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November 2025

The Political Economy of Green Hydrogen in Algeria

*Decarbonization, Development, and
the Quest for a Low-Carbon Economy*

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Executive summary:

Algeria has positioned hydrogen as part of its long-term energy strategy, with blue hydrogen prioritized as a bridge to export markets and green hydrogen cautiously explored through pilot projects. This approach allows the country to leverage its abundant fossil gas reserves and existing infrastructure, but it also risks reinforcing hydrocarbon dependency and creating a gas-based lock-in that delays the structural shift to renewables. Despite Algeria's exceptional solar potential, renewable deployment remains limited, with only 600.9 MW installed by 2030. Subsidized gas keeps renewables and hydrogen uncompetitive, and without reforms to address subsidies and entrenched lock-in dynamics, hydrogen risks becoming an extension of the hydrocarbon model rather than a driver of transition.

The government's USD 24.8 billion hydrogen strategy hinges on falling electrolyzer costs and foreign investment, marking a departure from Algeria's tradition of self-financing energy projects. Decades of expertise in hydrocarbons and regulatory management offer a partial foundation for hydrogen development, but scaling green hydrogen will require major requalification in renewables and electrolyzer technology. Partnerships with Germany, Italy, and others are central to Algeria's plans, yet they risk reinforcing technological dependency and raising questions about the extent to which hydrogen will serve domestic development rather than external markets.

Political views within Algeria remain divided: some actors perceive hydrogen as a threat to the hydrocarbon rentier model, while others regard it as a protective measure against

declining fossil fuel revenues. Unlike fossil gas, which rapidly became a self-sustaining business through long-term contracts, hydrogen markets remain subsidy-driven and politically fragile. The mismatch between modest demand projections in Europe and the intensity of hydrogen diplomacy reinforces Algerian skepticism about whether current enthusiasm is sustainable.

The social dimension will be decisive. With unemployment at 12.7 percent overall and nearly 30 percent among youth, hydrogen could create jobs mainly in the construction phase of the projects, but long-term employment opportunities are limited unless domestic value chains and labor standards are embedded. Severe water scarcity adds further challenges, as hydrogen projects compete with agricultural or household needs and risk provoking social conflict.

Two possible pathways lie ahead: i) Pursued primarily as an export commodity, hydrogen risks reproducing extractive patterns, with benefits flowing North while social and environmental costs remain local. ii) Anchored instead in domestic industries such as fertilizers, petrochemicals, and steel, and linked to renewables and electrolyzer manufacturing, hydrogen could become a catalyst for diversification, job creation, and industrial upgrading. Algeria's hydrogen future will ultimately depend not only on technology and investment but on whether the country can reform its subsidy system, overcome hydrocarbon lock-in, and align hydrogen with its own economic diversification, energy transition and development priorities.

Bridging with Blue, Experimenting with Green: Algeria's Hydrogen Pathway:

Algeria's National Hydrogen Roadmap sets a gradual transition that combines both blue and green hydrogen, with a production target of 40 TWh by 2040¹, largely aimed at export markets. Blue hydrogen stems from fossil gas, while only green hydrogen which is made from renewable energies is carbon neutral. In the short to medium term, the strategy gives priority to blue hydrogen, positioning it as a bridge technology that can capitalize on the country's vast fossil gas reserves and extensive export infrastructure. Green hydrogen, by contrast, is framed more as an area of experimentation and pilot projects, laying the groundwork for long-

term diversification. This dual approach reflects Algeria's cautious entry into the hydrogen economy, seeking to leverage existing assets while testing the feasibility of renewable-based alternatives.

The European hydrogen debate is closely linked to the risk of lock-in, where existing infrastructures and vested interests prolong dependence on fossil fuels. Blue hydrogen has been promoted as a "bridge technology," but in practice it often reinforces path dependency, safeguarding investments in pipelines, LNG terminals, and gas-fired power rather than

¹ Ministry of energy and mines, 'National Strategy for the Development of Green Hydrogen in Algeria'.

enabling real transformation^{2,3}. Strong lobbying by gas companies has further shaped EU policy in this direction^{4,5}. For Algeria, these dynamics are particularly relevant. The country holds Africa's second-largest proven fossil gas reserves (4,504 billion cubic meters (bcm)) and supplies around 19% of the EU's piped gas, making hydrocarbons central to its economy: between 2019 and 2023 hydrocarbons accounted for 14% of GDP, 83% of exports, and 47% of Algeria's budget revenues⁶. This heavy reliance strongly incentivizes policymakers to extend the rentier model into the hydrogen sector by prioritizing blue hydrogen.

Yet this pathway risks locking Algeria's hydrogen industry into a gas-based model, slowing the shift towards renewables and green hydrogen. The risk is heightened by the structure of the electricity system, which in 2023 was 99.8% powered by gas⁷. In this context, blue hydrogen could become a destination rather than a bridge technology, further entrenching gas dependency and impeding a genuine domestic energy transition. While using green hydrogen for power generation is generally seen as inefficient, Algeria nonetheless anticipates a role for it by 2040, as existing gas turbines could be retrofitted to burn hydrogen⁸.

The situation of lock-in, rooted in Algeria's abundant gas resources and relatively new gas-based electricity infrastructure, is further reinforced by subsidy policies⁹. The state-owned oil and gas giant Sonatrach, as the sole purchaser of gas for the domestic market, is obliged to sell gas for power generation at prices that reportedly do not cover costs, let alone generate returns¹⁰. This practice reflects the political rentier model, in which subsidies are framed as a way of distributing hydrocarbon rents among the population. Yet these subsidies not only undermine the competitiveness of renewables and thus green hydrogen, but also discourage the adoption of stronger climate policies. The environmental consequences are evident in persistent methane emissions and gas flaring. In 2023, Algeria flared 8.2 bcm of gas, ranking sixth globally, with a flaring intensity of 18.9 m³/bbl, the second-highest worldwide¹¹. These structural conditions suggest that, despite the relatively low levelized costs of electricity (LCOEs) from renewables and correspondingly low levelized costs of hydrogen (LCoH), both remain uncompeti-

tive under current conditions. Unless reforms address fossil fuel subsidies and lock-in dynamics, Algeria's hydrogen strategy risks reinforcing hydrocarbon dependency rather than enabling a genuine energy transition through green hydrogen.

Algeria is increasingly aware of the structural challenges posed by international climate policies such as the EU Carbon Border Adjustment Mechanism (CBAM), which have pushed policymakers to accelerate the deployment of renewable energy. The primary motivation has been to meet growing domestic electricity demand with renewables to save more gas for export revenues¹². Yet despite Algeria's world-class solar potential, renewable energy still contributes less than 1% to the national energy mix. By 2023, only 402 MW of solar PV capacity had been installed, far below the government's target of 15,000 MW by 2023¹³. This persistent gap between potential and actual deployment has raised renewables higher on the political agenda, paving the way for new reforms and tenders.

Since 2021, renewable energy has received renewed political attention, marked by large-scale tenders such as the 1,000 MW call for projects and by institutional reforms that re-established renewables as a national priority¹⁴. The Ministry of Energy and Mines was renamed the Ministry of Energy, Mines and Renewable Energies, while a new State Secretariat for Renewable Energies was created to oversee the 2035 targets and to advance the national hydrogen roadmap.

These steps signal a more serious political commitment to renewables, framing them as both a pillar of the electricity sector and a cornerstone of Algeria's emerging hydrogen strategy. However, the fact that only 600.9 MW of renewable capacity had been installed by 2023¹⁵ underscores the fragile foundation on which Algeria's large-scale green hydrogen ambitions rest. Unless the deployment gap is closed, hydrogen risks becoming another promise built on unrealized renewable potential rather than a driver of genuine energy transition.

2 Szabo, 'The Global Political Economics of Hydrogen'.

3 Faber et al., 'A Trojan Horse for Climate Policy'.

4 'EU Clean Industrial Deal in Action | Corporate Europe Observatory'.

5 'The Dirty Truth about the EU's Hydrogen Push | Corporate Europe Observatory'.

6 World Bank, 'The World Bank in Algeria'.

7 Ministry of energy and mines and renewable energy, Bilan Énergétique National.

8 Ministry of energy and mines, 'National Strategy for the Development of Green Hydrogen in Algeria'.

9 Boukhatem and Oei, 'Fossil Gas Lock-in Risks'.

10 Bernstein et al., Igniting Action to Reduce Gas Flaring: Real Opportunities. Real Projects. Real Results.

11 Bernstein et al., Igniting Action to Reduce Gas Flaring: Real Opportunities. Real Projects. Real Results.

12 Boukhatem, 'The challenges of the energy transition in fossil-fuel-exporting countries'.

13 Ministry of energy and mines and renewable energy, Bilan Énergétique National.

14 International Energy Agency (IEA), 'Algeria Solar Initiative – Policies'.

15 Ministry of energy and mines and renewable energy, Bilan Énergétique National.

Breaking with Tradition: External Financing in Algeria's Hydrogen Strategy

Algeria's hydrogen ambitions depend heavily on the global decline of electrolyzer costs, with competitiveness requiring prices to fall from about USD 1,000/kW to roughly USD 400/kW¹⁶. The National Hydrogen Strategy estimates investments of USD 24.8 billion but raising this capital will be a major challenge. Traditionally, Algeria has financed energy projects from its own hydrocarbon revenues, yet in the case of hydrogen the government has opted to pursue external financing, marking a significant departure from its long-standing model of self-reliance. The closed and restrictive nature of Algeria's financial sector has been a major barrier to scaling renewables. The energy sector is still shaped by the 51-49 partnership rule¹⁷, limiting foreign ownership in strategic industries and requiring heavy public contributions. Recent reforms, including the 2020 Hydrocarbon Law, a new Investment Law, and changes to the Money and Credit Law, were intended to attract investors, but they have had limited impact in new sectors such as hydrogen¹⁸. Policymakers are also reluctant to commit national funds, preferring to secure foreign partners before moving beyond pilot projects¹⁹. Taken together, this cautious approach and the lack of supporting infrastructure leave Algeria dependent on external capital and technology, raising doubts about whether hydrogen will drive genuine economic transformation or simply extend the country's reliance on external actors.

Financing mechanisms for renewable energy in Algeria have been limited and underutilized. Although the "National Fund for Energy Management, Renewable Energy, and Cogeneration" was created in 2009, it did not receive any deposits until 2016, when it was finally credited with US\$ 209 million sourced from a 1% share of the oil tax and 55% of the tax on gas flaring²⁰. Since then, Algeria has taken further steps to scale up financing for renewable energy, and by mid-2025, 21 contracts representing a total of 3,200 MWp had been awarded²¹. The government mobilized US\$ 3 billion to support these projects, demonstrating a clear political commitment to accelerating renewable energy deployment despite fiscal constraints²². However, to meet its long-term targets, this approach must be complemented by innovative financing mechanisms and by attracting a broader pool of domestic and international investors.

Hydrogen and the Rentier State: Divided Interests in Algeria's Energy Politics.

Political interests around hydrogen in Algeria remain divided. Within Sonatrach, some senior figures see green hydrogen as a threat to the rents and dominance of the oil and gas sector, while others in the government view it as a strategic opportunity to offset future revenue losses from the CBAM and the long-term decline of fossil fuel demand. These debates unfold within a highly centralized energy regime, dominated by Sonatrach, Sonelgaz the state-owned monopolized utility, and the High Energy Council chaired by the President²³. Efforts to integrate hydrogen into this structure have been slow, though Sonatrach's decision to allocate funds to pilot green hydrogen projects in 2022 marked an initial shift. A more supportive regulatory framework and incentive policies, expected only after 2025, will be essential to move beyond this cautious start²⁴.

Institutional instability has further complicated the picture. Responsibility for renewables, and by extension hydrogen, has shifted repeatedly, with a Ministry of Energy Transition created in 2019 but dissolved in 2022 as surging gas prices redirected government focus back to hydrocarbons²⁵. This episode reinforced the perception that renewables remain a secondary priority, mobilized only when gas revenues falter. Today, Sonelgaz oversees renewable initiatives, and the first regulatory measures for hydrogen are scheduled between 2023 and 2025. Yet the risk remains that hydrogen development will be shaped by the same rentier, state-centric logic that has long defined Algeria's hydrocarbon governance.

From Rents to Rights: Green Hydrogen and the Risk of Energy Injustice in Algeria

Unemployment in Algeria remains high, at 12.7% overall, 25.4% for women, and 29.3% among youth in 2024²⁶, which highlights the need to diversify the economy and expand labor opportunities. One structural cause is the hydrocarbon sector's low labor intensity compared to its central role in state revenues, since Sonatrach employed only 66,025 people in 2023²⁷, a modest figure given the scale of the industry.

¹⁶ Weko et al., 'The Politics of Green Hydrogen Cooperation: Emerging Dynamics in Morocco, Algeria and Mauritania'.

¹⁷ Algeria's 51-49 sovereignty rule mandates at least 51% local ownership in joint ventures, limiting foreign investors to 49%.

¹⁸ World Bank, 'The World Bank in Algeria'.

¹⁹ Weko et al., 'The Politics of Green Hydrogen Cooperation: Emerging Dynamics in Morocco, Algeria and Mauritania'.

²⁰ Yaïci, Retour Sur La Gestion Du Compte d'affectation Spéciale n 302-131 Intitulé Fonds National Pour La Maitrise de l'énergie et Pour Les Énergies Renouvelables et de La Cogénération.

²¹ Algeria Green Energy Cluster, Bilan Moral Pour L'année 2024.

²² Algeria Green Energy Cluster, Bilan Moral Pour L'année 2024.

²³ Boukhatem and Oei, 'Fossil Gas Lock-in Risks'.

²⁴ Ministry of energy and mines, 'National Strategy for the Development of Green Hydrogen in Algeria'.

²⁵ Aboushady et al., Towards a Green H2 Economy: Algeria Country Report.

²⁶ World Bank, 'The World Bank in Algeria'.

²⁷ Sonatrach, Annual Report 2023.

The renewable energy sector, still at an early stage, employs even fewer workers. Large-scale deployment of solar and hydrogen infrastructure could create jobs mainly at the construction phase. However, long-term employment in hydrogen will be limited because operating facilities require only a small number of highly skilled engineers. Without deliberate policies to foster local value chains, for example through supporting the production of hydrogen derivatives (such as green ammonia or synthetic fuels), and without enforcing local content requirements in contracts to strengthen the renewable energy industry, hydrogen risks reproducing the hydrocarbon model: capital-intensive, export-oriented, and socially narrow.

The potential for job creation in the hydrogen sector largely depends on the development pathway adopted. In an export-oriented scenario, most employment will occur during the construction phase, with fewer long-term positions in operation and maintenance. Once infrastructure is completed and exports begin, job numbers are likely to decline sharply. For instance, Namibia's Hyphen project estimates the creation of around 15,000 temporary (one-off) jobs and 3,000 permanent positions²⁸. In contrast, a domestically integrated pathway offers greater potential for indirect but still stable employment as local value chains develop and diversify.

Another important aspect concerns the skills required in the hydrogen sector. Most roles are expected to be technical and industry-specific, demanding targeted vocational training. For example, 58% of professions identified in France's hydrogen value chain require at least a master's degree²⁹. Unions can play a key role by mapping emerging skill needs, collaborating with training institutions to develop relevant curricula, and supporting knowledge transfer in international partnerships such as the German Algerian energy partnership, to prevent skill shortages and promote inclusive workforce development.

Although a complete phase out of fossil fuels in Algeria doesn't appear to happen in the short run, renewable energy and green hydrogen could provide alternative additional employment pathways, if carefully developed. Large-scale deployment has the potential to absorb parts of the hydrocarbon workforce while creating new opportunities for young people entering the labor market. The role of labor unions will be central to ensuring a just transition by shaping training and re-skilling programs, safeguarding labor standards, and supporting workers moving out of the fossil fuel industry. Their early involvement could also strengthen public acceptance by addressing concerns over job security, wages, and working conditions—an important consideration in Alge-

ria, where energy policy has historically been centralized and civil society participation limited. Finally, social sustainability extends beyond jobs to the management of land and water resources. Algeria's per capita renewable freshwater availability is limited to 258.84 m³ per year³⁰, among the lowest globally. If hydrogen production competes with agricultural or domestic water needs, or if land is allocated to export-oriented projects without consultation or fair compensation, conflicts could arise. The 2014 Ain Salah protests against shale gas extraction serve as a reminder of how local communities powerfully mobilize when water security is threatened.

Taken together, these dynamics highlight a central political economy challenge: if pursued solely as an export agenda, green hydrogen risks the "resource curse" becoming a new form of energy injustice, repeating past patterns of resource extraction without social benefit. But if linked to domestic job creation, industrial integration, and equitable resource management, hydrogen could evolve into a genuine pillar of Algeria's national development and just energy transition.

Leveraging Gas Expertise: The Role of Partnerships in Bridging Green Gaps

Algeria has developed longstanding expertise in oil and gas technologies as well as strong regulatory capacity in managing export contracts and negotiating gas prices, built over decades of hydrocarbon production. This experience provides an entry point for the country into the emerging hydrogen industry. In addition, its established capabilities in producing fossil gas-derived grey hydrogen offer relevant technical know-how that could be leveraged in the transition³¹.

However, the limited expertise in renewable energy and electrolyzer technologies means that transitioning to green hydrogen will demand substantial new investments in training and capacity-building. To address this gap, the government has increasingly turned to international partnerships, particularly with Germany and other foreign actors, to secure technology transfers and cooperation agreements³².

Since 2015, Algeria and Germany have had an energy partnership focused on renewable energy and energy efficiency. The GIZ study on Power-to-X potential in Algeria sparked interest from policymakers in both countries to explore opportunities in green hydrogen³³. The partnership was significantly deepened during the 2024 visit of German Economy

28 'International-PtX-Hub_202402_Sustainability-Briefing-5_skills-and-Jobs', p3.

29 'International-PtX-Hub_202402_Sustainability-Briefing-5_skills-and-Jobs', p.

30 Alami, Idriss and Materek, Filip, Green Hydrogen Market in North Africa with Forecast to 2050.

31 Drenkard and Mirakyan, 'Exploratory Study on the Potential of Power-to-X (Green Hydrogen) for Algeria/ Étude Exploratoire Sur Le Potentiel Du Power-to-X (Hydrogène Vert) Pour l'Algérie'.

32 Weko et al., 'The Politics of Green Hydrogen Cooperation: Emerging Dynamics in Morocco, Algeria and Mauritania'.

33 Power to x study

Minister Dr. Robert Habeck to Algiers, where a bilateral hydrogen task force was established to create the necessary technical and economic framework for hydrogen supplies from Algeria to Europe³⁴. A Memorandum of Understanding (MoU) for cooperation on the SouthH₂ Corridor³⁵ was the main outcome of the visit.

German companies are playing key roles in operationalizing the hydrogen vision. VNG, became the first German company to sign a mid-term pipeline gas supply agreement with Algeria's Sonatrach and also committed to importing green hydrogen via the South H₂ Corridor³⁶.

Meanwhile, SPG Steiner, a specialist in ammonia logistics, participated in the Habeck-led delegation to help develop Algeria's hydrogen infrastructure. The company is expected to contribute to ammonia-based hydrogen transport, terminal construction, and flare gas recovery projects for CO₂ reduction³⁷.

A further example of German involvement in Algeria's emerging hydrogen economy is Bayernnets' HyPipe Bavaria project which is designed to function as an entry point for hydrogen imports from North Africa. Integrated into the SouthH₂ Corridor, it aims to supply industrial clusters and link to the national hydrogen backbone³⁸.

A hydrogen pipeline experiment at Hassi R'mel with integrated separation and storage facilities; a solar-based storage project led by Sonatrach to power remote operations; and initiatives to produce green ammonia and methanol in Arzew and El Oued³⁹. International cooperation is a central pillar of this strategy, marking a notable shift in Algeria's traditionally inward-looking energy policy. Algeria is working with Germany on the SouthH₂Corridor of the European Hydrogen Backbone infrastructure, which seeks to repurpose existing pipelines for the annual transport of up to 4 million tons of green hydrogen to Europe by 2030, while Sonatrach has also expanded its collaboration with Eni on hydrogen and broader energy transition initiatives⁴⁰. Furthermore, Algeria participates in the MENA Hydrogen Alliance, positioning itself within regional regulatory dialogues and knowledge-sharing platforms to support the development of a competitive hydrogen economy.

While these partnerships may accelerate early project devel-

opment, they also risk reinforcing patterns of external dependency, where national hydrogen policies are shaped more by international demand than by a domestically driven innovation agenda. Left to domestic interests alone, Algeria would likely focus on grey hydrogen, but the push from external partners has elevated blue and green hydrogen on the policy agenda. Building a resilient hydrogen sector will therefore depend on whether Algeria can reorient its innovation system beyond hydrocarbons and develop genuine domestic capabilities in renewable energy and hydrogen technologies.

Why Hydrogen Cannot Simply Replace Algeria's Fossil Gas Exports?

In 2019, former Minister of Energy Transition Chemseddine Chitour declared that "green hydrogen will replace gas exports for Algeria by 2030."⁴¹ This political motivation underscores the importance of critically examining the similarities and differences between hydrogen and fossil gas in order to set realistic expectations for Algeria's hydrogen future. For a country whose expertise, infrastructure, and revenues have long been anchored in the hydrocarbon industry, it is crucial to assess how far existing gas capabilities can be leveraged and where fundamental differences may create new challenges. Understanding these distinctions is not only necessary to evaluate the feasibility of large-scale hydrogen exports, but also to identify the structural reforms required for hydrogen to become more than a continuation of Algeria's rentier gas model.

First, there are notable similarities between hydrogen and fossil gas in terms of physical properties, potential market structures, and regulatory frameworks. As the Hydrogen Council and McKinsey note, "The evolution of the global gas and liquefied natural gas (LNG) market may have parallels with the prospective global market for hydrogen"⁴². However, these parallels should not lead to the assumption that hydrogen will simply replace fossil gas. Technological, economic, and logistical differences are more significant and complex.

34 <https://www.bundeswirtschaftsministerium.de/Redaktion/EN/Pressemitteilungen/2024/02/20240208-germany-and-algeria-set-up-hydrogen-taskforce.html>

35 A 3,300 km hydrogen pipeline connecting North Africa to Europe. The corridor, expected to be operational by 2030, aims to transport **4 million tonnes of hydrogen per year**, equivalent to **40% of the EU's green hydrogen import target**, with **70% of the route utilizing repurposed gas pipelines**.

36 VNG Handel & Vertrieb GmbH. (2024, February 8). Gas supply contract with Algerian SONATRACH. Retrieved from <https://www.vng-handel.de/en/newsroom/2024-02-08-gas-supply-contract-algerian-sonatrach>

37 SPG STEINER GmbH. (2024, February 13). Family Business SPG Steiner at the Forefront of the German-Algerian Energy Partnership. Retrieved from <https://www.spg-steiner.com/en/news/article/family-business-spg-steiner-at-the-forefront-of-the-german-algerian-energy-partnership-n212>

38 Bayernnets. (2025;April.14). HyPipe Bavaria – The Hydrogen Hub. Retrieved [05.10.2025], from

39 Weko et al., 'The Politics of Green Hydrogen Cooperation: Emerging Dynamics in Morocco, Algeria and Mauritania'.

40 IRENA, Enabling Green Hydrogen Development in North Africa.

41 Boukhatem, 'The challenges of the energy transition in fossil-fuel-exporting countries'.

42 Hydrogen Council, Global Hydrogen Flows.

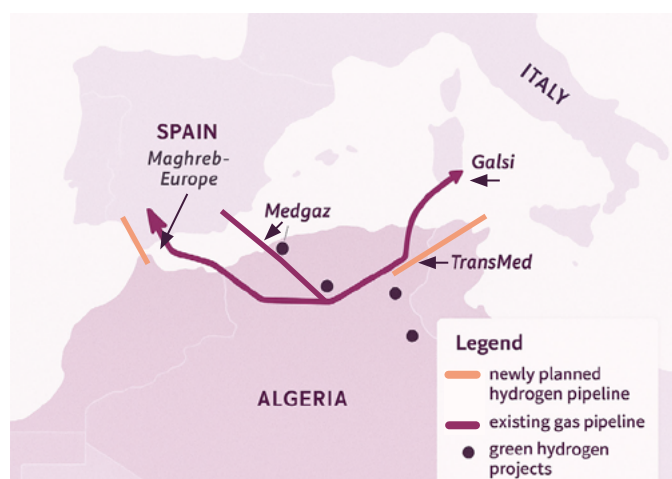
Hydrogen–Gas Blending: Infrastructure Potential and Lock-In Risks

Hydrogen shares important similarities with fossil gas, particularly in terms of infrastructure and export logistics. Just as fossil gas once replaced town gas in Europe through a gradual process of blending and infrastructure adaptation, current plans envision hydrogen being blended into existing gas networks before dedicated infrastructure is developed⁴³. For Algeria, this parallel is highly relevant: the country's gas export system evolved from initial LNG shipments, which required smaller upfront investments, to the construction of submarine pipelines in the 1980s, enabled by extensive collaboration with European partners. A comparable process is now anticipated for hydrogen, with initiatives such as the SouthH2Corridor aiming to repurpose pipelines for hydrogen transport. While this could allow Algeria to leverage its existing energy facilities, it also carries risks of locking the country into costly infrastructure renovation and reproducing patterns of dependence on external markets and technologies.

The map below highlights Algeria's extensive gas infrastructure, including its export pipelines to Europe. These assets not only illustrate the country's historical role as a key gas supplier but also frame its potential entry into hydrogen markets, where existing infrastructure could be repurposed for transport. At the same time, the scale of this network underlines the risk of lock-in, as heavy reliance on gas infrastructure may constrain Algeria's transition toward green hydrogen and renewable energy.

Map of green hydrogen projects in Algeria including pipelines (adapted from⁴⁴)

Fig. 1



⁴³ Cardinale, 'From Natural Gas to Green Hydrogen'.

⁴⁴ Boukhatem et al., 'Green Hydrogen Ambitions in Algeria and Morocco: Contrasting Conditions, Relational Paths'.

⁴⁵ Dejonghe et al., 'From Natural Gas to Hydrogen'.

⁴⁶ IRENA, Geopolitics of the Energy Transformation.

⁴⁷ Hydrogen Insights 2024. Hydrogen Council & McKinsey & Company, p. 12.

Uncertainty of Hydrogen Exports:

Hydrogen and fossil gas differ fundamentally in how their export markets are structured. While Algeria's first exported volumes of gas were secured through long-term take-or-pay contracts, with prices indexed to petroleum products in the destination country, hydrogen has not yet reached similar commercial maturity. Gas contracts reduced market risks, making exports a viable business case without the need for subsidies or state support. By contrast, hydrogen markets remain highly uncertain, relying heavily on governmental subsidies and policy incentives rather than stable offtake agreements.

For Algerian stakeholders, whose expertise was built on exporting gas under relatively secure contractual frameworks, this uncertainty creates hesitation. The lack of guaranteed demand and reliable pricing mechanisms makes hydrogen appear far riskier than gas once was, helping to explain why policymakers remain reluctant to commit boldly to hydrogen exports without stronger assurances.

Gas as Business, Hydrogen as Diplomacy:

A flagship difference between Algeria's entry into fossil gas markets and today's hydrogen push lies in the political nature of hydrogen⁴⁵. While fossil gas exports were built on clear market demand and long-term contractual arrangements, hydrogen expansion remains largely policy-driven, illustrated by the proliferation of national strategies and EU initiatives such as the Hydrogen Bank and H2Diplo. This contrast helps explain Algerian stakeholders' caution: unlike gas, which quickly became a self-sustaining business case, hydrogen is still sustained more by political will and subsidies than by proven market fundamentals.

This skepticism is reinforced by the gap between realistic demand projections and the intensity of hydrogen diplomacy. Studies by the Hydrogen Council, McKinsey, IRENA, and Deloitte all suggest that Northwest Europe's near-term hydrogen market will be much lower than originally projected, dominated by shipped imports of ammonia and methanol, with piped imports from North Africa unlikely to scale up before 2050⁴⁶. For instance, The Hydrogen Insights 2024 report notes that of the 48 Mt/year of clean hydrogen supply announced globally, only 12–18 Mt/year is likely to be deployed by 2030, due to project delays and natural attrition⁴⁷. Yet, European governments have engaged in extensive global diplomacy, signing bilateral hydrogen agreements far beyond expected demand. For Algerian policymakers, this mismatch raises doubts about whether current enthusiasm reflects genuine market prospects or simply another cycle of hype and crisis-driven politics.

Algeria's green hydrogen pathways at a crossroad:

Algeria stands at a critical juncture in shaping its hydrogen future. The pilot phase until 2030 will determine whether the country can overcome key barriers while leveraging its gas expertise to enter the sector. Beyond 2030, two diverging pathways emerge: hydrogen as a tool for green industrialization and diversification, or as another export commodity that risks deepening dependency and reproducing extractive dynamics as clarified in illustration two. The illustration below summarizes Algeria's potential entry into the hydrogen sector and the choices it faces. In blue, it highlights the enablers Algeria already possesses its gas expertise and infrastructure which make blue hydrogen a likely bridge into the industry. In orange, it shows the key barriers that must be addressed by 2030 during the pilot project phase, including limited renewable capacity, water scarcity, and financing challenges. Beyond 2030, as Algeria moves toward large-scale production and export, two divergent pathways emerge: one of opportunities (green industrialization, economic diversification, job creation) and one of risks (green grabbing, export-centered dependency, technological reliance). This dual perspective underscores that Algeria's hydrogen future will hinge not only on technical progress but also on political and institutional choices.

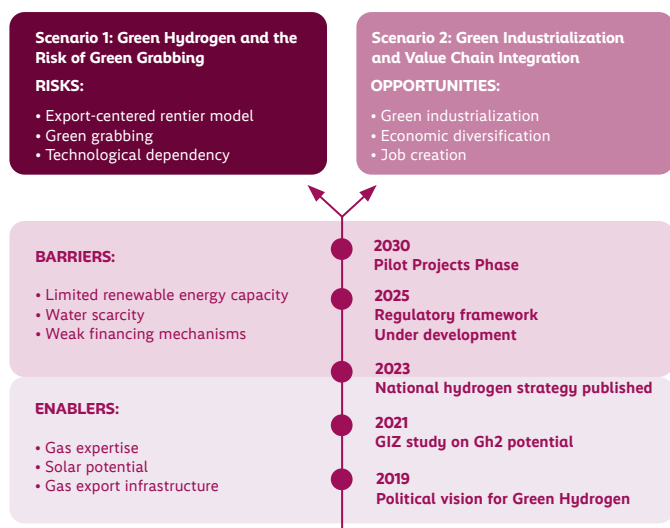
Scenario 1: Green Hydrogen and the Risk of Green Grabbing

A central critique of Algeria's green hydrogen ambitions is the risk of reproducing colonial patterns of resource extraction, where energy flows north to power European economies while the environmental and social costs are displaced onto local populations⁴⁸. In this framing, hydrogen becomes less a tool for Algeria's own transition and more a new export commodity, reinforcing the logic of dependency rather than diversification.

One of the most pressing risks lies in water use. Electrolysis requires large volumes of highly purified water in a country already facing severe water scarcity. Algeria has invested in desalination as a technical fix, but this carries its own sustainability challenges: it is energy intensive, costly, and harmful to marine ecosystems through brine discharge. Exploiting underground aquifers is even riskier, as many are non-renewable and vital for food security. Alternatives such as wastewater recycling remain at an experimental stage. Without careful planning, hydrogen production could come into conflict with agricultural or domestic water needs.

Beyond water, large-scale hydrogen development also raises land and capital concerns. Expansive solar farms, pipelines, and export infrastructure will demand vast tracts of land, potentially encroaching on communal or pastoral territories and risking displacement if communities are not meaningfully consulted or compensated. Meanwhile, channeling scarce public funds into capital-intensive, export-oriented hydrogen infrastructure appears risky given Algeria's fiscal dependence on hydrocarbons and the uncertain profitability of hydrogen exports. Taken together, these dynamics underscore the danger that green hydrogen, rather than driving a just transition, could become a form of "resource course" and green grabbing, securing European energy futures at the expense of Algerian resources, land, and communities.

Fig. 2 Crossroads for Algeria's Hydrogen Future: Barriers, Opportunities, and Risks



48 Tunn et al., 'Green Hydrogen Transitions Deepen Socioecological Risks and Extractivist Patterns'. plainCitation:»Tunn et al., 'Green Hydrogen Transitions Deepen Socioecological Risks and Extractivist Patterns'.»noteIndex»:48.»citationItems»:[[{«id»:308.»uris»:«http://zotero.org/users/local/xPUZHAWW/items/44NPJNBF».»itemData»:«id»:308.»type»:»article-journal».»abstract»:»The global green hydrogen rush is prone to repeat extractivist patterns at the expense of economies, ecologies, and communities in the production zones in the Global South. With a socio-ecological risk analysis grounded in energy, water, and environmental justice scholarship, we systematically assess the risks of the 'green' hydrogen transition and related injustices arising in 28 countries in the Global South with regard to energy, water, land and global justice dimensions. Our findings show that risks materialize through the exclusion of affected communities and civil society, the enclosure of land and resources for extractivist purposes, and through the externalization of socio-ecological costs and conflicts. We further demonstrate that socio-ecological risks are enhanced through country-specific conditions such as water scarcity, historical continuities such as post-colonial land tenure systems, as well as repercussions of a persistently uneven global politico-economic order. Contributing to debates on power, inequality, and justice in the global green hydrogen transition, we argue that addressing hydrogen risks requires a framework of environmental justice and a transformative perspective that encompasses structural shifts in the global economy, including degrowth and a decentering of industrial hegemonies in the Global North.».»container-title»:»Energy Research & Social Science».»DOI»:»10.1016/j.erss.2024.103731».»ISSN»:»2214-6296».»journalAbbreviation»:»Energy Research & Social Science».»page»:»103731».»source»:»ScienceDirect».»title»:»Green hydrogen transitions deepen socioecological risks and extractivist patterns: evidence from 28 prospective exporting countries in the Global South».»title-short»:»Green hydrogen transitions deepen socioecological risks and extractivist patterns».»volume»:»117».»author»:«{«family»:»Tunn».»given»:»Johanna»},«family»:»Kalt».»given»:»Tobias»},«family»:»Müller».»given»:»Franziska»},«family»:»Simon».»given»:»Jenny»},«family»:»Hennig».»given»:»Jesko»},«family»:»Ituen».»given»:»Imeh»},«family»:»Glatzer».»given»:»Nina»}],issued:»{«date-parts»:»[[2024,11,1]]}».»schema»:»https://github.com/citation-style-language/schema/raw/master/csl-citation.json»}

Scenario 2: Green Industrialization and Value Chain Integration

An alternative pathway for Algeria's hydrogen future emphasizes domestic industrialization and the integration of value chains, rather than simply exporting hydrogen as a raw commodity. In this scenario, hydrogen becomes a catalyst for economic diversification by supplying low-carbon feedstocks to key national industries such as fertilizers, petrochemicals, and steel, while also supporting new manufacturing sectors linked to renewable energy and electrolyzer technologies⁴⁹. By anchoring hydrogen within domestic production systems, Algeria could capture greater value, generate skilled jobs, and reduce vulnerability to volatile export markets.

The country's strong foundation in grey ammonia and fertilizer production provides a natural entry point for this strategy. Algeria is already the world's fourth-largest exporter of grey ammonia, with major players such as Sonatrach and Asmidal operating established infrastructure in Arzew. Redirecting hydrogen toward green ammonia production could strengthen food security, boost domestic agriculture, and position Algeria as a competitive supplier to global fertilizer markets that will increasingly demand decarbonized products. Similarly, leveraging hydrogen for green steel or petrochemicals could open up new export niches while meeting growing international climate standards such as the EU's CBAM.

Such a strategy would also require building local capabilities along the hydrogen value chain. Instead of relying exclusively on imported technologies, Algeria could invest in R&D, vocational training, and partnerships with foreign firms that emphasize technology transfer and local content requirements. Renewable energy currently employs a small workforce compared to the oil and gas sector. However, large-scale deployment could create thousands of jobs in construction, operation, and maintenance. Labor unions have a critical role to play in shaping training programs, ensuring fair labor standards, and supporting workers transitioning from fossil fuels to the renewables and hydrogen economy. Over time, this could enable Algeria to develop competencies in renewable power generation, electrolyzer assembly, and hydrogen logistics, embedding hydrogen into a broader industrial policy. While this pathway demands careful planning, significant upfront investment, and stronger institutions, it offers the prospect of turning hydrogen from an extractive export commodity into a driver of domestic industrial transformation and long-term economic resilience.

Wrap-up: Hydrogen is not a silver bullet for Algeria

Hydrogen is not a silver bullet for Algeria. It will neither resolve the country's deep dependence on hydrocarbons nor quickly decarbonize its fossil fuel dominated energy mix. Instead, it should be seen as one part of a broader set of solutions for energy transition and economic diversification. Its real promise lies less in exporting molecules than in building the value chains around green hydrogen. Industrial integration, technology transfer, and local job creation could underpin Algeria's longer-term industrialization and development goals. The country faces a clear choice. An export-led model risks reproducing patterns of path dependency and resource extraction, with limited benefits for domestic development. By contrast, a strategy that prioritizes industrial integration and value-chain development is more demanding. It requires innovative financing strategies, strong governance, and institutional reform. However, it could offer greater potential for a resilient economy, employment opportunities, and energy diversification. Whether hydrogen becomes just another export commodity or a lever for economic and energy reorientation will determine if it serves as a tool of reinforcing fossil dependency or a pathway to a more sustainable and equitable future.

⁴⁹ Kalvelage and Walker, 'Strategic Coupling beyond Borders: Germany's Extraterritorial Agency in Namibia's Green Hydrogen Industry'.

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Acknowledgement

Algeria has positioned hydrogen as part of its long-term energy strategy, with blue hydrogen prioritized as a bridge to export markets and green hydrogen cautiously explored through pilot projects. This approach allows the country to leverage its abundant fossil gas reserves and existing infrastructure, but it also risks reinforcing hydrocarbon dependency and creating a gas-based lock-in that delays the structural shift to renewables. Despite Algeria's exceptional solar potential, renewable deployment remains limited, with only 600.9 MW installed in 2023. A successful 3,200 MW tender in 2022 marked a major step toward the 2030 national target of 15,000 MW. Subsidized gas keeps renewables and hydrogen uncompetitive, and without reforms to address subsidies and entrenched lock-in dynamics, hydrogen risks becoming an extension of the hydrocarbon model rather than a driver of transition.

The Political Economy of Green Hydrogen in Algeria

Hydrogen is not a silver bullet for Algeria. It will neither resolve the country's deep dependence on hydrocarbons nor quickly decarbonize its fossil fuel dominated energy mix. Instead, it should be seen as one part of a broader set of solutions for energy transition and economic diversification. Its real promise lies less in exporting molecules than in building the value chains around green hydrogen. Industrial integration, technology transfer, and local job creation could underpin Algeria's longer-term industrialization and development goals. The country faces a clear choice. An export-led model risks reproducing patterns of path dependency and resource extraction, with limited benefits for domestic development. By contrast, a strategy that prioritizes industrial integration and value-chain development is more demanding.

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