MURAJ
Minnesota Undergraduate Research & Academic Journal
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Comparative Analysis of Renewable Energy Adoption in France and Sweden: Disparities under EU-Wide Incentive Programs

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Abstract: This research explores the comparative effectiveness of renewable energy adoption in France and Sweden, focusing on why these two European Union (EU) member states, despite operating under similar EU-wide incentive programs such as the Renewable Energy Directive (RED) and the European Green Deal, have achieved vastly different outcomes. Updated quantitative data reveal that Sweden's share of renewable energy increased from 53.4% to 66% between 2017 and 2022, still far outpacing France, who grew from 15.8% to 20.3% (Figure 1) (Eurostat, n.d.). While Sweden is the top European Union performer by a wide margin, France finds itself struggling. Coming in as the 15th ranked EU country when measured in share of renewable energy, France is some 3% below the EU average. France is also just one of four countries to miss their 2020 renewable energies target in 2022 ("Renewable Energy in the European Union," n.d.). Sweden's success stems from long-term policy consistency, high carbon taxes, and effective market-based mechanisms like the green certificate system (International Energy Agency, 2021; Andersson, 2019; Swedish Energy Agency, 2020). Meanwhile, France's reliance on nuclear energy and complex permitting processes has slowed renewable energy adoption (Bergek & Berggren, 2014; World Bank Group, 2020).

Introduction

The global transition to renewable energy is a critical strategy for mitigating climate change, reducing greenhouse gas emissions, and promoting sustainable economic growth (IPCC, 2022). Renewable energy sources, such as wind, solar, and bioenergy, are essential in lowering carbon footprints and reducing the reliance on fossil fuels (Jacobson et al., 2019). Within the European Union, member states are bound by comprehensive regulatory frameworks and incentive programs, such as the Renewable Energy Directive and the European Green Deal, which are designed to accelerate the adoption of renewable energy and achieve the EU's ambitious climate goals (European Commission, 2023a, 2019). These policies offer financial incentives, promote infrastructure

investment, and support market-based mechanisms like the EU Emissions Trading System (ETS), encouraging the transition towards a greener energy future (European Commission, 2023b; Ellerman & Buchner, 2007).

Despite these common EU-wide frameworks, there are significant disparities in how member states adopt renewable energy. France and Sweden, two countries on opposite ends of the renewable energy usage spectrum in the European Union, exemplify this divergence. These disparities highlight how national-level policy execution, regulatory efficiency, and historical energy reliance shape renewable energy adoption (Bergek & Berggren, 2014; World Bank Group, 2020).

The objective of this research is to examine the factors contributing to Sweden's success in renewable energy adoption compared to France's slower progress, despite both countries having access to the same EU-wide incentive programs. The study aims to analyze the domestic policy decisions, market structures, and societal attitudes that have allowed Sweden to lead in renewable energy adoption while France faces regulatory and policy barriers that have slowed its transition (Andersson, 2019; International Energy Agency, 2021).

This research integrates quantitative metrics—such as energy consumption, carbon emissions, and renewable energy growth—with qualitative analysis of policy frameworks and cultural factors. Findings reveal that Sweden achieved a 40% reduction in greenhouse gas emissions per capita (from 1.0 to 0.6 tonnes) and a 55% decrease in transport sector emissions (from 148.2 to 66.6 g/km) (Eurostat, n.d.). In contrast, France's progress has been more gradual, with a 16% reduction in greenhouse gas emissions per capita (from 6.8 to 5.7 tonnes) and a 23% decrease in transport emissions (from 133.8 to 103.1 g/km) (Eurostat, n.d.), highlighting regulatory inefficiencies and limited policy alignment. The results emphasize that Sweden's cohesive domestic policies offer a replicable model for France and other EU countries seeking to enhance renewable energy adoption and meet carbon neutrality goals.

This study is guided by the central question: Why has Sweden's domestic policy implementation led to more successful renewable energy adoption than France's, despite both countries operating under the same EU-wide frameworks? The hypothesis is that Sweden's long-term commitment to stable renewable energy policies, high carbon taxes, and community-driven projects facilitates its success, while France's historical dependence on nuclear power, policy fragmentation, and regulatory complexities have slowed its progress (Andersson, 2019; International Energy Agency, 2021). This research will provide insights into the critical role of national policy execution in achieving EU-wide renewable energy goals, offering valuable lessons for other EU countries aiming to enhance their renewable energy strategies.

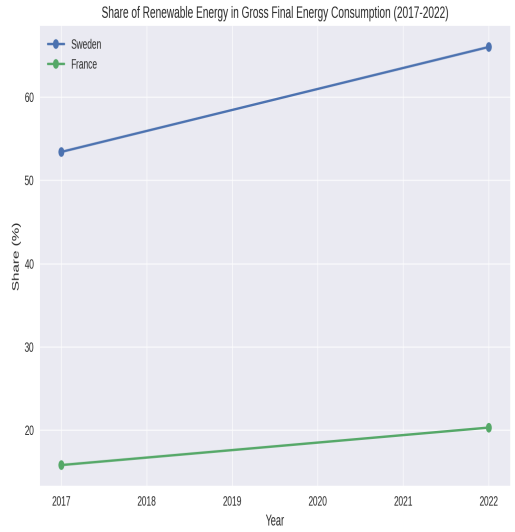

Figure 1. Share of Renewable Energy in Gross Final Energy Consumption (2017–2022)

Literature Review

Government policies play a crucial role in shaping the adoption of renewable energy across European Union member states (European Parliamentary Research Service, 2016). Several studies have demonstrated how national-level policy frameworks, financial incentives, and regulatory processes can either facilitate or hinder the transition to renewable energy (European Commission, 2020). The EU's Renewable Energy Directive and the European Green Deal provide overarching incentives for all member states to adopt renewable energy technologies (European Commission, 2023). However, the degree of success varies significantly between countries due to differences in how these EU-wide policies are implemented at the national level (European Commission, 2020). Research has consistently shown that stable, well-coordinated national policies are key drivers of renewable energy growth, while fragmented policies and complex regulatory environments tend to slow progress (European Parliamentary Research Service, 2016). Recent figures from the European Union highlight the role of financial mechanisms, such as green bonds, in accelerating renewable energy investments (European Commission, 2023). Sweden has prioritized green bond financing, with 16.2% of its total bond issuance in 2022 dedicated to green initiatives, whereas France allocated only 5.9% (Eurostat, n.d.). This disparity underscores Sweden's stronger commitment to leveraging financial tools for renewable energy transitions, while France has significant room for growth in this area. Figure 2 below provides a visual comparison of green bond allocations between the two countries, emphasizing Sweden's greater reliance on this financing strategy. Similarly, circular economy principles—more pronounced in France—can complement renewable energy strategies by ensuring material efficiency in infrastructure deployment (European Commission, 2023).

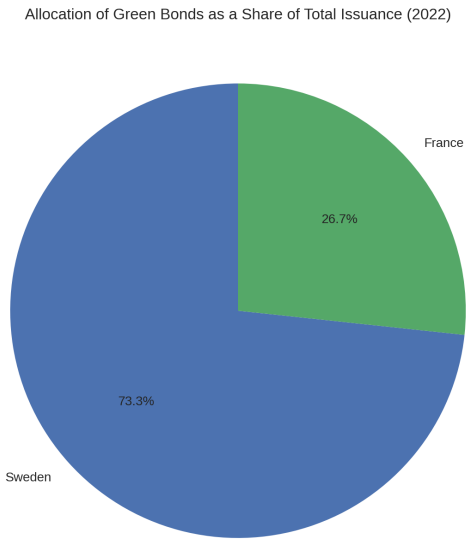

Figure 2. Allocation of Green Bonds as a Share of Total Issuance (2022)

Sweden's Success Factors

Sweden is frequently cited as a leader in renewable energy adoption, driven by several key policy initiatives (International Energy Agency, 2019). Its high carbon tax, among the highest globally, has been instrumental in making fossil fuels economically unattractive, resulting in a reduction of greenhouse gas emissions from 1.0 ton per capita in 2017 to 0.6 tonnes in 2022 (Figure 3) (Eurostat, n.d.).

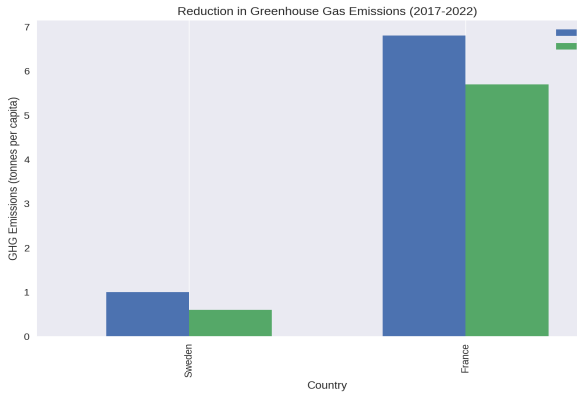

Figure 3. Reduction in Greenhouse Gas Emissions (2017–2022)

The country's commitment to energy efficiency is evident in the reduction of primary energy consumption per person, which decreased from 4.6 to 4.1 tonnes of oil equivalent (toe) per capita - a standard unit of energy that represents the energy content of one ton of crude oil - during this period (Eurostat, n.d.). Household energy use also saw a decline from 765 to 673 kgoe (kilogram of oil equivalent) per capita (Eurostat, n.d.) during this period. These reductions underscore the effectiveness of cohesive, long-term policies (Government Offices of Sweden, 2021).

Metric	2017 (Sweden)	2022 (Sweden)
Primary Energy Consumption (toe/capita)	4.6	4.1
Final Energy Consumption (toe/capita)	3.2	3.0
Household Energy Consumption (kgoe/capita)	765	673

Table 1. Key Household Energy Efficiency Metrics

In addition to the carbon tax, Sweden's green certificate system, implemented in 2003, has been identified as a critical success factor (Sweden.se, 2023). This market-based mechanism incentivizes the production of renewable electricity by requiring utilities to purchase green certificates to meet renewable energy quotas (CMS Law, 2023). Research shows that the predictability and consistency of this system have provided long-term confidence for investors, leading to significant growth in renewable energy infrastructure (International Renewable Energy Agency, 2020).

Community engagement is another factor contributing to Sweden's success (Lund University, 2021). Studies reveal that community ownership of renewable energy projects, particularly in wind energy, has increased public acceptance and participation (Institute for Human Rights and Business, 2022). Community-driven initiatives not only spread the financial benefits of renewable energy projects more equitably but also reduce opposition to new projects, which is often a major barrier in other countries (Lund University, 2021).

France's Barriers

Conversely, France has lagged in renewable energy adoption, despite having access to the same EU-wide incentive frameworks (International Energy Agency,

2021). France has a historical reliance on nuclear power, which supplies over 70% of the country's electricity (Figure 4) (AXA XL, 2023). This points to reduced urgency for renewable energy investments. While nuclear energy helps France meet its low-carbon goals, it has delayed the diversification of the country's energy mix (International Energy Agency, 2021). This dependence on nuclear power has created a policy environment less focused on expanding renewables like wind and solar (France 24, 2024).

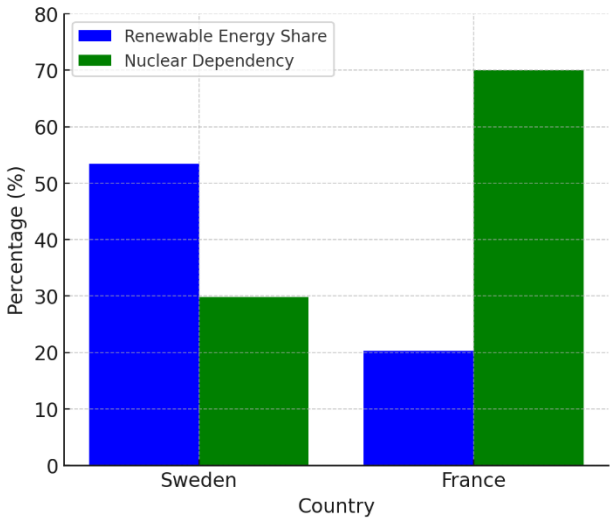

Figure 4. Renewable Energy vs Nuclear Energy Share by Country

Moreover, France's regulatory complexities have been a significant obstacle (IDDRI, 2022). Its slower progress is reflected in modest renewable energy growth, increasing from 15.8% to 20.3% between 2017 and 2022. While Sweden reduced transport CO2 emissions to 66.6 g/km, France's decline to 103.1 g/km highlights its comparatively slower adoption of low-carbon transport technologies.

Gaps in Existing Literature

While previous research has extensively covered the influence of national policies on renewable energy adoption within individual EU countries, there is a gap in the literature concerning direct comparative analyses between countries like Sweden and France, which operate under similar EU-wide incentives but have vastly different outcomes. Few studies have systematically examined the reasons behind Sweden's superior performance in renewable energy adoption compared to France's slower progress, considering the impact of domestic policy execution, regulatory frameworks, and cultural factors. This research addresses this gap by providing a detailed comparative analysis of the renewable energy strategies in Sweden and France, focusing on how domestic policies influence the effectiveness of EU-wide incentive programs. By exploring these differences, this study aims to contribute to a better understanding of how national contexts shape the success of renewable energy adoption under EU frameworks.

Methodology

This research employs a comparative analysis of renewable energy adoption in France and Sweden, using a mixed-methods approach that integrates both quantitative and qualitative data. Given the limitations of restricted funding, this research primarily relies on secondary data sources, including government reports, EU databases, academic literature, and case studies. The analysis is designed to understand the effectiveness of domestic policies in implementing EU-wide renewable energy incentive programs and to assess the broader

contextual factors that influence renewable energy adoption in both countries.

Research Design

This study follows a mixed-methods approach, combining quantitative data analysis with qualitative policy reviews. Quantitative data is used to measure the key metrics of renewable energy adoption, while qualitative analysis provides insights into the domestic policies, regulatory frameworks, and cultural factors that have shaped the renewable energy landscapes in France and Sweden. The comparative analysis framework allows for a systematic evaluation of how different domestic approaches, despite common EU policies, have resulted in divergent outcomes in renewable energy adoption.

Data Collection

Data for this research is sourced from a variety of secondary resources, including:

- **Government Reports**: Official energy reports from both France and Sweden, as well as EU-wide policy documents, provide information on renewable energy targets, policy initiatives, and the implementation of incentive programs.
- **EU Databases**: Data from Eurostat and other EU-level databases are used to track renewable energy adoption rates, carbon emission reductions, and financial investments in renewable infrastructure in both countries.
- **Academic Papers**: A comprehensive review of peer-reviewed academic studies on renewable energy adoption in France and Sweden is conducted to understand the academic perspective on national policies and their effectiveness.
- **Case Studies**: Existing case studies of renewable energy projects, along with firsthand insights from small and medium-sized enterprises (SMEs) gathered throughout the semester, provide valuable perspectives on renewable energy adoption and policy implementation.

Quantitative Metrics

The quantitative analysis focuses on several key metrics that allow for a direct comparison of renewable energy adoption between France and Sweden:

- Renewable Energy Adoption Rates: Percentage of energy derived from renewable sources.
- Energy Consumption: Primary and final energy consumption per capita, providing insights into energy efficiency improvements.
- Energy Productivity: Growth in economic output (EUR/kgoe) relative to energy use.
    - kgoe (kilogram of oil equivalent): A standard unit of energy that allows comparison between different types of energy sources (e.g., electricity, natural gas, coal). One kgoe equals approximately:
    - 41.868 megajoules (MJ)
    - 11.63 kilowatt-hours (kWh)
    - Carbon Emissions Reductions: Changes in greenhouse gas emissions per capita and

transport emissions (g CO2 per km).

- Social Energy Accessibility: Population unable to keep homes adequately warm, reflecting affordability and inclusivity of energy transitions.
- Green Financing: Share of green bonds in total issuance, measuring financial mechanisms supporting renewable energy investments.

The quantitative metrics of both countries were analyzed through a comparison of publicly available Eurostat metrics to evaluate how well each country has utilized EU-wide incentive programs, as well as to determine the financial and environmental impacts of renewable energy adoption in both contexts.

Qualitative Analysis

The qualitative analysis focuses on policy reviews and broader contextual factors that have influenced the success or challenges of renewable energy adoption in each country. Key areas of qualitative analysis include:

- Policy Reviews: A detailed examination of Sweden's and France's renewable energy policies, including the implementation of EU-wide directives, domestic incentives like Sweden's green certificate system (Swedish Business School, 2005), and regulatory challenges in France's wind energy sector.
- Public Engagement: Analysis of community involvement in renewable energy projects, particularly in Sweden, where community ownership models have been a driving force behind the success of wind energy projects (Energy, Sustainability and Society, 2023). The research explores the extent to which public acceptance and local involvement have played a role in renewable energy adoption.
- Regulatory Frameworks: A review of the regulatory processes in both countries, with a focus on the differences in permitting processes for renewable energy projects, which have been a major barrier in France but are more streamlined in Sweden (Tethys, 2021).

Results

The comparative analysis of France and Sweden's renewable energy adoption reveals significant differences in their progress despite both countries operating under the same EU-wide incentive structures. Quantitative data from the EU and national sources, combined with qualitative policy analysis, highlights contrasting outcomes in renewable energy growth, financial impacts, and overall policy effectiveness in each country.

Comparative Data on Renewable Energy Growth

Sweden's renewable energy adoption demonstrates remarkable growth underpinned by strong policy frameworks. Between 2017 and 2022:

- Sweden's share of renewable energy in gross final energy consumption grew from 53.4% to 66%, an increase of 12.6%, largely driven by bioenergy, hydropower, and wind (International Renewable Energy Agency, 2022).

- France's renewable share increased modestly from 15.8% to 20.3%, reflecting only a 4.5%, hindered by its reliance on nuclear power and slow development of wind energy projects (International Energy Agency, 2021).

Metric	Sweden (2017)	Sweden (2022)	France (2017)	France (2022)
Share of Renewable Energy (%)	53.4	66.0	15.8	20.3
Growth in Renewable Energy (%)	+12.6		+4.5	

Table 2. Renewable Energy Growth by Country (2017 v. 2022)

Emissions Reductions

Sweden achieved significant reductions in greenhouse gas emissions:

- Net Greenhouse Gas Emissions (per capita): Fell from 1.0 tonnes in 2017 to 0.6 tonnes in 2022, highlighting the impact of high carbon taxes and renewable energy growth (Statistics Sweden, 2023).
- Transport Emissions (CO2 per km): Dropped sharply from 148.2 g/km to 66.6 g/km, showcasing the effectiveness of Sweden's policies in promoting electric vehicles and low-carbon technologies (Statista, 2024).

France saw slower reductions:

- Net Greenhouse Gas Emissions (per capita): France saw a larger absolute reduction in net greenhouse gas emissions per capita (a drop of 1.1 tonnes, from 6.8 to 5.7 tonnes) compared to Sweden's 0.4-tonne decline (from 1.0 to 0.6 tonnes). However, in percentage terms, France's reduction of 16.2% was significantly smaller than Sweden's 40% decrease, suggesting that while France made notable progress in lowering emissions, its renewable energy adoption was still less effective relative to its overall emissions output. This contrast highlights the impact of Sweden's aggressive policies, such as high carbon taxes and green energy incentives, in driving a more rapid per capita reduction.
- Transport Emissions (CO2 per km): Declined from 133.8 g/km to 103.1 g/km, showing moderate progress compared to Sweden.

Metric	Sweden (2017)	Sweden (2022)	France (2017)	France (2022)
Net Greenhouse Gas Emissions (t)	1.0	0.6	6.8	5.7
CO2 Emissions per km (g)	148.2	66.6	133.8	103.1

Table 3. Emission Metrics by Country (2017 v. 2022)

Energy Efficiency and Accessibility

Sweden's energy consumption improvements:

- Primary Energy Consumption (toe per capita): Reduced from 4.6 to 4.1, reflecting better energy efficiency measures.
- Final Household Energy Consumption (kgoe per capita): Decreased from 765 to 673, highlighting Sweden's success in residential energy efficiency.

France's reductions were also notable but slower:

- Primary Energy Consumption (toe per capita): Declined from 3.6 to 3.0,

representing a 16.7% reduction, which is a larger relative and absolute drop than in Sweden, suggesting meaningful progress in energy efficiency.

- Final Household Energy Consumption (kgoe per capita): Dropped from 620 to 547.

Sweden also faced a smaller increase in energy accessibility challenges, with the population unable to keep homes adequately warm rising from 2.1% to 3.3%. Again, in France, this figure more than doubled from 4.9% to 10.7%, highlighting possible affordability challenges (Figure 5).

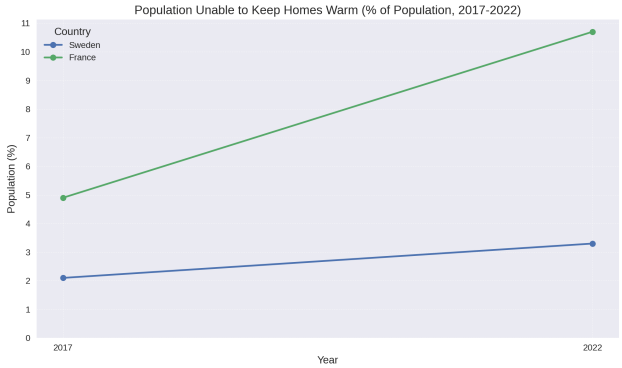

Figure 5. Population Unable to Keep Homes Warm (% of Population, 2017–2022)

Metric	Sweden (2017)	Sweden (2022)	France (2017)	France (2022)
Population Unable to Keep Homes Warm (%)	2.1	3.3	4.9	10.7
Household Energy Consumption (kgoe)	765	673	620	547

Table 4. Household Energy Metrics by Country (2017 v. 2022)

While Sweden has maintained relatively low energy import dependency, increasing marginally from 26.7% to 26.8%, France's reliance on energy imports has risen significantly from 48.7% to 51.9% (Eurostat, n.d.). This further illustrates Sweden's self-sufficient energy model compared to France's higher reliance on external energy sources.

A notable difference emerges in circular material use rates, which measure the proportion of recovered and recycled materials reintroduced into the economy rather than being discarded as waste. Higher rates indicate greater material efficiency and sustainability in resource consumption. France showed progress, increasing its circular material use rate from 18.7% to 19.3%, reflecting improved efficiency in reusing materials within domestic production. In contrast, Sweden's rate declined from 6.7% to 6.1%, suggesting a reduced emphasis on material reuse in renewable infrastructure. This highlights an area where Sweden could enhance its sustainability efforts, while France's expertise in circular economy strategies may present an opportunity to further integrate renewable energy solutions (Eurostat, n.d.).

Summary of Findings

Sweden's success in renewable energy adoption is the result of a cohesive and consistent policy framework, including high carbon taxes, an effective green certificate system, and strong community engagement (Government Offices of Sweden, n.d.; Sweden.se, n.d.). These policies have enabled Sweden to surpass its renewable energy targets while maintaining a balanced approach to energy accessibility (International Energy Agency, 2021). France's progress, in contrast, has been hindered by regulatory barriers, policy inconsistency, and its reliance on nuclear energy (International Energy Agency, 2021; France 24, 2024).

The findings underscore the critical role of policy stability, energy diversity, and public engagement in driving renewable energy transitions (IDDRI, 2022). Sweden's model offers valuable lessons for France and other EU countries seeking to enhance their renewable energy strategies.

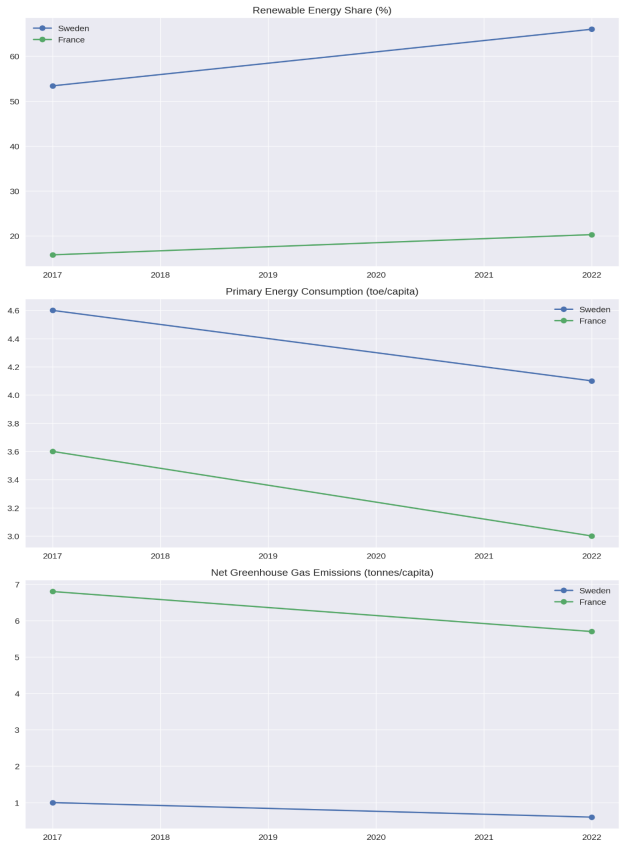

Figure 6. Summary of Major Comparative Metrics

Discussion

Interpretation of Findings

The findings reinforce the critical role of stable, long-term policy frameworks in driving renewable energy adoption:

- Sweden: Consistent growth in renewable energy (53.4% to 66%) and substantial emissions reductions (1.0 to 0.6 tonnes per capita) highlight the effectiveness of cohesive policies, including high carbon taxes, green certificates, and streamlined regulatory processes (CMS Law, n.d., Baker McKenzie, n.d.).
- France: Modest progress in renewables (15.8% to 20.3%) and slower emissions reductions underscore the challenges posed by fragmented policies, nuclear dependency, and bureaucratic delays. The French government has recognized these challenges and, in February 2023, adopted the Renewable Energy Acceleration Bill to address bureaucratic delays and streamline project development. The bill aims to cut red tape and expedite permitting procedures in specific 'acceleration zones' to boost renewable energy production (Cleary Gottlieb, 2023).

Policy Recommendations for France's Renewable Energy Transition

To accelerate France's renewable energy adoption and improve policy effectiveness, several key strategies can be implemented. Drawing from Sweden's success, these recommendations focus on streamlining regulatory processes, fostering long-term policy stability, enhancing financial incentives, and increasing public engagement. While Sweden's model offers valuable insights, France's unique reliance on nuclear power requires tailored solutions that balance renewable energy expansion with energy security considerations (International Energy Agency, 2021; Réseau de Transport d'Électricité, 2021; Los Alamos National Laboratory, 2024).

- Simplify Regulatory Processes: A major barrier to renewable energy growth in France is the complex and time-consuming permitting process for wind and solar projects. Streamlining these regulations would reduce delays and lower costs associated with legal and bureaucratic challenges. Expanding policies such as the Renewable Energy Acceleration Bill would foster a more efficient regulatory environment and encourage private sector investment.
- Establish Long-Term, Stable Policies: Frequent changes in renewable energy policies create uncertainty for investors and hinder long-term development. France should prioritize stable, predictable policies that reduce regulatory volatility and provide consistent financial incentives. Sweden's approach—offering long-term policy clarity—has attracted sustained investment in renewables, and a similar strategy in France could enhance investor confidence and drive infrastructure expansion (International Energy Agency, 2021).
- Expand Green Financing Mechanisms: Sweden's renewable energy transition has been significantly supported by green bond financing, with 16.2% of its total bond issuance dedicated to green initiatives in 2022. In contrast, France's 5.9% allocation indicates substantial room for growth in utilizing green finance to support renewable projects (Eurostat, n.d.). Expanding France's green bond market could attract private investment and accelerate the deployment of renewable energy infrastructure.
- Increase the Carbon Tax: Sweden's high carbon tax has been a key driver in its transition to renewable energy, creating financial incentives to reduce fossil fuel consumption and invest in clean alternatives. France could adopt a similar strategy by raising its carbon tax rate and channeling the revenue into renewable energy projects to drive further progress (Government of Sweden, n.d.).
- Improve Energy Accessibility and Affordability: France has experienced a sharp increase in energy accessibility challenges, with the percentage of the population unable to keep their homes adequately warm more than doubling from 4.9% to 10.7% (Eurostat, n.d.). Developing targeted subsidies or financial assistance programs for lower-income households would help mitigate the social impact of rising energy costs and ensure an equitable transition to renewable energy.
- Foster Community-Driven Renewable Projects: Public resistance, particularly against wind energy projects in rural areas, has slowed France's renewable energy deployment. Adopting Sweden's community-driven model, where local ownership and financial participation in wind projects have increased public support, could help address opposition and facilitate smoother project approvals (Walker & Devine-Wright, 2008). By encouraging profit-sharing mechanisms and participatory planning, France can enhance local engagement and broaden

the benefits of renewable energy across communities.

France's progress in renewable energy adoption has been slower compared to Sweden, despite operating under the same EU-wide incentive frameworks. By implementing regulatory streamlining, financial incentives, policy stability, and community engagement strategies, France can accelerate its transition while maintaining energy security. While Sweden's model is widely applicable, France's reliance on nuclear power necessitates a balanced approach that integrates renewable energy expansion with nuclear innovations. These policy recommendations provide a roadmap for enhancing France's renewable energy strategy and contributing to the EU's broader carbon neutrality goals.

Broader Significance

These disparities are not only national challenges but also impact the EU's collective ability to meet its 2050 carbon neutrality goals. Understanding the successes and barriers faced by Sweden and France is critical for designing strategies applicable across member states.

Program	Goals	Sweden's Adoption	France's Adoption
Renewable Energy Directive (RED)	Achieve 32% renewable energy share in the EU by 2030.	Exceeded targets with 66% renewable energy share by 2022.	Progress slower at 20.3% renewable energy share by 2022.
European Green Deal	Achieve net-zero emissions by 2050 with a focus on renewable energy investment.	Implemented green certificates and carbon tax policies.	Focused on nuclear energy and delayed renewable energy projects.

Table 5. EU Goal Progress by Country

Sweden has maintained relatively low climate-related economic losses, increasing slightly from EUR 10.9 to 11.6 per inhabitant. In contrast, France saw a substantial rise from EUR 43.0 to 50.2 per inhabitant, indicating higher vulnerability to climate-related impacts (Eurostat, n.d.). Energy accessibility challenges are more pronounced in France, highlighting the impact of rising energy costs and social equity considerations in renewable transitions.

Economically, the contribution of environmental goods and services to GDP has grown in both countries, with Sweden increasing from 3.5% to 4.1% and France from 2.6% to 3.0% (Eurostat, n.d.). This reflects the broader economic potential of transitioning to a green economy.

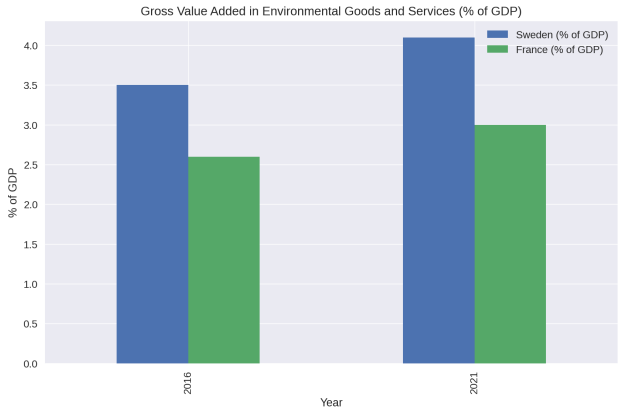

Figure 7. Environmental Value Added as % of GDP

Cultural Factors

Cultural and societal factors play a critical role in shaping the differences between Sweden and France's renewable energy adoption rates (Wang, Wang, Yu, & Mao, 2023). In Sweden, a strong cultural emphasis on sustainability is deeply integrated into public policy and corporate behavior (Hjorth Warlenius & Nettelbladt, 2023). This alignment has fostered widespread acceptance and active participation in renewable energy projects. A notable example is the use of community ownership models in wind energy projects,

which ensure that residents share in the economic benefits from these projects (International Renewable Energy Agency, 2020). These models, paired with community participation in decision-making processes, have minimized opposition and created a more equitable distribution of financial gains, accelerating project approvals (European Commission Joint Research Centre, 2016).

In contrast, France's public attitudes toward renewable energy are more complex, influenced in part by the country's heavy reliance on nuclear energy, which already provides a low-carbon alternative (International Energy Agency, 2021). While there is growing awareness of sustainability, wind energy projects in rural areas often face significant opposition. Concerns about visual impact, noise, and ecological disruption have led to delays and legal battles, slowing the adoption of renewables (Wretling, Balfors, & Mörtberg, 2022). Unlike Sweden, France has not fully embraced community ownership models or incentives that directly benefit local stakeholders (Leiren et al., 2020).

To overcome these challenges, France could adopt strategies inspired by Sweden's community-driven approach (Hjorth Warlenius & Nettelbladt, 2023). Implementing policies that encourage local ownership, such as profit-sharing mechanisms or co-ownership of wind farms, could help address opposition by providing tangible economic benefits to residents (International Renewable Energy Agency, 2020). Additionally, fostering participatory planning processes that involve local communities in project design and decision-making could build trust and reduce resistance (European Commission Joint Research Centre, 2016). These measures could create a stronger societal consensus around the need for a rapid energy transition, aligning public sentiment with France's renewable energy goals.

Limitations

This research is subject to several limitations:

- Reliance on Secondary Sources: The analysis relies exclusively on publicly available secondary data sources, such as government reports and academic literature, as there is no primary data collection or direct contact with stakeholders. This limits the scope of the research to existing information, which may not capture the most up-to-date developments in renewable energy policies.
- Data Availability: In some cases, comprehensive data on specific metrics (such as recent investment levels) may not be equally available for both countries, leading to potential gaps in the analysis.
- Generalizability: The focus on France and Sweden means that the findings may not be directly applicable to other EU countries with different energy profiles or policy environments. However, the insights generated from this comparison can provide valuable lessons for other EU member states facing similar challenges.

Despite these limitations, this research aims to provide a complete comparative analysis of renewable energy adoption in France and Sweden, offering insights into how domestic policies and contextual factors influence the success of EU-wide renewable energy programs.

Conclusion

This research has highlighted the significant disparity between Sweden's success in renewable energy adoption and France's slower progress, despite both countries operating under the same EU-wide incentive frameworks, such as the Renewable Energy Directive and the European Green Deal. Sweden's cohesive, stable policy framework, which includes a high carbon tax, the green certificate system, and robust community engagement, has facilitated the rapid expansion of renewable energy, particularly in wind, bioenergy, and hydropower. In contrast, France's progress has been slowed by policy fragmentation, regulatory complexity, and its reliance on nuclear power. Lengthy permitting processes and inconsistent policy have deterred investment and delayed the development of renewable infrastructure in France.

These findings demonstrate that Sweden's long-term policy consistency has been a key factor in its ability to meet and surpass its renewable energy targets, while France's fragmented approach has created uncertainty and slowed its transition to a more diverse energy mix. However, there are limitations in relation to the implementation of EU directives. As countries in the EU, such as France and Sweden, differ in a number of demographic categories, many frameworks that work for Sweden will likely require modification to fit the infrastructure capacities of other EU countries. Regardless, Sweden's success in policy and their applications provide a roadmap for other EU countries hoping to follow in their footsteps.

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