

Socio-Economic and Institutional Determinants of Renewable Energy Investment in Algeria: An Exploratory Analysis

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Abstract

This article examines the paradox of Algeria's energy trajectory: despite abundant solar potential and repeated policy announcements, renewable energy deployment remains marginal. The central research question is why Algeria continues to lag behind regional peers such as Egypt and Tunisia in advancing its energy transition. The study adopts a qualitative exploratory approach, drawing on secondary data from international institutions, national reports, and academic literature, complemented by descriptive and comparative analysis. Guided by theories of the resource curse, institutional economics, and socio-technical transitions, the analysis highlights how institutional fragility, hydrocarbon dependence, limited social legitimacy, and technological reliance interact to create a multidimensional lock-in. The findings suggest that Algeria's underperformance is not a matter of resource availability but of governance and systemic barriers that reinforce rentier dynamics. The article contributes theoretically by extending the resource curse debate beyond economic factors to include institutional and social dimensions, and practically by offering policy recommendations to stabilize regulatory frameworks, build local capacities, diversify financing, and foster societal engagement.

Key words: Algeria ; Renewable energy transition ; Hydrocarbon dependence, Institutional lock-in; Resource curse.

JEL Classification: Q42, Q48, Q32, Q35, Q38.

1. Introduction

The energy transition has become the focal point of global development agendas as a result of the accelerating tempo of climate change. The Intergovernmental Panel on Climate Change (IPCC, 2023)¹ cautions that the 1.5°C target necessitates a rapid and extensive transformation

¹ Intergovernmental Panel on Climate Change. (2018). Global warming of 1.5 °C: An IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission

of energy systems, with renewable energy and efficiency measures being critical. Renewables are being increasingly portrayed as strategic assets that can be used to reduce the geopolitical vulnerabilities associated with fossil fuel dependence, stimulate innovation, and enhance energy security, in addition to their environmental benefits. This has led to the adoption of ambitious targets, the restructuring of regulatory frameworks, and the mobilization of unprecedented volumes of investment in renewable energy infrastructure by governments worldwide. Algeria exemplifies a remarkable paradox in the context of this global landscape. On the one hand, the nation is endowed with exceptional renewable resources, particularly solar irradiation, which render it one of the most prospective regions for the deployment of large-scale renewable energy (IRENA, 2023). Conversely, hydrocarbons continue to dominate its energy system. Over the past two decades, oil and gas have accounted for between 20% and 25% of GDP and over 90% of merchandise exports (World Bank, 2023). Algeria is historically embedded in a rentier paradigm that has reduced the incentive for diversification, as hydrocarbon rents underpin fiscal revenues, foreign reserves, and the broader political economy (Auty, 1993; Ross, 2012). A structural vulnerability is established as a result of this dependence: high oil prices delay reform by providing fiscal comfort, while low prices generate budgetary crises that restrict investment in alternative sources.

The central puzzle of the current study is this paradox: *Why has renewable energy investment in Algeria remained restricted, despite the immense potential and repeated policy announcements?* To be more precise, the leading research question is: *What are the institutional, economic, social, and technological determinants that account for Algeria's renewable energy trajectory, and how do these determinants interact to either facilitate or impede investment?*

The article aims to achieve three interrelated objectives. Initially, it endeavors to pinpoint the structural impediments—institutional instability, resource dependence, limited public acceptability, and technological vulnerability—that impede the deployment of renewable energy. Secondly, it endeavors to examine their interactions as a mutually reinforcing lock-in mechanism that ensnares Algeria in hydrocarbon dependence. Third, it develops policy recommendations to assist the nation in breaking this lock-in and aligning with international decarbonization pathways.

The investigation implements an exploratory, qualitative methodology that is supplemented by descriptive quantitative data. International databases (World Bank, OPEC, IRENA), official Algerian policy documents, and peer-reviewed literature comprise the sources. The article utilizes comparative and descriptive methods to emphasize structural constraints and place Algeria within broader theoretical debates on the energy transition and the political economy of rentier states, as econometric modeling is not feasible due to the limited availability of consistent longitudinal data.

pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Réchauffement planétaire de 1,5 °C —

The article is organized in the following manner. Section 2 provides both a discussion of the conceptual framework and a literature evaluation. Section 3 has a full explanation of the method. The fourth section examines the Algerian context, with a particular emphasis on the ways in which hydrocarbon dependency and renewable strategies are significant. Section 5 focuses on the institutional, economic, social, and technological variables that influence renewable investment decisions. Section 6 provides a comparative analysis of Algeria's experience. The seventh portion presents recommendations for public policy, and the eighth section concludes with theoretical and practical contributions, limitations, and directions for further research.

2. Conceptual Framework

2.1 Energy Transition and Institutions

The energy transition, defined as the gradual movement from a fossil fuel-centric economy to one based on renewable energy and efficiency, is significantly influenced by the quality and efficacy of institutions (United Nations Development Programme, 2025)². Institutions, as defined by North (1990)³, denote the official and informal "rules of the game" that govern political, economic, and social relationships.

Their stability and credibility diminish uncertainty, encourage investment, and create conditions conducive to long-term strategic planning. In the energy sector, this indicates that regulatory clarity, stable policy frameworks, and transparent governance are essential for motivating commercial entities to invest in renewable energy projects (Sovacool, 2016)⁴.

Institutional theory posits that well-crafted policies are essential yet inadequate until integrated within a robust governance framework. Acemoglu and Robinson (2012)⁵ emphasize the differentiation between inclusive institutions, which foster innovation, diversity, and widespread involvement, and extractive institutions, which centralize authority and sustain reliance on resource rents.

In the realm of energy transitions, inclusive institutions promote cooperation among governmental bodies, commercial enterprises, and civil society, whereas extractive institutions typically concentrate authority and deter external investment.

² United Nations Development Programme. (2025, 3 février). What is the sustainable energy transition and why is it key to tackling climate change? Climate Promise. <https://climatepromise.undp.org/news-and-stories/what-sustainable-energy-transition-and-why-it-key-tackling-climate-change>.

³ North, D. C. (1990). institutions, changements institutionnels et performance économique. Presses de l'Université de Cambridge. 8. [Institutions Institutional Change and Economic Performance.pdf](#)

⁴ Sovacool, B. K. (2016). How long will it take? Conceptualizing the temporal dynamics of energy transitions. *Energy Research & Social Science*, 13, 202–215.

⁵ Acemoglu, D., & Robinson, J. A. (2013). Why nations fail: The origins of power, prosperity, and poverty. [WHY NATIONS FAIL: THE ORIGINS OF POWER, PROSPERITY AND POVERTY - ACEMOGLU, DARON, ROBINSON, JAMES A. - IMPORT ANGLAIS - - Librairie des Sciences-Politiques Paris](#)

Empirical study demonstrates that frequent legislative alterations, bureaucratic obstacles, and insufficient enforcement capacities dissuade international investors and amplify the perceived risks related to the deployment of renewable energy (Lockwood et al., 2017)⁶.

Algeria has implemented institutional reforms in the energy sector on numerous occasions, including the implementation of incentive programs like feed-in tariffs and tax exemptions (Haddoum, 2018)⁷. Nevertheless, the absence of long-term regulatory stability and the inconsistent application of these regulations have resulted in uncertainty for potential investors. Consequently, institutional instability has evolved as one of the most significant impediments to the development of renewable energy.

2.2 Resource Dependence and the “Resource Curse”

The "resource curse" argument is one of the most heavily contested models for understanding resource-based countries' slow diversification. Auty (1993)⁸ was among the first to argue that resource plenty can actually stymie long-term development by encouraging over-reliance on a particular industry. Building on this, Sachs and Warner (1995)⁹ presented strong empirical evidence that resource-rich countries tend to have lower long-term growth rates than resource-poor counterparts, owing mostly to commodity price volatility, rent-seeking behavior, and institutional fragility.

Hydrocarbons continue to be the foundation of Algeria's economy. According to the World Bank (2023)¹⁰, oil rents accounted for 14.5% of GDP in 2021, with total natural resource rents, including oil and gas, accounting for 22.6% of GDP¹¹. Exports are considerably more concentrated, with hydrocarbons accounting for more than 90% of overall merchandise exports during the past decade. Algeria's level of fiscal and external dependency categorizes it as a rentier state, making it prone to the processes described in the resource curse literature (Martinez, 2010)¹².

The fiscal consequences of this dependence are twofold. During periods of high oil prices, such as 2008 and 2011-2013, when Brent crude averaged more than USD 100 per barrel, Algeria achieved budgetary surpluses and large foreign reserve buildup. Under such conditions, there

⁶ Matthew Lockwood, Catherine Mitchell, Richard Hoggett, Caroline Kuzemko, The governance of industry rules and energy system innovation: The case of codes in Great Britain, Utilities Policy, Volume 47, 2017, Pages 41-49, <https://www.sciencedirect.com/science/article/pii/S0957178716301266>

⁷ Haddoum, S. (2018). Algerian energy policy: Perspectives, barriers, and missed opportunities. PMC. <https://pmc.ncbi.nlm.nih.gov/articles/PMC6607439/>

⁸ Auty, R. (1993). Sustaining development in mineral economies: The resource curse thesis (1^e éd.). Routledge. <https://doi.org/10.4324/9780203422595>

⁹ Sachs, J. D., & Warner, A. M. (1995). Natural resource abundance and economic growth (NBER Working Paper No. 5398). National Bureau of Economic Research. [faa380.tmp](https://www.nber.org/papers/w5398)

¹⁰ Data available from the World Bank, retrieved from <https://data.worldbank.org/indicator/NY.GDP.PETR.RT.ZS>

¹¹ Data available from the World Bank, retrieved from [Rentes totales sur les ressources naturelles \(% du PIB\) | Données](https://data.worldbank.org/indicator/NY.GDP.PETR.RT.ZS)

¹² Martinez, L. (2010, septembre). Algeria: The illusion of oil wealth (Les Études du CERI, n° 168 bis). CERI-Sciences Po. https://www.sciencespo.fr/ceri/sites/sciencespo.fr/ceri/files/Etude168_english.pdf

were little incentives to expand renewable energy investments, as petroleum revenues provided a substantial buffer for public spending. In contrast, during oil price declines—most notably in 2014-2016, when average Brent prices fell below USD 45 per barrel—the government experienced serious budgetary challenges (Lopez-Calix & Touqeer, 2016)¹³. Renewable energy programs were among the first to be cut or postponed as government budgets tightened. This cyclical dependence results in what Ross (2012)¹⁴ calls to as the "**rentier effect**": hydrocarbon riches enables governments to retain short-term budgetary stability and political legitimacy while avoiding structural reforms, such as those required to transition the energy mix. The Algerian instance highlights this lock-in process, in which the timing and breadth of renewable energy investments are heavily influenced by variations in international oil prices rather than a coherent long-term plan.

Quantitative proof of this lock-in is seen in investing patterns. Despite repeated announcements of ambitious renewable energy plans, Algeria's installed solar photovoltaic capacity increased only from 66 MW in 2010 to 435 MW in 2022 (IRENA, 2023)¹⁵, a tiny increase given the volatility of oil earnings during the same period. This mismatch between hydrocarbon rents and renewable deployment emphasizes the structural limits imposed by resource reliance, providing strong support for the resource curse concept.

To further illustrate the asymmetry between hydrocarbon rents and renewable deployment, Table 1 summarizes key values, while Figure 1 visualizes the relationship between oil price volatility and renewable energy capacity over the period 2000–2023

Table 1. Brent Oil Price and Installed Renewable Energy Capacity in Algeria, 2000–2023

Year	Brent Oil Price (USD/barrel)	Renewable Capacity (MW)
2000	28	0
2005	54	0
2010	79	66
2012	112	150
2014	99	270
2016	44	300
2018	71	370
2020	41	420
2022	70	435
2023	82	440

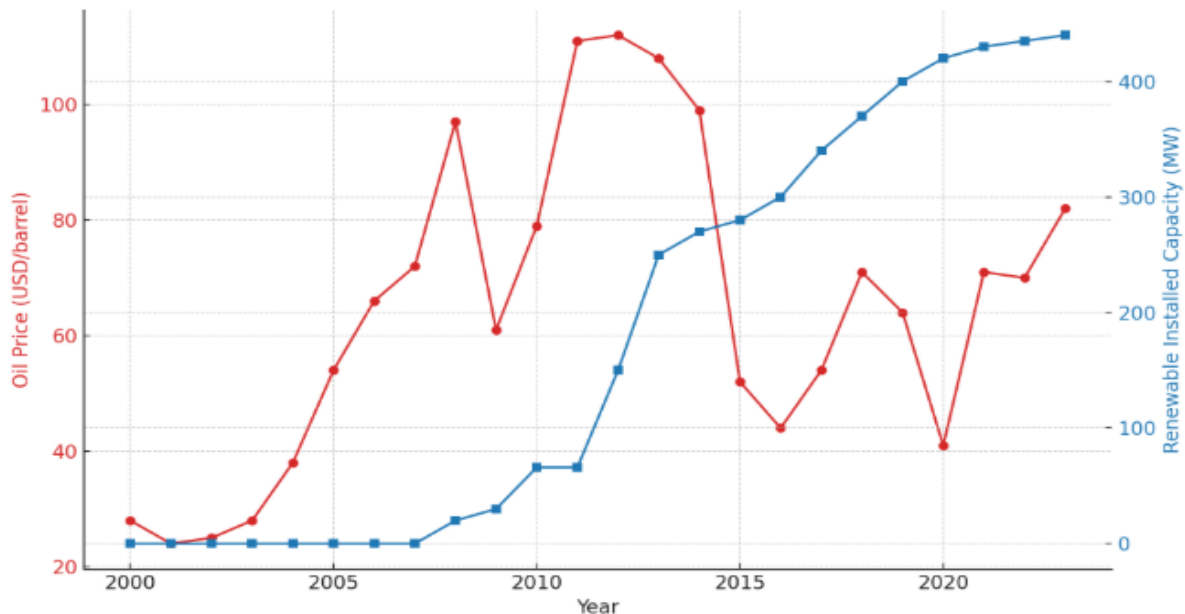
¹³ Lopez-Calix, J. R., & Touqeer, I. (2016). Algeria: Comparing the last two oil shocks and policy responses. *Topics in Middle Eastern and African Economies*, 26-Algeria Comparing the Last Two Oil Shocks and Policy Responses.pdf

¹⁴ Ross, Michael L., 'The Politics of the Resource Curse: A Review', in Carol Lancaster, and Nicolas van de Walle (eds), *The Oxford Handbook of the Politics of Development*, Oxford Handbooks (2018; online edn, Oxford Academic, 10 Sept. 2015), <https://doi.org/10.1093/oxfordhb/9780199845156.013.42>

¹⁵ International Renewable Energy Agency. (2023). Planning and prospects for renewable power: North Africa. Abu Dhabi: IRENA. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2023/Jan/IRENA_Planning_Prospects_NAfrica_2023.pdf

Sources: World Bank (2023), OPEC Annual Statistical Bulletin (2023), IRENA Renewable Energy Statistics (2023). Data compiled by the authors.

Figure 1. Oil Price Volatility and Renewable Energy Capacity in Algeria (2000–2023)



hydrocarbon windfalls, while price collapses restricted the fiscal space available for renewable projects. The classic "resource curse" is reflected in this dual mechanism: resource rents generate complacency during booms and austerity during busts, leaving little space for consistent investment in renewable energy. Consequently, Algeria's trajectory serves as an illustration of how rent dependence impedes long-term structural transformation, despite the repeated policy commitments to renewable expansion.

Algeria's relative underperformance is further emphasized by a regional comparison. Egypt, a resource-dependent economy that shares structural similarities, has nevertheless made far more substantial progress in the deployment of renewable energy. One of the greatest solar installations in the world, the Benban Solar Park, which was completed in 2019, added 1.65 GW of solar capacity in a single project ((United Nations Framework Convention on Climate Change, 2021)¹⁶. Egypt's cumulative renewable capacity exceeded 6 GW by 2022, while Algeria's capacity was only 0.44 GW (IRENA, 2023)¹⁷. In contrast to Algeria, Egypt has implemented public-private partnerships and international financing to expedite the deployment of renewable energy and address fiscal constraints (Egyptian Environmental Affairs Agency, 2022)¹⁸. This discrepancy implies that the degree to which rentier states can circumvent the

¹⁶ United Nations Framework Convention on Climate Change. (2021). Solar projections. UNFCCC.

<https://unfccc.int/news/solar-projections>

¹⁷ International Renewable Energy Agency. (2022). Renewable capacity statistics 2022. IRENA.

https://www.spr.pe/wp-content/uploads/2022/04/IRENA_RE_Capacity_Statistics_2022.pdf

¹⁸ Egyptian Environmental Affairs Agency (EEAA). (2022). Egypt National Climate Change Strategy (NCCS) 2050. <https://www.eeaa.gov.eg/Uploads/Topics/Files/20221206130720583.pdf>

structural pitfalls of the resource curse is contingent upon institutional frameworks and policy decisions, rather than resource endowment alone.

2.3 Social Acceptance and Public Perceptions

Social factors are increasingly acknowledged as critical determinants of energy transitions, in addition to institutional and economic dimensions. "Social acceptance" is a multidimensional phenomenon that encompasses community, market, and socio-political acceptance, as conceptualized by Wüstenhagen, Wolsink, and Bürer (2007)¹⁹. This framework emphasizes that the success of renewable energy initiatives is contingent upon the attitudes of citizens, communities, and broader societal stakeholders, in addition to economic viability and regulatory incentives.

Sovacool and Ratan's (2012)²⁰ and Susana Batel's (2020)²¹ studies build on this idea by showing that cultural stories, access to knowledge, and strongly held social values all affect how people accept things. People typically oppose renewable energy projects because they disagree about how the land should be used, they are worried about damage to the environment, they don't like the way the projects look, or they don't trust the organizations who are in charge of putting them into action. These obstacles have been thoroughly recorded in both developed and developing settings, underscoring the necessity for intentional and inclusive engagement techniques in the implementation of renewable energy.

In Algeria, social acceptance presents distinct challenges. Public awareness of environmental and climate issues remains relatively limited, and energy is often perceived primarily through the lens of affordability and supply security rather than sustainability.

Civil society's involvement in the energy sector is still weak. Some non-governmental organizations (NGOs) and universities have pushed for more use of solar energy, but their impact on public opinion and policy-making is still small compared to the powerful petroleum lobby. Because there aren't any organized information campaigns or ways for people to get involved, renewable energy regulations are frequently made by the government and don't engage many people at the local level. Because of this, projects have trouble getting money and technology, as well as getting people to trust them.

The Algerian situation exemplifies the essential function of social acceptance in energy transitions. Even well-thought-out policies may not work if they don't have a lot of public support and people are involved in making decisions. To get over the societal barriers that are currently holding back Algeria's renewable energy path, it will be important to raise awareness, trust, and involvement among the people of Algeria.

¹⁹ Wüstenhagen, R., Wolsink, M., & Bürer, M. J. (2007). Social acceptance of renewable energy innovation: An introduction to the concept. *Energy Policy*, <https://doi.org/10.1016/j.enpol.2006.12.001>

²⁰ Sovacool, Benjamin K. & Lakshmi Ratan, Pushkala, 2012. "Conceptualizing the acceptance of wind and solar electricity," *Renewable and Sustainable Energy Reviews*, Elsevier, vol. 16(7), pages 5268-5279. [Conceptualizing the acceptance of wind and solar electricity](#)

²¹ Susana Batel, Research on the social acceptance of renewable energy technologies: Past, present and future, *Energy Research & Social Science*, Volume 68, 2020, [Research on the social acceptance of renewable energy technologies_Past, present and future](#)

Table 2 uses the three elements of social acceptance to make the framework suggested by Wüstenhagen, Wolsink, and Bürer (2007) function in Algeria. It points out the most important people, possible drivers, and obstacles that are unique to Algeria's path to renewable energy.

Table 02. Dimensions of Social Acceptance of Renewable Energy in Algeria (adapted from Wüstenhagen, Wolsink, & Bürer, 2007²²)

<i>Dimension</i>	<i>Main Actors Involved</i>	<i>Drivers in Algeria</i>	<i>Barriers in Algeria</i>
Community Acceptance	Local residents, municipalities	Potential for job creation in solar projects (e.g: southern regions); electrification of remote areas	Land-use conflicts in desert areas; limited community involvement in project planning
Socio-Political Acceptance	Government, NGOs, civil society	Political discourse on diversification; emerging environmental NGOs	Low trust in state institutions; weak public consultation; limited awareness campaigns
Market Acceptance	Consumers, investors, utilities	Abundant solar potential; state subsidies for pilot projects	Heavy fossil fuel subsidies reduce competitiveness of renewables; low investor confidence; dependence on imports

Source: Adapted from Wüstenhagen, Wolsink, & Bürer (2007); contextualized with Algerian data (World Bank, IRENA, Afrobarometer) by the authors.

The table shows that Algeria has strong reasons for social acceptance, like the possibility of creating jobs through solar projects and bringing electricity to remote places. However, structural constraints are still the biggest problem. Weak local participation and worries about land usage make it harder for the community to accept the project. Limited trust in state institutions and a lack of transparency make it harder for socio-political acceptance. Fossil fuel subsidies that are hard to get rid of and investors who are unsure about the project make it harder for the market to embrace it. These results confirm that social acceptance, together with institutional and economic issues, constitutes a significant impediment in Algeria's energy transition.

²² Wüstenhagen, R., Wolsink, M., & Bürer, M.J. (2007). "Social acceptance of renewable energy innovation: An introduction to the concept." *Energy Policy*, 35(5), 2683-2691. [Social acceptance of renewable energy innovation: An introduction to the concept - ScienceDirect](#)

2.4 Technological Capabilities and Innovation Readiness

To spread renewable energy, there also need to be enough technological and industrial skills. Freeman and Soete (1997)²³ emphasize that sustained economic progress depends on the accumulation of technological knowledge and the absorptive potential of national innovation systems. For renewable energy, this comprises both infrastructure (like grids and factories) and people (such engineers, technicians, and research institutes).

Geels (2002)²⁴, with his multi-level view of socio-technical transitions, says that technology changes are part of bigger systems that include businesses, governments, and people in society. For diffusion to work, it needs systemic alignment instead of just one-off actions. In the case of Algeria, this perspective highlights the strong reliance on imported technologies and the lack of specialized training programs, which illustrates limited readiness for innovation and hinders the advancement of renewable energies. Un tel contexte montre des problèmes d'alignement systémique, ce qui rend la transition énergétique plus difficile..

2.5 Research Gap and Contribution

While there is a lot of international research on energy transitions, there isn't much research on Algeria. Current research frequently focuses on either macroeconomic resource dependence or energy policy formulation; however, there is a scarcity of studies that incorporate institutional, economic, social, and technological components into a cohesive analytical framework. Furthermore, comparison analyses with other nations are infrequently utilized to contextualize Algeria's trajectory.

This research addresses this deficiency by introducing a multidimensional framework that encapsulates the interaction of these determinants and by employing it in the context of Algeria through descriptive evidence. The objectives are twofold: (i) to enhance the literature concerning resource-dependent nations encountering energy transition difficulties, and (ii) to offer pragmatic suggestions for policymakers aiming to promote renewable energy investment.

2.6 Conceptual Framework

Based on the literature that was evaluated, the prior conceptual framework posits that investment in renewable energy is contingent upon the interplay of four categories of determinants:

1. **Institutional factors** – regulatory stability, governance, and enforcement capacity.
2. **Economic factors** – oil price dynamics, GDP growth, and financial availability.
3. **Social factors** – public awareness, community acceptance, and civic engagement.
4. **Technological factors** – infrastructure, industrial capabilities, and skilled workforce.

These determinants are interrelated rather than independent. For example, institutional uncertainty makes the consequences of oil rent volatility more, and limited societal acceptance

²³ Freeman, C., & Soete, L. (1997). The economics of industrial innovation (3^e éd.). Routledge. Economie de l'innovation industrielle | Chris Freeman, Luc Soete | Taylor

²⁴ Frank W. Geels, Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study, Research Policy, Les transitions technologiques en tant que processus de reconfiguration évolutive : une perspective à plusieurs niveaux et une étude de cas - ScienceDirect

may make it harder to use new technology. This comprehensive viewpoint offers the analytical framework for assessing Algeria's renewable energy investment environment.

3. Methodology

3.1 Research Approach

This research employs an exploratory qualitative methodology, supplemented by descriptive quantitative data. The justification for this selection is twofold: firstly, to elucidate the multifaceted determinants of renewable energy investment in Algeria, encompassing institutional, economic, social, and technological factors; and secondly, to address the deficiency of dependable longitudinal data necessary for econometric modeling. Eisenhardt (1989)²⁵ posits that exploratory designs are especially appropriate in circumstances where theoretical advancement and empirical evidence are still in the nascent stages.

3.2 Data Sources

The empirical basis of this research is grounded in a methodical aggregation of secondary data from several credible sources to guarantee trustworthiness and triangulation. There are four primary groups of sources:

A. Policy and Institutional Document:

- ✓ The Algerian government passed laws, made decisions, and made plans between 2010 and 2023. Some of them are the Renewable Energy and Energy Efficiency Program (2011), the Renewable Energy Development Plan (2015), and the National Energy Transition Strategy 2020–2035.
- ✓ Reports from the Ministry of Energy and Mines and the Ministry of Energy Transition and Renewable Energies give formal information about policy directions and problems with putting them into action.

B. Macroeconomic and Energy Statistics :

- ✓ The World Bank's World Development Indicators (WDI) give information about hydrocarbon rents as a percentage of GDP, total resource rents, GDP growth rates, and energy use per person.
- ✓ The OPEC Annual Statistical Bulletin (2023) has historical data on Brent crude oil prices, production levels, and export quantities.
- ✓ The International Renewable Energy Agency (IRENA) Renewable Energy Statistics (2023) show how much renewable energy is installed, how it is generated, and how it is used in different technologies.

C. Scholarly and Comparative Literature :

- ✓ Peer-reviewed articles and books that look at the resource curse, institutional governance, social acceptance, and technology preparedness.

²⁵ Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, 14(4), 532–550. <https://doi.org/10.2307/258557>

4. The Algerian Context

4.1 Hydrocarbon Dependence

Algeria has one of the most hydrocarbon-dependent economies in the world. Since the 1970s, oil and gas have been the main drivers of the country's macroeconomic structure, affecting trade, fiscal balances, and development paths. According to World Bank (2023)²⁶, hydrocarbons made up more than 90% of merchandise exports and about 20–25% of GDP over the past 20 years. In 2021, oil rents made up 14.5% of GDP, while overall natural resource rents made up 22.6%²⁷. This dependence puts Algeria in the group of rentier economies, where the stability of the economy and the outside world are strongly linked to commodities markets²⁸.

Table 3. Hydrocarbon Dependence in Algeria (2000–2023)

<i>Year</i>	Hydrocarbon Exports (% of total)	Hydrocarbon Rents (% of GDP)	Total Natural Resource Rents (% of GDP)
2000	96.7	28.5	34.8
2005	97.3	31.2	37.5
2010	97.0	26.2	28.9
2012	98.0	29.8	33.6
2014	98.1	31.4	35.6
2016	95.5	15.7	18.1
2018	94.8	19.9	23.2
2020	95.1	10.5	14.7
2021	94.2	14.5	22.6
2022	93.9	17.8	25.3
2023	93.5	16.1	23.4

Source: Data collected and compiled by the authors from World Bank (2023), World Development Indicators; OPEC (2023), Annual Statistical Bulletin.

Table 4. Oil Price Volatility and Algeria's Fiscal Position (2000–2023)

<i>Year</i>	Brent Crude (USD/barrel)	Fiscal Balance (% GDP)	Foreign Reserves (USD billion)
2000	28	+8.5	12
2005	54	+12.0	56
2008	97	+9.1	143

²⁶ World Bank. (2023). Algeria economic update: Continuing the diversification effort (Fall 2023). Washington, DC: International Bank for Reconstruction and Development / The World Bank.

<https://openknowledge.worldbank.org/server/api/core/bitstreams/41f17be1-0198-4e59-b4ba-51b9ed923033/content>

²⁷ World Bank. Contribution of natural resources to gross domestic product (Table 3.14). In World Development Indicators. <https://wdi.worldbank.org/table/3.14>

²⁸ Mañé-Estrada, A., & Albinyana, R. (2023). Revisiting rentierism through the lens of Algerian gas. *Revue internationale des études du développement*, 251, 35-62. <https://doi.org/10.4000/ried.8149>

2010	79	+6.2	162
2012	111	+5.4	191
2014	99	−0.9	194
2016	44	−15.2	114
2018	71	−9.6	79
2020	41	−9.4	47
2021	70	−6.1	54
2022	100	−4.5	61
2023	82	−5.0	62

Source: Data collected and compiled by the authors from OPEC (2023), Annual Statistical Bulletin; Bank of Algeria (various years); IMF (2017, 2022)²⁹.

Table 5. Renewable Energy Targets vs. Achievements in Algeria (2011–2023)

Year	Policy Target (MW)	Actual Installed Capacity (MW)	Share in Electricity Mix (%)
2011	1,200	66	<0.5
2012	2,000	120	0.6
2013	2,500	180	0.8
2014	3,500	270	1.0
2015	4,500	270	1.0
2016	5,500	300	1.1
2017	6,000	340	1.3
2018	6,500	370	1.4
2019	6,800	400	1.5
2020	7,000	420	1.5
2021	8,000	425	1.7
2022	9,000	435	1.8
2023	10,000	440	2.0

Source: Data collected and compiled by the authors from Ministry of Energy and Mines (2015); IRENA (2023), Renewable Energy Statistics.

Tables 3, 4., and 5 show the structural paradox of Algeria's energy and economic path when looked at collectively. Table 3 shows that the country is still dependent on hydrocarbons, with oil and gas making up more than 90% of exports and resource rents always making up a large part of GDP. Table 4 shows how this dependence makes the economy more vulnerable: while oil prices are high, the government can make temporary surpluses and build up foreign reserves, but when prices go down, the government's budget quickly goes into the red and it has to cut

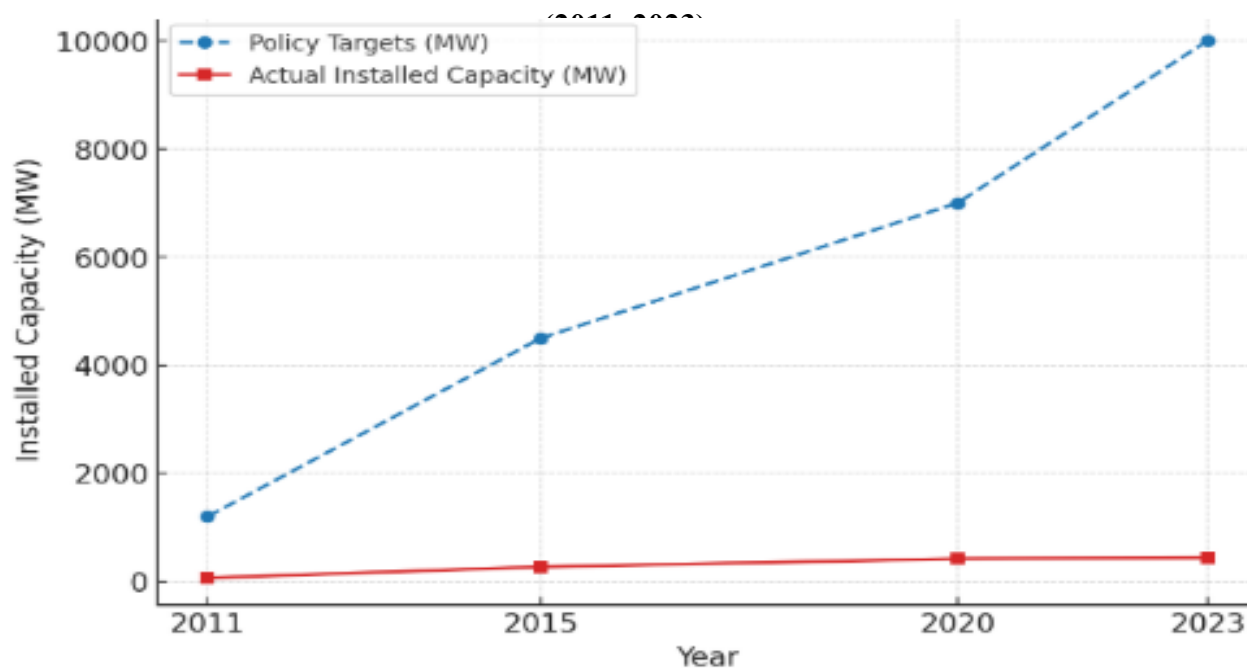
²⁹ IMF (2017, 2022) refers to the Article IV Consultation reports of the International Monetary Fund (IMF) on Algeria. Published annually or biennially, these reports provide an in-depth assessment of the country's macroeconomic and fiscal situation, growth prospects, key risks (including hydrocarbon dependence, budget deficits, and foreign reserves), and policy recommendations.

spending. Lastly, Table 5 shows the gap in renewable energy policy implementation. While each new program has set high-capacity goals, actual deployment has stayed at around 440 MW by 2023, which is less than 2% of the electricity mix. These findings collectively illustrate that Algeria's rentier-state dynamics engender a structural lock-in: hydrocarbon revenues ensure short-term fiscal stability while systematically postponing investment in diversification, resulting in renewable energy development being marginal in relation to the country's resource potential and articulated policy objectives. This background sets the stage for the next section, which will look at the institutional, economic, social, and technological factors that affect the situation.

In short, the three tables show the main contradiction of Algeria's energy transformation. Hydrocarbons still make up most of exports and GDP, which makes the economy very unstable because oil prices change so often. At the same time, renewable energy initiatives have only had small successes, with installed capacity staying at 440 MW in 2023, even though they had big goals. The difference between resource dependency, fiscal vulnerability, and limited renewable deployment shows that Algeria is stuck in a rentier condition that makes it hard for the country to make a real energy transformation.

The persistent discrepancy between Algeria's renewable energy policy objectives and its actual accomplishments can be further elucidated by contrasting the installed capacity with the announced targets. The evolution of renewable energy objectives in relation to actual deployment between 2011 and 2023 is illustrated in Figure 2.

Figure 2: Renewable Energy in Algeria: Policy Targets vs. Actual Installed Capacity



remained at approximately 440 MW, which is less than 5 percent of the announced objective. This discrepancy is the result of a combination of factors, including regulatory instability and the repeated postponement of tendering processes, fiscal constraints associated with the 2014–2016 oil price collapse, restricted local industrial capacity, and the prevalence of hydrocarbon

subsidies, which erode the competitiveness of renewable projects. The structural barriers of Algeria's rentier economy are underscored by this persistent implementation gap, which systematically constrains policy ambition due to institutional, economic, and technological constraints.

5. Analysis of Determinants

This section investigates the four primary categories of determinants that are influencing Algeria's transition to renewable energy: institutional, economic, social, and technological. In accordance with the analytical framework established in Section 2, each subsection employs qualitative evidence and descriptive data to emphasize drivers and obstacles.

5.1 Institutional Determinants

Algeria's institutional framework for renewables has been characterized by regulatory instability and long delays in implementation. Each of the 2011 program, the 2015 reforms, and the 2020 strategy introduced new targets; however, investors were left uncertain by the frequent revisions.

Table 6. Renewable Tenders Issued vs. Awarded (2015–2023)

Year	Tenders Issued (MW)	Tenders Awarded (MW)	Completion Rate (%)
2015	400	120	30
2016	0	0	—
2017	4,000	0	0
2018	200	100	50
2019	150	70	47
2020	100	0	0
2021	200	50	25
2022	1,000	200	20
2023	2,000	250	12.5

Source: Data collected and compiled by the authors from Ministry of Energy and Mines reports (2015–2023)

The tenders' inadequate performance is indicative of not only administrative inefficiencies but also broader institutional instability. The development of a coherent long-term strategy has been impeded by the uncertainty that has been generated for investors as a result of the successive relaunches and shifting targets that have characterized Algeria's renewable energy policy. The primary policy announcements since 2011 and their limited outcomes are summarized in Table 6, which demonstrates this volatility.

Table 7. Timeline of Major Renewable Energy Policy Announcements in Algeria

Year	Policy Initiative	Main Objectives	Outcomes

2011	Renewable Energy & Energy Efficiency Program	Install 22,000 MW by 2030 , dominated by solar PV; diversify energy mix	Initial projects launched (≈ 66 MW solar by 2011); implementation delays
2015	Revised Renewable Energy Plan	Adjust target to 15,000 MW by 2035 ; introduce new incentives and tendering schemes	Limited tenders (≈ 270 MW by 2015); regulatory instability discouraged investors
2020	National Energy Transition Strategy (2020–2035)	Reaffirm diversification; strengthen solar PV, wind, and efficiency measures; prioritize industrial integration	Target still 15,000 MW by 2035 , but actual capacity remained ≈ 440 MW by 2023 ($< 2\%$ of mix)

Source: Data collected and compiled by the authors from Ministry of Energy and Mines (2015); Ministry of Energy Transition and Renewable Energies (2020); IRENA (2023).

Interpretation

The structural implementation deficit in Algeria's renewable energy sector is underscored by the combined evidence from **Tables 6** and **7**. While the energy mix was diversified through successive programs (2011, 2015, 2020), there was a strong political intention to do so. Conversely, the inadequate conversion of announced tenders into completed projects is indicative of persistent institutional inefficiencies, bureaucratic delays, and frequent regulatory changes. Many projects were stalled at the planning stage, and less than 25% of the tendered capacity was effectively awarded between 2015 and 2023. In Algeria, the volatility of regulatory frameworks and the absence of transparent enforcement mechanisms have discouraged both domestic and international investors, as North (1990)³⁰ argues. Credible and predictable institutions are necessary to promote long-term investment. Algeria's renewable capacity in 2023 was below 500 MW, which is a significant departure from the ambitious targets that were established over a decade ago, in part due to this institutional fragility.

5.2 Economic Determinants

The country's enduring dependence on hydrocarbons is inextricably linked to the economic dimension of Algeria's renewable energy transition. A paradoxical effect is produced by petroleum rents, which have been the sustenance of Algeria's fiscal and macroeconomic stability for a long time. The state experiences substantial fiscal revenues during periods of elevated international oil prices; however, these windfalls serve to diminish the necessity of diversifying the energy mix. In contrast, the fiscal space necessary to finance large-scale renewable investments experiences a significant contraction during oil price downturns, when diversification would be most imperative. The central arguments of the resource curse

³⁰ North, D. C. (1990). Institutions, institutional change and economic performance. Cambridge University Press. <https://doi.org/10.1017/CBO9780511808678>

hypothesis are consistent with the cyclical relationship, which exemplifies a structural lock-in (Auty, 1993; Sachs & Warner, 1995).

5.2.1. Oil Prices and Renewable Capacity

Algeria's renewable energy trajectory continues to be significantly influenced by the volatility of global crude prices. These windfalls frequently diminish the urgency of investing in alternatives, despite the fact that periods of elevated prices generate abundant fiscal revenues. In contrast, the fiscal space required to maintain renewable programs is significantly reduced when prices decrease. Figure 1 in Section 2 emphasizes this paradox: renewable capacity has expanded only marginally, despite the fact that Brent crude prices have experienced dramatic swings since 2000. This indicates a structural dependence of renewable investment on the cyclical nature of hydrocarbon rents rather than on coherent long-term planning. Although there have been numerous declarations of ambitious renewable energy strategies, the installed renewable capacity has only expanded marginally, from a baseline of 0 MW in 2000 to 440 MW in 2023. During the same time frame, oil prices experienced significant fluctuations, with maxima exceeding USD 100/barrel in both 2012 and 2022, compared to USD 28/barrel in 2000 (Deboutte, 2024)³¹. Algeria's renewable investments are not anchored in a long-term development strategy, as evidenced by the feeble correlation between hydrocarbon rent cycles and renewable deployment. Rather, they are dependent on fluctuating fiscal resources that are derived from hydrocarbons.

5.2.2. GDP Growth and Energy Consumption

This entrenched dependency is further emphasized by Algeria's macroeconomic trajectory. The economy's susceptibility to external disruptions has been further exacerbated by the consistent correlation between GDP growth and hydrocarbon revenue fluctuations. Simultaneously, domestic energy consumption has maintained a consistent upward trajectory, which is indicative of not only demographic and developmental pressures but also a more profound structural dependence on fossil fuels. This dual dynamic is illustrated in Table 8, which compares per capita energy consumption with GDP growth from 2000 to 2023.

Table 8. GDP Growth vs. Energy Consumption in Algeria (2000–2023)

Year	GDP Growth (%)	Energy Use (kg oil equivalent per capita)
2000	2.4	1,090
2005	5.1	1,340
2010	3.6	1,560
2012	3.3	1,640
2014	3.8	1,700
2016	3.2	1,580
2018	1.4	1,620
2020	–5.0	1,420
2021	3.5	1,460

³¹ Deboutte, G. (2024, 10 septembre). Algeria's PV capacity tops 436.8 MW. pv magazine International. <https://www.pv-magazine.com/2024/09/10/algerias-pv-capacity-tops-436-8-mw/>

2022	4.1	1,500
2023	2.7	1,530

Source: Compiled by the authors from World Bank (2000 - 2023).

The energy system of Algeria is under increasing pressure due to the fact that energy consumption per capita has increased by more than 40% since 2000. At the same time, the growth of GDP has continued to be highly susceptible to fluctuations in crude prices. This structural double bound is the result of this dual dynamic: the state's capacity to finance renewable infrastructure is undermined by revenue volatility, while the volume of hydrocarbons available for export is reduced as a result of increasing domestic energy demand. Consequently, foreign currency revenues are restricted.

5.3 Social Determinants

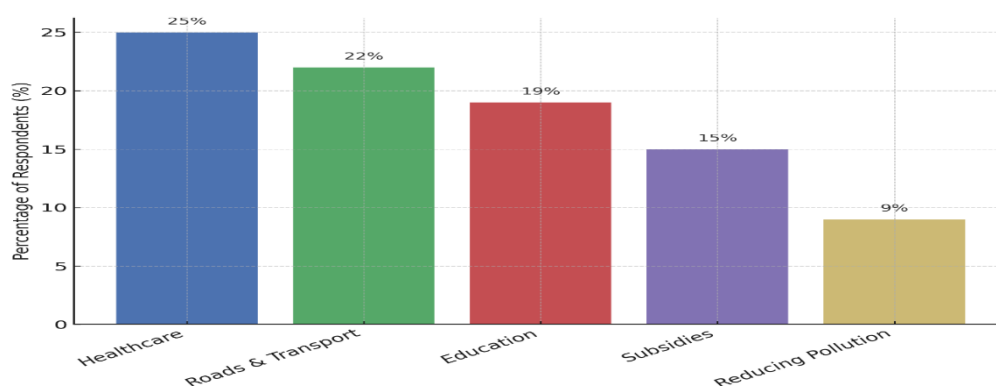
In addition to institutional and economic obstacles, the progression of renewable energy transitions is profoundly influenced by societal acceptance and public views. In Algeria, this social aspect is still not very developed, but it is still quite important because subsidies have a big influence in molding people's expectations, short-term socio-economic issues are more important, and civil society doesn't have much say in determining policy.

5.3.1. Public Perceptions of Energy Priorities

Algerian citizens prioritize socio-economic concerns over environmental objectives, according to survey evidence. The economic situation (25%) and corruption (30%) were the most pressing national problems identified by respondents in the Arab Barometer (2022)³². Climate change was essentially absent from the list of top concerns.

As seen in Figure 3, when asked about government expenditure priorities, Algerians preferred healthcare (25%), roads and transportation (22%), education (19%), and subsidies (15%), with only 9% indicating pollution control and nearly none mentioning climate change.

Figure 3. Public Perceptions of Government Spending Priorities in Algeria (2022)



Source: Arab Barometer, Wave VII (2022); data compiled by the authors.

This preference distribution demonstrates the fundamental challenge of gaining widespread public support for renewable energy initiatives. In a situation where fossil fuel subsidies

³² Arab Barometer. (2022). Algeria report: Arab Barometer VII. [ABVII Algeria Report-EN.pdf](#)

reinforce expectations of cheap energy and immediate socioeconomic needs take precedence, environmental and climatic concerns are politically ignored.

5.3.2. Civil Society and Awareness Indicators

The fragility of Algeria's social base for energy transformation is reflected in proxy metrics of civic participation. As indicated in Table 9, the number of environmental NGOs and university programs in renewable energy has gradually increased since 2010. Nonetheless, the scale is modest when compared to regional neighbors like Egypt and Tunisia, where civil organizations and academic programs play a larger role in shaping national energy debates. This trend can be represented by the evolution of registered environmental NGOs and specialized university programs in renewable energy, as detailed in Table 9.

Table 9. Proxy Indicators of Social Engagement with Renewables in Algeria

<i>Year</i>	Registered Environmental NGOs	University Programs in Renewable Energy
2010	35	2
2015	60	5
2020	85	8
2023	110	10

Source: Ministry of Interior (2023); Ministry of Higher Education and Scientific Research (2023); data compiled by the authors.

Although improvements may be seen, the insufficient integration of civil society into energy policies, along with low public awareness, prevents the formation of a strong societal coalition capable of forcing the state to accelerate renewable investments. The Algerian situation validates the findings of Wüstenhagen et al. (2007) and Sovacool (2016): energy transformations cannot be sustained solely as technocratic exercises devoid of societal legitimacy. In Algeria, little civil society engagement, limited academic involvement, and public objectives focused on immediate socioeconomic demands impede the political viability of ambitious renewable policies. Without a larger social coalition for change, the renewable energy transition risks staying vulnerable to policy reversals and external shocks, rather than being rooted in long-term societal agreement.

Algeria's ability to successfully shift to renewable energy is heavily reliant on the availability of educated engineers and technicians. While national statistics do not break down graduates by energy expertise, international sources offer useful proxies. According to the Global Innovation Index (WIPO, 2022)³³.

5.4 Technological Determinant

Algeria's energy transformation is hampered by technological and logistical limitations. The heavy reliance on imported equipment—more than 80%³⁴ of solar and wind components—raises costs, makes the industry vulnerable to global supply shocks, and inhibits local value

³³ World Intellectual Property Organization. (2022). Algeria: WIPO country profile (WIPO publication). [dz.pdf](#)

³⁴ Algeria Invest. (2024, 5 septembre). Industrie : la capacité de production de la filière photovoltaïque a augmenté de 35 % en 2023. [Industrie: la capacité de production de la filière... | Algeria Invest](#)

generation. Domestic assembly attempts have been minimal and fragmented, in contrast to regional counterparts like Egypt, which has implemented stricter local content policies.

On the human capital front, the number of engineers and technicians in energy disciplines has increased, but training remains out of sync with renewable sector requirements. In response, Algeria established specialized universities and programs, such as the University of Adrar and the Higher School of Renewable Energy in Batna, which focus on solar PV, wind, and energy systems engineering. While these projects represent progress, their small scale and lack of industry integration restrict their immediate influence. To summarize, technology reliance and a lack of specialized training continue to be important barriers, limiting renewable implementation and reducing its role in economic diversification.

6. Regional Potential and Structural Comparison (Algeria – Egypt – Tunisia)

Despite Algeria's exceptional solar endowment, the country's advancement in renewable energy remains markedly limited relative to regional counterparts such as Egypt and Tunisia. A longitudinal comparison over the past decade reveals that this disparity stems less from differences in natural resource potential than from variations in institutional robustness, investment governance, and the consistency of policy implementation.

Table 10 — Oil, Natural Gas, and Renewable Energy Capacity (2020–2023)

<i>Country</i>	<i>Year</i>	Crude Oil Production (thousand barrels/day)	Natural Gas Production (billion m³/year)	Renewable Energy Capacity (MW, end-year)	Main Sources
<i>Algeria</i>	2020	899	85.1	420	OPEC <i>Annual Statistical Bulletin 2025</i> , Tables 3.5 & 9.2; EIA (2024); IRENA (2024)
	2021	911	105.0	425	Same as above
	2022	1 020	108.9	435	Same as above
	2023	973	111.3	440	OPEC (2025); IRENA (2024)
<i>Egypt</i>	2020	447	60.7	≈ 6 000	OPEC (2025); EIA (2024); Trade.gov (2024); IRENA (2024)
	2021	445	70.0	≈ 6 378	Same as above

	2022	449	67.0	≈ 6 600	Same as above
	2023	453	59.4	≈ 6 700	OPEC (2025); IRENA (2024)
<i>Tunisia</i>	2020	≈ 33	2.52	520	OPEC (2025); Enerdata (2023); TheGlobalEconomy (2023); IRENA (2024)
	2021	≈ 31–35	2.05	540	Same as above
	2022	≈ 33	1.81	555	Same as above
	2023	31.4	1.40	570	OPEC (2025); IRENA (2024)

Interpretation of Results (2020–2023)

The comparative evidence reveals a pronounced structural divergence among the three North African economies. While Algeria remains an energy powerhouse anchored in hydrocarbon wealth, both Egypt and Tunisia exhibit a more coherent alignment between policy formulation and the effective deployment of renewable energy initiatives.

Algeria: Abundant resources, limited diversification.

In 2023, Algeria maintains its supremacy in regional hydrocarbon production, generating almost one million barrels of crude oil day and 111 billion cubic meters of natural gas (OPEC, 2025)³⁵. However, renewable capacity has stabilized at approximately 440 MW—merely two percent of the national electrical composition (IRENA, 2024)³⁶. Ongoing institutional instability, substantial fossil-fuel subsidies, and frequent postponements in public tenders have sustained a rentier dependency (World Bank, 2023³⁷; Haddoum and al, 2018³⁸). Periods of high oil prices reduce the motivation for diversification, while declines in global markets limit fiscal capacity and hinder ongoing investment in renewable energy.

Egypt: Strategic governance and international partnerships.

³⁵ Organization of the Petroleum Exporting Countries (OPEC). (2025). Annual statistical bulletin 2025. [asb-2025.pdf](#)

³⁶ International Renewable Energy Agency (IRENA). (2024). Renewable capacity statistics 2024. [Statistiques sur la capacité renouvelable 2024](#)

³⁷ World Bank. (2023). Algeria economic update: Continuing the diversification effort (Fall 2023). [Algérie : mise à jour économique - Poursuivre l'effort de diversification](#)

³⁸ Haddoum S, Bennour H, Ahmed Zaïd T. Politique énergétique algérienne : perspectives, obstacles et opportunités manquées. Glob Chall. 3 juillet 2018 ; 2(8):1700134. DOI : 10.1002/gch2.201700134. PMID : 31565341 ; PMCID : PMC6607439.

In contrast, Egypt's comparatively modest hydrocarbon base is offset by robust governance mechanisms and deliberate policy coordination. The implementation of feed-in tariffs, public–private partnership (PPP) frameworks, and transparent competitive bidding has attracted substantial foreign and domestic investment (Egyptian Environmental Affairs Agency [EEAA], 2022³⁹; World Bank, 2022⁴⁰). Landmark projects such as the *Benban Solar Park* (1.65 GW) and the *Gulf of Suez Wind Farm* illustrate this success (IRENA, 2024). By 2023, Egypt's renewable capacity had surpassed 6.7 GW—an order of magnitude greater than Algeria's—reflecting the decisive role of regulatory credibility and policy continuity in enabling energy transition (OPEC, 2025; IRENA, 2024).

Tunisia: Limited resources, steady institutional advancement.

Although Tunisia produces only about 31 thousand barrels of oil and 1.4 billion m³ of natural gas annually, its renewable capacity expanded from roughly 520 MW in 2020 to about 570 MW in 2023 (IRENA, 2024). This gradual yet consistent progress is underpinned by regulatory stability, European Union–funded cooperation programs, and incremental grid modernization efforts, including the planned *ELMED* interconnection with Italy (European Commission, 2022⁴¹). Tunisia's trajectory illustrates how sustained institutional coherence and targeted international collaboration can drive incremental energy diversification despite fiscal and resource constraints.

Comparative synthesis

The comparison results indicate that mere resource abundance does not ensure a successful energy transition. The stagnation of Algeria is attributable to institutional fragility, misleading pricing signals due to fossil-fuel subsidies, and structural fiscal reliance on hydrocarbon rents. In contrast, Egypt illustrates how inclusive government, viable power purchase agreements (PPAs), and external financing can expedite transformation despite resource unpredictability. Tunisia's example further illustrates that robust regulatory structures and enduring partnerships can maintain growth without significant fiscal reserves.

The disparity noted between 2020 and 2023 underscores the principal assertion of this study: the critical factor influencing renewable energy investment in North Africa is not natural resources, but rather the interplay of institutional quality, governance credibility, and socio-economic alignment.

7. Discussion

The descriptive information offered in Section 5 demonstrates Algeria's structural challenges in promoting renewable energy deployment. By 2022, the country's installed renewable capacity

³⁹ Egyptian Environmental Affairs Agency (EEAA). (2022). Egypt National Climate Change Strategy (NCCS). [Ministry of Environment | Sustainable Energy](#)

⁴⁰ World Bank. (2022). The employment benefits of an energy transition in Egypt. World Bank Publications. [The Employment Benefits of an Energy Transition in Egypt](#)

⁴¹ European Commission. (2022). ELMED interconnection project factsheet. Directorate-General for Energy. [Interconnexion électrique ELMED en Tunisie - Partenariats internationaux](#)

remained below 500 MW, accounting for less than 2% of its power mix (IRENA, 2023)⁴². This contrasts sharply with regional peers. Tunisia, with significantly less natural resources and a smaller economy, achieved approximately 700 MW of renewables, accounting for 8% of its electrical generation (Ersoy & Terrapon-Pfaff, 2021)⁴³. Egypt has made considerably more progress, with plans to deploy over 6 GW of renewable energy by 2022, led by large-scale projects like the Benban solar park and major wind developments along the Gulf of Suez (World Bank, 2022)⁴⁴.

This variance emphasizes an important point: whereas Algeria exhibits the structural dynamics of the resource curse (Auty, 1993; Sachs & Warner, 1995), resource dependency alone cannot fully explain the country's underperformance. Egypt, despite its hydrocarbon wealth, has showed superior institutional capacity to assemble public-private partnerships and attract foreign financing, resulting in large-scale renewable deployment. Tunisia, despite its fiscal constraints, has benefited from clearer regulatory frameworks and ongoing donor participation, allowing it to obtain a greater share of renewables in its energy mix than Algeria. According to the comparative perspective, Algeria's stagnation is the outcome of a multidimensional lock-in. Economic dependency on hydrocarbon rents diminishes the motivation to diversify during price booms, while fiscal austerity during downturns limits the state's ability to support renewable projects. Institutional volatility, as evidenced by multiple program relaunches with inconsistent follow-through, further erodes investor confidence (North, 1990). Social factors exacerbate the challenge: fossil fuel subsidies reinforce expectations of cheap energy, while a lack of awareness of climate dangers undermines community support for renewables (Matallah et al., 2023)⁴⁵. Finally, technological dependence on imported equipment limits project scalability, making Algeria vulnerable to global supply chain shocks (IRENA, 2023).

From a theoretical sense, Algeria's instance validates and expands on the resource curse literature. It reveals how institutional fragility, social legitimacy deficits, and technology dependency all contribute to rentier dynamics, resulting in a robust lock-in mechanism (ECCO Climate, 2025)⁴⁶. Tunisia and Egypt, on the other hand, demonstrate that development is feasible when institutional frameworks are stabilized, public-private partnerships are

⁴² International Renewable Energy Agency. (2022). Renewable energy statistics 2022. [Renewable Energy Capacity Statistics 2022](#)

⁴³ Ersoy, S. R., & Terrapon-Pfaff, J. (2021, décembre). Sustainable transformation of Tunisia's energy system: Development of a phase model. Friedrich-Ebert-Stiftung. [Sustainable Transformation of Tunisia's Energy System](#)

⁴⁴ World Bank. (2022, novembre). The employment benefits of an energy transition in Egypt (MENA Energy). [World Bank Document](#)

⁴⁵ Matallah, S., Boudaoud, S., Matallah, A., & Ferhaoui, M. (2023). The role of fossil fuel subsidies in preventing a jump-start on the transition to renewable energy: Empirical evidence from Algeria. *Resources Policy*, 86, [Le rôle des subventions aux combustibles fossiles dans la prévention d'un redémarrage de la transition vers les énergies renouvelables : preuves empiriques en Algérie | Demander le PDF](#)

⁴⁶ ECCO Climate. (2025, septembre). The risks of a delayed transition for Algeria. [Les risques d'une transition retardée pour l'Algérie - ECCO](#)

strengthened, and civic engagement is mobilized—even in the face of fiscal or resource restrictions.

To summarize, Algeria's underperformance is not due to a lack of potential, but rather to a set of structural impediments anchored in the rentier political economy. According to comparative evidence, addressing these barriers involves a systemic reconfiguration that includes stabilizing regulatory frameworks, modifying subsidy regimes, involving civil society, and nurturing indigenous technology capabilities. Without such breakthroughs, Algeria risks continuing reliant on hydrocarbons, missing a vital window of opportunity for a sustainable energy transition.

8. Recommendations

According to the study described above, Algeria's delayed adoption of renewable energy is mostly due to structural impediments in the institutional, economic, social, and technological domains. Addressing these challenges necessitates a broad and multifaceted strategy. The recommendations below identify important areas for reform.

8.1 Regulatory Stability and Clarity

A first and fundamental aim is to develop a stable and predictable regulatory structure. Frequent target adjustments and conflicting procurement regulations have created uncertainty, undermining investor trust. Algeria should enact long-term legislation, comparable to the renewable energy laws in Egypt and Tunisia, to ensure regulatory continuity beyond political cycles. This includes specific definitions for feed-in tariffs, tendering procedures, and grid-access requirements. Stability in regulation would boost Algeria's credibility among domestic and international investors, allowing for large-scale renewable deployment.

8.2 Administrative Simplification

Bureaucratic complexity has been a major obstacle to project implementation. Tendering processes have often been delayed or canceled due to overlapping competencies between ministries and agencies. Streamlining procedures is essential. Establishing a **single-window agency** dedicated to renewable energy projects could significantly reduce administrative burdens, shorten approval timelines, and improve coordination. Transparency in procurement and contract allocation would also help mitigate perceptions of arbitrariness, a recurrent deterrent for private investors.

8.3 Technical Capacity and Industrial Development

Algeria's renewable energy transition will be dependent on its ability to build indigenous technological competence. This necessitates investment in specialized training programs in universities and technical institutes aimed at engineers, technicians, and project managers in solar and wind technology. In addition, authorities should encourage the growth of a local renewable energy industry, notably in solar panel assembly, inverters, and storage systems. Partnerships with multinational enterprises might help with knowledge transfer, while focused industrial policies would support the development of local value chains, reducing dependency on imports.

8.4 Financing Instruments

Financing remains a significant obstacle in renewable energy deployment. Traditional public funding is hampered by its reliance on volatile hydrocarbon rents. Algeria should diversify its financial instruments by implementing green bonds, concessional loans, and blended financing methods in partnership with development banks and international donors. Establishing a national green investment fund may also direct hydrocarbon earnings into renewable energy infrastructure, transforming rentier wealth into long-term sustainable assets.

8.5 Social Awareness and Engagement

Finally, no energy shift can occur without cultural acceptance. In Algeria, public knowledge of climate change and renewables remains low, and subsidies promote expectations of cheap fossil-based electricity. National awareness programs emphasizing the economic, social, and environmental benefits of renewable energy are critical. Furthermore, incorporating civil society organizations and local communities into project design can lessen opposition while increasing acceptability. Climate and energy transition information should be included in educational curricula to ensure that future generations are equipped to participate in and support the energy system's transformation.

8.6 Regional and International Cooperation

Beyond domestic reform, Algeria could benefit from strengthened cooperation with regional peers. Initiatives such as the *Mediterranean Solar Plan* and the *Union for the Mediterranean Energy Platform* offer opportunities for technical exchange and joint investment in cross-border infrastructure (European Commission, 2022; IRENA, 2024). Leveraging comparative experience from Egypt and Tunisia would enable Algeria to benchmark progress, harmonize regulatory standards, and enhance regional energy integration—an essential step for positioning North Africa as a future renewable energy hub.

9. Conclusion

This study began with a paradoxical question: : *Why has renewable energy investment in Algeria remained restricted, despite the immense potential and repeated policy announcements?* The evidence presented here demonstrates that the solution rests not in a single impediment, but in the interaction of institutional fragility, hydrocarbon dependence, inadequate social legitimacy, and technology reliance - a multifaceted lock-in that has slowed the speed of transition.

The paper contributes to theory by reframing the resource curse via a systemic lens, demonstrating that rentier dynamics are not only economic, but also institutional, social, and technological. Algeria's experience demonstrates that energy transitions cannot be reduced to price or potential; they are deeply ingrained in governance institutions, public attitudes, and innovation processes.

In practice, the data show that Algeria's dilemma is not one of capability, but of choice: whether to keep hydrocarbons as a short-term safety net, or to channel rents toward developing a resilient, diverse, and low-carbon economy. Stability in legislation, investment in local capabilities, innovative funding instruments, and true social involvement are not optional—they are necessary ingredients for a smooth transition.

As with any exploratory investigation, this work has limitations, particularly its reliance on secondary sources and the lack of quantitative modeling, which limits causal depth. Future study should integrate econometric analysis, public perception surveys, and comparative studies to improve our knowledge of the variables that either impede or facilitate energy transitions in rentier economies.

Finally, the Algerian situation serves as a reminder that plentiful resources do not always translate into long-term sustainability. The fundamental frontier of the energy transformation is not the desert sun, but rather the governance and societal institutions that can harness it. Algeria's destiny will thus be determined less by the intensity of its solar irradiation and more by the intensity of its political will.

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