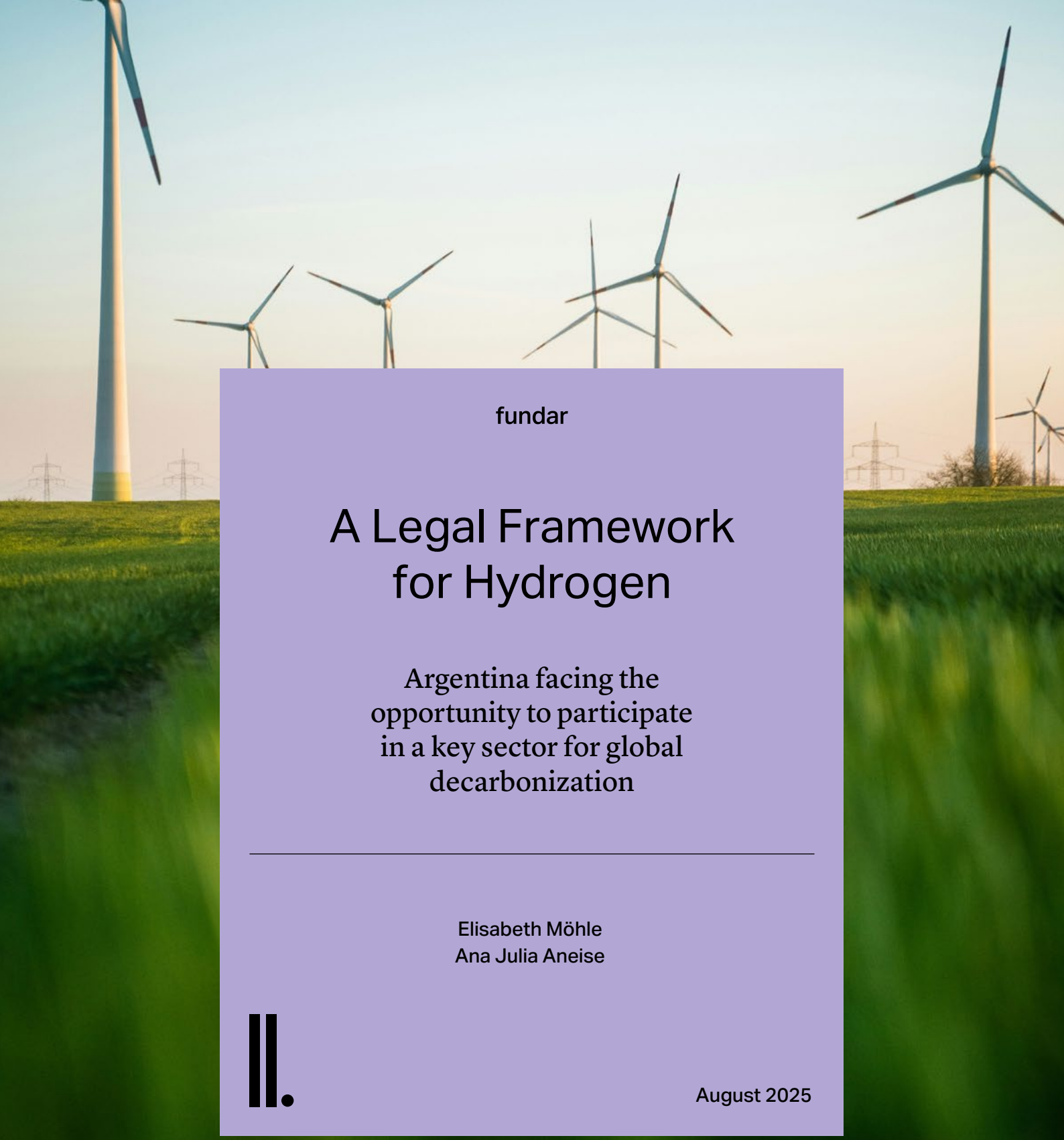

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A Legal Framework for Hydrogen

Argentina facing the opportunity to participate in a key sector for global decarbonization

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August 2025

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Suggested citation

Möhle, E., & Aneise, A. J. (2025). *A Legal Framework for Hydrogen*. Fundar.

Acknowledgments

The authors would especially like to thank Verónica Robert, Julio Mateo, Magdalena de Luca, Carina Guzowski, Jorge Peña, Juan Carlos Villalonga, Matías Ginsberg, Tomás Allan, Daniel Schteingart, Ignacio Sabatella, and Esteban Serrani, who read preliminary versions of this work and provided valuable comments that helped improve it. Any remaining opinions, omissions, or errors are the sole responsibility of the authors.

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1

Starting Points

Executive Summary

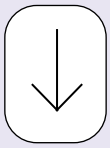
Low-emission hydrogen is a key technology for advancing the decarbonization of the global economy. While the direct electrification of sectors such as residential, transportation, and certain industries—supported by a low-carbon electric matrix—represents the main strategy for climate change mitigation, there are applications where this alternative is not technically or economically viable. That is where hydrogen can play a strategic role.

The use of hydrogen in industrial processes is not new: it has been widely used in sectors such as the chemical industry and hydrocarbon refining. What is new is its use as a clean energy vector, that is, as a means to store, transport, and release low-emission energy. However, today, hydrogen is produced almost entirely from fossil fuels. For it to play a role in the decarbonization of sectors that are difficult to electrify (such as steelmaking, heavy transportation, or certain high-temperature industrial processes), it must be produced from low-emission sources, such as wind, solar, biomass, nuclear, or natural gas with carbon capture. That is why producing this type of hydrogen, commonly referred to as low-emission hydrogen, implies developing and scaling a new industrial sector.

"Although significant uncertainty remains regarding the pace of technological and commercial maturation of low-emission hydrogen —as well as the scale of its eventual participation in energy markets— the potential magnitude of demand and its role in transforming industrial structures opens a relevant window of opportunity for participation in a new industrial sector and its associated technological development (Andreoni and Roberts, 2022).

Argentina has enormous potential for hydrogen production. Its geographical conditions, along with the abundance and quality of its energy resources, position it as a potential large-scale producer, capable of entering international markets as an exporter and supplying its internal demand to decarbonize its industries. At the same time, the development of this industry opens opportunities to generate productive linkages at a local level, based on greater demand for goods and services in related industrial sectors.

Developing the sector requires attracting investment in a highly competitive international environment. To position itself effectively, it is necessary to have a regulatory framework that offers regulatory certainty and a strategic direction sustained over time.



Key Findings

- **Low-emission hydrogen represents an opportunity for Argentina to position itself as a pioneer in an emerging sector,** diversify and increase exports, advance in industrial decarbonization, and promote the development of local capabilities throughout the entire value chain.
- **The magnitude of the opportunity justifies establishing the necessary conditions now for Argentina to consolidate itself as an attractive destination for investment,** although some uncertainty persists regarding the pace of development of this technology.
- **Improving Argentina's competitiveness compared to other countries requires establishing a regime that provides regulatory predictability to the sector** and protects it from measures that could affect investment decisions.
- **This focus on competitiveness must be complemented with policies aimed at maximizing the economic and social impact of the sector, beyond exports and direct employment.** This implies fostering the development of local suppliers, the generation of qualified employment, the transfer of technological and industrial capabilities, the decarbonization of national productive sectors, and compliance with environmental and social standards.
- **For the framework to be credible, it must rest on broad cross-party consensus among the main political forces,** guaranteeing predictability and continuity for the hydrogen development strategy over time.

Recommendations for Public Policies

→ The National Congress should enact legislation establishing a promotional framework for low-emission hydrogen, with the aim of driving the sector's development.

While its mere existence does not guarantee success, the absence of a legal framework would mean competing at a disadvantage compared to countries in the region that have more consolidated policies to promote the industry. To be effective, the legislation must be broad in scope and flexible in design, capable of balancing three fundamental dimensions: attracting investment oriented toward export production, leveraging hydrogen as a catalyst for capability development across the value chain, and laying the foundations for its use in the decarbonization of domestic industrial sectors.

This law should contain seven elements:

1. **Include all variants of low-emission hydrogen in the promotion regime,** in order to favor technological competition and facilitate the early development of the sector.

1. **Set no minimum investment threshold for the framework,** as this could exclude smaller-scale projects with high potential impact.

2. **Keep the deadline for joining the regime open at least until 2035,** given the maturation horizon of the projects.

3. **Incorporate incentives that mitigate the risk** associated with local macroeconomic instability and the history of capital controls, in order to compete under better conditions for investments.

4. **Promote the integration of local capabilities through progressive incentives and not through mandatory requirements,** to foster the development of suppliers without discouraging investment.

5. **Foster the creation of domestic demand for hydrogen in industrial sectors without imposing quotas,** through additional benefits and stimulation mechanisms.

6. **Designate an enforcing authority to define the technical, regulatory, and certification** frameworks required for the safe, traceable, and competitive development of the sector.

2

The Study

The Potential of Hydrogen

A Key Technology for Decarbonization

Hydrogen functions as an energy carrier that allows storing clean energy and utilizing it in different processes. This capability makes it a relevant alternative for decarbonizing sectors where electrification is not technically or economically viable, such as long-distance transportation, the chemical industry, or iron and steel production. In these cases, hydrogen can be used as a fuel in combustion engines, in fuel cells to generate electricity, or as energy storage. Nevertheless, for its use to represent an effective contribution to the energy transition, its production must come from clean sources. Hence, hydrogen is classified by color—gray, blue, pink, or green—depending on the type of energy used: gray is generated from fossil fuels; blue is also generated from fossil fuels but incorporates carbon capture technologies; pink is produced with nuclear energy; and green is produced with renewable sources.

DIAGRAM 1

Classification of hydrogen types according to the generation source

		Low-emission hydrogen			
	Gray/brown hydrogen	**Blue hydrogen**	**Green hydrogen**		**Pink hydrogen**
Raw material Direct input for hydrogen production	Methane or coal	Methane or coal	Water	Biomass	Water
Source Energy source that drives the process	Methane	Methane	Renewable energy	Biomass / Renewable energy	Nuclear energy
Process Hydrogen production process	Reforming or gasification	Reforming or gasification with carbon capture	Electrolysis	Gasification	Electrolysis

Source: Fundar based on the National Hydrogen Strategy (2023).

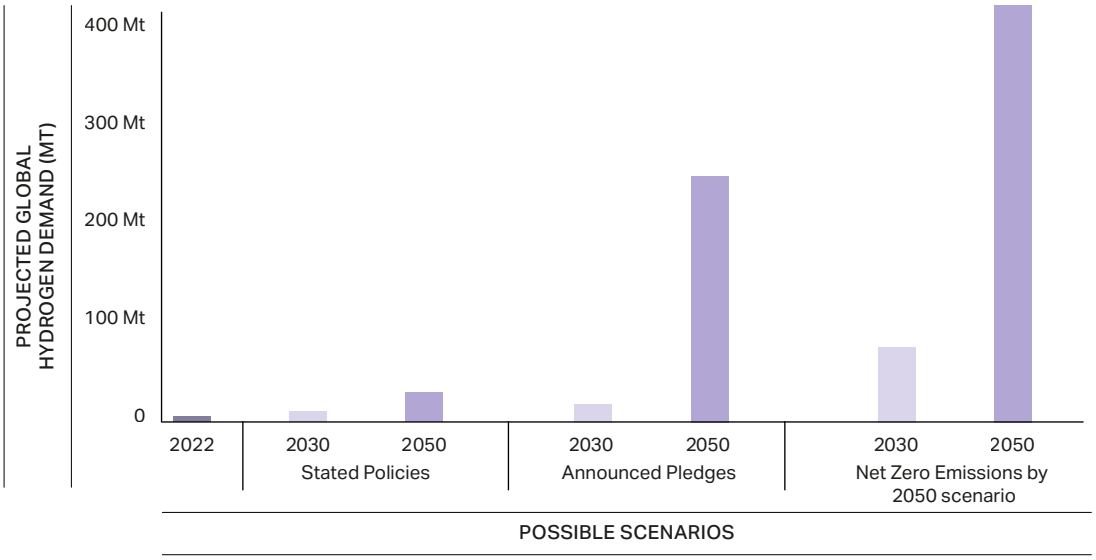
Currently, hydrogen demand is concentrated on its traditional applications, such as industry and refining. In 2023, global hydrogen demand reached 97 Mt, of which less than 1% came from new applications in transportation, heavy industry, or power generation, and only 1 Mt (1%) was low-emission (IEA, 2024). This situation reflects challenges on both the supply and demand sides: low-emission hydrogen applications

are not yet competitive against fossil fuels, and end-use technologies have not yet reached commercial maturity.

It is expected, however, that hydrogen will play an increasingly relevant role. Projections from specialized agencies agree that its share in final energy consumption will increase significantly by 2050, although with very different trajectories depending on the scenario considered (Graph 1) (BP, 2024; IEA, 2023; McKinsey, 2024). In terms of supply, the number of projects announced for low-emission hydrogen production grew rapidly until 2024 and, if all are realized, would allow reaching a production of 49 Mtpa by 2030. Nevertheless, only 7% of these projects have reached a final investment decision stage, due to the persistence of multiple barriers: uncertainty regarding the future evolution of demand, high production costs, lack of regulatory clarity, and a lack of necessary infrastructure for the transportation, storage, and distribution of hydrogen to end-users (IEA, 2024).

FIGURE 1

Projected global hydrogen demand under different scenarios, 2022–2050*



Source: Fundar, based on IEA (2023).

Note: The International Energy Agency (IEA) projects the evolution of global hydrogen demand under three distinct scenarios. The first, more conservative, assumes that currently enacted policies will remain in place until 2050 (stated policies scenario). The second scenario considers the full implementation of climate commitments already announced by countries, even if they are not yet backed by policies. The third, most ambitious scenario, estimates the hydrogen demand necessary to achieve net-zero emissions globally by 2050, that is, a context in which aggressive measures are adopted to reduce greenhouse gas emissions to near-zero levels.

Challenges to Sector Growth

The speed at which new hydrogen applications will expand and the role they will play in the energy transition is still uncertain. It will depend on the speed adopted for decarbonization, that is, on the ambition of climate policies, the competitiveness of hydrogen prices, electricity market prices, the future use of natural gas, and the development of carbon prices (BP, 2024; WEF, 2022). This uncertainty is explained, in part, by the "circular dynamics" that characterize the deployment of low-emission hydrogen: its large-scale adoption requires a supply that is competitive in economic and technological terms, but the development of such supply depends, in turn, on the existence of market conditions and infrastructure that guarantee sufficient demand—which is still in an incipient stage.

The hydrogen value chain faces persistent structural challenges regarding storage, transportation, safety, and costs. The current technical consensus indicates that its main application will be associated with its use as an input in the production of derivatives—such as ammonia, methanol, or synthetic fuels—which are relatively easier to store, transport, and employ in hard-to-abate sectors, such as heavy industry and maritime transportation. However:

- Hydrogen **storage**, both in its molecular form and in carrier compounds, continues to face technical and economic barriers linked to the need for specialized infrastructures, high conversion costs, and risks associated with handling toxic or flammable substances (IEA, 2023).
- Its **transportation**, even as a derivative, requires significant investments in physical infrastructure and logistics: from port facilities and pipeline networks to loading, back-conversion, and specialized storage terminals. Added to this is the need to adapt regulatory frameworks, train personnel, and develop safety protocols for handling substances with physical properties and risks very different from those of traditional fuels.
- **Safety** remains a critical aspect, both due to the flammable nature of hydrogen and its high permeability through materials, which can lead to leaks if adequate containment technologies are not used. This challenge also extends to its derivatives—such as ammonia and methanol—which, although they facilitate transportation and storage, imply additional risks due to their toxicity, corrosiveness, or flammability. All of this requires strict safety, handling, and operational standards across the entire chain.
- Further compounding these challenges are the high production **costs**[1] of low-emission hydrogen which, although they have decreased, still far exceed those of fossil fuels in most markets. In the case of green hydrogen, a relevant component

1 In 2023, renewable hydrogen prices were nearly three times higher than the levelized cost of hydrogen (LCOH) produced from gas without capture (IEA, 2024).

is electrolyzers—devices that use renewable energy to separate water into oxygen and hydrogen. Revised cost projections for this equipment suggest that the final cost of green hydrogen could triple by 2050 (Bloomberg, 2024). For blue hydrogen, specific challenges arise associated with the management of CO^2. For it to be effectively considered a low-emission alternative, it is necessary to have adequate infrastructure for carbon capture, transportation, and storage (CCS), as well as to guarantee the environmental integrity of the process through monitoring and regulation.

Overcoming these barriers requires not only technological advances, but also clear regulatory frameworks, active industrial policies, and financing instruments that allow for the development of infrastructure, generation of early demand, and construction of trust in international markets.

Commercial Potential

→ Despite the challenges facing its development, low-emission hydrogen and its derivatives are considered today one of the few viable solutions for hard-to-abate sectors to reach net-zero emissions.

Therefore—unless an accessible technological alternative emerges—it is expected that its market share will grow over time. This implies that those who develop competitive hydrogen projects will have the opportunity to position themselves in a market with high growth potential (Aneise and Möhle, 2024).

For this reason, numerous countries are integrating hydrogen into their long-term energy planning, in terms of both domestic production and supply. As of 2023, 41 countries had published specific strategies or plans for the development of hydrogen as an energy vector. Among the stimulus policies for the sector are instruments aimed at both supply—such as concessional financing, subsidies, preferential rates, and tax incentives—and demand, through consumption subsidies, tax reductions, or requirements in public procurement. Measures to strengthen the value chain also stand out, such as support for research and development (R&D) and national content requirements, according to the strategic priorities of each country.

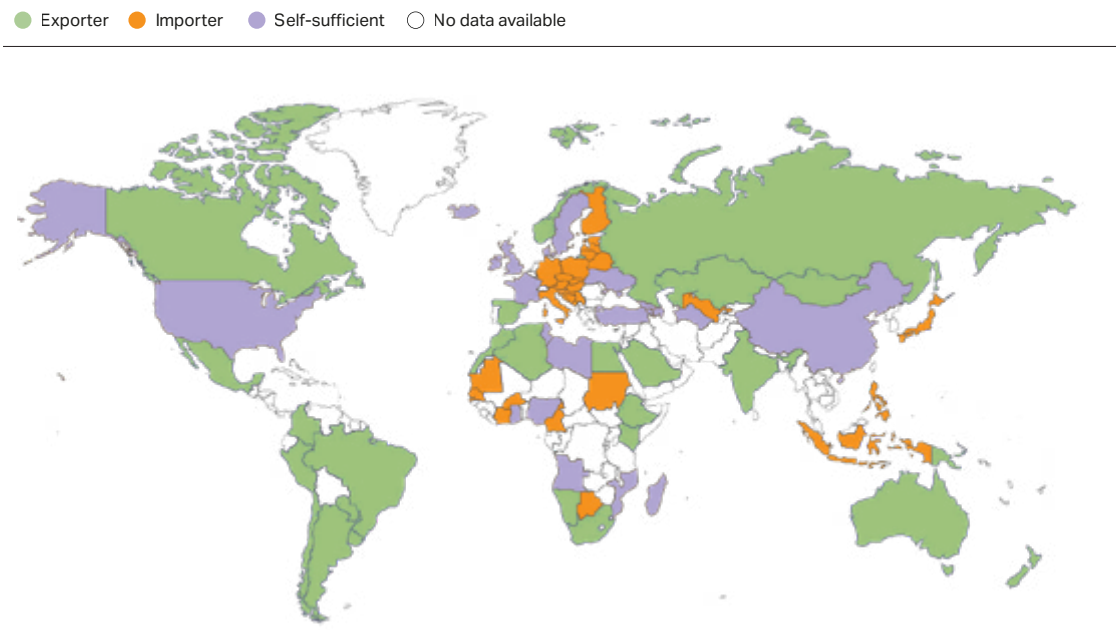
In the case of green hydrogen, while technically it can be produced anywhere using local energy resources, the competitiveness and relative cost of renewable energies are key factors in determining its final cost and, ultimately, the economic viability of producing it in that country (Quitzow and Zabanova, 2024).

At the same time, while all countries are likely to consume low-emission hydrogen in some of its applications, depending on the level of industrial development, that demand may be self-supplied or depend on imports. In many cases—particularly in densely populated countries with high energy demand, such as Germany, Japan, or South Korea, among others—the needs for low-emission hydrogen exceed the local capacity for renewable generation. This is due, among other factors, to the limited availability of land and the socio-environmental tensions derived from the installation of infrastructure (such as wind turbines) near urban centers. For these reasons, many countries are seeking to guarantee their supply through projects located outside their territories.

Consequently, two types of countries are emerging: producers—typically those with good renewable resources, space for solar and wind farms, availability of water, nuclear electricity and/or fossil fuels and carbon capture, utilization, and storage (CCUS) capabilities—and consumers—those with important industrial sectors, ambitious decarbonization objectives, and limited renewable resources (WEF, 2022). Producer countries, depending on the size of their domestic demand, can become exporters or be self-sufficient. Similarly, consumer countries, depending on their hydrogen production capacity, can be self-sufficient or importers.

MAP 1

Country categorization in the global hydrogen market (2022)



Source: Fundar based on the World Economic Forum and IRENA (2022).

In the initial stage, countries with abundant renewable resources and established industrial economies show converging interests: some seek to position themselves as hydrogen suppliers and capture local economic benefits; others, to secure a reliable and competitive supply to decarbonize their industries. However, as market development progresses, tensions emerge around the price of hydrogen, ownership of production technologies, and control over infrastructure and supply security. Thus, initial cooperation can lead to new asymmetries or geopolitical disputes around this strategic resource (Quitzow and Zabanova, 2024) and, consequently, the categorization between exporters and importers is shaped by additional factors:

- High transportation costs and concerns about energy supply security tend to favor hydrogen production near consumption centers.
- In the case of green hydrogen, the capacity of producer countries to generate renewable energy at low cost—which depends, among other things, on available financing and the quality of solar or wind resources—is determinant for the resulting hydrogen to be competitive (Argentina Productiva, 2023).
- The possibility that large industrial consumers may locate their new facilities near regions with abundant renewable energy at a competitive price, taking advantage of what is called the "renewable attraction effect" (Samadi et al., 2023).
- Global competition for control of strategic technologies, which also reaches hydrogen: major economic blocs seek to lead the associated value chains to guarantee their technological and industrial sovereignty (Van de Graaf et al., 2020).

In this context, both countries seeking to guarantee imports and those looking to consolidate themselves as exporters are increasingly involved in hydrogen-dedicated diplomacy (IRENA, 2022). This is expressed in technical, commercial, and diplomatic missions, memorandums of understanding (MoU), and pre-agreements, with the aim of strengthening cooperation, exchanging knowledge, and establishing strategic partnerships that allow building this market according to their interests. While Argentina signed memorandums of understanding[2], its diplomatic action in this field has been limited compared to that of other countries in the region. Some private projects, such as the one promoted by the Australian firm Fortescue or by RP Global with technical support from GIZ in Santa Cruz, reflect sectoral interest, but do not constitute a sustained diplomatic strategy. In contrast, countries like Chile, Uruguay, Brazil, and Colombia deploy more active diplomacy, signing multiple bilateral agreements and participating in international initiatives to position themselves as strategic suppliers of low-emission hydrogen[3].

The Argentine Situation: From Pioneers to Pending Issues

Argentina is emerging as a potentially relevant large-scale producer of low-emission hydrogen, capable of positioning itself as an exporting country in international markets and self-supplying to decarbonize its industries. In addition to the diversification of its export base toward low-emission products, the development of this industry opens opportunities to generate productive linkages at a local level, based on greater demand for goods and services in related industrial sectors.

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2 For example, with the European Union for cooperation on green hydrogen, between the Korean company Posco, YPF, and YPF Luz for the production of green hydrogen and ammonia, or the agreement between the Fraunhofer Institute and IEASA for project development.

3 Examples of countries with agreements of this type in the region are Chile, for example, H2Chile with Hydrogen Europe (2024) or the Ministry of Energy of Chile with the Port of Rotterdam (2021, renewed in 2023); Brazil, for example, those from Electrobras with Green Energy Park (2024), the Japan Bank for International Cooperation with the Brazilian Association of the Green Hydrogen Industry (2025); Uruguay, for example, the one signed with the European Union (2025); Colombia, for example, the one signed with South Korea (2023), the Port of Rotterdam (2022), the Fraunhofer-Gesellschaft Institute of Germany (2023), or the Japan Bank for International Cooperation (2024).

Enabling Conditions

1. The geographical conditions and resource availability are optimal for the development of low-emission hydrogen.

The country's geographical conditions are optimal for green hydrogen generation, as the capacity factor of its renewable farms—that is, the ratio between the energy effectively generated and what would have been generated if the plants operated all the time at their maximum nominal power—was 47% for wind energy and 29% for solar energy in 2021 (CAMMESA, 2022)[4]. These conditions are reinforced by low population density and the availability of land suitable for installing renewable farms, as well as access to water sources. In particular, the Patagonian region combines excellent quality wind resources with extensive, sparsely populated areas and proximity to ports, making it a strategic area for the development of green hydrogen. In addition to green hydrogen, the country's abundant gas resources also position Argentina as a relevant candidate for blue hydrogen production. In particular, the presence of Vaca Muerta, with the second-largest non-conventional gas resources globally, gives it the possibility of transitioning part of its current gray hydrogen production towards its blue variant through carbon capture, utilization, and storage (CCUS) technologies.

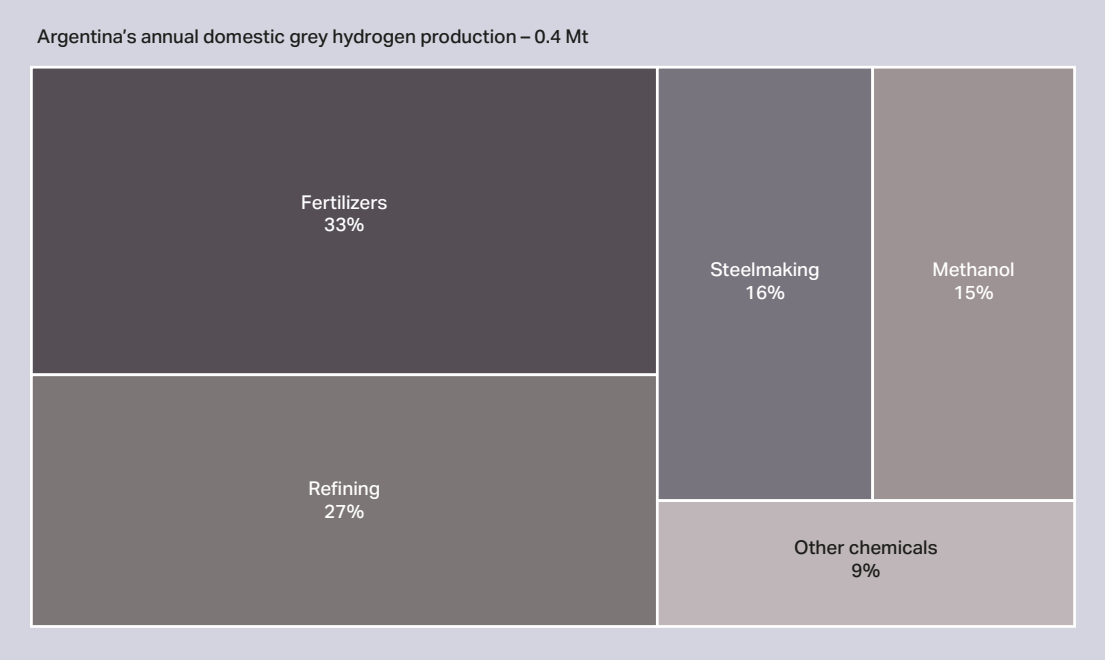
2. There is a productive trajectory in hydrogen that opens the door to intelligent insertion into the value chain.

The existence of a mature local market is one of the strengths that Argentina brings to boost the low-emission hydrogen economy. In Argentina, hydrogen is not an unknown input: the country produces 0.4 Mt of gray hydrogen per year for domestic consumption, representing 9% of the Latin American market (4.4 Mt) and approximately 0.4% of global demand (94 Mt). This hydrogen, produced from natural gas, is used in fertilizer production—such as in ammonia synthesis and urea manufacturing—and in the fuel refining sector, where it is used to reduce sulfur content. Additionally, it has important applications in methanol production, the steel industry, and the manufacturing of various chemical products.

4 For reference, in 2024 the capacity factors in the United States were 34.3% for wind power and 23.4% for solar power (Department of Energy, 2025).

GRAPH 2

Distribution of annual Argentine internal production of gray hydrogen according to end-use (2023)



Source: Fundar based on the Secretariat of Strategic Affairs, 2023.

This industrial base not only reflects installed capacities and structural demand, but also provides a concrete platform from which to advance both in the production of low-emission hydrogen and in its industrial adoption. In this way, building on this trajectory would allow Argentina to gradually integrate into global hydrogen value chains, capitalizing on its technical capabilities and industrial base.

3. The Argentine science and technology system has been promoting research and development (R&D) initiatives in hydrogen.

Argentina has been building hydrogen-related capabilities for over 20 years. As early as 2000, the Secretariat of Science and Technology supported the construction of a pilot plant for hydrogen production and purification from biomass. In 2005, a Strategic Area Project (PAE) on production, purification, and applications of hydrogen as fuel and energy carrier was approved and funded. In 2007, with the creation of the Ministry of Science, Technology, and Productive Innovation, the linkage between the productive sector and the scientific sector was strengthened, along with the delivery of training sessions and the development of proprietary technology (Bril Mascarenhas et al., 2021). These initiatives, in turn, sought to link to a network of public companies, such as YPF Tecnología (Y-TEC)—a public-private company jointly owned by YPF and CONICET—, INVAP—a state-owned enterprise of the province of Río Negro that leads complex technological projects—, the provincial energy company

of the province of San Juan oriented towards photovoltaic solar technology (EPSE), and the Heavy Water Industrial Plant (PIAP) managed by CNEA and the Neuquén government with potential for ammonia production (ESMAP, 2020; Secretariat of Strategic Affairs, 2023).

Argentina sought to promote the development of hydrogen through Law N° 26123 of the year 2006. In it, the development of technology, as well as the production, use, and applications of hydrogen as fuel and energy carrier, were declared of national interest. However, this law was never regulated.

Early on, small-scale renewable hydrogen production experiences emerged from the company Hychico S.A. in Comodoro Rivadavia, Chubut, and the experimental plant in Pico Truncado, in Santa Cruz. In recent years—and especially since the post-pandemic period—announcements of green hydrogen production projects in Argentine territory multiplied, driven by both national and international capital. Most of these initiatives were conceived with an export profile and a significantly larger scale than previous pilot experiences (see Annex). However, so far, none reached advanced stages of development or effective investment.

→ Thanks to this accumulated experience, there are actors in Argentina with experience in hydrogen, many of whom are already participating in collaboration spaces.

In the year 2020, the Consortium for the Development of the Hydrogen Economy in Argentina (H2ar) was formed, led by Y-TEC, with the goal of bringing together the actors of the hydrogen value chain. This initiative seeks to create a collaborative work-space that gathers already involved companies—or those interested in participating—along the entire chain, from production to its industrial applications. For that reason, it includes both firms from the oil and gas sector, and renewable energy generators, as well as manufacturers and potential hydrogen consumers from various industrial sectors, industrial suppliers, firms from the energy sector in general, and ammonia pro-ducers. Meanwhile, the Plataforma H2 Argentina is a multisectoral space integrated by academic institutions, business chambers, and non-governmental organizations, which promotes the development of a national roadmap for hydrogen. Since 2020, it has promoted public activities and strategic articulation to position Argentina as a relevant actor in the energy transition based on hydrogen, with an agenda oriented towards regulation, innovation, and international cooperation.

Challenges

1. High Cost of Capital

The development of the hydrogen economy involves large-scale projects, with long maturation times and high requirements in infrastructure, technology, and logistics. Therefore, it is a capital-intensive industry, where access to financing under competitive conditions is determinant for the viability of investments. In these types of sectors, the cost of capital—and in particular, the real interest rate demanded by financiers—depends heavily on country risk. This risk is reflected in an additional premium that is added to the base rate and increases the cost of long-term financing. In emerging economies, the risk premium is usually considerably higher, raising the effective cost of capital and reducing the relative competitiveness of projects. In Argentina, this premium is even higher than in other countries in the region, mainly for two reasons:

- The history of restrictions on capital flows and access to the foreign exchange market, which hinder both the repatriation of profits and the importation of goods and services necessary during the investment and operation stages.
- The sustained macroeconomic instability that has characterized the Argentine economy in recent years. In sectors like hydrogen, where returns are expected over horizons of 10 to 20 years, these types of restrictions hinder financial structuring, lengthen project closing times, increase the cost of access to debt, and reduce investor interest. As a consequence, the cost of capital differential compared to economies with lower systemic risk widens, compromising Argentina's competitiveness as a destination for technology- and capital-intensive projects (Gómes et al., 2024). In this way, Argentina is emerging as a country with higher production costs compared to other regions with high potential for hydrogen, such as Brazil, Sub-Saharan Africa, or northern Australia (Ministerio de Economía, 2023).

2. Lack of a Comprehensive and Sustained Policy Positioning Hydrogen as a Strategic Sector for the Country

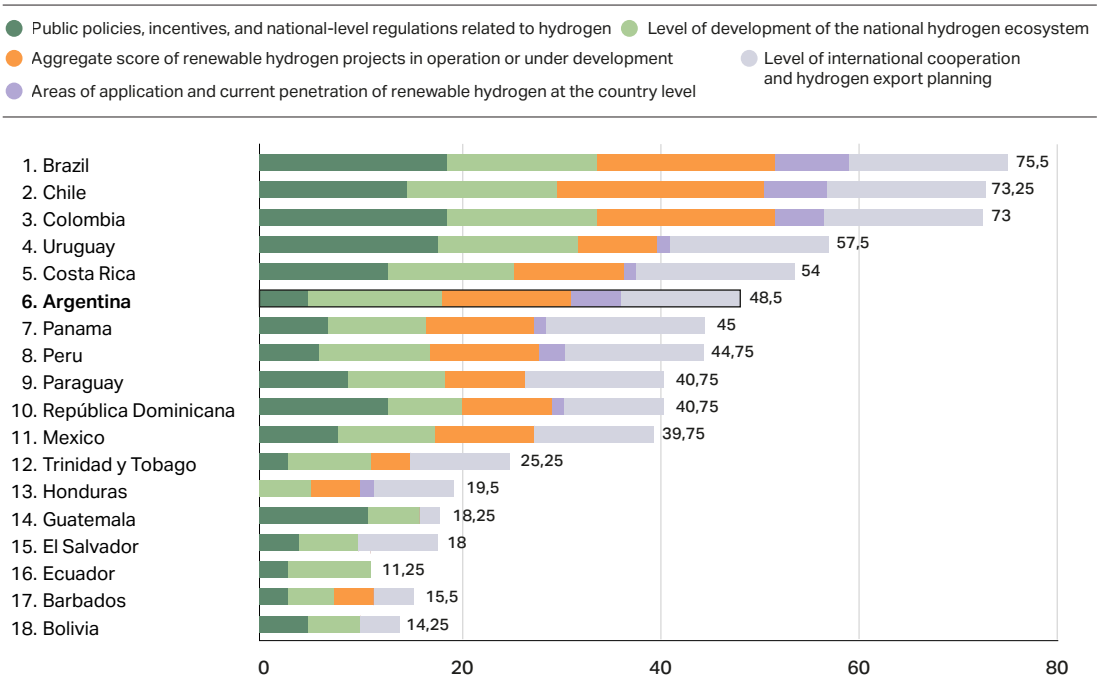
Argentina adopted a series of public policies aimed at fostering hydrogen development, but it did so erratically. The aforementioned Law N° 26123, which declared the development of hydrogen technology of national interest, was never regulated, and its implementation stalled. After years of inaction, in 2019, the hydrogen agenda was reactivated through various mechanisms. A new bill was presented to promote the activity, it was incorporated into the 2022 National Plan for Adaptation and Mitigation to Climate Change (MAyDS, 2022) as a line of action for the energy transition, and it was identified as a strategic sector in the Plan Argentina Productiva 2030[5]. In 2023, the National Strategy for the Development of the Hydrogen Economy was presented, which set goals for 2050 and sought to generate certainty about

5 Even a large investment in an export project in the province of Río Negro was announced (Ministry of Economy, 2021).

the path of low-emission hydrogen as a key vector for clean energy and industry[6]. Based on this trajectory, the Hydrogen for Latin America and the Caribbean Index (H2LAC Index) in 2025 places Argentina in sixth place regarding the degree of development of the low-emission hydrogen economy in the region's countries, after Chile, Colombia, Brazil, Uruguay, and Costa Rica (H2LACIndex, 2025)[7]. In this index, each country is analyzed according to its performance in five dimensions: (1) public policies and regulations, (2) number of projects in operation or in the development process, (3) the consolidation of the national hydrogen ecosystem, (4) hydrogen application areas, and (5) planning and number of international agreements[8]. The "public policies" dimension appears as one of the main factors explaining this relative lag. This suggests that, although Argentina has shown advances in project and application development, the absence of a robust regulatory framework and clear strategic planning limits its overall positioning in the regional ranking.

GRAPH 3

Ranking of 18 Latin American countries according to their level of hydrogen industry development (H2LAC index general score), 2025



Source: Fundar based on the H2LACIndex, 2025 (accessed 7/14/2025).

6 It was developed within the framework of the Interministerial Hydrogen Table formed at the end of 2020. [7] The index methodology establishes 100 points as a reference for a fully developed hydrogen economy.
7 The index methodology establishes 100 points as a reference for a fully developed hydrogen economy.
8 The evaluation is based on surveys conducted with more than 60 leaders from different countries—including government officials, public and private sector experts, and representatives of international organizations—supplemented with analysis and verification of public data by the index's technical team.

→ Together the combination of high capital costs and the absence of a comprehensive and sustained policy has resulted in limited development of the hydrogen sector compared to other countries in the region[9].

The plans and projects promoted so far failed to generate the economic stability conditions required by investments of this magnitude. At the same time, the actors in the hydrogen ecosystem also failed to build a broad political consensus regarding the need to promote the sector or on the concrete terms of its development.

TABLE 1

Summary of enabling conditions and challenges for the development of low-emission hydrogen in Argentina

Dimension	Enabling conditions	Challenges
Structural conditions	Exceptional geographical conditions for low-emission hydrogen production	High cost of capital in a highly investment-intensive sector
Production context	Pre-existing technological and industrial base in hydrogen-related processes	Less progress compared to the region, with no large-scale projects in operation.
Institutional progress	Early start of regulation and multiparty legislative interest	Lack of a comprehensive policy for the development of the sector
Ecosystem capabilities	Consolidated ecosystem articulated across platforms	Limited capacity of the ecosystem to influence public policy and legislative processes

Source: Fundar.

From the analysis of the enabling factors and challenges for the development of low-emission hydrogen in Argentina, it emerges that, although favorable structural conditions and consolidated technical-productive capabilities exist, relevant barriers persist that limit the takeoff of the sector. In particular, the high cost of capital presents itself as a significant structural obstacle, especially in an investment-intensive industry like hydrogen. However, it is a restriction of a systemic nature that exceeds this sector and can only be addressed through broader macroeconomic reforms.

In that context, the main opportunity for concrete influence lies in the institutional level: the enactment of a specific law appears as a key turning point to provide the sector with a stable, credible, and long-term regulatory framework. A consensus-based legislation would not only provide predictability to projects and actors but would also

9 For example, in the case of Chile, according to the Chilean Hydrogen Association, as of December 2023, there were 64 industrial projects regarding this fuel, of which 6 were already operational (H2 Chile, 2024). At the same time, according to the Central Bank of Chile, there are 5 projects currently in the Environmental Impact Assessment System (SEIA), which estimate investments around USD MM 15,000 and whose estimated start dates for operations are between 2025 and 2026 (Central Bank of Chile, 2024). Likewise, the country has already signed MoUs with various nations, among them Japan, Korea, Germany, and the Netherlands. In the case of Brazil, it has five projects in operation and 40 in development (H2LAC, 2024).

allow strengthening public-private coordination, aligning regulatory incentives, and generating clear signals towards investors and financing institutions.

Why a Legal Framework for Hydrogen?

Low-emission hydrogen represents an opportunity for Argentina to position itself as a pioneer in an emerging sector, diversify and increase exports, and advance toward industrial decarbonization. Although uncertainty persists regarding the speed of its development, the magnitude of the opportunity justifies creating the necessary conditions now so that, if the sector takes off, Argentina consolidates itself as an attractive destination for investment.

Increasing Argentina's competitiveness compared to other countries requires establishing a framework that provides regulatory predictability to the sector and protects it from measures that could discourage investment decisions. The investments necessary for hydrogen projects—and, consequently, the policies to promote them—are comparable to those foreseen in other large investment regimes. However, hydrogen has particularities: it is still an incipient market, with projects in the early phase of exploration, technological maturation, and search for buyers (off-takers). Therefore, it is probable that the main investment opportunities will materialize only in the coming years, which reinforces the need to have a specific, broad, flexible, and long-term regime.

This focus on competitiveness must be complemented with policies that expand the economic impact of the sector beyond exports and direct employment. Hydrogen production can generate productive linkages in industrial sectors such as the manufacturing of capital goods, foundries, special steels, electrical components, construction materials, adaptation of vessels for hydrogen or green ammonia, and road and port infrastructure works (Argentina Productiva, 2023). In the case of green hydrogen, additional opportunities are opened linked to the deployment of renewable energies, which include the manufacturing of wind turbine components, towers, metal structures, solar farms, and storage systems, as well as specialized installation, operation, and maintenance services. For its part, blue hydrogen can boost activities related to natural gas and carbon capture and storage, such as pipeline engineering, infrastructure operation, and services associated with carbon capture, utilization, and storage technologies. In both cases, there is also significant potential in knowledge-intensive technological and professional services, such as certification, environmental monitoring, consultancy, traceability, and process digitalization.

These complementary chains can amplify the impact of hydrogen on the national productive structure, generating qualified jobs, exportable capabilities, and new

regional development opportunities. However, this dynamization does not occur automatically: it requires public policies designed to maximize both investment and local content (UNCTAD, 2014; Macatangay, 2016).

At the same time, it will be especially critical how environmental and social impacts associated with the sector's development are managed. Both the regulatory framework and the expansion of projects must be built on the basis of broad political support and a solid social license, both at a general and territorial level. For this, it is key to complete the Strategic Environmental Assessment initiated in 2023, incorporating aspects such as biodiversity conservation and water availability, and other criteria that guarantee that projects effectively contribute to the social and economic well-being of the communities where they are implemented.

Finally, given that hydrogen development involves a wide variety of actors—whose interests do not always coincide with each other or with a strategy oriented towards maximizing local benefits—it is fundamental to have a national planning that orders the deployment of the sector strategically based on objectives defined from public policy. A law can provide the necessary support to that strategy by providing it with a robust regulatory framework.

Seven Requirements for an Effective Legal Framework for Hydrogen

1 **The legal framework should promote all variants of low-emission hydrogen, without restricting incentives exclusively to green hydrogen.**

In the context of integration into an international market still in formation, where different production technologies coexist and compete, it is up to the private sector to evaluate the risks and opportunities associated with each type of project, as well as ensure the existence of buyers (off-takers) for derived products. Favoring technological diversity can contribute to dynamizing the local industry, increasing its productive density, and attracting investments in different segments of the value chain. From this perspective, a rigid classification between hydrogen subtypes within the promotion regime could be unnecessary or even counterproductive, considering that international markets already tend to establish emission traceability and certification standards that will regulate commercial access on a global scale.

2 **It is not advisable to establish a minimum investment threshold to access the benefits of the regime.**

Hydrogen projects can vary significantly in scale: while initiatives aimed at the local market may involve investments in the order of USD 100 million, large projects destined for export markets usually require amounts exceeding USD 600 million (Hydrogen Council, 2023). Although larger-scale developments tend to show better cost competitiveness, this is an incipient sector, with trajectories still in formation. Therefore, setting a minimum threshold could exclude valuable projects in early stages or of smaller scale, which may be key to building local capabilities, fostering innovation, and diversifying the base of actors.

3 **The deadline for joining the framework must remain open at least until 2035.**

The most recent projections at a global level indicate that hydrogen projects will require longer maturation times, with extended investment horizons and high levels of technological, regulatory, and commercial uncertainty. The update of global projections shows that projects will require time to mature, extending investment horizons and increasing uncertainty. For these reasons, it is fundamental to grant predictability over time and avoid adhesion windows that are too tight, which could discourage or exclude initiatives still in the formulation stage.

4 **The legal framework must decouple projects from local macroeconomic conditions.**

While Argentina has high potential for low-emission hydrogen production, its entry into the market is late and occurs in a context of structurally less favorable macroeconomic conditions. Therefore, it is necessary for the framework to include instruments that reduce risk and bring local conditions closer to those offered by neighboring countries competing for the same investments. This implies benefits such as fiscal and regulatory stability, access to the Free and Single Exchange Market, among others (see Annex).

5 The law must include tools that promote local development.

The integration of national capabilities into the hydrogen value chain is a necessary condition to maximize the long-term benefits associated with the development of this new industry. Promoting local development allows generating qualified employment, dynamizing national suppliers, fostering technological transfer, and building a stronger social license. One of the most common tools for these objectives are local content requirements[10]. Considering that in Argentina the scale of production and technological positioning are still limited, establishing a mandatory local content threshold as a condition of entry into the regime may be counterproductive, generating uncertainty and disincentivizing investments. Instead, it is recommended to adopt a gradual and flexible approach, in which local integration functions as a criterion to access additional benefits—such as tax credit[11] or preferential access to public financing[12]—instead of being an exclusive requirement. This would allow for realistically accompanying the growth of the national productive ecosystem. Other complementary instruments also exist that can strengthen local development: human resource training programs[13], incentives for investment in R&D—especially in collaboration with universities and technological centers[14]—, targeted public procurement schemes and early demand policies, association mechanisms between foreign companies and local actors, or the creation of a Hydrogen Fund that channels resources towards research projects and the development of local technological and productive capabilities. The financing of these initiatives should not depend on a mandatory contribution from the projects, as this could discourage investments. But it is desirable to establish a system of state incentives under a recognition logic: the greater the investment in local capabilities, the greater the fiscal, financial, or contractual benefits should be.

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10 For example, in Brazil, the Special Incentive Regime for the Production of Low Carbon Emission Hydrogen establishes a progressive national content requirement: no requirements until 2027; a minimum of 10% between 2028 and 2030; and, from 2031 onwards, a percentage that may reach up to 50%, subject to periodic revisions every three years, based on the degree of industrial maturity and the evolution of the sector (Ministry of Mines and Energy of Brazil, 2025).

11 As a reference, Law 27,191 for the Promotion of Renewable Energies grants a tax certificate to cancel taxes for 20% of the value of local integration (provided it exceeds 30%).

12 In Brazil, the National Bank for Economic and Social Development (BNDES) grants access to financing lines with preferential conditions for renewable energy projects that comply with a certain percentage of local content in equipment and services.

13 Chile launched the "Human Capital Training for Green Hydrogen" program in 2023, driven by CORFO and the Ministry of Energy, which seeks to develop technical, operational, and professional profiles in hydrogen production, transportation, and use, through alliances with educational institutions and technical training centers.

14 The Indian Institute of Petroleum and Energy (IIPE) signed an agreement in 2024 with the firm Magnivia Ventures to create an Energy Research Park, focused on green hydrogen, battery storage, and carbon capture. The initiative seeks to connect applied research with the needs of the productive sector, generating proprietary technologies and training qualified talent in close relationship with emerging industries

6 **The law should explicitly state interest in developing local hydrogen demand.**

The incorporation of hydrogen in the decarbonization of local industries represents an attractive alternative for Argentina, not only based on its climate commitments but also for reasons of techno-economic viability. The transport of hydrogen on a large scale and over long distances continues to present technical challenges and high costs, and its deployment has not yet been fully demonstrated. In this context, using hydrogen near its place of production—that is, through the installation of consumer industries in the territories where it is generated—can be a competitive strategy from a financial and infrastructure perspective (Patagonia, 2023). While it is not recommended to impose a mandatory quota destined for the local market—given that forcing premature adoption could compromise the competitiveness of local actors—it is desirable to contemplate additional benefits for projects that allocate part of their production to the internal market, as well as mechanisms that stimulate potential end-users, understanding that adoption presents not only technical challenges but also significant costs (Gómes et al., 2024).

7 **The regulation must designate an enforcement authority—new or existing—that defines the technical, operational, and regulatory parameters of the sector.**

Among these guidelines are:

- safety regulations for the production, storage, distribution, and use of hydrogen, including protocols for leaks, explosiveness risks, compatible materials, and industrial operation standards;
- technical requirements for transportation and distribution, both for hydrogen in its pure state and for its derivatives;
- certification systems at origin and carbon footprint, with standardized methodologies to calculate and verify associated emissions, in line with the requirements of international markets and global standards;
- traceability mechanisms that allow tracking hydrogen from its production to its final use, guaranteeing transparency in its environmental and energetic attributes;
- hydrogen quality standards based on its purity level and final application.

In conclusion, it is essential to establish a broad and flexible regulation that harmonizes three fundamental dimensions: creating attractive investment conditions that protect the sector from the fluctuations of the Argentine macroeconomy, utilizing hydrogen as a catalyst for capacity development throughout the entire value chain, and, in turn, decarbonizing local industrial sectors. However, even with an optimal legislative framework, the consolidation of a new sector—technologically complex, capital-intensive, and exposed to high levels of risk—is extremely challenging. Therefore, a broad and transversal consensus among the main political forces is indispensable to provide predictability and long-term support to the vision and development strategy of hydrogen.

Bibliography

- International Energy Agency (IEA). (2023). World Energy Outlook 2023.
- International Energy Agency (IEA). (2024). Global Hydrogen Review 2024: Hydrogen Production.
- International Renewable Energy Agency (IRENA). (2022). Geopolitics of the Energy Transformation: The Hydrogen Factor.
- Andreoni, A., & Roberts, S. (2022). Green Hydrogen for Industry and the Challenges for an Entrepreneurial Regulatory State (CCRED-IDTT Working Paper 2022/11). Centre for Competition, Regulation and Economic Development (CCRED) & Institute for Development, Technology and Trade (IDTT).
- Aneise, A. J. y Möhle, E. (2024). Argentina frente al cambio climático. Un nuevo modelo de desarrollo para un mundo en transición. Fundar.
- Argentina Productiva 2030. (2023). Misión 2: Desarrollar la economía verde para una transición ambiental justa. Plan para el Desarrollo Productivo, Industrial y Tecnológico. Ministerio de Economía de la Nación.
- Central Bank of Chile. (2022, May 3). Hidrógeno verde: Potencial, desafíos y oportunidades para Chile.
- BP. (2023). Energy Outlook 2024 Edition.
- Bril Mascarenhas, T., Gutman, V., Dias Lourenco, M. B., Pezzarini, L., Palazzo, G. y Anauati, M. V. (2021). Políticas de desarrollo productivo verde para la Argentina. Buenos Aires: Fundar.
- CAMMESA. (2022). Informes y estadísticas.
- United Nations Conference on Trade and Development (UNCTAD). (2014). Local Content Requirements and the Green Economy (UNCTAD/DITC/TED/2013/7).
- Argentine National Congress. (2006). Law No. 26,123: Declare of national interest the development of technology, production, use, and applications of hydrogen as fuel and energy vector. Official Gazette of the Argentine Republic.
- World Energy Council. (2022). World Energy Perspectives: Regional Scaling of Low-Carbon Hydrogen [Working paper].
- Fundar. (2021). Políticas de desarrollo productivo verde: oportunidades para una transición productiva ambientalmente sostenible en Argentina [Policy brief].
- Gomes, I., Patonia, A., Gogorza, A., Caratori, L., Gama, N., Diazgranados, L., Hartmann, N., Kulenkampff, H., & Carlino, H. (2024). Hydrogen for the 'low hanging fruits' of South America: Decarbonising hard-to-abate sectors in Brazil, Argentina, Colombia, and Chile. The Oxford Institute for Energy Studies.

- Honorable Chamber of Deputies of the Nation. (2019). Bill 1769-D-2019: Hydrogen promotion regime.
- Hydrogen Council and McKinsey and Company. (2023). Hydrogen Insights.
- Hydrogen Europe. (2024). Hydrogen Europe and H2 Chile agree to strengthen industrial cooperation for the deployment and trade of clean hydrogen.
- H2 Chile – Chilean Hydrogen Association. (n.d.). Official Website.
- H2LAC Index. (2024). Brazil: Country Factsheet – Hydrogen Index for Latin America and the Caribbean.
- Japan Bank for International Cooperation. (2025, March 26). Support for collaboration between Japanese and Brazilian companies in the hydrogen and derivatives sector [Press release].
- Macatangay, R. E. (2016). Industrial policy and renewable energy development: A review of international experiences. Energy Policy, 96, 611–620.
- McKinsey and Company. (2024). Global energy perspective 2024.
- Ministry of Environment and Sustainable Development. (2022). National Plan for Adaptation and Mitigation to Climate Change 2022.
- Ministry of Mines and Energy of Brazil. (2023). Guidelines of the National Hydrogen Program and the Low Carbon Hydrogen Plan.
- Netherlands Enterprise Agency. (2024). Hydrogen opportunities in Chile: Brochure 2024.
- Patonia, A. (2023). Renewable hydrogen production for export: Risks of value leakage and its mitigation in Global South countries. Energy Research & Social Science, 104.
- Quitzow, R., Thielges, S., Schloemann, H., & Seidl, T. (Eds.). (2024). The Geopolitics of Green Hydrogen: A Global Perspective (1st ed.). Springer.
- Reuters. (2024, May 14). Brazil's Eletrobras partners with GEP for green hydrogen.
- Samadi, S., Fischer, A. y Lechtenböhmer, S. (2023). The renewables pull effect: How regional differences in renewable energy costs could influence where industrial production is located in the future. Energy Research & Social Science, Volume 104.
- Secretariat of Strategic Affairs. (2023). National Strategy for the Development of the Hydrogen Economy. Chief of Staff of Ministers, Presidency of the Nation.
- Van de Graaf, T., Overland, I., Scholten, D., & Westphal, K. (2020). The new geopolitics of energy. Energy Research & Social Science, 70, 101667.
- World Energy Insights. (2022). Working paper regional insights into low-carbon hydrogen scale up.

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