



Collaborative and Reproducible Practices

Global Renewable Energy Leaders

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1 Executive summary

This report investigates global trends in renewable energy transitions by analyzing the top 10 countries in 2023 and examining the energy sources in the leading country. The analysis uses reliable data from Our World in Data. Among these countries, Norway stands out as a global leader with 72.09% of its primary energy sourced from renewables. These findings offer valuable insights for shaping national strategies toward sustainable energy transitions.

2 Introduction

The global energy landscape has transformed rapidly in the last few decades. Many countries are transitioning toward renewable sources—such as hydropower, wind, and solar—in response to climate change and resource sustainability challenges. Renewables now serve as a critical alternative to fossil fuels, helping to reduce dependence and mitigate greenhouse gas emissions.

Throughout the report, global renewable energy trends are identified, with a focus on the top 10 countries with the highest proportion of renewable energy in total energy consumption in 2023. Norway leads the way, with roughly 72% of its 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 of Norway is conducted to understand how a developed country achieves high renewable integration through energy infrastructure management. 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.

Specifically, the report explores two key questions on why Norway leads in renewable energy share, and whether its dominance reflects real capacity or just proportional advantage.

3 Methodology

The primary dataset, obtained from Our World in Data, includes global and country-level renewable energy statistics. We filtered out aggregate regions, enabling the identification of the top 10 countries by renewable energy share in 2023.

Norway, ranking first, was selected for focused analysis. The analysis investigates Norway’s domestic electricity mix and compares hydropower output with other major economies to reveal the structural and strategic factors underpinning its performance.

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 |

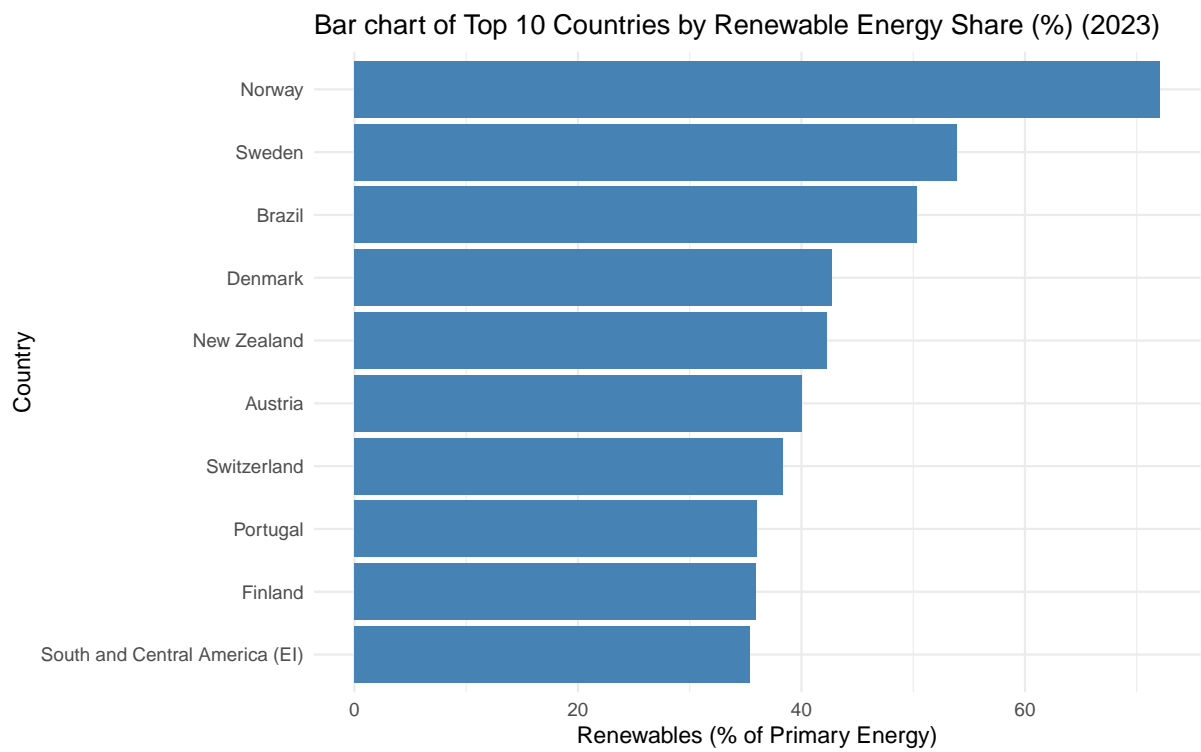


Figure 1: Bar chart of Top 10 Countries by Renewable Energy Share (%) (2023)

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 |

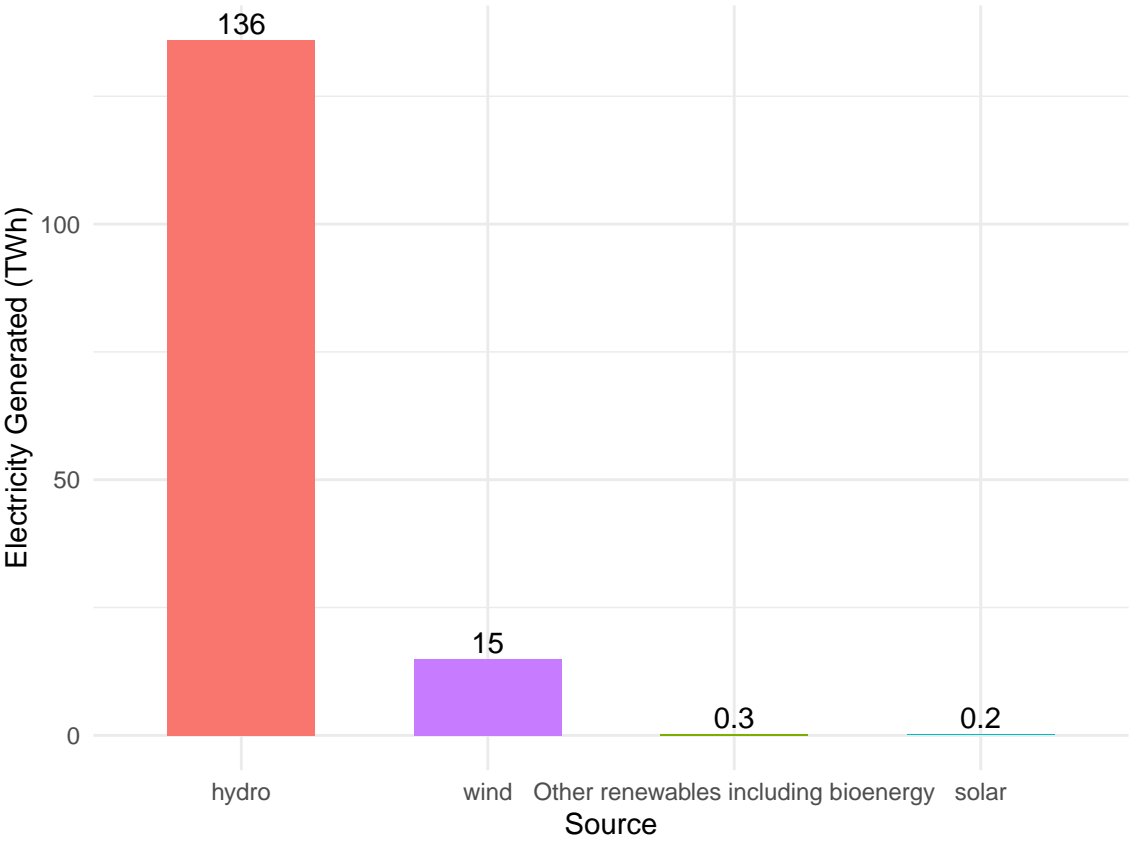


Figure 2: Norway’s Renewable Electricity Breakdown by Source in 2023 (TWh)

Figure 2 shows that hydropower contributed over 90% of Norway’s renewable electricity in 2023 (136 TWh), while wind (15 TWh), solar, and bioenergy made minor 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)

While Norway’s renewable share is impressive, percentage alone may 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.

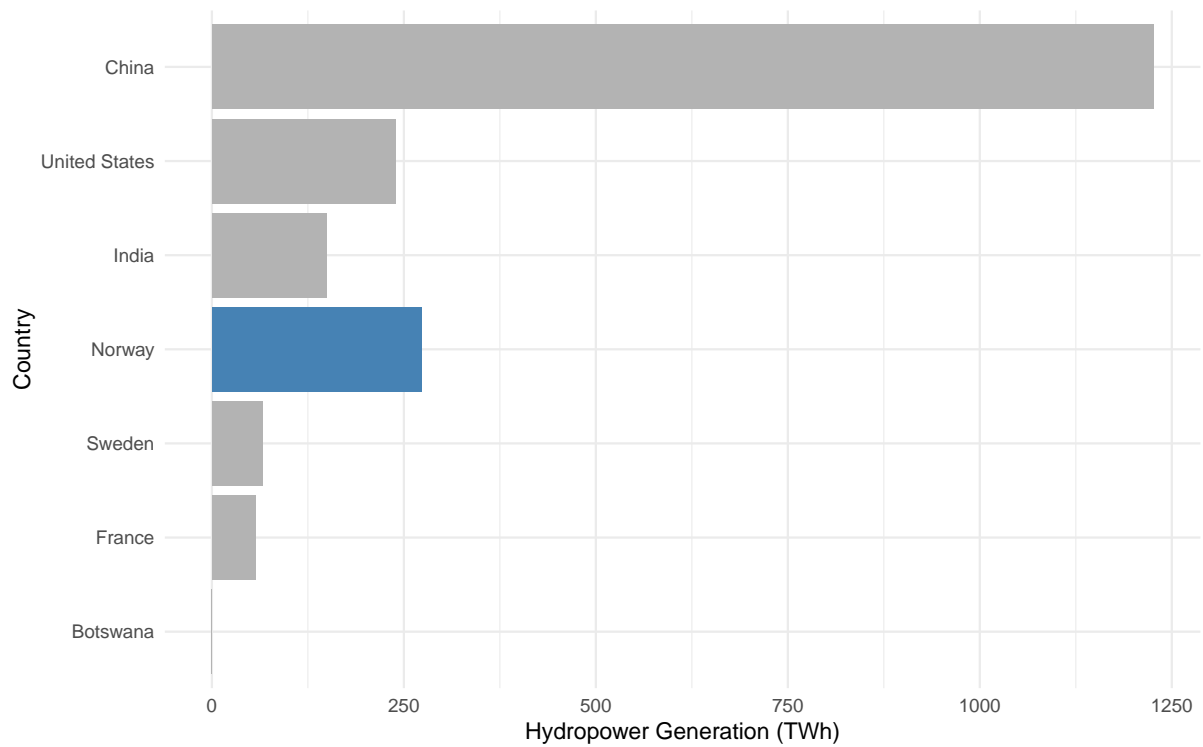


Figure 3: Global Hydropower Generation (TWh) in 2023 by Country

Despite its small size, Norway produced 270 TWh, exceeding the U.S. (239 TWh) and India (149 TWh) [Figure 3](#). This comparison confirms that Norway’s renewable leadership is not only proportional, but also supported by significant absolute generation and robust infrastructure.

4 Results

Based on the methodology outlined above, this section presents key findings from our data analysis. In 2023, Norway led globally in renewable energy adoption, with 72.09% of its primary energy from renewable sources, followed by Sweden (53.9%) and Brazil (50.3%) as shown in [Table 1](#). These figures highlight strong national commitments to clean energy.

[Figure 1](#) visualizes the top 10 countries, with Norway’s share standing clearly above others. This exceptional performance reflects sustained investment and abundant hydropower resources.

To explore the drivers of this leadership, [Table 2](#) and [Figure 2](#) show that over 90% of Norway’s electricity in 2023 came from hydropower, with limited contributions from wind, solar, and bioenergy.

As shown in [Figure 4](#), Norway has maintained a renewable share above 60% for two decades, signaling consistent national strategy and infrastructure planning.

Overall, these findings suggest that Norway’s leadership is not merely proportional but supported by robust capacity. The case exemplifies how favorable geography, long-term policy, and investment alignment can enable sustained renewable integration at scale.

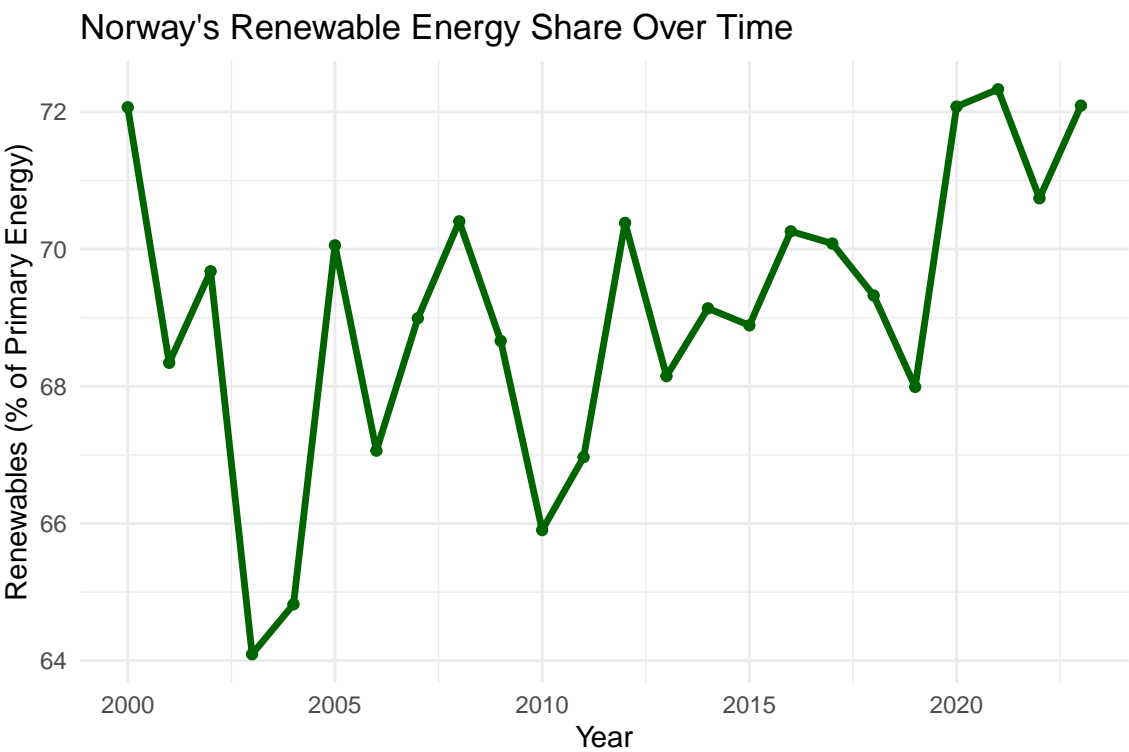


Figure 4: Norway’s Renewable Energy Share (2000–2023)

5 Conclusion

The findings shed light on the structural factors driving Norway's renewable energy leadership. Its top ranking is the result of long-term investment in hydropower, supported by favorable geography and consistent national policy. Norway's energy profile—dominated by hydropower—demonstrates how natural resources can be effectively leveraged for a low-emission energy transition.

Nevertheless, dependence on a single energy source introduces potential risks. Climate variability—such as droughts and shifting precipitation patterns—could significantly reduce hydroelectric output. Additionally, Norway's limited deployment of wind, solar, and bioenergy reveals an untapped opportunity for further diversification of its renewable portfolio.

The international comparison further reinforces that Norway's renewable dominance is not just proportional but also absolute. This rare combination of high renewable share and significant generation volume underscores the success of sustained, resource-aligned energy strategies.

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.

A key limitation of this study is its focus on quantitative data, without capturing differences in policy or social context. Future research could explore how governance, incentives, and behavior shape renewable adoption. Studying other high-performing countries may also offer valuable policy insights.

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.

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