

Turkey's Green Economic Transformation: Lessons from Qatar's Energy Transition

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Abstract

As global climate change intensifies, nations are increasingly seeking green economic transformations to achieve sustainable development. Turkey, as an emerging economy, faces unique opportunities and challenges in this process. This paper explores Turkey's achievements and issues in promoting a green economy through international cooperation and domestic policy coordination, drawing lessons from Qatar's energy transition to provide valuable insights for Turkey.

Keywords

Turkey, Qatar, Energy Transition

1. Introduction

The global trend towards green economic transformation has gained significant momentum in recent years. This movement aims to mitigate climate change impacts, enhance energy efficiency, and promote the development of renewable energy sources. In 2023, climate change trends have underscored the urgent need for such transformation, with global temperatures reaching record highs and extreme weather events becoming more frequent and severe. For instance, last year saw unprecedented heatwaves across Europe and North America, along with devastating floods in Asia, which have highlighted the vulnerability of current energy and infrastructure systems to climate-related disruptions. According to the latest data from the Intergovernmental Panel on Climate Change (IPCC), global CO₂ emissions must be reduced by at least 45% by 2030 from 2010 levels to limit global warming to 1.5°C (IPCC, 2023). These alarming trends and data points emphasize the critical importance of transitioning to a green economy.

Green economic transformation is not only vital for environmental sustainability but also offers substantial economic and social benefits. It can drive innovation, create jobs, and enhance energy security. Within this global context, countries like Turkey and Qatar face unique challenges and opportunities in their respective transitions towards greener economies.

Turkey, a rapidly developing emerging market, has achieved significant economic growth in recent years. However, its energy structure remains heavily reliant on fossil fuels, leading to escalating environmental and energy security issues. To achieve sustainable development, Turkey urgently needs to accelerate its transition to a green economy. Conversely, Qatar, one of the world's largest producers of liquefied natural gas, has made notable progress in its energy transition. By actively promoting renewable energy development and enhancing energy efficiency, Qatar has significantly reduced carbon emissions and diversified its energy sources.

This study aims to explore the challenges and opportunities Turkey faces in its green economic transformation and draw valuable lessons from Qatar's energy transition experience. Specifically, the research objectives are to analyze the primary obstacles and driving factors in Turkey's journey towards a green economy, to examine the successful strategies and policies implemented in Qatar's energy transition, and to propose actionable policy recommendations tailored for Turkey's sustainable development goals.

2. Literature Review

Green economic transformation is a comprehensive shift towards sustainability that integrates environmental health, economic viability, and social equity. According to Pearce, Markandya, and Barbier (1989), green economics seeks to align economic activities with ecological principles to reduce carbon emissions, conserve resources, and promote biodiversity. This transformation requires a multifaceted approach involving policy reform, technological innovation, and behavioral change (UNEP, 2011). The theoretical framework encompasses sustainable development goals (SDGs), emphasizing the need for an economy that supports both current and future generations without compromising ecological integrity (Sachs, 2015).

Turkey's economy has grown rapidly over the past decade, with a notable increase in industrialization and urbanization. As of 2023, Turkey's GDP growth rate stands at approximately 4.5%, driven by manufacturing, construction, and services sectors (World Bank, 2023). However, this growth has been energy-intensive, heavily reliant on fossil fuels, particularly coal and natural gas. The energy sector accounts for a significant portion of Turkey's greenhouse gas emissions, posing a challenge to sustainable development. Turkey's energy mix in 2022 consisted of 32% coal, 29% natural gas, 20% hydro, 7% wind, 6% solar, and 6% other renewables (IEA, 2022). This dependence on non-renewable energy sources necessitates a strategic shift towards renewable energy and energy efficiency to achieve a green economic transformation.

Qatar, one of the world's leading natural gas producers, has embarked on an ambitious energy transition to diversify its energy sources and reduce carbon emissions. The country's National Vision 2030 outlines a comprehensive strategy for sustainable development, emphasizing the importance of renewable energy and energy efficiency (Qatar National Vision 2030, 2008). Key policies include substantial investments in solar energy projects, enhancing energy efficiency in industries, and promoting sustainable urban development. By 2023, Qatar aims to generate 20% of its energy from renewable sources, primarily solar, and has implemented stringent regulations to improve energy efficiency across various sectors (Qatar General Electricity & Water Corporation, 2023). These efforts have led to a significant reduction in carbon intensity and positioned Qatar as a regional leader in energy sustainability.

Comparative studies in energy transitions provide valuable insights into the factors that drive successful transformations and the challenges that hinder progress. Sovacool (2016) highlights that successful energy transitions often involve a combination of strong policy support, technological innovation, and societal acceptance. A comparative analysis of Germany's *Energiewende* and Denmark's renewable energy policies reveals the critical role of government incentives, public-private partnerships, and community engagement in achieving substantial renewable energy penetration (Lauber & Jacobsson, 2016). Similarly, Qatar's experience underscores the importance of leveraging natural resources, financial capacity, and strategic planning in driving energy transitions.

In methodology, comparative studies often employ a mixed-methods approach, combining quantitative data analysis with qualitative case studies to provide a comprehensive understanding of the transition dynamics (Yin, 2014). This approach allows researchers to identify best practices, assess policy impacts, and draw lessons applicable to other contexts. For Turkey, a comparative analysis with Qatar's energy transition can reveal potential pathways and strategies to overcome its reliance on fossil fuels and achieve a green economic transformation.

3. Current State of Turkey's Green Economic Transformation

Turkey has implemented several environmental policies and green economy strategies aimed at reducing its carbon footprint and promoting sustainable development. Key policy frameworks include the

National Renewable Energy Action Plan (NREAP) and the Energy Efficiency Strategy Paper. The NREAP, introduced in 2014, set ambitious targets for increasing the share of renewable energy in Turkey's energy mix to 30% by 2023 (Republic of Turkey Ministry of Energy and Natural Resources, 2014). Additionally, the Energy Efficiency Strategy Paper aims to reduce primary energy consumption by 14% from 2017 levels by 2023 through various measures such as improving energy efficiency in buildings, industry, and transportation (Republic of Turkey Ministry of Energy and Natural Resources, 2017).

Turkey's energy structure is characterized by a heavy reliance on fossil fuels, with coal and natural gas accounting for a significant portion of its energy consumption. As of 2022, Turkey's energy mix comprised approximately 32% coal, 29% natural gas, 20% hydro, 7% wind, 6% solar, and 6% other renewables (IEA, 2022). Despite this dependence on non-renewable sources, Turkey has made notable progress in developing renewable energy. The installed capacity for wind energy reached 10 GW in 2022, up from just 3 GW in 2015, and solar capacity increased to 7 GW from 1 GW over the same period (Turkish Wind Energy Association, 2023; Turkish Solar Energy Industry Association, 2023).

In terms of renewable energy advancements, Turkey has seen significant investments in solar and wind power. The Turkish government has introduced various incentives, including feed-in tariffs and tax exemptions, to attract investment in the renewable energy sector. These efforts have resulted in a substantial increase in the share of renewables in the electricity generation mix, which stood at 42% in 2022, up from 28% in 2015 (Republic of Turkey Energy Market Regulatory Authority, 2023).

However, Turkey faces several challenges in its quest for a green economic transformation. One of the primary challenges is the continued reliance on fossil fuels, which is driven by substantial domestic coal resources and geopolitical considerations related to natural gas imports. The entrenched interests of the fossil fuel industry and the need for substantial investments in renewable energy infrastructure further complicate the transition. Another significant challenge is the intermittency of renewable energy sources such as wind and solar. This requires the development of robust grid infrastructure and energy storage solutions to ensure a stable and reliable power supply. Additionally, Turkey's current energy market structure and regulatory framework need further reforms to support the integration of renewable energy and enhance energy efficiency.

Despite these challenges, Turkey has substantial opportunities to accelerate its green economic transformation. The country has significant renewable energy potential, particularly in wind and solar power, due to its favorable geographic location. Leveraging this potential can reduce dependency on imported fossil fuels, enhance energy security, and create green jobs. Furthermore, Turkey's strategic location at the crossroads of Europe and Asia presents opportunities to become a regional hub for renewable energy technologies and green innovation. By investing in research and development, Turkey can drive technological advancements and export green technologies to neighboring countries.

4. Lessons from Qatar's Energy Transition

Qatar has implemented a series of strategic policies and measures to transition its energy sector towards sustainability. One of the cornerstone policies is the Qatar National Vision 2030, which sets forth a comprehensive framework for sustainable development. This vision includes goals for reducing carbon emissions, enhancing energy efficiency, and increasing the share of renewable energy in the national energy mix (Qatar National Vision 2030, 2008).

In line with this vision, the Qatar Energy Strategy 2024 aims to diversify the energy portfolio by investing in renewable energy sources, primarily solar power. This strategy outlines specific targets such as generating 20% of the country's electricity from renewable sources by 2030 (Qatar General Electricity & Water Corporation, 2023). Additionally, Qatar has introduced regulatory measures and incentives to encourage energy efficiency and the adoption of renewable technologies. These include feed-in tariffs, tax exemptions for renewable energy projects, and subsidies for energy-efficient appliances.

Qatar's strategic focus on energy transition has led to several significant achievements. By 2023, Qatar had installed a total of 1.8 GW of solar capacity, up from virtually zero in 2015 (Qatar General Electricity & Water Corporation, 2023). This rapid expansion in solar capacity is largely attributed to the establishment of

large-scale solar farms, such as the Al Kharsaah Solar PV Power Plant, which is expected to generate 800 MW of electricity and meet 10% of the country's peak electricity demand once fully operational. Moreover, Qatar has made substantial progress in enhancing energy efficiency. The implementation of energy efficiency standards and labeling for appliances has led to a 15% reduction in energy consumption in the residential sector since 2018 (Qatar Statistics Authority, 2023). Additionally, improvements in industrial energy efficiency have resulted in significant cost savings and reductions in greenhouse gas emissions. The adoption of advanced technologies in the oil and gas sector, such as carbon capture and storage (CCS), has also played a crucial role in reducing the carbon intensity of hydrocarbon production.

According to the above analysis, there are several critical factors can provide valuable insights for Turkey, which have contributed to Qatar's successful energy transition. Firstly, a strong governmental vision and commitment are essential to drive the transition. Turkey can benefit from setting clear and ambitious targets for renewable energy and energy efficiency, similar to Qatar's strategic plans. Secondly, securing financial resources and creating attractive investment conditions are crucial. Turkey can enhance its investment climate by offering incentives and subsidies for renewable energy projects and by fostering public-private partnerships. Thirdly, developing a robust regulatory framework that supports renewable energy deployment and energy efficiency improvements will be vital. Implementing feed-in tariffs, tax benefits, and other incentives can attract investment and encourage innovation. Finally, public awareness and engagement should not be overlooked. Promoting energy conservation and efficiency through education and awareness campaigns can build public support and drive behavioral changes essential for a successful energy transition.

5. Pathways for Turkey's Green Economic Transformation

Turkey has recently introduced the National Energy Efficiency Action Plan (NEEAP) 2023-2030, which aims to significantly reduce energy consumption and promote renewable energy sources. The NEEAP outlines a comprehensive strategy to improve energy efficiency across various sectors, including industry, transportation, buildings, and agriculture. The plan targets a 20% reduction in primary energy consumption by 2030 and aims to increase the share of renewable energy in the national energy mix to 32% by the same year (Republic of Turkey Ministry of Energy and Natural Resources, 2023).

Key components of the NEEAP include:

- Energy Efficiency in Industry: Implementing advanced technologies and practices to reduce energy consumption in manufacturing and processing industries.
- Renewable Energy Integration: Expanding the capacity for wind, solar, and hydroelectric power through government incentives and private sector investment.
- Building Sector Improvements: Enhancing the energy performance of new and existing buildings through stricter building codes, energy-efficient materials, and retrofitting initiatives.
- Transportation Sector Efficiency: Promoting the use of electric vehicles, improving public transportation infrastructure, and encouraging energy-efficient logistics practices.

To achieve the objectives outlined in the NEEAP and the proposed policy recommendations, a comprehensive action plan is suggested. In the short-term (2023-2025), Turkey should launch pilot projects for renewable energy integration and energy efficiency improvements in key sectors. Additionally, a national fund should be established to support green technology startups and innovation. Public awareness campaigns and educational programs on energy conservation and sustainability should also be conducted to engage the public and promote a culture of sustainability.

In the medium-term (2025-2027), successful pilot projects should be scaled up, and the deployment of renewable energy installations should be expanded. Implementing mandatory energy efficiency standards for buildings, industries, and appliances will be crucial during this phase. Enhancing grid infrastructure to support renewable energy integration and energy storage solutions is also essential to ensure a stable and reliable energy supply.

In the long-term (2027-2030), the action plan aims to achieve a 20% reduction in primary energy consumption and increase the share of renewable energy to 32% of the national energy mix. Continuous investment in innovation, public engagement, and international cooperation will be necessary to foster a

sustainable green economy. Monitoring and evaluating the progress towards achieving the NEEAP targets will allow for necessary adjustments in policies and strategies to ensure the successful implementation of the action plan.

6. Conclusion

This paper has examined the critical elements of Turkey's green economic transformation, drawing valuable lessons from Qatar's energy transition. Turkey's energy policy, characterized by the National Energy Efficiency Action Plan (NEEAP) 2023-2030, sets ambitious targets for reducing energy consumption and increasing the share of renewable energy in the national energy mix. Through a comparative analysis, we identified key factors contributing to Qatar's success, including strong governmental vision, financial investment, effective regulatory frameworks, technological innovation, and public engagement. These insights have informed policy recommendations tailored to Turkey's context, emphasizing the importance of a holistic and integrated approach to achieving sustainable development.

Future research should focus on several key areas to further support Turkey's green economic transformation. First, there is a need for more in-depth studies on the effectiveness of specific policy instruments, such as feed-in tariffs and tax incentives, in promoting renewable energy adoption. Second, research should explore the potential of emerging technologies, such as energy storage and smart grid systems, in enhancing the reliability and efficiency of renewable energy integration. Third, case studies of successful local and regional renewable energy projects can provide practical insights and best practices that can be scaled up nationally. Additionally, socio-economic impacts of the energy transition, including job creation and community engagement, should be thoroughly investigated to ensure an inclusive and equitable transformation.

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Conflicts of Interest

The authors declare no conflict of interest.

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