REPORT SERIES CLEAN HYDROGEN PROJECTS IN THE GLOBAL SOUTH

Pathways to final investment decision: A data-driven perspective on clean hydrogen in Africa

H2Global Foundation

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About this report

Contributions

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Executive summary

Clean hydrogen[i] is poised to become a critical pillar of the global energy transition, yet actual investment and project deployment remain highly uneven across regions. While more than 2,600 clean hydrogen projects are currently tracked worldwide, according to the International Energy Agency (IEA), only a small share has progressed to final investment decision (FID) or operation, and these are overwhelmingly concentrated in the Global North and China. In Africa, only eight of 122 projects have reached FID, underscoring a substantial maturity gap.

This report explains these differences through a data-driven analysis of global project success factors.

Using the IEA hydrogen project database enriched with AI-assisted research, the study identifies three distinct success pathways: export-oriented large-scale projects, vertically integrated sponsor—offtaker models, and projects benefiting from favorable economic and renewable energy conditions.

Africa's project pipeline shows a heavy bias toward large, export-oriented models, with 89% of projects in North Africa and 76% in sub-Saharan Africa targeting export markets. This approach increases exposure to offtake uncertainty—one of the most significant barriers to securing investment.

Limited value-chain integration and weaker economic and institutional environments compound these challenges. Despite vast renewable energy resources, African projects often lack the domestic anchors and risk-mitigation structures characteristic of successful global projects.

A key opportunity lies in building stronger domestic or regional anchors, particularly around established demand centers such as fertilizers or bunkering hubs for marine fuels. Exploring local or regional offtake options could substantially lower commercial risk by reducing reliance on distant and uncertain export markets.

Figure 1: Identified pathways for successful clean hydrogen project development.

Pathway 1

Large-scale (ø 200 MWel), export-oriented projects being successful through international offtake opportunities.

Pathway 2

Small-scale (ø 20 MWel), domestically focused projects with vertically integrated sponsor-offtaker models.

Pathway 3

Mid-scale (ø 50 MWel), domestically focused projects with beneficial economic and renewable energy conditions.

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[i] Clean hydrogen refers to hydrogen produced with substantially lower greenhouse gas emissions than conventional unabated fossil-based production. The analytical part of this publication focuses on a subset of 569 successful renewable (n = 543) and low-carbon, i.e. natural gas with CCUS (n = 26), hydrogen projects tracked by the IEA.

Complementing such strategic project design with concessional finance and targeted financial support instruments could also play a decisive role. These mechanisms are essential for de-risking clean hydrogen projects and mobilizing the capital required to reach FID, especially during costly early development stages.

Targeted financial support for clean hydrogen in Africa currently totals EUR 4 billion

However, the financing landscape further illustrates the continent's structural constraints. Targeted financial support for clean hydrogen in Africa currently totals EUR 4 billion, compared with USD 222 billion (EUR 192 billion) available to the rest of the world. In addition, only 20% of these funds available to African projects have been disbursed, highlighting a disconnect between available capital and project readiness. Funding is highly concentrated, with 78% originating from EU institutions and governments, particularly through the European Investment Bank, the EU Global Gateway, and German instruments such as H2Global (EUR 887 million committed)[ii] and the Power-to-X (PtX) Platform of Kreditanstalt für Wiederaufbau (KfW). Although multilateral actors such as the Climate Investment Funds (CIF) and national investment funds in Egypt, Namibia, and South Africa provide additional support, this remains limited relative to overall needs.

Based on the data-driven analysis of success pathways for clean hydrogen projects and the complementary analysis of the financial landscape in Africa, the report identifies targeted, actionable recommendations to accelerate project development:

- **Establish stronger domestic anchors**—through regional value-chain development, industrial integration, and local offtake—to reduce commercial risk and enhance long-term socio-economic benefits.
- **Evolve funding structures beyond simple grants and loans toward more catalytic financial instruments**—including blended-finance vehicles, guarantee mechanisms, and structured offtake agreements—to mitigate risk and mobilize private investment.
- **Expand technical assistance and early-stage project development finance**, as early-phase costs can reach several million euros and often represent a major bottleneck for African project developers.
- **Diversify financial partnerships beyond Europe** by engaging additional multilateral, export credit, and climate finance institutions, while leveraging EU instruments as anchor financiers.

Overall, the report concludes that Africa holds significant potential to develop a robust clean hydrogen sector, yet realizing this opportunity will require a shift in project design, targeted de-risking instruments, and broader international financial engagement.

Funding structures should evolve beyond simple grants and loans toward more catalytic financial instruments.

Strengthening early-stage support and fostering domestic value chains will be essential to unlock investment, accelerate project maturity, and ensure Africa can meaningfully participate in the global hydrogen economy.

[ii] Initial commitments from the German government to implement Hintco's double-sided auction mechanism included EUR 300 million for the 2024 ammonia pilot auction—awarded to a project based in Egypt—and EUR 587 million dedicated to the Africa lot in Hintco's second auction round.

The hydrogen opportunity: Status of clean hydrogen production projects globally

Clean hydrogen is poised to become a key element of global green industrial development efforts. An indicator of progress in this field is the status of clean hydrogen production projects currently under development.

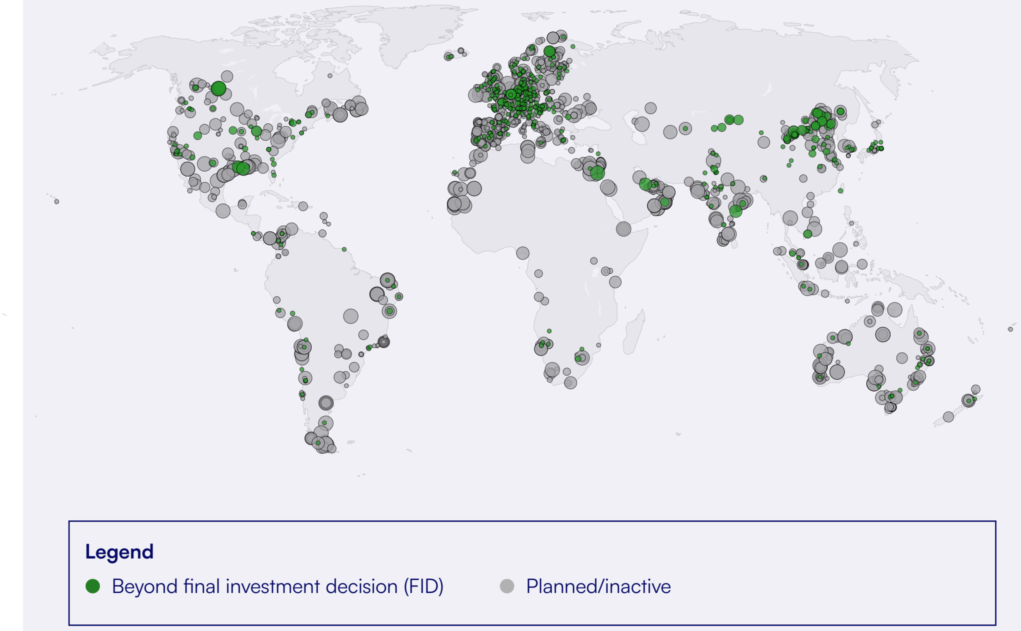
According to the International Energy Agency's (IEA) latest database release,[1] 2,618 clean hydrogen projects are being tracked worldwide, representing a total planned production capacity of 218 Mtpa-H2. Among these, 599 projects have reached a final investment decision (FID) or are already under construction or in operation. However, their combined production output amounts to only 7 Mtpa-H2—about 3% of the global project pipeline.

Projects that have advanced beyond FID are concentrated primarily in the Global North (notably in North America and Europe), as well as in the Middle East and Asia (including China, South Korea, Japan, and India).

Countries in Africa, Latin America, and Southeast Asia show strong ambitions to enter the emerging clean hydrogen market, but project pipelines in these regions remain at an early stage of maturity. Focusing on Africa,[iii] only three projects have reached FID, and five are operational out of a total of 122 projects listed in the IEA database. The average planned production capacity across the entire African project pipeline stands at 369 ktpa-H2, compared with a global average of 94 ktpa-H2, reflecting a focus on export-oriented offtake models.

This report examines the key characteristics of successful clean hydrogen project development, drawing on an analysis of IEA database projects that have advanced beyond FID. The findings provide insights into pathways for more effective project development in emerging and developing countries—particularly in Africa—to help narrow the gap with developed countries.

Figure 2: Global overview of clean hydrogen production projects based on IEA database.[1]



[iii] A list of all eight African projects which have taken FID or are already operational can be found in the annex.

Global investments in clean hydrogen: A fraction of a fraction goes to African countries

Bloomberg New Energy Finance (BNEF) reports that global investment in renewable energy and clean hydrogen reached USD 770 billion in 2024.[2] Of this total, funding for renewable and low-carbon hydrogen—excluding renewable energy tied to hydrogen projects—accounted for only USD 8 billion, or 1% of renewable energy investment. In Africa, spending on electrolyzers for renewable hydrogen production amounted to merely USD 13 million.

These figures underscore a striking imbalance: despite ambitious project pipelines, actual investment commitments remain limited globally, and even more so in Africa.

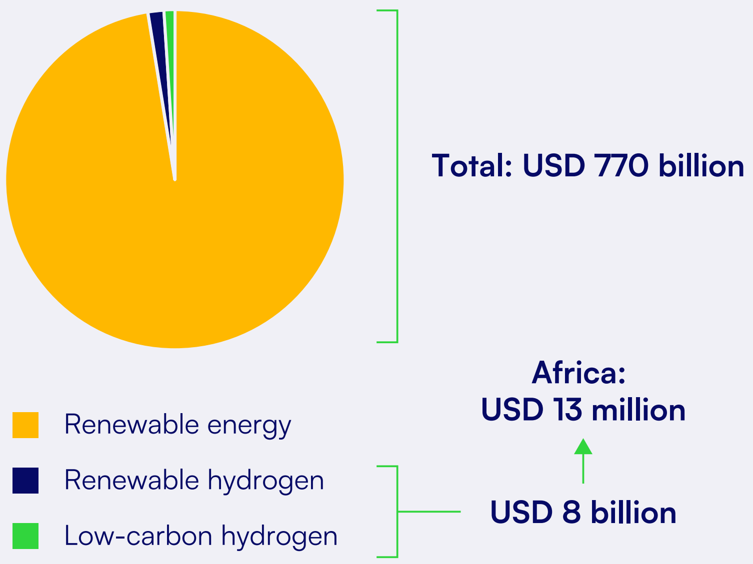
The report seeks to answer the guiding question: Which key factors foster and sustain successful clean hydrogen project development?

In October 2025, H2Global hosted a stakeholder workshop with energy finance experts from across Africa during the World Power-to-X (PtX) Summit in Morocco. The discussions highlighted three key factors for the successful development of clean hydrogen projects:

1. Long-term offtake agreements with reliable counterparties;
2. Robust risk management, regulatory clarity, and political support;
3. A strong domestic project anchor that fosters regional value chains, local employment, and community buy-in.

This report takes the analysis further, adopting a quantitative approach to explore how investment decisions in successful clean hydrogen projects are shaped. It seeks to answer the guiding question: Which key factors foster and sustain successful clean hydrogen project development?

Figure 3: Global investments in renewable energy and clean hydrogen in the year 2024, based on BNEF.[2]



Methodology: Analyzing success factors for clean hydrogen projects

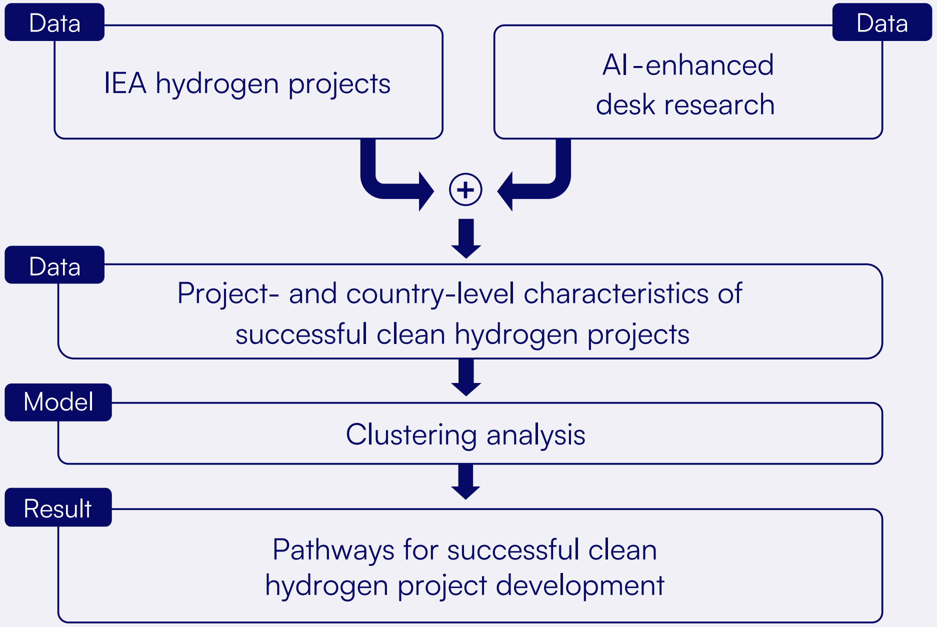
To identify the enabling conditions for successful clean hydrogen projects, this report adopts a data-driven analytical framework (see Figure 4). The foundation of this approach is the 2025 release of the International Energy Agency (IEA) database of clean hydrogen production projects,[3] which is enriched with additional data obtained through AI-assisted desk research. Supplementary indicators include country-level metrics on production costs of renewable electricity, economic strengths and hydrogen-related opportunities, as well as various risk dimensions (financial, political, climate change, and water). At the project level, further attributes capture investor profiles and offtake structures.

To identify the enabling conditions for successful clean hydrogen projects, this report adopts a data-driven analytical framework.

The consolidated dataset is analyzed using several clustering algorithms—k-means, Gaussian mixture models, DBSCAN, and agglomerative clustering—across configurations of two to ten clusters.

Subsequent statistical analysis identifies pathways for successful clean hydrogen project development. These pathways are then compared with the project pipeline in African countries to derive targeted support instruments that address specific challenges and capitalize on regional opportunities.

Figure 4: Research methodology to identify successful pathways for clean hydrogen project development.



Explaining investment decisions through ten factors influencing risk-return profiles

Risk—return profiles of clean hydrogen projects shape final investment decisions (FIDs). This report seeks to explain FIDs on clean hydrogen projects by quantifying the interplay of key factors influencing risk and return.

Captured factors in the underlying dataset include the Decarbonization Technology Strength (DTS) and Decarbonization Technology Opportunity (DTO) indices,[4,5] derived from the Harvard Atlas of Economic Complexity.[6] Both indices are calculated relative to a basket of goods relevant to clean hydrogen value chains. DTS reflects a country's current capability to produce these goods, while DTO captures its potential to develop such capabilities based on related industrial output. Together, these indices describe domestic economic opportunities and are linked to a project's market orientation, i.e., whether it targets export markets or domestic offtake.

Another crucial determinant is the potential for low-cost renewable energy production, measured by the levelized cost of electricity (LCOE) and based on open-source data from the Energiewirtschaftliches Institut an der Universität zu Köln (EWI Cologne).[7] At the project level, the dataset records whether sponsors hold a strategic interest in the project, for instance by aiming to secure a position within the emerging hydrogen value chain. Such long-term strategic motivations may lead investors to accept higher levels of risk or lower short-term returns. In contrast, non-strategic investors tend to place greater emphasis on immediate economic viability and on risk—return profiles that align with their broader portfolio objectives.

A related indicator records whether a sponsor also acts as an offtaker, directly mitigating offtake-related risks. Risk factors encompass the country risk premium,[8] water risk,[9] and the OECD country risk index[10] (as a proxy for political stability), along with climate risk.[11] The first three typically exert a negative influence on investment decisions, while elevated climate risk may, conversely, in some circumstances, strengthen political will and accelerate investment by prioritizing national resilience and decarbonization efforts.

Table 1: Captured factors that have an influence on risk-return profiles of clean hydrogen projects.

Captured factor in dataset	Status
Offtake market orientation	AI-enhanced desk research
Sponsor: Offtaker	
Sponsor: Strategic	
DTO Index	The Growth Lab at Harvard University: International Trade Data (HS92)
DTS Index	
LCOE	EWI Cologne: Global PtX Cost Tool V2.1
Financial: Country risk premium	A. Damodaran, NYU Stern: Country Default Spreads and Risk Premiums
Environmental: Climate risk	Germanwatch: Climate Risk Index 2026
Environmental: Water risk	World Resources Institute: Aqueduct 4.0 Updated Decision-Relevant Global Water Risk Indicators
Political: OECD country risk	OECD: Participants' Country Risk Classification

Results of the clustering analysis: Four clusters and three key success pathways

The clustering analysis looks at successful projects, i.e., those that are either operational or have obtained FID, based on the International Energy Agency's (IEA) global database of clean hydrogen production projects.[12] Agglomerative clustering with four cluster centers was identified as the most suitable model configuration. This number of clusters is a compromise between clustering quality—measured through standard metrics such as the silhouette score,[13] Davies—Bouldin index,[14] and Calinski—Harabasz index[15]—and the interpretability of the resulting groups. For each of these four mutually exclusive clusters, the defining factors, or drivers, are identified by calculating z-scores for each factor within the cluster. The statistical analysis shows that only three of the four clusters exhibit distinct success factors.

The subsequent analysis therefore focuses on these three clusters, referred to as success pathways:

Cluster 1: Export-oriented projects

Comprising 8% of all successful projects, this cluster is primarily driven by a strong focus on export markets (z=3.4) for clean hydrogen and its derivatives.

Pathway 1

Cluster 2: Sponsor—offtaker integration

Representing 16% of successful projects, these projects demonstrate strong vertical integration (z=2.2), with at least one project sponsor also serving as the offtaker of hydrogen-based products. This integration significantly mitigates offtake risk.

Pathway 2

Cluster 3: Favorable economic and renewable conditions

Accounting for 15% of successful projects, this cluster comprises projects in host countries that combine high industrial maturity (DTS, z=1.1) and opportunity (DTO, z=0.5) elevated climate risk (z=0.8), and abundant low-cost renewable energy potential (LCOE, z=1.8). Increased climate risk is correlated with lower LCOE, indicating that elevated climate risk is not a success factor itself but rather a common characteristic of countries with potential for low-cost renewable energy production.

Pathway 3

Cluster 4: Multiple success factors

Representing 62% of successful projects, this largest cluster has no dominant driver. Moderate contributions come from low-cost renewable energy potential (z=0.5), vertical sponsor—offtaker integration (z=0.4), and domestic market orientation (z=0.3), with generally low z-scores indicating limited differentiation across factors.

No specific success factors identified

Each four mutually exclusive clusters, the defining factors, or drivers, are identified by calculating z-scores for each factor within the cluster. The z-score shows how far a cluster's mean for a specific factor deviates from the overall sample mean.

Table 2: Overview of the top five characteristic factors in each cluster, measured by a z-score.[iv]

Cluster	Cluster size (% of all)	1. Driver (z-score)	2. Driver (z-score)	3. Driver (z-score)	4. Driver (z-score)	5. Driver (z-score)
1	8%	Market orientation (3.4)	OECD risk (1.1)	LCOE (0.8)	Water risk (0.5)	Country risk (0.5)
2	16%	Sponsor: Offtaker (2.2)	Strategic sponsor (0.3)	DTS (0.3)	Market orientation (0.3)	LCOE (0.3)
3	15%	LCOE (1.8)	DTS (1.1)	Climate risk (0.8)	DTO (0.5)	Sponsor: Offtaker (0.5)
4	62%	LCOE (0.5)	Sponsor: Offtaker (0.4)	Market orientation (0.3)	DTS (0.2)	OECD risk (0.2)

It is important to note that the mutually exclusive assignment of projects to clusters is an analytical simplification used to highlight key success factors. In practice, individual projects may not fit neatly into a single cluster and often exhibit characteristics shared across multiple clusters.

[iv] The z-score shows how far a cluster's mean for factor j deviates from the overall sample mean, measured in standard deviations: $z_{k,j} = \frac{\bar{x}_{k,j} - \mu_j}{\sigma_j}$ where $\bar{x}_{k,j}$ is the mean of factor j in cluster k, μ_j the overall mean, and σ_j the overall standard deviation. $z > 0 (<0)$ indicates above-average (below-average) values; larger absolute values indicate stronger differentiation of the cluster on that factor.

Export-oriented projects

Projects in this cluster are predominantly large-scale, export-oriented initiatives, with an average installed electrolyzer capacity of approximately 200 MWel, expected to be commissioned within the next few years. Their main products—ammonia and methanol—are globally traded commodities, supported by established international markets and logistics infrastructures.

It is noteworthy, however, that such export-oriented projects account for only about 8% of all successful projects in the dataset. The remaining 92% are primarily smaller-scale, domestically focused projects, most of which are already operational. This indicates that export orientation and large-scale development are not success factors in themselves, but rather represent an emerging pathway in hydrogen production that is opening new global offtake opportunities. As the global clean hydrogen economy matures and hydrogen and its derivatives become internationally traded commodities, export-oriented production projects are expected to become a more common business model. This approach helps de-risk offtake structures by enabling participation in global markets. However, since a fully functioning global market does not yet exist, this strategy remains a risky bet on the future, and export-oriented projects continue to rely heavily on bilateral offtake agreements.

Representative examples from Cluster 1 include the Da'an Renewable Hydrogen and Ammonia Project in Jilin, China, developed by Jilin Electric Power.[16] The facility is already operational and integrates 800 MW of renewables with electrolysis to produce 32,000 t H_2 and 180,000 t NH_3 annually. Likewise, Phase I of the Green Hydrogen and Chemicals project, developed by ACME and SCATEC in Oman, plans to produce 100,000 t NH_3 annually from an installed electrolysis capacity of 320 MWel.[17]

Figure 5: Average commissioning year, typical end use sectors, and average installed electrolyzer capacity of Cluster 1.

Commissioning year
After 2025

End-use sector
Ammonia, Methanol

Electrolyzer capacity
~200 MWel

PATHWAY 2

Value chain integration

Projects in the second cluster are small-scale (~20 MWel) early-mover initiatives with a strong focus on domestic offtake. A defining feature is the active involvement of investors who also serve as offtakers, particularly in the mobility sector, as well as in power generation, refining, and steel production.

> **The integration of production and offtake within a single consortium represents the core success factor of small-scale early-mover initiatives.**

This integration of production and offtake within a single consortium represents the core success factor of these projects. It reduces commercial risk and enables viable business models by leveraging synergies within regional industrial ecosystems, such as chemical parks or hydrogen refueling stations for commercial vehicle fleets.

Illustrative examples of this pathway include the Niagara Hydrogen Center in Canada, developed by Atura Power.[18] The project deploys a 20 MW electrolyzer powered by hydroelectricity from Niagara Falls to supply low-carbon hydrogen to local industrial and mobility offtakers, exemplifying a tightly integrated, regionally focused value chain. Similarly, Iberdrola's hydrogen plant in Puertollano, Spain, integrates a 20 MW electrolyzer to produce renewable ammonia for on-site fertilizer production.[19] Both projects demonstrate how local integration of production and use underpins commercially viable early-mover models.

Figure 6: Average commissioning year, typical end-use sectors, and average installed electrolyzer capacity of Cluster 2.

Commissioning year	End-use sector	Electrolyzer capacity
~2020	Mobility, Power, Refining, Steel	20 MWel

PATHWAY 3

Favorable economic and renewable conditions

Projects in the third cluster are mid-scale (~50 MWel) and resemble those in the second cluster in that they are early-mover initiatives focused on domestic offtake, primarily within the mobility sector. Their distinction lies in the host country's enabling environment: these projects are situated in economies that demonstrate high industrial maturity and opportunity related to clean hydrogen—reflected in high scores on the Decarbonization Technology Strength and Decarbonization Technology Opportunity indicators—coupled with a low country risk premium and abundant renewable energy potential.

Mid-scale projects are situated in economies that demonstrate high industrial maturity and opportunity related to clean hydrogen, coupled with a low country risk premium and abundant renewable energy potential.

The convergence of these factors creates a particularly favorable investment climate for clean hydrogen development.

Illustrative examples of this pathway include Plug Power's Green Hydrogen Plant[20] in Camden County, Georgia, United States, and the Mongolia Ordos Otog Front Banner Shanghaimiao Hydrogen and Solar Energy Complex[21] in China. The Camden County facility, with an electrolyzer capacity of around 45 MW, produces up to 15 tons of green hydrogen per day, powered by renewable electricity, for domestic mobility and industrial applications across the southeastern United States. The Shanghaimiao complex combines large-scale solar generation with electrolytic hydrogen production to supply regional industrial and mobility demand. Both projects exemplify domestically oriented, early-mover initiatives situated in favorable economic environments with strong renewable energy potential, reflecting the defining characteristics of Cluster 3.

Figure 7: Average commissioning year, typical end-use sectors, and average installed electrolyzer capacity of Cluster 3.

Commissioning year
~2023

End-use sector
Mobility, Power

Electrolyzer capacity
50 MWel

Benchmarking Africa's clean hydrogen projects against three success pathways

As outlined above, the clean hydrogen project pipeline in Africa remains less mature compared to the global project pipeline: In North Africa, 64 projects have been announced, while 58 are under development in sub-Saharan Africa. Nearly all planned projects focus on renewable hydrogen production, while only two projects—one in Egypt and one in South Africa—target low-carbon hydrogen production. Only eight projects have progressed beyond final investment decision (FID). Comparing the characteristics of the African project pipeline with the three clusters for which characteristic success factors have been identified provides valuable insights into the underlying reasons for this disparity.[24]

Offtake orientation: Among the successful clean hydrogen projects in the analyzed database, 92% are oriented toward domestic or regional offtake opportunities. In contrast, 89% of all projects in North Africa and 76% in sub-Saharan Africa are primarily export oriented. This strong export focus reflects a strategic bet on the future global ramp-up of clean hydrogen demand and familiar commodity-driven business models, but it also exposes projects to significant offtake risk. Such risk constitutes a major barrier to the maturation of African hydrogen projects. Among the eight successful projects—in Egypt, Morocco, Namibia, and South Africa (see Annex 1)—half are anchored in domestic offtake opportunities, primarily serving clean transport applications.

Value chain integration: Sixteen percent of successful projects exhibit vertical integration across the value chain, with a project sponsor also acting as an offtaker—substantially reducing offtake risk. In Africa, however, this share is markedly lower: only 5% of projects in North Africa show such integration, and none in sub-Saharan Africa. This lack of domestic or regional offtake capacity further amplifies the offtake risk that African clean hydrogen projects are facing.

Strong conditions: A third success factor is the presence of favorable economic conditions—namely, a combination of industrial maturity, low country risk premiums, and abundant renewable energy potential. While African nations possess vast renewable energy resources, they generally face less favorable investment conditions due to elevated country risk premiums and limited industrial maturity. This, in turn, leads to elevated financing costs and lower foreign direct investment.

IMAGE CREDIT: ADOBE STOCK

African clean hydrogen projects could mitigate their heightened offtake risk through a complementary focus on domestic and regional offtake opportunities and by pursuing greater value chain integration. Both strategies align with the strong industrial growth potential observed in the analyzed African economies. To address the inherent macroeconomic risks and low levels of foreign direct investment, tailored financial support instruments will be essential. Both issues are discussed in greater detail in the following sections of the report.

Financing an archetypal 100 MWel clean hydrogen project

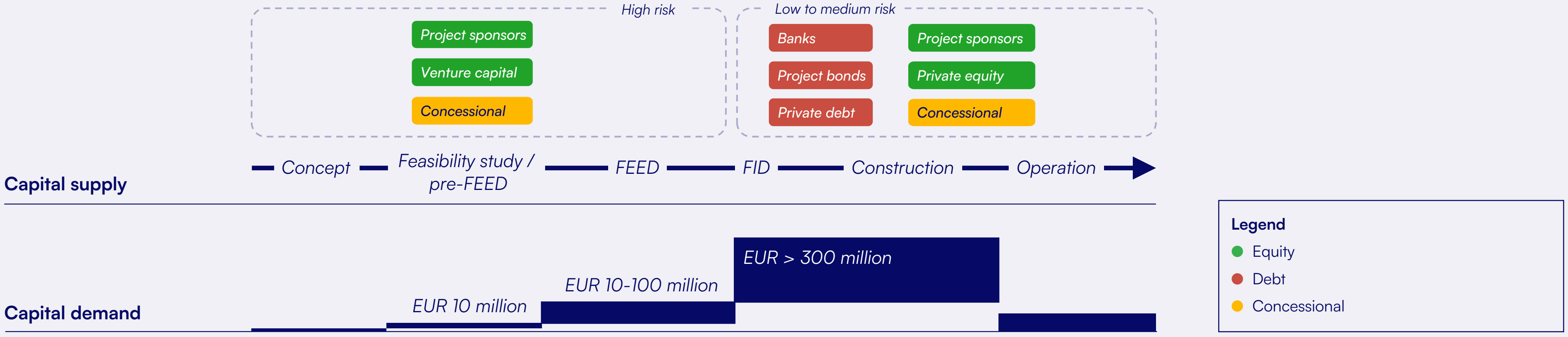
The total investment cost for an archetypal clean hydrogen project with an installed electrolyzer capacity of 100 MWel can reach up to EUR 400 million.[25] However, this full amount is not required during the construction phase alone; significant capital is already needed during the early development phases of the project.

Projects typically require between EUR 10 and 100 million during the concept, pre-Front-End Engineering and Design (pre-FEED), and FEED stages, before reaching the FID.[26] During these stages, financing generally comes from equity investors (project sponsors, venture capital funds) or from concessional sources. Because the project outcome is still uncertain, this capital is considered high-risk. Limited access to such high-risk funding in many African countries creates substantial barriers for project developers and contributes to the immaturity of the continent's clean hydrogen pipeline. Concessional financing options that could alleviate this gap remain scarce.

To reach FID, projects must secure substantial debt financing (bank loans, project bonds, private debt). Debt providers require lower risk exposure, which in turn demands strong de-risking measures and secure offtake agreements. For many African clean hydrogen projects, challenging macroeconomic environments and the absence of creditworthy offtakers hinder access to debt. As an alternative, lenders may require a higher equity share as risk compensation—raising overall financing costs.

Analysis of a typical financing structure across the development stages of a clean hydrogen project highlights critical gaps both in the early development phases and in the lead-up to securing FID. Addressing these gaps will require tailored financial support instruments that can de-risk investments and mobilize capital, enabling the successful development of clean hydrogen across Africa.

Figure 8: Overview of financing needs and potential sources of finance across project development stages for an archetypal 100 MWel clean hydrogen project.



Financial support instruments for clean hydrogen in Africa: Overview

Total financial support currently targeted toward the development of clean hydrogen projects in Africa amounts to EUR 4 billion, based on an updated analysis of a database published by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in May 2025.[27] This figure stands in stark contrast to the USD 222 billion (EUR 192 billion) in available clean-hydrogen funding for the rest of the world in 2025, as estimated by Bloomberg New Energy Finance (BNEF).[28] Moreover, only 20% of the committed financial support in Africa has been disbursed to date, highlighting persistent bottlenecks in fund distribution, limited project readiness, and a shortage of investable hydrogen projects across the continent.

Financial support for clean hydrogen in Africa is predominantly driven by EU-based institutions and governments, which account for 78% (approximately EUR 3.1 billion) of all available funding. Key actors include the European Investment Bank (EIB)—providing a mix of grants, concessional loans, and technical assistance—and the broader EU Global Gateway initiative, designed as a multi-instrument platform to mobilize additional private capital. Germany emerges as the single most significant contributor of funds, primarily through the H2Global double auction mechanism (with EUR 887 million committed[v]) and the national development bank Kreditanstalt für Wiederaufbau (KfW), including its Power-to-X (PtX) Platform.

Alongside European actors, the Climate Investment Funds (CIF) represent an important multilateral source of concessional finance supporting Africa's emerging hydrogen sector. Within Africa itself, three major national investment funds—the Sovereign Fund of Egypt, the SDG Namibia One Fund, and the South Africa-H2 Fund—have begun to play a significant role as equity providers for domestic clean hydrogen projects. Notably, the Namibian and South African funds are structured as blended-finance vehicles, supported by national governments and the EU, with the explicit aim of leveraging private capital.

Figure 9: Available funding for clean hydrogen

"Grey discount" for low-carbon hydrogen

This report covers both renewable and low-carbon hydrogen. Several caveats must be considered when comparing the two. To be comparable with renewable hydrogen, low-carbon hydrogen must achieve high CO2 capture rates (above 95%) and near-zero upstream methane emissions, as well as ensure permanent, verified CO2 storage. In practice, regulatory standards for comprehensive emissions accounting remain unclear or inconsistent, creating an uneven playing field vis-à-vis renewable hydrogen.[29] Moreover, explicit and implicit fossil fuel subsidies can further skew cost comparisons, leading to overly optimistic cost projections for low-carbon hydrogen that do not fully reflect these requirements.[30] Ignoring these structural differences when setting up financial support instruments for clean hydrogen risks distorting competition and reinforcing long-term lock-in of fossil-based infrastructure.

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[v] Initial commitments from the German government to implement Hintco's double-sided auction mechanism included EUR 300 million for the 2024 ammonia pilot auction—awarded to a project based in Egypt—and EUR 587 million dedicated to the Africa lot in Hintco's second auction round.

Financial support instruments for clean hydrogen in Africa: Findings

Four key findings emerge from this analysis of Africa’s hydrogen-finance landscape.

78%

Share of EU-based funds

The strong dominance of EU-based funding (78%) suggests considerable room to diversify the geographical base of financial support, which could help increase the total available funding.

20%

Share of disbursed funds

The low disbursement rate of just 20% reflects a mismatch between the risk profiles targeted by available concessional capital and the maturity of the project pipeline. Many projects remain at an early stage of development and are therefore unable to meet concessional financing requirements. Development finance institutions (DFIs) should accordingly reconsider their targeted risk profiles and their degree of willingness to provide first-loss capital for early-stage project development.

37%

Share of simple support through grants and loans

Simple loans and grants together represent 37% of available support. Meanwhile, more catalytic instruments, such as blended-finance structures or contract-for-difference schemes, remain underused despite their potential to mobilize significant private investment. A greater emphasis on such instruments would increase the effectiveness and leverage of concessional funds.

<2%

Share of pre-FID financial support

Early-stage financial support, such as technical assistance grants, accounts for less than two percent of total available support. Yet such early-stage support is indispensable during initial development phases, where costs can quickly reach several million euros and require scarce high-risk equity. Strengthening these early-stage support mechanisms would substantially improve project maturity across African hydrogen pipelines and facilitate more efficient deployment of financial resources in later development stages.

Given that only 20% of available funds have been disbursed, future research should examine whether the key constraint lies less in the availability of concessional capital than in the risk appetite of DFIs to deploy it at early stages of project development.

Recommendations

The report identifies three pathways that have thus far resulted in successful clean hydrogen project development: (1) export orientation, (2) value chain integration, and (3) favorable economic and renewable resource conditions.

Clean hydrogen projects announced in Africa are primarily export-oriented, with limited local value chain integration. This pattern reflects a replication of established commodity-driven business models, existing infrastructure geared toward export, and a strong dependence on foreign capital—factors that collectively reinforce export-focused project structures. The report's analysis of successful project pathways is integrated with a financial overview of Africa's clean hydrogen sector, highlighting three structural characteristics: concentration of funding from EU-based sources, persistent low disbursements, and scarce financial support during early development phases.

These insights point to two main areas of recommendation:

1. Build a domestic anchor.

The emerging clean hydrogen market is marked by two defining features: non-transparent pricing, due to the absence of price indices or public markets, and a persistent gap between production costs and market willingness to pay. A strong reliance on export markets heightens the risks associated with these uncertainties and often results in projects stalling at early development stages due to missing offtake agreements. In contrast, domestic or regional value chain integration can help mitigate these shortcomings by leveraging local synergies such as reduced infrastructure needs, established business relationships, and shared strategic interests. In Africa, however, developing a domestic anchor is more challenging than in other regions due to comparatively weaker local markets for clean hydrogen. Regional cooperation and an initial focus on certain sectors, such as fertilizers and steel, offer promising avenues to anchor domestic demand. Establishing a domestic anchor not only improves project viability but also enhances supply chain resilience and supports more sustainable socio-economic development within the region.

2. Use tailored financial support instruments in three steps.

First, international financial institutions should complement simple funding structures with more targeted and catalytic instruments. This includes embedding grants and concessional loans into blended-finance vehicles and innovative mechanisms like double auctions to mobilize greater private investment, while also strengthening guarantee instruments that help de-risk projects approaching final investment decisions (FIDs). Second, expanding technical assistance will further enhance project maturity and enable more effective disbursement of available funds. Third, African countries should aim to diversify their financial partnerships beyond Europe by engaging additional multilateral, export credit, and climate finance institutions, while leveraging EU instruments as anchor financiers. Together, these measures would help accelerate project development and improve the overall effectiveness of clean hydrogen financing in Africa.

Annex 1: Successful clean hydrogen projects in Africa

Table 3 provides an overview of the characteristics of successful clean hydrogen projects in Africa, based on the analyzed and expanded dataset of hydrogen production projects compiled by the IEA. Projects are considered successful if they have reached FID or are already operational.

Table 3: List of successful clean hydrogen projects in Africa.

Project name	Country	Electrolyzer capacity [MWel]	Product	Status, commissioning year	Offtake
Anglo-American Mogalakwena Mine	South Africa	3.5	Hydrogen	Operational, 2022	On-site offtake by Anglo's mining fleet (refueling solution)
OCP Group Demo Project	Morocco	1	Hydrogen	FID/Construction, 2035	(demo)
EBIC — Ammonia Plant — Phase 1	Egypt	15	Ammonia	Operational, 2022	Export
Sasolburg Green Hydrogen Project	South Africa	60	Hydrogen	Operational, 2024	Domestic offtake to a regional hydrogen mobility ecosystem
O&L Group — CMB. TECH Hydrogen Hub	Namibia	4	Hydrogen	FID/Construction, 2025	Domestic offtake to mobility and industrial users
Daures Green Hydrogen Village, Phase 1	Namibia	0.25	Ammonia	FID/Construction, 2025	Export orientation planned for larger phases
Cleanergy Solutions Namibia HRS	Namibia	5	Hydrogen	Operational, 2024	Domestic offtake to local public hydrogen refueling station
Oshivela DRI Project, Phase 1	Namibia	12	DRI	Operational, 2025	Export

Annex 2: Cluster analysis of variance (ANOVA statistics)

F-statistic (ANOVA test statistic)

The F-statistic measures whether variation between cluster means exceeds variation within clusters: $F = \frac{MS_{\text{between}}}{MS_{\text{within}}}$ where MS_{between} is the mean square between groups and MS_{within} the mean square within groups.

Larger F values indicate stronger evidence of differences across group means.

p-value (statistical significance)

The p-value gives the probability of observing an F-statistic at least as extreme as the one obtained, assuming no true group differences: $p = P\,(F_{\text{obs}} \geq F \mid H_0)$

A small p-value (e.g. $p < 0.05$) suggests statistically significant differences between groups.

Eta-squared (η^2, effect size)

Eta-squared quantifies the proportion of total variance explained by group membership: $\eta^2 = \frac{SS_{\text{between}}}{SS_{\text{total}}}$

Values range from 0 to 1, with higher values indicating a stronger group effect.

Table 4: Analysis of variance for each influencing factor.

Factor	F	p	η^2
Market orientation	inf	0	1
Sponsor: Offtaker	1394	1.15E-260	0.88
Levelized cost of electricity (LCOE)	424	3.63E-144	0.69
Decarbonization Technology Strength (DTS)	60	7.09E-34	0.24
Climate risk	29	3.05E-17	0.13

Factor	F	p	η^2
OECD risk	27	3.34E-16	0.12
Sponsor: Strategic	13	4.19E-08	0.06
Water risk	13	4.50E-08	0.06
Country risk premium	8	2.54E-05	0.04
Decarbonization Technology Opportunity (DTO)	8	3.06E-05	0.04

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