



Collaborative and Reproducible Practices

Global Renewable Energy Leaders

Arisara Therdthianwong, Quanyu Qian, Dhruv
Kaushal Gal

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1 Executive summary

This report investigates the top 10 countries with the highest renewable energy share in 2023 and global trends in energy transitions. It further analyzes the sources of renewable energy in the leading country. The analysis is conducted using reliable data from Our World in Data. Among these countries, Norway stands out as a global leader with 72.09% of its primary energy coming from renewable sources. The findings offer valuable insight to effectively implement national approaches that could transform sustainable energy transitions worldwide.

2 Introduction

The global energy landscape has transformed rapidly in the last few decades. Many countries are undergoing a major shift toward adopting renewable sources such as hydropower, wind, and solar in response to the challenges of climate change and resource sustainability. Renewable energy now plays an important role as an alternative source that helps to reduce reliance on fossil fuels and mitigate greenhouse gas emissions.

Throughout the report, global renewable energy trends are identified, with a focus on the top 10 countries with highest proportion of renewable energy in total energy consumption in 2023. Norway leads the way, with roughly 72% of primary energy sourced from renewable. Sweden and Brazil are also undergoing significant transitions, with 53.9% and 50.3% renewable shares, respectively.

A deeper analysis on Norway has been conducted to better understand how a developed country manages its energy infrastructure achieving a high level of renewable integration. Understanding these factors behind Norway's performance can be beneficial for planning and improving renewable energy policies and strategies that could be adapted to different regional and national contexts. This analysis aims to provide a useful insight that can guide future energy transitions globally.

3 Methodology

This report adopts a data-driven comparative analysis approach. The primary dataset is sourced from Our World in Data. The dataset includes global and country-level energy data, which was filtered to exclude aggregated regions identifying the top 10 countries by renewable energy share in 2023.

Among the countries identified, Norway was selected for further analysis due to its top ranking. A focused case study was conducted to examine its internal energy composition and assess the scale of its renewable output.

3.1 Top 10 Countries by Renewable Energy Share in 2023

Table 1: Top 10 Countries by Renewable Energy Share (%) in 2023

Country	Code	Year	Renewables (%)
Norway	NOR	2023	72.09110
Sweden	SWE	2023	53.89018
Brazil	BRA	2023	50.33141
Denmark	DNK	2023	42.73486
New Zealand	NZL	2023	42.26695
Austria	AUT	2023	40.08019
Switzerland	CHE	2023	38.32534
Portugal	PRT	2023	36.04341
Finland	FIN	2023	35.93626
South and Central America (EI)	NA	2023	35.39018

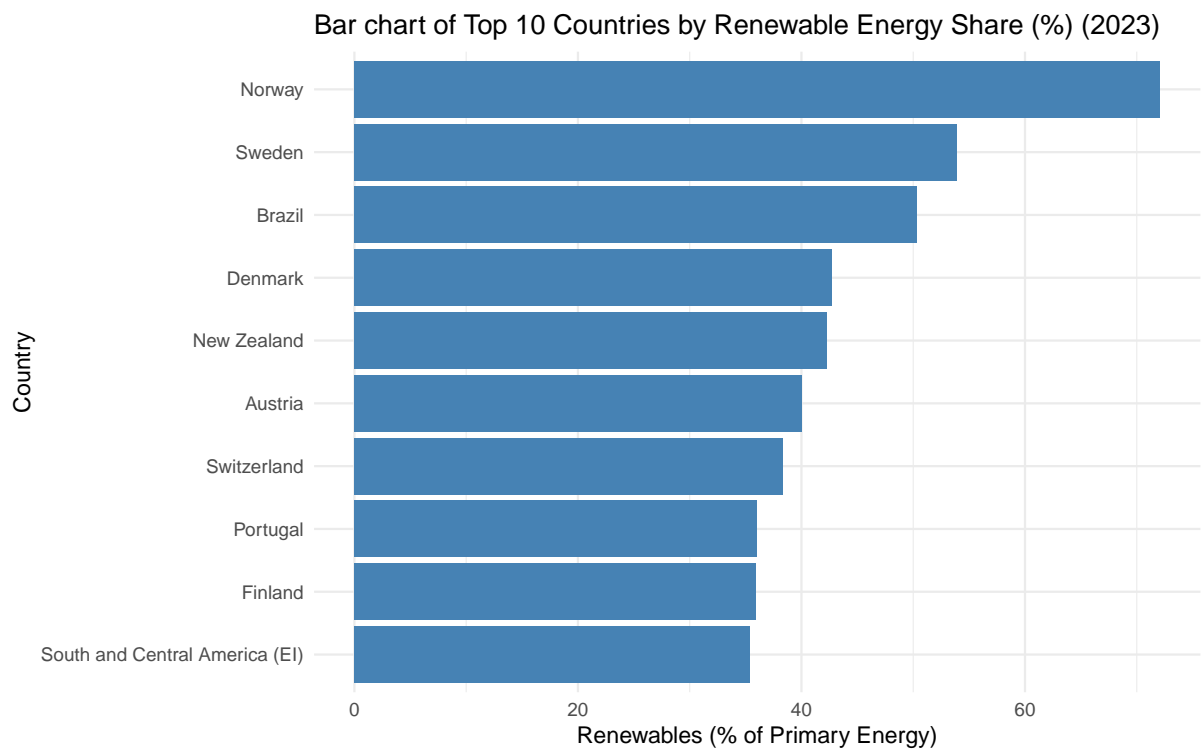


Figure 1: Bar chart of Top 10 Countries by Renewable Energy Share (%) (2023)

Table 1 and Figure 1 present the top 10 countries with the highest renewable energy shares in 2023. Norway ranks first with renewable share exceeding 72%, significantly ahead of other countries. This exceptional performance drives deeper examination of Norway’s domestic energy composition.

3.2 Norway: Global Leader in 2023

To understand Norway’s energy landscape, we examined its 2023 electricity mix data.

Table 2: Norway’s Renewable Electricity Generation by Source in 2023 (TWh)

Source	TWh
wind	14.96
hydro	135.96
solar	0.17
Other renewables including bioenergy	0.26

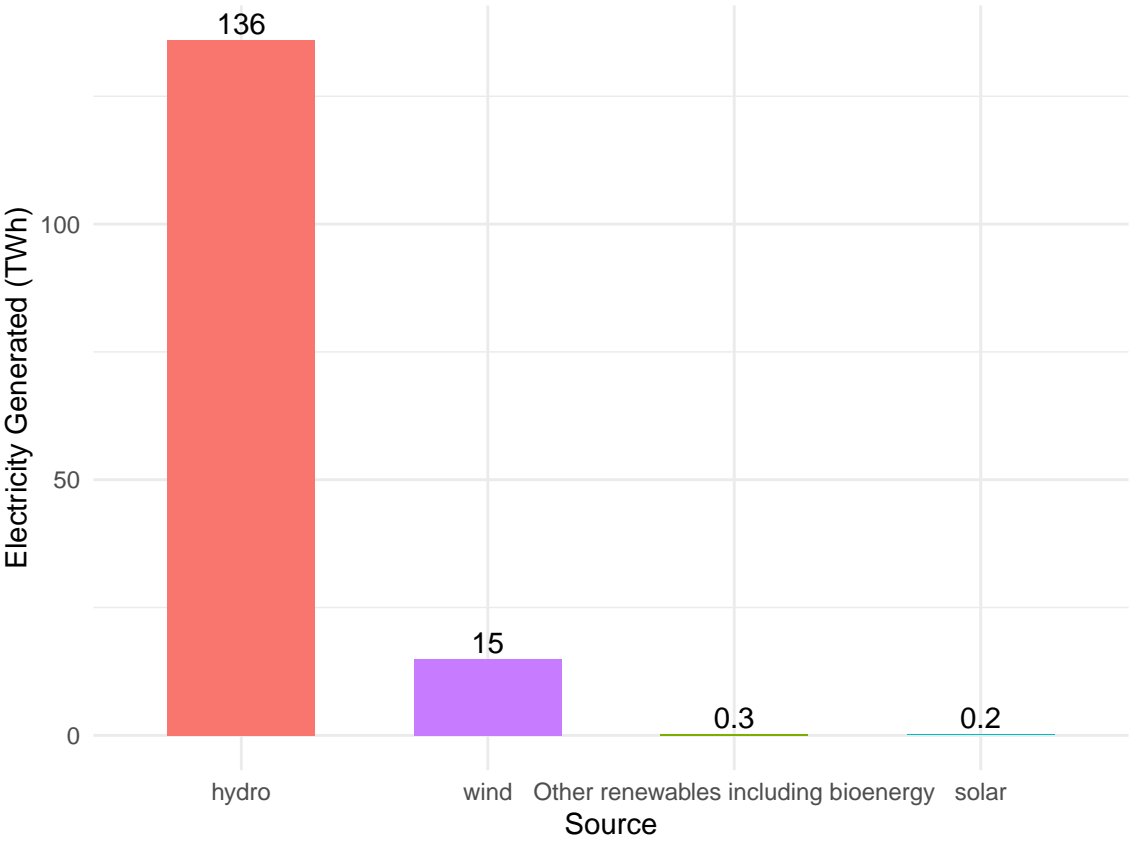


Figure 2: Norway’s Renewable Electricity Breakdown by Source in 2023 (TWh)

As shown in Figure 2, hydropower accounted for approximately 136 TWh, contributing over 90% of the country’s renewable electricity generation. Wind energy produced 15 TWh, while Solar and bioenergy made only marginal contributions.

These figures highlight that Norway’s renewable energy leadership is largely driven by its heavy reliance on **hydropower**, rather than a diversified renewable portfolio.

3.3 Global Hydropower Generation by Country (2023)

Eventhough we can clearly see Norway performance in renewable energy share, percentage alone does not reflect actual capacity. A high share could result from low total energy demand. Therefore, we compared its absolute hydropower output with that of other major economies to determine whether its position is based on scale, not proportion.

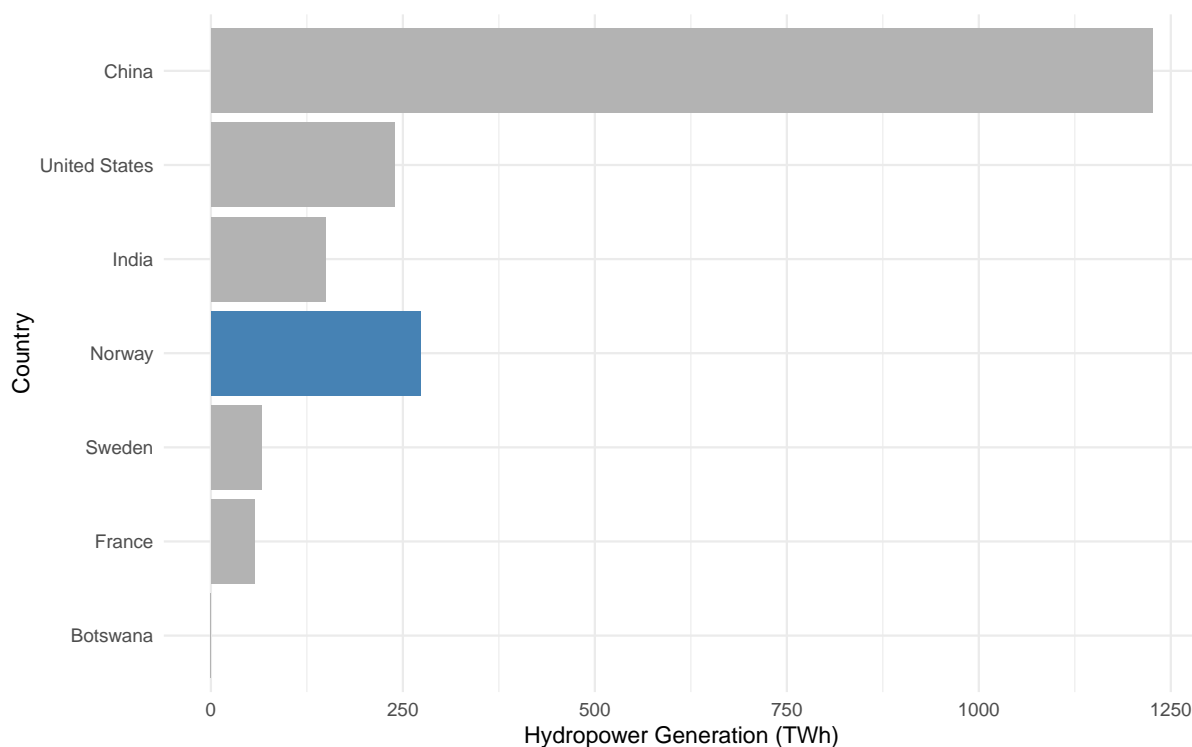


Figure 3: *Global Hydropower Generation (TWh) in 2023 by Country*

Figure 3 illustrates Norway's hydropower generation in 2023 compared to other major producers. Despite its relatively small population and geographic size, Norway position itself among top global hydropower generators. This reinforces Norway's leadership in renewable energy. Not solely based on high proportional share but supported by substantial infrastructure and high absolute generation capacity.

4 Results

The analysis revealed that in 2023, Norway led globally in renewable energy adoption, with 72.09% of its primary energy coming from renewable sources, as shown in Table 1. Sweden (53.9%) and Brazil (50.3%) followed closely, highlighting strong national commitments to clean energy transitions.

Figure 1 visualizes these rankings, with Norway’s share standing distinctly above the rest of the top 10. This outperformance reflects long-term national investments and natural hydroelectric potential.

To understand this further, Table 2 and Figure 2 show that Norway’s 2023 electricity mix was over 90% hydropower, supported by modest wind output and minimal solar and bioenergy contributions.

Crucially, Figure 4 illustrates that Norway’s leadership is not new—it has maintained a renewable share above 60% for over two decades. This trend reinforces the country’s sustained commitment to renewable development through stable policy, investment, and infrastructure planning.

Overall, these results demonstrate that top-performing countries combine favorable geography with long-term national strategies. Norway exemplifies how consistent planning and natural resource optimization can produce a globally leading clean energy profile.

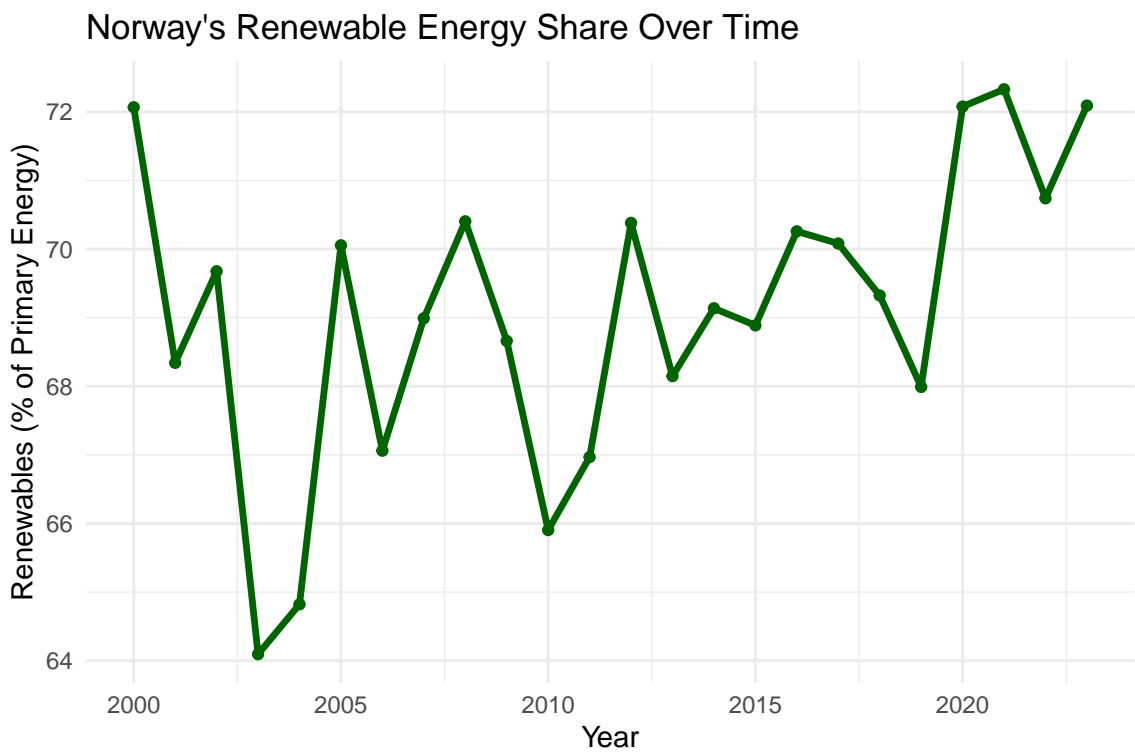


Figure 4: Norway’s Renewable Energy Share (2000–2023)

5 Discussion and Conclusion

Norway's top ranking in renewable energy share is not incidental—it reflects decades of strategic investment in hydroelectric infrastructure, supported by favorable geography and a stable policy environment. The country's energy profile, dominated by hydropower, illustrates how natural endowments can be effectively leveraged to transition away from fossil fuels.

However, this reliance on a single dominant source introduces potential vulnerabilities. Climate variability, such as droughts or shifting precipitation patterns, could significantly impact hydroelectric generation. Furthermore, despite its leadership, Norway's use of wind, solar, and bioenergy remains minimal, indicating untapped potential for diversification.

The global comparison in hydropower generation reinforces Norway's substantial absolute output relative to its size. This combination of high renewable share and high volume is rare among countries and highlights the effectiveness of long-term, resource-aligned energy planning.

In conclusion, Norway's case exemplifies how geographic advantages, when matched with consistent national policy and infrastructure investment, can result in world-leading performance in renewable energy integration.

Recommendations

- *Diversify energy sources:* Invest in wind and solar to reduce over reliance on hydropower.
- *Modernize energy infrastructure:* Improve grid flexibility to integrate more variable renewables.
- *Export expertise:* Share Norway's policy, regulatory, and engineering frameworks with other nations.
- *Support adaptive policy:* Prepare for climate risks by developing redundancy and storage solutions.

5.1 References

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