

# РОЗДІЛ 1

## СВІТОВЕ ГОСПОДАРСТВО

### І МІЖНАРОДНІ ЕКОНОМІЧНІ ВІДНОСИНИ

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#### TAX INCENTIVES FOR RENEWABLE ENERGY DEVELOPMENT IN THE EUROPEAN UNION: HISTORICAL OVERVIEW AND EMERGING TRENDS

The paper has provided a comprehensive overview of tax incentives for RES energy development in the EU. The study has shown that tax incentives have played a crucial role in driving the growth of RE energy markets in EU countries by reducing the cost of renewable energy and improving its competitiveness. With the continued evolution of the market, tax incentives will continue to be an important tool for supporting the growth of renewable energy markets in EU countries. The emerging incentives, such as green bonds, carbon trading, and performance-based incentives, provide a flexible and market-driven approach to supporting renewable energy development and attract private investment into the sector. However, despite their success, there are still challenges to be addressed, such as the complexity of implementing these incentives and the potential resistance from some industries.

**Keywords:** tax incentives, renewable energy, European Union, energy policy, green electricity.

**Formulation of the problem.** The development of renewable energy sources has become a key priority for many countries worldwide to address the pressing issue of climate change and ensure a sustainable future. The European Union has been at the forefront of this effort, committed to reducing greenhouse gas emissions and increasing the use of clean energy sources. One of the key tools used to encourage the growth of renewable energy in the EU has been the implementation of tax incentives. These incentives have taken various forms, from subsidies and grants to tax credits and exemptions.

Governments worldwide have used tax incentives for renewable energy development for decades, and the European Union is no exception. In the early days of renewable energy development, these incentives were primarily used to encourage the adoption of new technologies. Over time, however, they have become increasingly sophisticated and have evolved to address a broader range of issues, such as cost-competitiveness, grid integration, and market development. Today, tax incentives for renewable energy are integral to many countries' energy policies. They are widely recognised as a critical tool for advancing the transition to a clean energy future.

**Analysis of recent research and publications.** The use of tax incentives to promote renewable energy development is a topic of great interest in the European Union (EU). In an overview of EU-27 countries, Cansino et al. [1] found that 16 EU-27 member states have used tax incentives, with the most widely used incentive being an exemption from payments of excise duties for electricity generated from renewable energy sources. Tax incentives vary across EU-27 member states, with some offering deductions in taxable profit, lower tax rates in Value-Added Tax (VAT), and effective tax incentives in property tax.

Nie et al. [13] explored the role of subsidies in carbon finance for promoting renewable energy development. They found that government subsidies can increase the outputs and debt levels of renew-

able energy firms and improve shareholder value. However, financial debts can also decrease the net profit per unit of debt due to limited liability effects. Therefore, the subsidy policy plays a critical role in renewable energy development and its success depends on the degree of subsidies provided.

Ringel [16] discussed the use of feed-in tariffs and green certificates as two support models for fostering the use of renewable energies in the EU to meet ambitious targets set by the European Commission and its member states. The success of either model depends on the regulations and the liberalized power markets.

Cansino et al. [2] analyzed the role of taxes in promoting renewable energy deployment in the EU-27. They found that in 2008, the share of Renewable Energy Sources (RES) in gross final energy consumption was 10.3% in the EU-27. Deployment of RES contributes to reducing primary energy dependency and the stress of demand on primary energy resources, two of the four targets of the EU-27 energy strategy. The EU has developed intense ruling activity around the promotion of RES, including the passing of the Directive (EC, 2003/96), which restructures the community regime about taxation over energy products and electricity.

**Identification of previously unresolved parts of the overall problem.** In recent years, the EU has seen a growing interest in RES to reduce its dependence on fossil fuels and mitigate the effects of climate change. However, the use of tax incentives to support this development has come under scrutiny, with some EU countries beginning to reform or reduce their tax incentives for renewable energy. This highlights the need for a comprehensive understanding of the historical development of tax incentives in the EU and the current trends and challenges in this area.

**The purpose of the article.** This research paper aims to provide a comprehensive overview of tax incentives for renewable energy development in the EU, focusing on historical trends and emerging

incentives such as green bonds, carbon trading, and performance-based incentives.

**Presenting main material.** In pursuing a more sustainable and clean energy future, tax incentives for renewable energy have emerged as a crucial tool for governments. These financial benefits are designed to stimulate investment and development in the sector, mitigating the high costs associated with bringing cutting-edge renewable energy technologies to market.

These incentives come in various forms, from tax credits for residential and commercial renewable energy systems to production tax credits for renewable energy production, to investment tax credits for renewable energy investment. Their role is clear: to make renewable energy a more attractive and economically viable option for investors and thus drive the growth of this burgeoning industry.

As one of the green transition leaders, the EU offers several tax incentives to promote RES for electricity generation. Some of the leading tax incentives are presented in table 1.

These tax incentives are only sometimes offered in every EU Member State, and their specifics and conditions may vary between countries. Additionally, these tax incentives are subject to change over time and depend on the current political and economic situation.

Analyzing tax incentives for renewable energy markets in EU countries' development helps us reveal several distinct stages, each reflecting changing priorities and economic realities.

The early stage of the development of renewable energy markets in EU countries was characterized by direct subsidies and tax incentives aimed at supporting the growth of the fledgling industry and making it more cost-competitive with traditional energy sources. This was an important first step in establishing renewable energy as a viable alternative to conventional sources of energy, and it provided the foundation for further growth.

As the renewable energy market matured, the focus shifted from direct subsidies to tax incentives. Governments in EU countries began to offer tax credits and deductions to encourage investment in renewable energy projects, such as wind and solar farms. These incentives played an important role in reducing the costs of renewable energy and making it more competitive with traditional sources of energy.

Over time, tax incentives for renewable energy have expanded to cover a wider range of technologies, including geothermal, bioenergy, and energy efficiency. Incentives have also become more complex, with governments offering a range of credits, deductions, and exemptions to support different types of projects. This expansion reflects the grow-

ing maturity of the renewable energy market and the increasing sophistication of the policies aimed at promoting its growth.

In recent years, some EU countries have begun to reform or reduce tax incentives for renewable energy for a variety of reasons. One factor is a desire to control public spending and reduce government debt, which has led to a need to reevaluate the cost-effectiveness of tax incentives for renewable energy. For example, Germany in 2016 announced plans to reduce subsidies for RE production and shift towards auction-based mechanisms for awarding new projects [4]. In 2012, Spain suspended new subsidies for RE projects, cut support for existing projects and Italy in 2013 reduced subsidies for RE production, both following concerns over the cost of the incentives and the impact on the country's finances [6]. These examples show that, while tax incentives for RE remain an important part of the support framework in the EU, some countries have started to reform or reduce incentives in response to changing economic and policy considerations.

Additionally, as the renewable energy industry has matured and become more cost-competitive with traditional sources of energy, there has been a growing consensus that the industry can become more self-sufficient and no longer needs to rely on the same level of government support.

However, it's worth noting that while some EU countries have reduced or reformed tax incentives for renewable energy, others have continued to support the industry through tax incentives and other forms of financial support. The right balance between supporting the renewable energy industry and controlling public spending is a complex issue that varies from country to country, and will likely continue to evolve as the industry continues to grow and mature.

Emerging incentives, such as green bonds, carbon trading, and performance-based incentives, aim to provide a more flexible and market-driven approach to supporting renewable energy development. These new incentives reflect the continued growth of the renewable energy market and the desire to make it more sustainable in the long term (table 2).

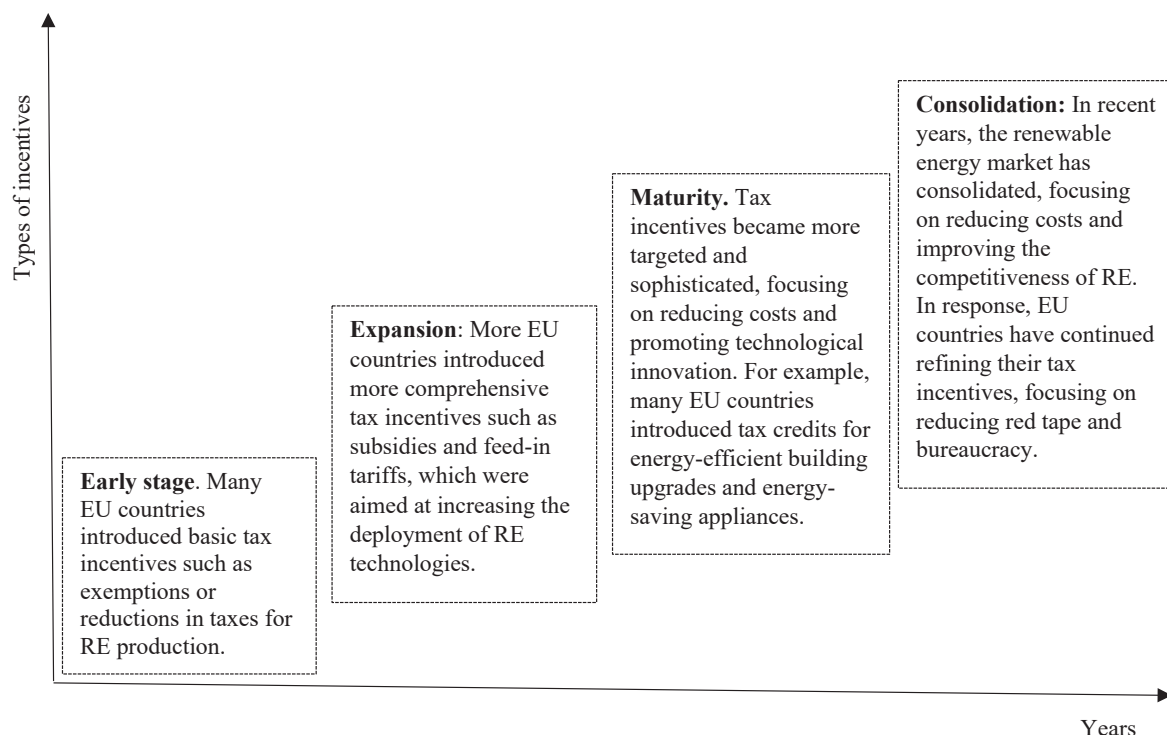
The German Green Bond market, which was first introduced in 2007, has emerged as a favored method of raising capital for renewable energy projects by corporations, public entities, and financial institutions. These Green Bonds, unlike those in the United States, are subject to stringent certification requirements, such as those set by the international Climate Bonds Initiative (CBI). This guarantee that funds raised through German Green Bonds are only used for environmentally friendly projects and are in compliance with relevant sustainability standards.

Table 1

Main tax incentives for renewable energy in EU

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1.	Reduced or waived value-added tax (VAT) for renewable energy equipment and services	It can lower the cost of purchasing and installing renewable energy systems, making them more financially viable for individuals and businesses.
2.	Tax exemptions or credits for renewable energy production	can provide a financial benefit to individuals and businesses that generate renewable energy, either through a tax credit or by exempting them from paying taxes on the income generated from renewable energy production
3.	Tax deductions for investment in renewable energy	This allows individuals and businesses to deduct a portion of the cost of investing in renewable energy equipment and infrastructure from their taxable income, reducing their overall tax liability.
4.	Tax incentives for energy efficiency	This can include tax credits or deductions for energy-efficient improvements to buildings or vehicles.

Source: summarized by the author [3, 6; 12]



**Figure 1. Stages of tax incentives for renewable energy markets in EU countries' development**

Source: developed by the author [8; 11; 12]

The Green Bond market has had a significant impact on the renewable energy sector by providing a source of long-term capital for renewable energy projects that may not have been feasible through conventional financing methods. This has fostered growth in the German renewable energy market and solidified the country's status as a leader in the field. Despite the challenges posed by the perception of the Green Bond market as a niche and the lack of standardization, they are expected to continue to play a significant role in the renewable energy sector, particularly in Germany and other EU countries.

France and the Netherlands are two other EU countries that have embraced the Green Bond market, experiencing significant growth in recent years. In France, the Green Bond market has experienced rapid growth since the first Green Bond was issued in 2014 by the French Development Agency, with French issuers raising over €20 billion in 2019. The French government has been supportive of the Green Bond market and has implemented various policies to promote its growth. The Netherlands, with the first Green Bond issued in 2013, has become a leader in the Green Bond market with Dutch issuers rais-

ing over €10 billion in 2019. The Netherlands government has also implemented various supportive policies, including tax incentives for Green Bond investors and a strong legal framework.

The impact of Green Bonds on the renewable energy sector in France and the Netherlands has been substantial, providing financing for projects that may have been unfeasible through other means. The growth of the Green Bond market in both countries has also heightened awareness and understanding of the crucial role of renewable energy and finance in addressing environmental challenges.

To guarantee the sustainable growth and evolution of the Green Bond market, there is a need for standardization and transparency, effective regulation, increased investor education, market development through investment and innovation, and stakeholder engagement across the entire value chain. The Green Bond market remains in its early stages of development and requires concerted effort to ensure its continued growth and responsible evolution.

Carbon trading is another mechanism used to reduce greenhouse gas emissions and promote sustainable development. The European Union estab-

Table 2

**Emerging financial instruments supporting renewable energy development**

Financial Instrument	Description	EU Countries Implementing
Green Bonds	A debt instrument used to finance environmentally beneficial projects such as renewable energy, energy efficiency, and clean transportation.	Germany, France, Netherlands
Carbon Trading	A market-based approach to reducing greenhouse gas emissions by giving companies a limited amount of emissions allowances and allowing them to trade among themselves.	United Kingdom, Germany
Performance-based Incentives	Encourages the deployment of renewable energy technologies by rewarding project developers based on the actual performance of their projects. Can take the form of production tax credits, feed-in tariffs, or renewable energy certificates.	Germany, Spain, Italy

Source: summarized by the author [7; 14]

Comparison of Carbon Trading Systems in Germany and the UK

	Germany Carbon Trading System	UK Carbon Trading System
Introduction	Participated in EU ETS since 2005	Participated in EU ETS since 2005
Volumes and values	€22 billion in 2020	£5 billion in 2020
Impacts	Positive impact on renewable energy market, increased investment in renewable energy	Positive impact on energy market, promoted energy efficiency and low-carbon technologies
Distinct Features	Follows EU ETS rules and regulations	Follows EU ETS rules and regulations, has separate scheme for businesses
Challenges	Complex implementation, resistance from some industries	Complex implementation, resistance from some industries

Source: summarized by the author [9; 10]

lished the EU Emissions Trading System (ETS) in 2005, which is the world's largest carbon market. Germany and the United Kingdom both participate in the EU ETS. The comparison of the carbon trading systems in Germany and the UK are presented below.

Both countries participated in the EU Emissions Trading System (ETS) since its establishment in 2005 and have experienced positive impacts on their energy markets through the promotion of energy efficiency and low-carbon technologies. In 2020, Germany's carbon market was worth over €22 billion, making it one of the largest carbon markets in the world, while the UK's carbon market was worth around £5 billion. The UK also has a separate carbon trading scheme for businesses, known as the Climate Change Agreement, which provides financial incentives for companies to reduce their carbon emissions [15]. Despite the positive impacts, implementing carbon trading systems can be complex and challenging, requiring close collaboration, and overcoming resistance from some industries.

The integration of Performance-based Incentives (PBIs) has been adopted by a number of European Union (EU) nations as a means to advance renewable energy growth and attract investment in the sector. The aim of PBIs is to provide a flexible and market-driven approach in supporting the development of renewable energy, with incentives linked to specific performance targets or outcomes. Three EU countries – Germany, Spain, and Italy – have adopted PBIs in their own ways, each with its own goals and design [6].

Germany introduced PBIs as part of the Renewable Energy Sources Act (EEG) in 2000, with a feed-in tariff (FIT) system to provide financial support for renewable energy projects and a premium price for the energy fed into the grid. The EEG has undergone various adjustments to keep up with changes in technology and market conditions, with PBIs introduced as a way to further encourage innovation and reduce costs. In 2007, Spain integrated PBIs as part of the Royal Decree on Renewable Energy, providing support through a combination of FITs and PBIs to encourage the deployment of new renewable energy technologies and foster innovation. Italy followed

suit in 2012, with the integration of PBIs as part of the national Renewable Energy Sources and Energy Efficiency support scheme, providing financial support through a combination of FITs and PBIs to encourage the deployment of new renewable energy technologies and support innovation in the sector.

Although there are similarities in the goals and design of PBIs across the three EU countries, the specifics of each PBI vary based on the local market conditions and policy goals. The impact of PBIs on the renewable energy sector is not easy to measure as they are just one component of a wider set of policies and measures aimed at promoting renewable energy. Nevertheless, the growth of renewable energy in these countries suggests that PBIs have been successful in attracting investment and fostering innovation in the sector.

As the renewable energy sector continues to evolve, it will require continued policy support and innovation, including refining and adjusting existing PBIs, as well as the introduction of new measures and incentives. Close monitoring and evaluation of the impacts of these policies will be necessary to ensure that they are accomplishing their intended goals and contributing to the sustainable growth of the renewable energy sector.

**Conclusions and suggestions.** Tax incentives have played a crucial role in reducing the cost of renewable energy and improving its competitiveness, and they have been a significant driver of the growth of renewable energy markets in EU countries. As the market continues to evolve, there is an expectation of a continued evolution in the nature and design of tax incentives, reflecting the changing priorities and economic realities.

It is evident that tax incentives will continue to play an important role in supporting the growth of renewable energy markets in EU countries, and they are likely to remain a key policy tool in the future. Further research can explore the effectiveness of different types of tax incentives and their impact on renewable energy deployment and the development of a low-carbon economy. Additionally, research can also examine the challenges faced in the implementation of tax incentives and the potential solutions to address these challenges.

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## ПОДАТКОВІ СТИМУЛИ ДЛЯ РОЗВИТКУ ВІДНОВЛЮВАНОЇ ЕНЕРГЕТИКИ В ЄВРОПЕЙСЬКОМУ СОЮЗІ: ІСТОРИЧНИЙ ОГЛЯД ТА НОВІ ТЕНДЕНЦІЇ

### Анотація

Стимули для розвитку відновлюваної енергетики стають все більш важливими для урядів у всьому світі, які прагнуть до більш сталого та чистого енергетичного майбутнього. Європейський Союз (ЄС) не є винятком, пропонує різні форми заохочення інвестицій та зростання в секторі відновлюваної енергетики. Ці стимули надаються у формі податкових кредитів для житлових і комерційних систем, виробничих та інвестиційних податкових кредитів. Мета вказаних податкових ініціатив – зробити відновлювану енергетику більш економічно життєздатною, а також стимулювати інвестиції та зростання галузі. У минулому прямі субсидії були основною формою підтримки, але з часом фокус змістився в бік податкових пільг і розширився, охопивши ширший спектр технологій відновлюваної енергетики. У той час як деякі країни ЄС скоротили або реформували свої стимули через занепокоєння щодо економічної ефективності та державних витрат, інші продовжують підтримувати галузь відновлюваної енергетики. В останні роки були запроваджені нові стимули, такі як зелені облігації, торгівля квотами на викиди вуглецю та стимули, що базуються на результатах діяльності, для забезпечення більш гнучкого та ринкового підходу до підтримки. Німеччина є лідером на ринку «зелених» облігацій, інші країни ЄС, такі як Франція та Нідерланди, також приєдналися до нього. Ці «зелені» облігації є джерелом довгострокового капіталу для проектів з відновлюваної енергетики, які, можливо, не були б реалізовані за допомогою традиційних методів фінансування, і, як наслідок, сприяють зростанню цього ринку. На додаток до цих стимулів, ЄС встановив амбітні цілі у сфері відновлюваної енергетики та енергоефективності, маючи на меті досягти 32% частки відновлюваної енергії в кінцевому енергоспоживанні до 2030 року. Це значне збільшення порівняно з поточним рівнем, і ЄС працює над створенням сприятливого регуляторного середовища для підтримки його зростання. Забезпечуючи поєднання прямих і непрямих стимулів, ЄС робить важливий крок до більш стійкого і чистого енергетичного майбутнього, а також до зменшення своєї залежності від невідновлюваних джерел.

**Ключові слова:** податкові стимули, відновлювана енергетика, Європейський Союз, енергетична політика, зелена електроенергія.