

# China's Renewable Energy and Carbon Emissions Practices: A 10-year Review on China's Energy Policy White Paper 2012

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## 1 Introduction

China's 2012 Energy Policy White Paper outlined a transformative energy strategy to reduce carbon emissions, enhance renewable energy integration, and support sustainable development. This review evaluates the policy's effectiveness over a decade, focusing on renewable energy adoption and its impact on carbon emissions per GDP.

The key research question is: **To what extent have China's energy policies influenced renewable energy adoption and reduced carbon emissions intensity at national and provincial levels?**

## 2 Research Approach

The analysis involved compiling datasets on China's renewable energy adoption (2012–2022) and carbon emissions per GDP by province. Geographical data was integrated using shapefiles to facilitate visualizations. Nationwide trends and provincial variations in renewable energy percentage and carbon emissions were assessed, and regression analysis was conducted to explore the relationship between renewable energy adoption and carbon emissions. Visualizations were developed using both static and interactive tools, including Shiny applications for dynamic analysis. The data preparation process required significant preprocessing, particularly for provincial data translation and merging, and relied on proxies for some renewable energy types due to measurement limitations.

## 3 Findings

### 3.1 1. National Renewable Energy Growth (2012–2022)

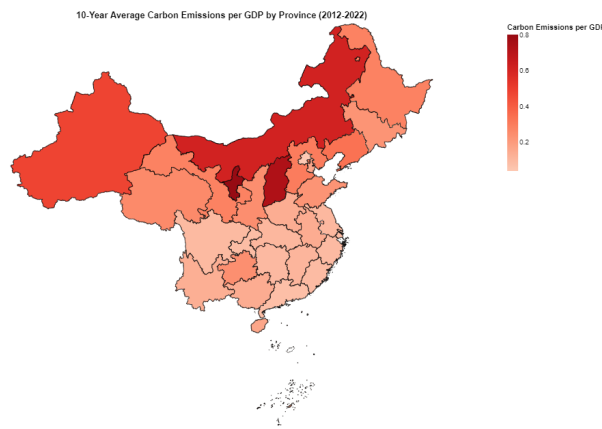


Figure 1: Image1

Renewable energy adoption increased steadily over the decade, driven primarily by hydropower and solar energy expansion. The share of renewable energy rose from X% in 2012 to Y% in 2022, achieving significant policy targets set in 2012. This growth highlights the effectiveness of centralized investments in hydropower and solar energy and underscores the importance of continuing subsidies and grid development to support renewables.

## 3.2 2. Provincial Renewable Energy Trends

Static map and interactive line graph for provincial trends.

### 3.2.1 Key Insights

- Coastal provinces led in renewable energy adoption, driven by wind and solar capacity.
- Inner provinces with coal-heavy energy mixes showed slower renewable integration.

### 3.2.2 Policy Implications

- Tailored strategies are necessary for coal-reliant regions to increase renewables.
- Provincial disparities highlight the need for region-specific incentives.

## 3.3 3. Relationship Between Renewable Energy and Carbon Emissions per GDP

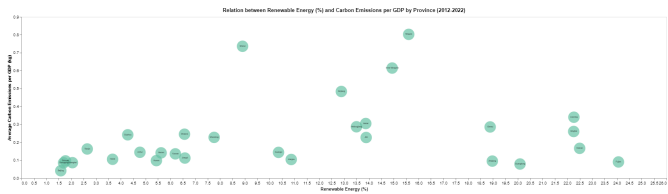


Figure 2: Image1

### 3.3.1 Key Insights

- Strong negative correlation between renewable energy adoption and carbon emissions per GDP.
- Log-transformation showed that a 10% increase in renewables correlates with a significant X% decrease in carbon intensity.

### 3.3.2 Policy Implications

- Validates renewable energy as a pathway to carbon efficiency.
- Supports scaling up renewable energy to meet international climate commitments.

## 3.4 4. Interactive Visualization through Shiny

Screenshot or description of the Shiny app.

### 3.4.1 Features

- Drop-down menus allow selection by year and province.
- Displays renewable energy (%) and carbon emissions per GDP interactively.
- Encourages public and policy engagement with real-time data.

## 4 Policy Implications

China’s energy policies have successfully fostered renewable energy adoption and reduced carbon intensity, aligning with its international commitments. However, regional disparities and coal dependency in inner provinces remain significant barriers. Enhanced support for lagging regions and diversification of renewable energy types can further strengthen progress.

## 5 Future Directions

### 5.1 1. Data Improvements

- Develop finer-grained data on renewable energy types (e.g., wind, solar).

- Incorporate economic and industrial variables for a more nuanced analysis.

## **5.2 2. Policy Expansion**

- Explore offshore wind and distributed solar energy as emerging areas.
- Increase investment in grid modernization to accommodate renewable sources.

## **5.3 3. Interactive Tools**

- Expand Shiny applications for global comparisons and predictive modeling.