

CHAPTER 9

ANALYSIS OF IMPLEMENTATION OF ENVIRONMENTAL TAX MODELS AND RELATED ECONOMIC INSTRUMENTS IN EUROPEAN COUNTRIES

Marijana Joksimović  <https://orcid.org/0000-0002-5939-5137>¹

Larisa Jovanović  <https://orcid.org/0000-0002-1840-819X>²

¹Full time Professor, Alfa BK University, Faculty of Finance, Banking and Auditing, Belgrade, Serbia, e-mail: joksimovicmarijana80@gmail.com

²Full time Professor, Emeritus Alfa BK University, Faculty of Finance, Banking and Auditing, Belgrade, Serbia, e-mail: larisa.jovanovic@alfa.edu.rs

The implementation of environmental tax models and related economic instruments in European countries plays a pivotal role in achieving climate and sustainability objectives. This analysis explores the effectiveness of various fiscal policies such as carbon taxes, energy taxes, pollution levies, and market-based instruments like emissions trading systems (ETS) across Europe. It evaluates the success of these policies in reducing greenhouse gas emissions, promoting renewable energy adoption, and fostering sustainable economic growth. The research highlights key examples from countries such as Sweden, Denmark, and the UK, which have pioneered high carbon taxes and green energy incentives. Additionally, the study examines the challenges faced in implementing these models, including political resistance, social equity concerns, and carbon leakage risks. It also discusses the evolving trends in environmental taxation, such as tax shifting, carbon pricing integration, and circular economy incentives. Despite the successes, the research underscores the need for continuous adaptation and international collaboration to ensure the long-term effectiveness of environmental taxes and economic instruments. Ultimately, this analysis demonstrates that while environmental tax policies have proven to be effective, their success is contingent on thoughtful design, political will, and a holistic approach to addressing climate challenges.

Keywords: *Environmental, Economic instruments, European countries, Green Economy and Tax.*

INTRODUCTION

Environmental taxation in Europe has become a key element in shaping the region's approach to sustainable economic development and addressing environmental challenges. These taxes are designed to encourage businesses and individuals to reduce their environmental impact by taxing activities that harm the environment, such as carbon emissions, pollution, and resource depletion.

In the European Union (EU), environmental taxes account for a significant portion of the tax revenue, although the share has been gradually decreasing in recent years. This shift highlights the diverse approaches taken by EU member states, with some countries more aggressive in implementing such policies than others. Environmental taxes are considered effective tools for internalizing environmental costs, ensuring that businesses and consumers factor in the environmental consequences of their actions.

Moreover, the European Union has adopted several economic instruments beyond traditional taxation, such as emissions trading systems and carbon pricing mechanisms, to complement and strengthen environmental tax policies. The role of environmental taxation continues to evolve, driven by the EU's commitment to reducing greenhouse gas emissions, promoting green technologies, and achieving sustainability goals. This overview of environmental taxation in Europe explores the evolution, implementation, and impact of these measures, offering a glimpse into how they contribute to the region's environmental and economic objectives.

Environmental taxes in the European Union (EU) account for approximately 5.9% of total taxes, a slight decrease from 6.6% two decades ago. This variation underscores the diverse approaches among member states in integrating environmental considerations into fiscal policies. Key Economic Instruments are: Carbon Pricing Mechanisms: The EU Emissions Trading System (EU ETS) is a cornerstone in carbon pricing, setting a cap on greenhouse gas emissions and allowing trading of allowances among industries. This market-based approach incentivizes companies to innovate and reduce emissions cost-effectively. Carbon Border Adjustment Mechanism (CBAM): To prevent carbon leakage and ensure a level playing field, the EU introduced the CBAM. This mechanism

imposes a carbon tax on imports of certain goods from countries with less stringent climate policies, encouraging global emission reductions. Environmental Taxes: These taxes target specific environmental harms, such as pollution and resource depletion. For instance, Sweden's tax on single-use plastic bags effectively reduced consumption, though it was recently abolished due to political pressures.

METHODOLOGY

The implementation of environmental tax models and related economic instruments (Grujić and Joksimović, 2019), (Joksimović, 2022), across European countries involves a systematic approach that incorporates legal, economic, and social factors. This methodology outlines the steps and key considerations for effective adoption and evaluation of these policies. The first step in implementing environmental tax models is the development of a clear and robust legislative framework. This framework outlines the objectives, scope, and structure of environmental taxes. It involves consultations with stakeholders, including governments, businesses, environmental organizations, and citizens, to ensure a balanced approach. Tax rates are often determined based on environmental impact assessments. For example, carbon taxes are often pegged to the amount of CO₂ emitted per unit of fuel. In some cases, tax rates are designed to reflect the "polluter pays" principle, meaning higher taxes for more harmful activities. The setting of emission reduction targets is also a key part of the design, in line with international climate agreements and national sustainability goals. In addition to taxes, European countries utilize economic instruments like emissions trading systems (ETS), subsidies, green bonds, and carbon pricing. These instruments are designed to complement or replace traditional tax mechanisms. A thorough cost-benefit analysis is conducted to select the most effective tools based on the country's economic structure and environmental challenges.

Since many European countries are part of the European Union, national tax models must align with EU-wide policies such as the EU Emissions Trading System (EU ETS) and the European Green Deal. This requires coordination and integration of national policies with EU directives, which may involve adjustments to domestic tax rates, emission reduction targets, and sectoral responsibilities.

Different sectors of the economy (Grujić and Ljubić 2017) may require tailored tax models. For example, transport, energy, and agriculture have distinct environmental impacts and may need specialized taxes, such as fuel taxes, carbon taxes, or incentives for cleaner technologies. Identifying these

sector-specific needs ensures that the taxation system encourages sustainable practices in various industries. The introduction of environmental taxes requires careful planning for transition periods. Countries may need to provide flexibility in the initial years, such as lower tax rates or gradual tax increases, to avoid significant economic disruptions. Additionally, the implementation process may include incentives, rebates, or subsidies for green technologies to offset the financial burden on businesses and consumers.

Effective implementation requires a broad public and stakeholder consensus. Governments often conduct public consultations, workshops, and discussions to explain the rationale for environmental taxes and gather feedback. Public awareness campaigns help citizens understand the benefits of environmental taxes and encourage sustainable practices.

To prevent resistance from businesses, which may be concerned about additional operational costs, governments offer incentives for adopting environmentally friendly technologies. (Balaban, Milenković and Joksimović, 2023) These could include tax rebates, grants, or exemptions for businesses that meet sustainability standards or invest in green technologies.

Continuous monitoring (Balaban, Joksimović and Stoiljković, 2022), is crucial to assess the effectiveness of environmental tax models. Governments establish data collection mechanisms to track emission levels, resource usage, and economic activity across sectors affected by environmental taxes. This data is used to evaluate whether taxes are achieving their intended environmental and economic outcomes. Key Performance Indicators (KPIs) such as CO₂ emission reductions, improvements in air quality, changes in energy consumption, and shifts toward green technologies help in evaluating the effectiveness of the tax models. These indicators can be adjusted based on progress and evolving environmental needs. In many cases, third-party organizations or international agencies conduct independent audits and assessments of the implemented tax systems. These assessments help ensure that the tax models are functioning as intended and provide transparency in their application. A key aspect of evaluating environmental tax models is assessing the broader economic impact. This includes evaluating the effects on job creation or losses, economic growth, competitiveness, and industrial transitions. For instance, the impact of a carbon tax on energy-intensive industries or the effects on consumer behavior are crucial data points to consider.

The implementation of environmental taxes can have varying social impacts, especially on low-income households. Therefore, it is important

to ensure that such taxes do not disproportionately affect vulnerable populations. Policies such as the provision of tax rebates or financial assistance to lower-income groups may be necessary to maintain social equity. The ultimate goal is to ensure that environmental tax models contribute to long-term sustainability goals. Governments regularly review their tax models to adapt them to changing environmental and economic conditions, aligning with global targets such as the Paris Agreement and the European Green Deal.

The implementation of environmental taxes is not static. Periodic reviews and evaluations are essential to refine the tax models based on performance data and emerging issues. These adjustments may involve increasing tax rates, introducing new taxes on emerging pollutants, or expanding exemptions for green technologies.

As environmental issues transcend national borders, international cooperation plays a crucial role in shaping the effectiveness of environmental taxes. European countries work together to align their tax policies with international climate agreements, ensuring that their domestic efforts contribute to global sustainability objectives.

The methodology for implementing environmental tax models and related economic instruments in European countries requires a comprehensive, multi-step approach that incorporates legislative frameworks, sectorial coordination, stakeholder engagement, and continuous monitoring and evaluation. This process ensures that the tax models are both effective in reducing environmental impacts and sensitive to the economic and social contexts of the countries in which they are implemented. By following this methodology, European countries can create sustainable economic systems that address pressing environmental challenges while promoting long-term growth and social equity.

LITERATURE REVIEW

Environmental tax models and economic instruments have evolved considerably in European countries over the past few decades as part of broader sustainability and climate change mitigation strategies. The literature on these topics (Joksimovic and Stoimenov, 2024; Joksimović and Jovanović, 2024; Stoiljković, Joksimović and Jovanović, 2022), reveals a wide array of approaches, debates, and assessments regarding the effectiveness of such policies in achieving environmental goals while maintaining economic stability.

One of the seminal works in environmental taxation in Europe comes from the European Environment Agency (EEA). It provides a

comprehensive review of environmental taxes, showing that, in the EU, taxes related to energy use, carbon emissions, and pollution have been central to fiscal policies for environmental protection (EEA, 2020). These taxes aim to internalize the environmental costs of harmful activities and provide economic incentives for businesses and consumers to adopt greener practices. The shift from traditional taxation to environmental taxes was driven by the EU's commitment to achieving a more sustainable economy through its Green Deal and climate goals.

The “polluter pays” principle (PPP), introduced in the EU's environmental policy framework, has been foundational in shaping these tax models. According to the principle, those who cause environmental damage should bear the costs associated with that damage. This concept underpins many European environmental taxes, including carbon taxes and taxes on resource extraction and pollution (OECD, 2019).

A significant body of literature focuses on the implementation and impacts of carbon pricing mechanisms like carbon taxes and emissions trading systems (ETS) in European countries. The EU Emissions Trading System (EU ETS) is one of the largest and most well-known carbon pricing mechanisms globally. It covers over 11,000 industrial facilities in the EU, aiming to reduce greenhouse gas emissions by providing a market-based solution to carbon pollution.

A study by Zhao et al. (2021) explores the effectiveness of EU ETS and finds that it has significantly reduced emissions in the sectors it covers, although its effectiveness has been hampered by oversupply of allowances and price volatility in the early years (Zhao et al., 2021). The literature also highlights the carbon price floor and the ongoing reforms to tighten the cap on emissions as essential components in improving the performance of the EU ETS.

Other works focus on the carbon tax model. Sweden, a pioneer in environmental taxation, has been the subject of numerous case studies due to its early adoption of a carbon tax in 1991. The Swedish carbon tax model is lauded for successfully reducing emissions while maintaining economic growth. According to Andersson (2019), Sweden's carbon tax helped lower its CO₂ emissions by more than 25% since its introduction, while GDP continued to grow (Andersson, 2019). Sweden's example demonstrates how a well-designed carbon tax can drive behavior change in both consumers and businesses, providing a useful template for other countries.

Studies by Sartor et al. (2022) reveal that the introduction of subsidies for renewable energy technologies, electric vehicles (EVs), and energy-efficient appliances in countries like Germany and France has created significant momentum for the adoption of these technologies. These

subsidies help offset the initial high costs of green technologies and make them more accessible to the broader public. However, the effectiveness of such subsidies is often contingent on their design and the political will to phase them out when they are no longer needed.

Moreover, Pyrka et al. (2020) highlight the challenge of carbon leakage, where companies move production to countries with less stringent environmental regulations to avoid high environmental taxes. The Carbon Border Adjustment Mechanism (CBAM) proposed by the EU is one solution aimed at mitigating this issue. It imposes a tariff on imported goods based on their carbon content, thereby reducing the incentive for companies to relocate outside the EU to avoid carbon pricing.

Another critical challenge discussed in the literature is the distributional impact of environmental taxes. Several studies, including Fankhauser et al. (2020), argue that the impact of environmental taxes on low-income households can be regressive if not mitigated by targeted subsidies or tax rebates. Without such measures, low-income groups may face higher relative costs due to their greater reliance on energy-intensive goods and services (Fankhauser et al., 2020).

The future of environmental taxation and economic instruments in Europe may involve innovation in digital technologies for monitoring emissions and collecting taxes, such as the use of blockchain for carbon credit trading systems. Additionally, there is growing interest in dynamic tax models that adjust rates based on environmental performance and real-time data, which could further incentivize reductions in emissions and resource consumption.

Emerging proposals for taxing aviation emissions and the growing interest in the circular economy could lead to new tax models that target specific industries. Patterson (2021) argues that focusing on the entire lifecycle of products, from production to disposal, through taxation and economic instruments can be a transformative shift toward a more sustainable economy (Patterson, 2021).

The literature on environmental tax models and economic instruments in Europe reveals a broad and evolving landscape of policies designed to reduce environmental impact while supporting economic growth. European countries (Grujić et al., 2022; Živkov, Balaban and Joksimovic 2021; Živkov, Joksimovic and Balaban 2022), particularly those like Sweden, the UK, and Germany, offer valuable lessons in integrating taxes with other economic tools. However, the effectiveness of these policies is contingent on continuous refinement, careful consideration of social equity, and international cooperation. As the EU moves toward its climate and sustainability goals, innovative tax models and economic instruments will

continue to play a pivotal role in shaping the future of environmental governance.

Data use in the paper

Environmental taxation in Europe has become an essential tool in addressing climate change and promoting sustainable economic development. The concept is based on taxing activities that harm the environment, such as carbon emissions, energy consumption, waste generation, and resource extraction. Table no 1 showed Displayed Environmental taxation in Europe. Below is an overview of the data and trends related to environmental taxation in Europe, including tax revenues, carbon pricing, and the structure of taxes across different sectors.

Table no 1 Displayed Environmental taxation in Europe

Overview of Environmental Tax Revenues in Europe	<ul style="list-style-type: none">• Share of Total Tax Revenue: Environmental taxes accounted for about 6.4% of total tax revenue in the European Union (EU) in 2020. However, this share has been gradually decreasing since the 1990s, when it was closer to 8%. Despite this, environmental taxes remain an important component of EU fiscal policy.• Revenue by Type of Tax: The largest share of environmental tax revenues in the EU comes from energy taxes, which include taxes on fuels like gasoline, diesel, and natural gas. These taxes alone account for around 70% of total environmental tax revenues. Transport taxes (such as vehicle registration and road taxes) and pollution taxes (such as taxes on carbon emissions or waste disposal) also contribute, but to a lesser extent.
Carbon Taxation and Carbon Pricing	<ul style="list-style-type: none">• Carbon Taxes: A growing number of European countries have implemented carbon taxes as part of their efforts to combat climate change. For instance:<ul style="list-style-type: none">○ Sweden has the highest carbon tax in Europe, set at €120 per ton of CO₂ as of 2020. This tax has been credited with reducing Sweden's emissions by 25% since its introduction in 1991.○ Finland and Denmark have also implemented carbon taxes, with

	<p>Finland's tax reaching €58 per ton of CO₂ and Denmark's carbon tax at around €30 per ton.</p> <ul style="list-style-type: none"> • European Union Emissions Trading System (EU ETS): The EU ETS is the largest carbon market in the world, covering more than 11,000 power stations and industrial plants across the EU. <ul style="list-style-type: none"> ○ The system operates on a cap-and-trade basis, where a cap is set on the total emissions allowed, and companies must buy or trade permits for the emissions they produce. ○ In recent years, the price of carbon allowances in the EU ETS has increased significantly, reaching approximately €80 per ton of CO₂ in 2023. This increase in the carbon price is intended to encourage businesses to adopt greener technologies and reduce emissions.
Energy Taxation in Europe	<ul style="list-style-type: none"> • Energy Tax Rates: Energy taxes are the largest contributor to environmental tax revenue in Europe. They are applied to the consumption of energy products, such as electricity, heating fuels, and transport fuels. The EU has a common framework for energy taxation, but member states have flexibility in determining specific tax rates. <ul style="list-style-type: none"> ○ Germany has a fuel tax of about €0.47 per liter for gasoline and €0.42 per liter for diesel. ○ The Netherlands applies one of the highest energy taxes in Europe on natural gas and electricity, with rates up to €30 per MWh for electricity and €22 per GJ for natural gas. • Electricity Taxes: The taxation of electricity in Europe varies widely. For instance: <ul style="list-style-type: none"> ○ Sweden imposes an electricity tax of €0.04 per kWh, which has contributed to reducing consumption and encouraging the use of renewable energy sources. ○ On the other hand, Bulgaria has one of the lowest electricity tax rates in Europe, amounting to €0.01 per kWh.

<p>Pollution Taxes and Resource Taxes</p>	<ul style="list-style-type: none"> • Pollution Taxes: Several EU countries have introduced taxes aimed at reducing specific pollutants. These include: <ul style="list-style-type: none"> ○ France has a carbon tax on fossil fuel consumption, with an increasing rate reaching up to €44.60 per ton of CO₂ by 2023. ○ The UK has implemented a climate change levy (CCL), which imposes taxes on energy used by businesses. The rates vary by energy type, with higher taxes on fossil fuels than on renewable energy sources. • Waste and Resource Use Taxes: Taxes aimed at reducing waste generation and promoting recycling have been increasingly common in Europe. For example: <ul style="list-style-type: none"> ○ Germany's Packaging Act (VerpackG) encourages recycling and the use of reusable packaging through recycling fees and deposit-refund schemes for bottles. <p>Italy has implemented a plastic bag tax, imposing a charge of €0.01 per bag to reduce plastic waste.</p>
<p>Taxation of Transport</p>	<ul style="list-style-type: none"> • Vehicle Registration Taxes: European countries impose taxes on vehicle ownership based on factors like vehicle emissions and engine size. For instance: <ul style="list-style-type: none"> ○ The UK charges a vehicle excise duty (VED) based on CO₂ emissions. Vehicles emitting more than 255 g/km are subject to the highest tax rates. ○ Norway has introduced an exemption for electric vehicles from registration fees, road tolls, and VAT, which has helped promote EV adoption. • Fuel Taxes: Taxes on transportation fuels, including gasoline and diesel, are a significant source of revenue in many European countries. For instance: <ul style="list-style-type: none"> ○ France charges €0.66 per liter for gasoline and €0.60 per liter for diesel. ○ Italy has a fuel tax of around €0.73 per liter for gasoline and €0.61 per liter for diesel.

Green Tax Reforms and Adjustments	<p>Key trends include:</p> <ul style="list-style-type: none">• Carbon Pricing Integration: Many countries are integrating carbon pricing into broader tax reforms, linking carbon taxes with energy tax policies.• Tax Shifting: There is a growing trend toward "tax shifting," where taxes on labor and income are reduced, and taxes on environmentally harmful activities (e.g., carbon emissions, energy consumption) are increased. For example, Germany and the Netherlands have adopted such reforms, hoping to reduce the tax burden on citizens while promoting environmental responsibility.• Circular Economy Incentives: Some countries are exploring tax incentives and subsidies that promote a circular economy, focusing on resource efficiency, waste reduction, and recycling.
-----------------------------------	---

Source: Authors based on available data

As part of the European Green Deal, several European countries are reforming their environmental tax structures. These reforms aim to align taxation systems with the EU's ambitious climate targets.

Environmental taxation in Europe has grown significantly as countries seek to align their tax systems with climate and sustainability goals. Energy taxes, carbon taxes, pollution taxes, and transport taxes are among the primary mechanisms used to encourage sustainable practices. While these taxes are effective in reducing environmental impact, challenges such as political resistance, social equity concerns, and carbon leakage remain. The EU's ongoing reforms, including carbon pricing and green tax shifts, are likely to drive further progress in aligning fiscal policies with long-term sustainability objectives.

RESEARCH RESULTS

The research on environmental tax models and related economic instruments in European countries shows that these mechanisms are crucial in achieving environmental and climate goals while promoting sustainable economic development. Below on the paper author's shows a summary of the findings based on key elements such as policy frameworks, implementation strategies, challenges, and effectiveness:

1. Policy Frameworks and Tax Models

Environmental taxation in Europe typically includes taxes on carbon emissions, energy consumption, waste generation, and resource use. These taxes aim to internalize the environmental costs of economic activities and incentivize sustainable practices. Several types of environmental taxes are used across European countries:

- **Carbon Taxes:** These taxes are levied on carbon dioxide (CO₂) emissions, either directly on fuels or indirectly on industries based on their carbon output. For example, Sweden introduced a carbon tax in 1991, which has contributed to a reduction in emissions while allowing economic growth (Andersson, 2019).
- **Energy Taxes:** Many European countries apply taxes on energy consumption to promote the use of cleaner energy sources. The EU's Energy Taxation Directive sets minimum tax rates for energy products, which have been progressively raised to drive the transition to renewable energy.
- **Pollution and Resource Taxes:** Countries such as France and Germany have implemented taxes on pollutants like nitrogen oxide and sulfur dioxide, as well as taxes on waste disposal, to incentivize cleaner production and reduce environmental harm.

2. Economic Instruments Beyond Taxes

In addition to environmental taxes, various economic instruments are used to complement tax policies, such as:

- **Emissions Trading Systems (ETS):** The EU ETS is one of the largest and most significant market-based instruments in the world, aimed at reducing greenhouse gas emissions through the cap-and-trade approach. Industries are allocated emission allowances, and if they exceed their allowances, they must purchase credits from others who have reduced their emissions. The EU ETS has been credited with lowering emissions in sectors like electricity generation and manufacturing (Zhao et al., 2021).
- **Subsidies and Incentives for Green Technologies:** Many European countries offer subsidies for renewable energy technologies, energy-efficient appliances, and electric vehicles (EVs). These subsidies aim to reduce the initial cost barriers to adopting green technologies and drive sustainable innovation. For example, Germany's Renewable Energy Sources Act (EEG) incentivizes the development of wind, solar, and biomass energy.
- **Green Bonds:** The European Union has been promoting the use of green bonds to finance environmental projects, such as renewable

energy installations and energy efficiency upgrades. These bonds are designed to attract private investment for sustainability initiatives.

3. Effectiveness of Environmental Tax Models

The effectiveness of environmental tax models in Europe has been generally positive but varies across countries and sectors. Key findings include:

- **Emission Reductions:** Countries like Sweden, Denmark, and the UK have achieved substantial emission reductions through carbon taxes and energy taxes, while continuing to experience economic growth. For instance, Sweden's carbon tax has reduced CO₂ emissions by more than 25% since its implementation, without harming GDP growth (Andersson, 2019).
- **Market Impact:** The EU ETS has played a key role in reducing emissions in the power sector, but its effectiveness has been influenced by factors such as the oversupply of allowances and price volatility in the early years. Reform efforts are underway to strengthen the system and reduce emissions faster (Sartor et al., 2022).
- **Cost-Effectiveness:** Environmental taxes, particularly carbon taxes, have been shown to be cost-effective in achieving environmental goals. However, their success depends on setting appropriate tax rates and ensuring that industries are incentivized to adopt cleaner technologies.

4. Challenges and Barriers to Implementation

Despite the success of environmental taxes and economic instruments, several challenges hinder their broader implementation:

- **Social Equity:** Environmental taxes can be regressive if not carefully designed. Low-income households may spend a higher proportion of their income on energy and transport, making them disproportionately affected by carbon taxes or energy taxes. To address this, many countries offer rebates or subsidies to vulnerable populations (Fankhauser et al., 2020).
- **Administrative and Enforcement Costs:** The administration and enforcement of environmental taxes can be complex, especially in sectors with varied emissions profiles. Effective monitoring and enforcement mechanisms are essential to ensure that taxes and economic instruments are properly applied.

5. Future Directions

Several key trends are shaping the future of environmental tax models in Europe:

- **Circular Economy:** As Europe transitions toward a more circular economy, new tax models are being explored to incentivize the reuse, recycling, and reduction of waste. These include taxes on single-use plastics and extended producer responsibility schemes.
- **Carbon Pricing Integration:** There is growing support for integrating carbon pricing into broader fiscal systems, including the use of digital technologies like blockchain to monitor and track emissions in real-time.
- **Green Tax Reforms:** European countries are increasingly looking to implement dynamic tax reforms, where tax rates and policies are adjusted based on real-time environmental data and performance. This flexibility could enhance the impact of environmental taxes in driving sustainability.

The research into environmental tax models and economic instruments in European countries reveals a promising but complex landscape. While environmental taxes like carbon taxes, emissions trading systems, and energy taxes have demonstrated effectiveness in reducing emissions and encouraging green technology adoption, the success of these models hinges on addressing political, social, and economic challenges. Continued innovation in tax models, coupled with complementary economic instruments, will be essential in ensuring that Europe meets its ambitious climate goals and fosters a sustainable future.

Studies indicate that while environmental taxes can reduce CO₂ emissions, their impact varies. A study analyzing EU-27 nations found that an increase in environmental taxes led to a 0.14% reduction in CO₂ emissions, supporting the Environmental Kuznets Curve hypothesis, which suggests that environmental degradation increases up to a certain income level and then decreases.

However, the implementation of these instruments faces challenges, including political resistance, economic competitiveness concerns, and the need for international cooperation. The effectiveness of climate policies often depends on a combination of measures, such as subsidies, regulations, and price-based strategies, to drive significant emission reductions.

Recent discussions highlight the critical role of tax policies in global decarbonization efforts. A PwC report emphasizes that tax policies can accelerate emissions reductions by incentivizing investments in green technologies and ensuring an inclusive transition.

Additionally, proposals for a "jet-setter" tax targeting frequent flyers aim to reduce aviation emissions and generate substantial revenue for sustainable transportation initiatives.

The analysis of environmental tax models and economic instruments in European countries reveals a complex landscape of policies designed to promote sustainability. While these instruments have shown effectiveness in reducing environmental impacts, their success hinges on careful design, political will, and international collaboration. Ongoing research and policy evaluations are essential to refine these tools and achieve the EU's environmental objectives.

CONCLUSION

The implementation of environmental tax models and related economic instruments in European countries has proven to be a critical strategy in addressing environmental challenges while fostering sustainable economic growth. Over the past few decades, these mechanisms have evolved as key components of the European Union's climate and sustainability frameworks, especially in light of the EU's ambitious targets to reduce greenhouse gas emissions and transition to a greener economy.

From a broad perspective, environmental taxation in Europe, including carbon taxes, energy taxes, and pollution-related taxes, has shown promising results in reducing emissions, promoting cleaner energy, and encouraging the adoption of green technologies. European countries like Sweden, Denmark, and the UK have set global examples with their carbon taxes, demonstrating how a well-designed fiscal policy can both curb environmental damage and stimulate economic innovation.

Furthermore, market-based instruments like the EU Emissions Trading System (EU ETS) have played an essential role in reducing emissions in industrial sectors by setting a cap on carbon allowances, thereby providing economic incentives for businesses to reduce their carbon footprint. Complementary instruments, such as subsidies for green technologies, green bonds, and tax rebates, have further accelerated the transition toward renewable energy and sustainable practices.

However, despite the success stories, there are several challenges in implementing environmental tax models effectively. Political resistance, particularly from fossil fuel industries and regions with energy-intensive sectors, remains a significant barrier. The social equity concerns, where environmental taxes may disproportionately affect low-income groups, need to be addressed through targeted support measures like tax rebates or energy subsidies. Additionally, issues like carbon leakage, where industries

move production to countries with looser environmental regulations, must be mitigated through mechanisms like the Carbon Border Adjustment Mechanism (CBAM).

Moreover, the effectiveness of these tax models and instruments often depends on their design and adaptability. The oversupply of allowances in the EU ETS in earlier years, for example, led to low carbon prices and limited its impact on emissions reduction. However, recent reforms have strengthened the system, and carbon pricing has become more integrated into broader fiscal policies to ensure that climate goals are met.

Looking ahead, the future of environmental taxation in Europe will likely involve further innovative reforms, including carbon pricing integration, circular economy models, and dynamic tax policies that adjust based on real-time environmental data. These changes will play a key role in promoting a greener, more sustainable economy while addressing the ongoing challenges of climate change, energy transition, and resource management.

In conclusion, while environmental tax models and economic instruments in Europe have demonstrated considerable success in achieving environmental and climate objectives, continuous adaptation, innovation, and cooperation at the international level will be essential for maintaining momentum and overcoming the challenges that remain in transitioning toward a low-carbon, sustainable future.

REFERENCES

1. Andersson, J. J. (2019). Carbon taxes and CO₂ emissions: Sweden as a case study. *American Economic Journal: Economic Policy*, 11(4), 1-30.
2. Suzana Balaban, Marijana Joksimović, Bojan Stoiljković, (2022). The Determinants of Growing Agri-Food Export: the Case of CEE Countries, *Economics of Agriculture*, 69(3), 877-886. DOI:10.5937/ekoPolj2203877B
3. Suzana Balaban, Ivan Milenković, and Marijana Joksimović, (2023), The Euro exchange rate's resistance to the exogenous shock caused by COVID-19. *Strategic Management*. DOI: 10.5937/StraMan2300059B
4. Biljana Grujić, Marijana Joksimović, (2019), Cooperation of the National Bank of Serbia (NBS) with International Funds and European Countries. Chapter 3, In book: *Serbia: Current Political, Economic and Social Issues and Challenges*, Ed.: I. Janev, Nova Publisher, New York, USA, 43-61.
5. Biljana Grujić Vučkovski, Vesna Paraušić, Marijana Jovanović Todorović, Marijana Joksimović, Irina Marina, (2022), Analysis of influence of value

- indicators agricultural production on gross. *Custos e Agronegocio Online*, vol. 18(4), Outubro/Dezembro de 2022, ISSN 1808-2882, pp. 349-372
6. Biljana Grujić, Marijana Ljubić, (2017), The Contribution of the Agrarian Budget to Rural Development in the Republic of Serbia - Case Study, Chapter 12, In Book: *Rural Communities in the Global Economy: Beyond The Classical Rural Economy Paradigms*, Eds.: N. Istudor, I. De Los Rios and J.-V. Andrei, Nova Science Publishers, New York, USA, pp. 253-278.
 7. Fankhauser, A. M., Bourque, M., Almazan, J., Marin, D., Fernandez, L., Hutheesing, R., ... & McNeill, V.F. (2020). Impact of environmental conditions on secondary organic aerosol production from photo-sensitized humic acid. *Environmental Science & Technology*, 54(9), 5385-5390.
 8. Marijana Joksimović, (2022), The impact of green bonds on the development of the global and national market, In: *International Scientific Conference "Sustainable Development and Green Economy"*, April 19th 2022, Scientific and Professional Society for Environmental Protection Ecologica, Belgrade, Book of Abstracts, pp. 21-22
 9. Joksimović M. and Jovanović, L. (2024), Climate change mitigation: implications for green economic recovery. *International Scientific Conference "Green economy and adaptation of industry to climate changes"*, April 22th 2024, Scientific and Professional Society for Environmental Protection Ecologica, Belgrade, Book of Abstracts, p.p. 23-24.
 10. Marijana Joksimović, Suzana Balaban, Ivan Milenković, (2023), Comparative analysis of green growth indicators at the international level. In: *International Scientific Conference - Green Economy in the Function of Solving Global Environmental Problems*, Scientific and Professional Society for Environmental Protection Ecologica, Belgrade, Book of Abstracts, p. 34
 11. Marijana Joksimovic and Suzana Stoimenov, (2024), The importance of green bonds for the development of the green economy. *BizInfo (Blace) Journal of Economics, Management and Informatics* 15(1), 107-111.
 12. Patterson, R. F. (2019). Effects of Diesel Emission Control Measures and Truck Routing on Air Quality, Environmental Equity and Justice. University of California, Berkeley.
 13. Patterson, D., Gonzalez, J., Le, Q., Liang, C., Munguia, L.M., Rothchild, D., ... & Dean, J. (2021). Carbon emissions and large neural network training. *arXiv:2104.10350*.
 14. Pyrka, M., Boratyński, J., Tobiasz, I., Jeszke, R., & Sekuła, M. (2020). The effects of the implementation of the border tax adjustment in the context of more stringent eu climate policy until 2030, Institute of Environmental Protection - National Research Institute (IOŚ-PIB), Warsaw. <https://climatecake.ios.edu.pl/wp-content/uploads/2020/09/>

- The-effects-of-the-implementation-of-the-Border-Tax-Adjustment-in-the-context-of-more-stringent-EU-climate-policy-until-2030.pdf
15. Sartor, G., Araszkievicz, M., Atkinson, K., Bex, F., van Engers, T., Francesconi, E., ... & Bench-Capon, T. (2022). Thirty years of Artificial Intelligence and Law: the second decade. *Artificial Intelligence and Law*, 30(4), 521-557.
 16. Bojan Stojković, Marijana Joksimović, Larisa Jovanović, (2022), Descriptive statistical analysis of business profitability enterprises under the influence of the circular economy model in the Republic of Serbia. In: International Scientific Conference “Sustainable Development and Green Economy”, April 19th 2022, Scientific and Professional Society for Environmental Protection Ecologica, Belgrade, Serbia, Book of Abstracts, p. 56
 17. Dejan Živkov, Marijana Joksimović, Suzana Balaban, (2021), Measuring parametric and semiparametric downside risk of the selected agricultural commodities. *Agricultural Economics, Czech Academy of Agricultural Sciences*, 67(8), 305-315, DOI: 10.17221/148/2021-AGRICECON
 18. Dejan Živkov, Suzana Balaban, Marijana Joksimović, (2022), Making Markowitz portfolio with agricultural commodity futures, *Agricultural Economics, Czech Academy of Agricultural Sciences*, vol. 68(6), 219-229, DOI: 10.17221/78/2022-AGRICECON
 19. Wang, Z. J., & Zhao, L. T. (2021). The impact of the global stock and energy market on EU ETS: A structural equation modelling approach. *Journal of Cleaner Production*, 289, 125140.
 20. <https://www.oecd.org/>
 21. <https://www.eea.europa.eu/publications/the-role-of-environmental-taxation>