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## FISCAL STRATEGIES FOR SUSTAINABLE TRANSITION: ADDRESSING REVENUE CHALLENGES AND INFRASTRUCTURE INVESTMENT

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**Abstract.** This research examines the fiscal challenges and potential solutions associated with the global transition to electric vehicles. Electric vehicle adoption is accelerating, and governments need more revenues from traditional fuel taxes while simultaneously needing to invest in charging infrastructure. The research examines possible tax strategies to reduce the budget deficit and provide long-term finance for transportation projects. It also emphasizes the importance of considering both tax policies' short- and long-term impact on electric vehicle deployment and environmental goals. The research shows that phasing in taxes on electric vehicles, such as road tolls, mileage fees, battery production taxes, and electricity use taxes, can effectively offset lost revenues from fuel taxes. By proactively implementing such policies, governments may help smooth the transition to electric vehicles, ensure financial stability, and create a cleaner, more sustainable transportation system.

**Keywords:** *Fiscal challenges, electric vehicles, traditional fuel taxes, electricity use taxes, lost revenues, sustainable transportation system.*

**JEL Classification:** O23, Q56

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### INTRODUCTION

In the face of unpredictable fuel prices and predicted cutbacks in fossil fuel supplies, the adoption of electric vehicles (EVs) has increased significantly. Unlike typical internal combustion engine (ICE) vehicles, EVs have higher efficiency, a lower environmental impact, and cheaper running costs, which drive this trend. The automotive industry and consumers increasingly favour electric vehicles, spurred on by comprehensive government support mechanisms. These include direct financial incentives, such as purchase discounts, and indirect measures, such as tax exemptions. Despite this growing interest, the market penetration of EVs remains limited, mainly due to a complex interplay of technical, financial, cultural, social, and infrastructural factors.

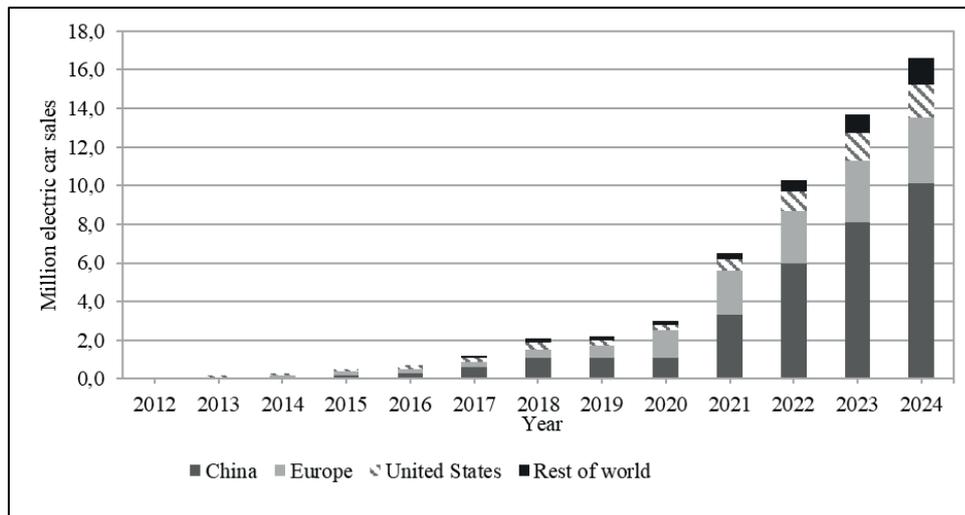
This research aims to investigate the economic implications of the transition from ICE vehicles to EVs, mainly focusing on the impact of decreased fuel tax revenues and the need for significant investments in charging infrastructure. By exploring case studies from different countries and analysing their approaches to

EV taxation and infrastructure development, the research seeks to identify effective policies that balance fiscal sustainability with environmental goals.

The importance of this research lies in its potential to inform policymakers and industry stakeholders about effective strategies for managing the fiscal and environmental impacts of the EV transition. The novelty of this research is reflected in its comprehensive analysis of the interplay between EV adoption, taxation policies, and infrastructure development, offering a holistic perspective on the future of transportation.

## 1. LITERATURE REVIEW

As shown in Fig. 1, the pace of electric vehicle sales is increasing. According to the latest forecasts, the global electric vehicle market, encompassing all types of vehicles, will continue to grow and reach an impressive \$802.81 billion by 2027, with a compound annual growth rate (CAGR) of 22.6 % (Qadir et al., 2024).



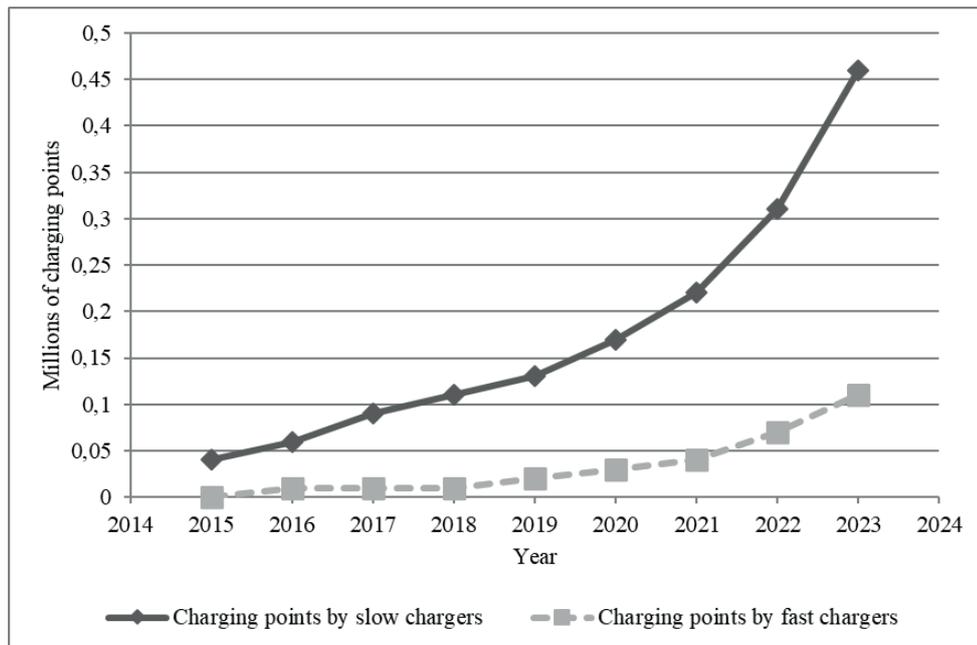
**Fig. 1.** Electric vehicle sales data globally (IEA, 2024).

Despite the rapid growth of the market and ambitious goals of many governments to transition from internal combustion engine (ICE) vehicles to electric vehicles (EVs), their share on the roads still needs to grow. This is because changing people's attitudes towards transportation depends on various factors, including technical and financial aspects as well as cultural, social, and infrastructural aspects. However, continued government support and subsidies for the transition to electric vehicles are stimulating the development of this sector (Ramachandaramurthy et al., 2023).

The longer the government financially supports the transition to electric vehicles, and as electric vehicles become more popular, traditional taxation schemes for the transport sector are under threat. Excise taxes on gasoline and diesel fuel are a significant source of government budget revenue. These taxes are often earmarked to finance road infrastructure, maintenance, and other transport projects.

With the decline in the number of cars using fossil fuels, excise tax revenues will decrease significantly, which could lead to a budget deficit. It is predicted that by 2030, the deficit in budget revenues from the fuel tax in Europe could reach 40 billion euros compared to 2010 (Noll et al., 2024).

At the same time, the transition to electric vehicles requires significant investments in charging infrastructure. The correlation between the availability of charging stations and the growth of electric vehicle sales is evident. Global experience shows that the charging network's expansion stimulates demand for electric vehicles. Such investments create an additional burden on the budget (Qadir et al., 2024). Moreover, in addition to expansion in general, it is necessary to prioritize fast public charging points, the number of which in Europe is significantly lower than slow ones (Fig. 2). At the end of 2023, the European Union agreed on the text of the Alternative Fuel Infrastructure Regulation (AFIR), which will require public fast charging stations every 60 km along the main transport corridors of the European Union (IEA, 2024).



**Fig. 2.** Publicly installed accessible light-duty vehicle charging points by slow and fast chargers in Europe, 2015–2023 (IEA, 2024).

While electric vehicles do not produce direct emissions, their lifecycle involves significant environmental externalities, from manufacturing to disposal. Imposing taxes on electric vehicles can serve as an economic instrument to internalize these externalities and ensure a more equitable distribution of environmental and economic costs.

A potential budget deficit without introducing additional taxes on electric vehicles could lead to cuts in funding for vital social programs. Introducing a tax on electric vehicles would protect the interests of the middle class by preventing tax increases on other goods and services, which could negatively impact the well-

being of all citizens. Therefore, the tax policy regarding electric vehicles should be carefully considered to ensure sustainable development and a fair distribution of the financial burden.

From a budgetary perspective, all three types of taxation – acquisition, ownership, and usage – can recover lost fuel tax revenue if calibrated correctly (Noll et al., 2024).

The results of the research (Hensher et al., 2021; Liu et al., 2023) in China show that government incentives do indeed contribute to the growth of electric vehicle sales, but their effectiveness varies over time. In the short term, direct financial measures such as purchase subsidies, tax breaks, and restrictions on purchasing traditional vehicles work best. These measures help increase demand for electric vehicles when the market is just developing. In the long term, creating favourable conditions for using electric vehicles is a higher priority (Liu et al., 2023).

Many countries have already begun developing and implementing various taxation measures for electric vehicles. Notable examples include distance-based road tolls, engine power taxes, and excise duties. A study in Norway suggests that a controlled, phased introduction of taxation will enable the country to achieve its environmental goals: 100 % zero-emission vehicles by 2025 and a 55 % reduction in CO<sub>2</sub> emissions by 2030 compared to 2005 levels while generating significant government revenue (Noll et al., 2024). Research conducted in South Korea has demonstrated that a tax on electric vehicle charging can mitigate the projected decline in fuel tax revenue (Chang & Woo, 2024). In 2024, electric vehicles in Switzerland began to be subject to the same registration tax as fossil fuel vehicles (Benrath, 2023). Due to the budget crisis, the subsidizing electric vehicle program was terminated in Germany (Carson, 2023).

Experts are also trying to evaluate the impact of battery production on environmental and economic aspects. Because together with the increase in mass production, battery manufacturers will be forced to find solutions for EV batteries' price reduction in order to increase the affordability of electric vehicle purchases (Asgarian et al., 2023). Besides that, one more important moment is the impact of battery disposal on the environment and its price. However, experts are confident that rapidly growing new technologies will help to find solutions (Asgarian et al., 2023; Maciuk et al., 2024).

## **2. METHODS AND PROCEDURES**

This research uses a combination of qualitative and quantitative methods to evaluate the fiscal challenges and potential solutions associated with the global transition to electric vehicles (EVs). The methodology includes the following key components.

### **1. Literature Review**

A literature review was conducted to identify key risks and challenges associated with EV adoption. This involved analysing academic studies, government reports, and industry publications. The review focused on areas such as the loss of fuel tax revenue and the need for investments in charging infrastructure.

2. Data Analysis

Quantitative data on government revenues, EV adoption rates, and charging infrastructure availability were collected from publicly accessible databases and case studies.

3. Risk Assessment

A risk assessment framework was applied to identify and categorize the risks associated with EV adoption. The risks were grouped into economic, environmental, infrastructural, and social categories based on their potential impacts on countries and fiscal sustainability. Table 1 outlines these risks and possible tax solutions.

4. Case Study Analysis

International case studies, such as those from Norway, Germany, and South Korea, were examined to analyse successful and problematic approaches to EV taxation. These case studies provided valuable insights to inform the development of proposed tax solutions.

These methods allow the research to systematically evaluate the impact of tax policies on the transition to electric vehicles and offer evidence-based recommendations for balancing economic, environmental, and social considerations.

**Table 1.** Risks Associated with Switching to Electric Vehicles and Possible Solutions (compiled by the authors)

Category	Risk	Impact on countries	Tax solutions
Economic	Loss of revenue from fuel taxes	Budget deficits due to reduced revenues from excise taxes on gasoline and diesel fuel	Road tolls and mileage-based tolls
	Investment in charging station infrastructure	High initial costs to build and maintain an extensive network of charging stations	
Environmental	Production and disposal of batteries	Environmental externalities associated with the life cycle of EV batteries	Taxes on the production and import of batteries to finance recycling and disposal programs
Infrastructural	Insufficient charging station infrastructure	Limited number of charging stations can hinder the adoption of EVs	Use of tax revenues to finance the construction of charging stations
	Power grid capacity	Increased demand for electricity may require additional resources and power grid capacity	Introduction of taxes on electricity for charging electric vehicles
Social	Unequal access to charging infrastructure	Lack of charging stations in remote areas	

The move to electric vehicles has enormous potential to enhance environmental quality significantly, yet adequate finance is required, as with any large-scale revolution. The imposition of taxes on electric vehicles should not be viewed as a hardship on owners but rather as an essential investment in the common good and the development of a sustainable transportation system. This concept is comparable to the toll road system: customers pay a fee to gain access to infrastructure that allows for faster and more comfortable mobility. Similarly, taxes on electric vehicles can be used to fund charging infrastructure expansion, assist clean technology research and development, and compensate for budget losses caused by decreasing fuel excise tax income.

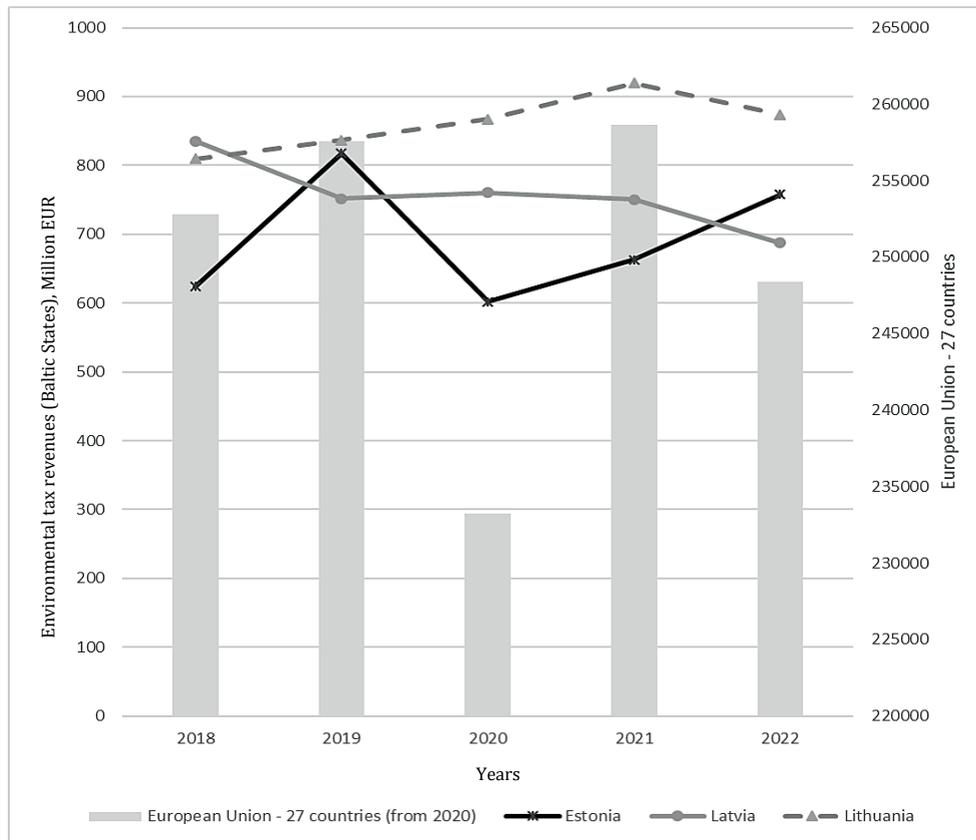
This method will provide a fair division of the expenses of establishing a new transportation system, encourage the further deployment of electric vehicles, and help to accomplish environmental goals. Ultimately, this will result in a cleaner, healthier environment for all inhabitants.

### 3. RESULTS

One of the main goals for both the world and the EU is the strategy to achieve climate neutrality by the year 2050. Nowadays, several European Green Deal instruments are already operating. EVs also play a significant role in EU Green Deal implementation because EVs have a significant part in the transport sector's decarbonization, which, in turn, is one of the biggest problems; the reason that the transport sector makes up a notable part of the total greenhouse gas emissions. Along with that, EVs are an over-discussed topic in both mass media and academic research, as the increasing prevalence of the EV creates various challenges. For example, the charging station network expansion and power generation capacity increase. Developing a long-term strategy that ensures a balance between government support of EV usage and fiscal stability is essential. So, the main question is how to adapt a country's tax system to the new transport habits, as using EVs reduces income from fossil fuel taxes.

Fuel for transport is included in the energy taxes category, which is one of the parts of the environmental tax. Moreover, the energy category is also separated into three main sub-categories:

1. Energy products for transport purposes (unleaded and leaded petrol, diesel, other energy products for transport purposes (LPG, natural gas, kerosene or fuel oil, etc.));
2. Energy products for stationary purposes (light and heavy fuel oils, natural gas, coal, coke, biofuels, electricity consumption and production, district heat consumption and production, other energy products for stationary use);
3. Greenhouse gases (carbon content of fuels, emissions of greenhouse gases (including proceeds from emission permits recorded as taxes in the national accounts)) (Eurostat, 2024).



**Fig. 3.** Environmental tax revenues in the EU, including the Baltic States, 2018–2022, Million euro (Eurostat, 2024).

According to Eurostat's available statistics (Fig. 3), till the year 2022, there has been a decrease in the dynamic in EU countries. Even before the Covid-19 period, income was much higher than in 2022. During only one year (from 2021 to 2022), 27 EU countries' statistics show a fall of 10 284.48 million EUR. It is safe to assume that the drop in income is more or less, but it is still connected with EV subsidies. Even better, we can see this one-year decline dynamic in the EU (among EV consumers), such as Germany and the Netherlands. Even more critical and sensitive in the context of budget revenues, this issue is essential in the countries of the Eastern bloc, including the Baltic states. So, in this case, it is a red light, especially EU countries, which should expect to lose if all switch to exemptions (Eurostat, 2024).

Most world countries (Norway, the Netherlands, Germany, France, Denmark, the UK, Israel, the USA, etc.) are concerned about budget income drops due to using different EV bonuses and fuel excise tax reductions. In addition, there is another risk – an increase in energy demand. With all of these mentioned, various changes in fiscal policy are necessary and have already been implemented in many countries.

For sure, tax efficiency depends on a variety of policy tools. Drivers' proposals are already being introduced in many countries around the world, such as new EV registration tax (based on the weight or value of the car) or road user charge for

each driven kilometre where emission tax is adjusted in the way to take into account not only the CO<sub>2</sub> emission, linked to traditional engines' usage but also to observe the impact of battery production and disposal.

Still, all options need to be explored separately, and most likely, each country's inhabitants must be ready for further price increases. Besides that, various social and economic problems may appear, so it is essential to ensure fair and socially responsible tax policy development.

Although the researchers' assessment forecasts show that the countries can achieve the goals set by the EU Green Course, the governments urgently need to act and consider the necessary action measures to implement the policy (Brizga et al., 2022).

Each economic activity requires energy. It is a significant climate change subject linked to economic activity growth and carbon emissions. This link means that measurable emissions reduction will limit economic growth, while decoupling means that measurable emissions reduction is possible with little or no effect on growth (Deutch, 2017).

Climate change is one of the biggest world problems, and each country needs to decrease its carbon emissions. That is why it is essential to provide decoupling statuses to find a better balance between economic growth and carbon emissions. Various research uses different decoupling indexes, but the most noticeable are total carbon emission, carbon intensity and carbon emission per capita. Based on this, there are given recommendations for local governments and global organizations to put into practice a three-stage strategy for carbon emission reduction: decoupling economic growth from carbon intensity, carbon emission per capita, and total carbon emission one by one (Shuai et al., 2019).

Researches also show that countries with high-income levels promote less carbon emission economics, focusing more on economic decoupling growth from total carbon emissions because the majority part of countries with high-income levels already decoupled their economic growth from carbon emission intensity and carbon emission per capita. However, countries with upper middle income are advised to spend their efforts decoupling carbon emissions per capita. Finally, lower-middle and low-income countries should promote carbon-intensive decoupling status (Shuai et al., 2019).

Developing countries generally display low decoupling, which is non-stable and has missing regularity. For example, China's stabilization in the decoupling process is better than Brazil's and India's. There are lots of methods to measure decoupling economic growth, but there is no everyday lens which is the best one (Wu et al., 2018).

Therefore, economic growth can be decoupled by changing development paths to the long-term direction, changing growth criteria, stimulating the development of green technologies and innovations, and diversifying revenue sources. This makes it possible to reduce dependence on traditional fossil industries, creating a more stable and sustainable economic model.

## CONCLUSIONS

The transition to electric vehicles is an inevitable and necessary process for sustainable development. However, a thorough review of tax policies and budget planning is required to avoid significant fiscal losses and ensure stable infrastructure financing and other public goods. Timely solutions are needed that take into account the economic, social, and environmental aspects of the transition to electric vehicles.

The experience of various countries demonstrates that the taxation of electric vehicles can be successfully integrated into the existing transport taxation system. It is important to consider both the short-term and long-term effects of various tax measures. Such an approach will ensure a balance between economic and environmental interests, creating conditions for further growth of the electric vehicle market and achieving carbon reduction goals.

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