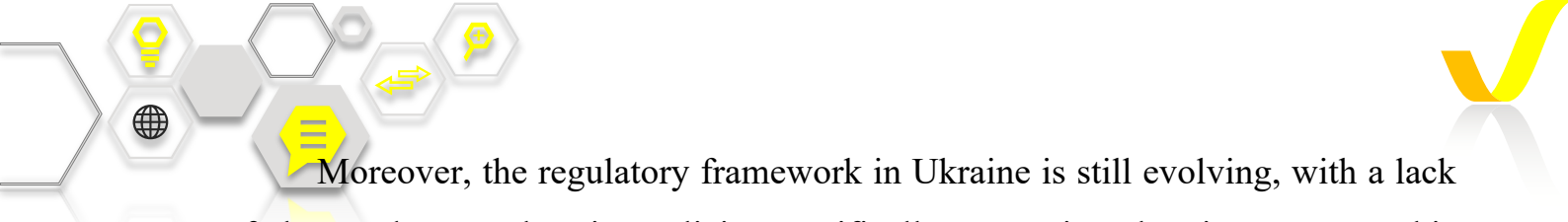
Table 6 summarizes technological and Regulatory Challenges in the Adoption of Electric Transport in Ukraine.

Table 6

Challenge	Current Situation	Impact on Transition
Driving Range	Limited driving range compared to conventional vehicles	Leads to range anxiety and limits EVs' practicality for long distances
Charging Time	Long charging periods compared to refueling traditional vehicles	Reduces convenience, particularly for frequent travelers
Regulatory Framework	Lack of comprehensive and consistent EV-related regulations	Creates uncertainty, hindering investment and consumer confidence
Public Awareness	Limited public knowledge and awareness of electric vehicle benefits	Slows adoption due to lack of understanding and misinformation

Source: author's own development

In the current technological and regulatory landscape, several challenges hinder the adoption of electric transport in Ukraine. Technologically, the limited driving range of most electric vehicles compared to traditional internal combustion engine vehicles is a significant concern for consumers, particularly those who need reliable transportation for long distances. This challenge, coupled with the longer charging times associated with electric vehicles, reduces their overall convenience and attractiveness.





Moreover, the regulatory framework in Ukraine is still evolving, with a lack of clear and comprehensive policies specifically supporting electric transport. This regulatory uncertainty discourages both consumers and investors, who may be hesitant to fully commit to electric vehicles without clear governmental support and guidelines. Additionally, public awareness remains a critical issue; the general population's limited understanding of the benefits and potential of electric vehicles contributes to slower adoption rates.

The development of strategic directions to support public policies promoting electric transport and renewable energy use in Ukraine is critical for advancing the country's sustainability agenda. With the global transition towards cleaner energy sources, Ukraine faces the dual challenge of modernizing its transport infrastructure and integrating renewable energy into the national grid. Effective public policies must address both the economic and environmental benefits of this transition, while also overcoming existing barriers such as infrastructure deficits, financial constraints, and regulatory inconsistencies. The strategic directions should therefore focus on creating a conducive environment for electric transport adoption, incentivizing renewable energy use, and ensuring the necessary infrastructure and public awareness are in place to support these changes (table 7).

Table 7

Strategic Directions for Enhancing Electric Transport Adoption in Ukraine

Strategic Direction	Current Challenges	Proposed Actions
Infrastructural Development	Insufficient charging stations, particularly in rural areas	Investment in nationwide charging networks, especially in underserved areas
Financial Incentives	High initial costs of electric vehicles and renewable technologies	Implement subsidies, tax breaks, and low-interest loans for consumers and businesses
Regulatory Reforms	Lack of clear and supportive policies for electric transport	Develop and enforce regulations that support EV adoption and renewable energy integration

Public Awareness and Education	Low public understanding of the benefits of electric transport	Launch awareness campaigns and educational programs to promote electric transport and renewable energy
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Source: author's own development

The strategic directions outlined above aim to address the most pressing challenges currently hindering the adoption of electric transport in Ukraine. Infrastructural development is crucial, as the lack of charging stations, especially in rural and remote areas, significantly hampers the feasibility of electric vehicles (EVs) for the broader population. By prioritizing investments in a nationwide charging network, the government can facilitate wider EV adoption.

Financial incentives are equally important, as the high initial costs of electric vehicles and renewable energy systems remain a major deterrent for consumers and businesses. Subsidies, tax breaks, and low-interest loans can help mitigate these costs, making the transition more accessible and economically viable for all sectors of society.

Moreover, regulatory reforms are necessary to create a stable and supportive legal framework that encourages investment in electric transport and renewable energy. Clear policies and regulations can reduce uncertainty for consumers and investors alike, fostering a more favorable environment for sustainable development.

Public awareness and education also play a critical role in this transition. Despite the potential benefits of electric transport, a significant portion of the population remains unaware or misinformed about these advantages. Public awareness campaigns and educational programs can help bridge this knowledge gap, encouraging more informed decision-making and greater public support for these technologies. Projected Improvements in Environmental Indicators through Increased Adoption of Electric Transport and Renewable Energy in Ukraine shown in table 8.



Table 8

Projected Improvements in Environmental Indicators through Increased Adoption of Electric Transport and Renewable Energy in Ukraine

Indicator	Current Value (2023)	Projected Value (2035)
Reduction in CO2 emissions (compared to 1990 levels)	60%	50%
Share of renewable energy in general primary energy supply (GPES)	8%	25%
Share of renewable energy in electricity generation	13%	25%
Integration of the Ukrainian energy system into the ENTSO-E's Continental Europe zone	Partially Integrated	Fully Integrated

Source: developed by the author based on [17, 18]

The table highlights the anticipated environmental improvements resulting from the increased integration of electric transport and renewable energy in Ukraine. As shown, significant reductions in CO2 emissions are expected by 2035, with the share of renewable energy in both the general energy supply and electricity generation projected to more than double. Moreover, Ukraine's energy system is on track to achieve full integration with the European energy market, further enhancing its environmental performance. Fig. 1. illustrates step-by-step algorithm for implementing strategic directions.

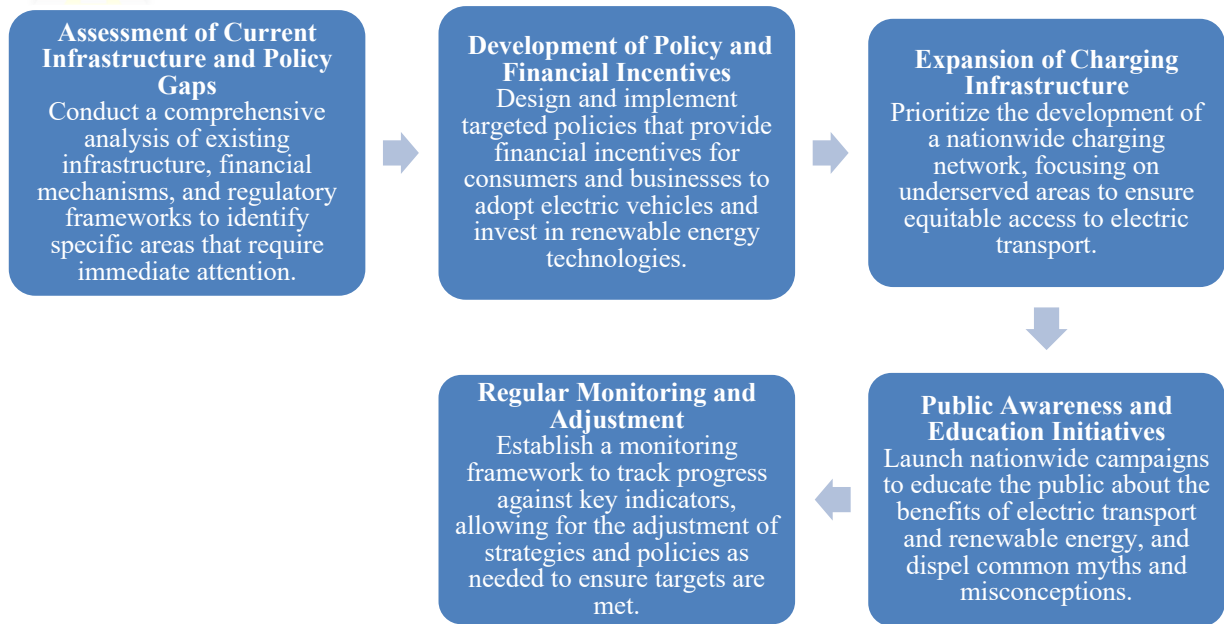
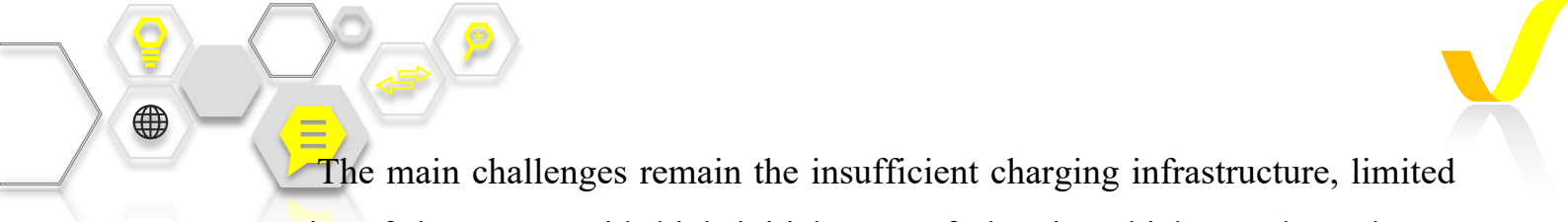


Fig. 1. Step-by-step algorithm for implementing strategic directions.

Source: author's own development

The implementation of these strategic directions requires a coordinated effort across multiple sectors, with active involvement from both the public and private spheres. By following this algorithm, Ukraine can create a supportive environment for the expansion of electric transport and renewable energy use, driving the country towards a more sustainable and economically resilient future.

Conclusions. The transition to electric transport powered by renewable energy sources is a crucial step for sustainable development in Ukraine, offering significant economic and environmental potential. Economically, it could reduce fuel costs, decrease dependence on oil imports, and create new jobs. However, substantial investments are needed for developing renewable energy infrastructure and charging networks, as well as optimizing the electricity grid to ensure stable energy supply. Environmentally, the shift to electric transport can significantly reduce harmful emissions and improve air quality, aiding Ukraine in meeting its international environmental commitments.



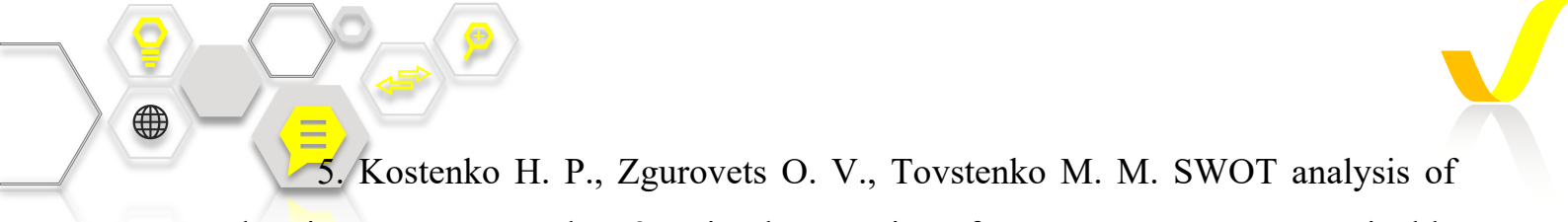
The main challenges remain the insufficient charging infrastructure, limited capacity of the power grid, high initial costs of electric vehicles, and regulatory complexities. Additional technological hurdles include limited driving range and long charging times, which reduce the attractiveness of electric vehicles for consumers.

It is recommended to invest in the development of charging infrastructure, particularly in rural areas, implement financial incentives for consumers, reform the regulatory framework to support electric transport, and conduct educational campaigns to raise public awareness.

Further research prospects involve integrating renewable energy sources into Ukraine's national energy system and developing effective strategies to address economic and environmental challenges in the transition to electric transport.

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