Project

Hydro Gen 2040: Mapping uncertainties and future of Green Hydrogen in Saudi Arabia.

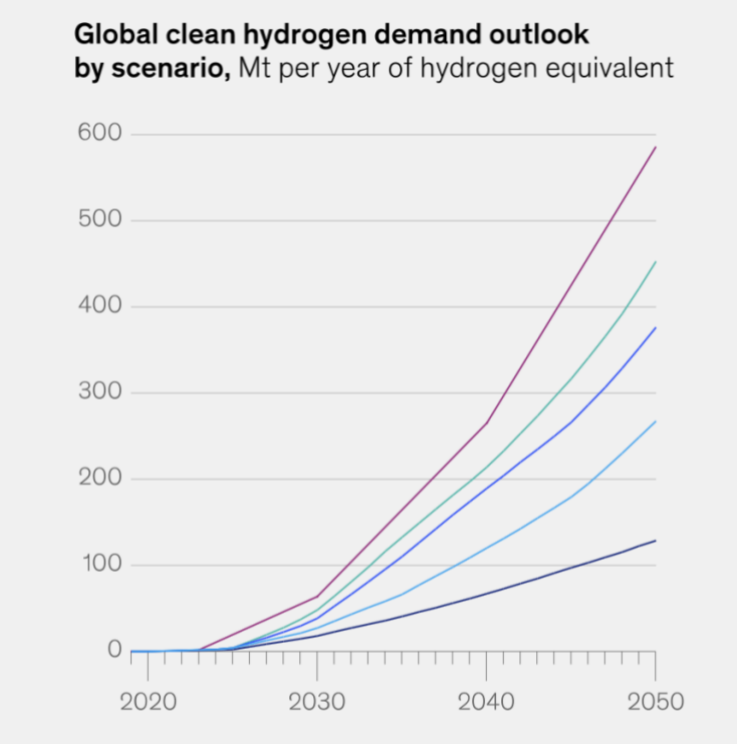
About Hydrogen Energy

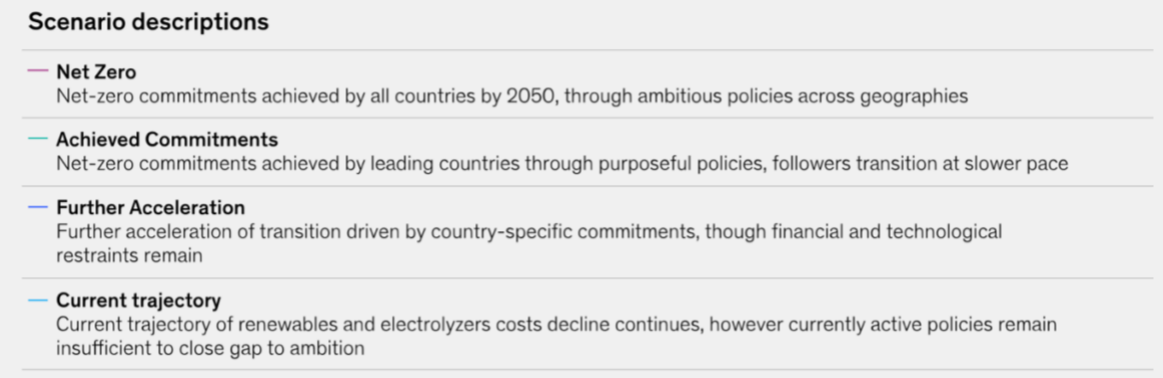
Talking about green hydrogen, we are targeting the energy sector. Energy is a dynamic sector with an accelerating advancement and transformation, but the focus will be on 'Green Hydrogen Energy'. We first need to understand the types of hydrogen energy-

- **Grey Hydrogen** accounts for around 90% of global hydrogen production. The principle is based on steam methane reforming (SMR), which involves reacting methane with high-temperature steam to produce hydrogen and carbon monoxide. In step two, carbon monoxide is reacted with steam to produce more hydrogen and carbon dioxide. The resulting hydrogen gas is then purified for use.
- **Blue Hydrogen**, an additional step of carbon capture and storage (CCS), is used, here, instead of releasing the carbon monoxide, it is stored in underground reservoirs and later reused for industrial purposes.
- **Green Hydrogen** is produced using renewable energy sources, such as solar or wind power, to power the process of splitting water into hydrogen and oxygen through an electrolysis process. This results in a zero-emissions hydrogen source.

Industry Life Cycle

According to McKinsey's article Global Energy Perspective 2023: Hydrogen Outlook, we can see exponential growth and demand for green hydrogen energy, with a global need of 100-200 million tons annually by 2040.



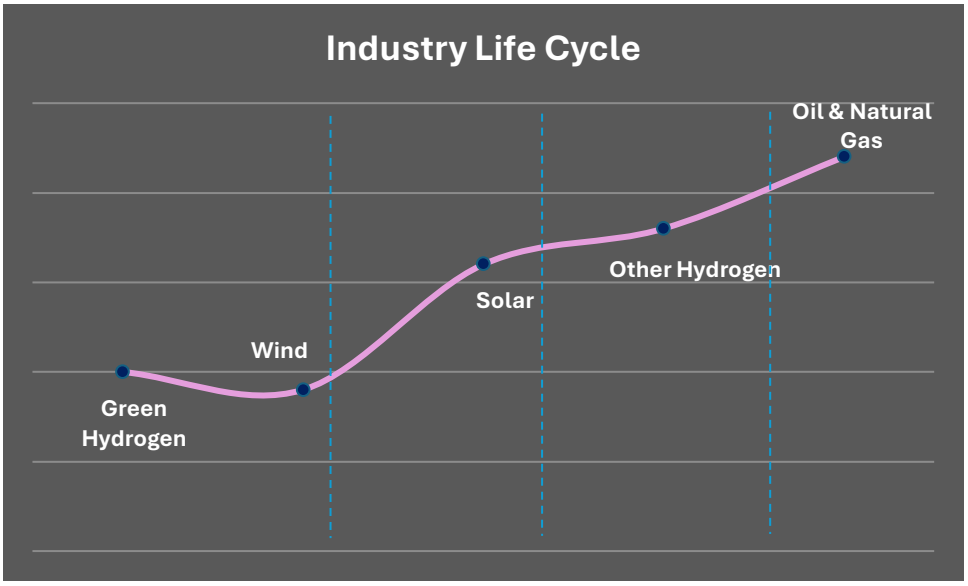


Source: Global Energy Perspective 2023: Hydrogen outlook

From the market demand and accelerated growth, we can determine that this segment of the vast energy industry is still in the development/ introduction phase of the Industry Life Cycle.

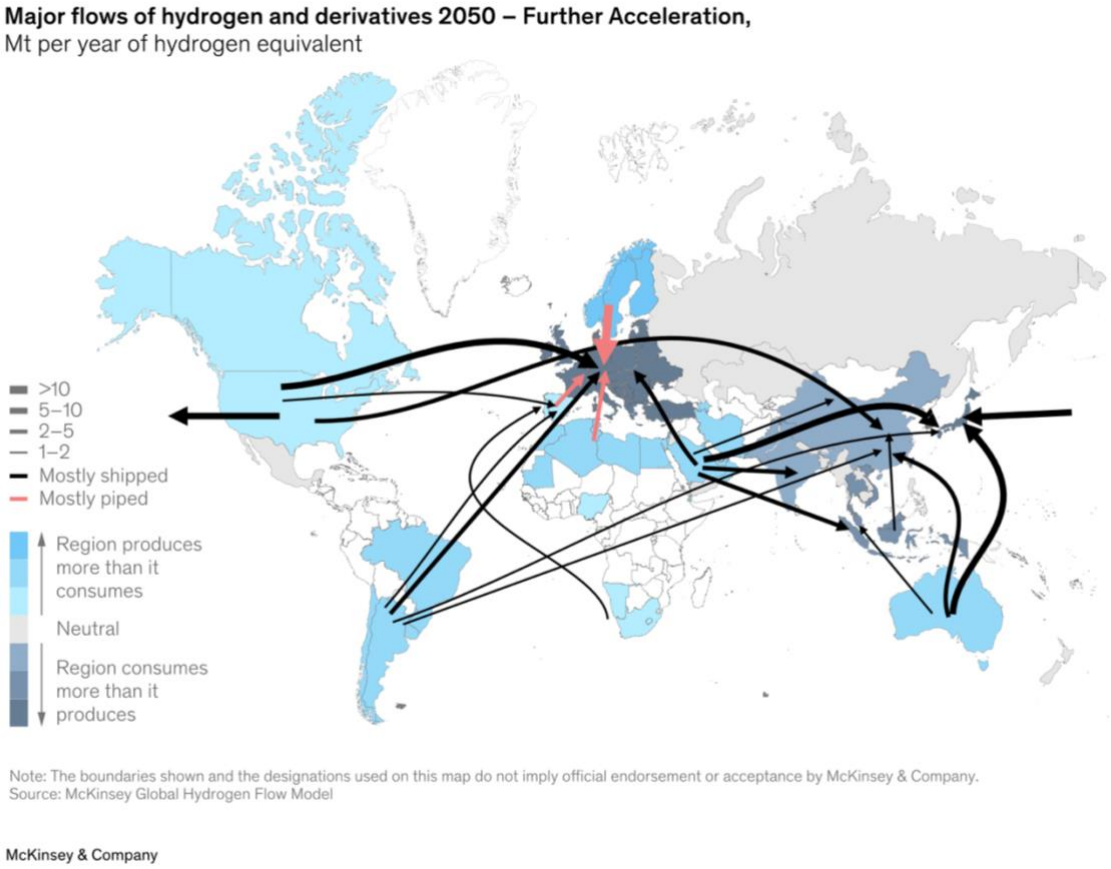
	Oil & Natural Gas	Solar	Wind	Green Hydrogen	Other Hydrogen
CAGR % 2050	-2%	4%	11%	10%	2%
Global Market Value 2023	4,2 Trillion	235 billion	99 billion	1,4 billion	135 billion

Source for Market Value: Statista Market Insights, Global Energy Perspective 2023: Hydrogen outlook and IEA report



Saudi Arabia can be a strategic point as being close to the equator gives it a geographical advantage with abundant renewable sources like solar, wind, and tide; these are the primary components for green hydrogen production. Saudi Arabia ranks 6th in solar energy potential and 13th for onshore wind energy resources worldwide. Consequently, the geographical positioning of Saudi Arabia, being close to Europe and Asia, will help in

global connectivity. Finally, Saudi Arabia also has financial stability, lowering the risk in investment.



PESTELL Analysis

Political

The Helios (parent of NEOM) project is the only joint venture involving Saudi Arabia's ACWA Power, US-based Air Products and Chemicals, and NEOM for producing green hydrogen in the foreseeable future. Helios is anticipated to be the world's largest green hydrogen production facility once completed by the end of 2026. The investment of $6.1 billion is part of an estimated $8.4 billion investment to build the Helios carbon-free green hydrogen plant. Previously, ARAMCO, in August 2020, successfully shipped 40 tons of high-grade blue ammonia to Japan. Other policies:

- Royal Decree No. M/85 (2016): This decree covers the regulation of renewable energy production and trade, including provisions on the export of green hydrogen.
- Energy Law (2020): Published under Royal Decree M/23, this law establishes guidelines for hydrogen exports in line with international standards and bilateral agreements.

Economic

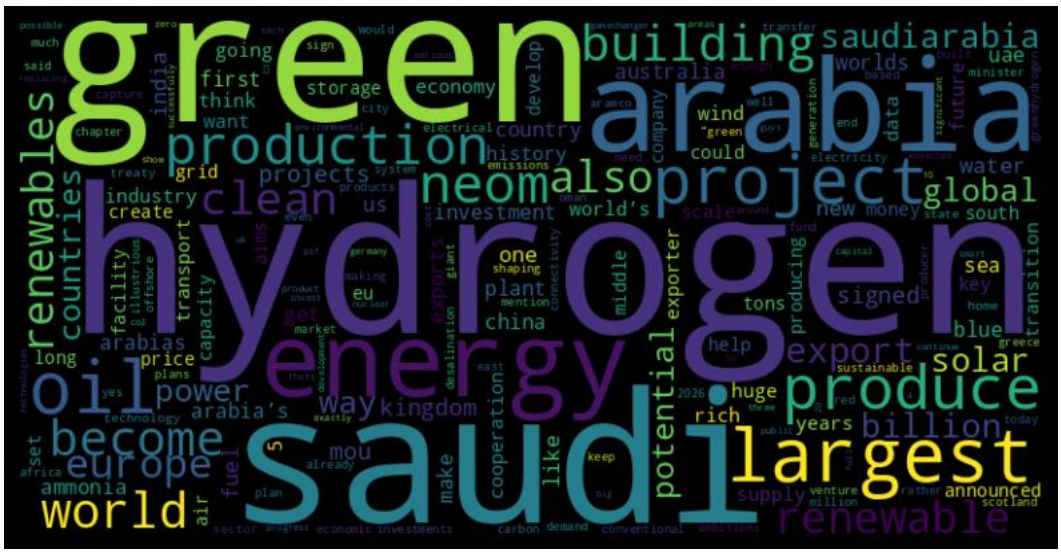
Years	Metrics	GDP of Saudi Arabia (B $)	Trade balance in Energy (TJ)
2023			
2022		1,109.00	18,075,260.00
2021		874.20	15,395,086.00
2020		734.30	15,857,079.00
2019		838.60	17,153,226.00
2018		846.60	18,074,833.00

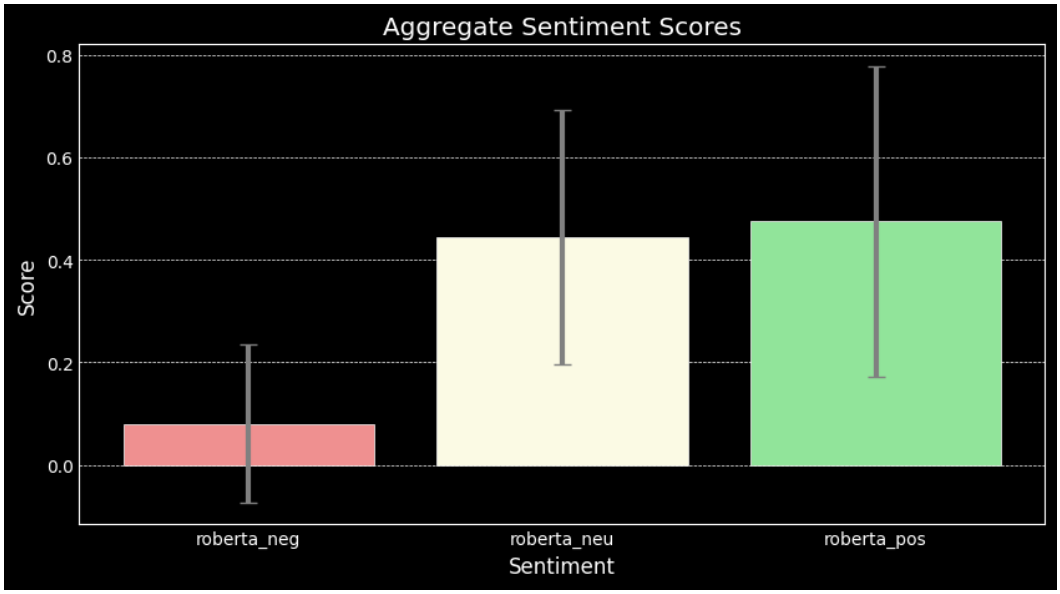
Social

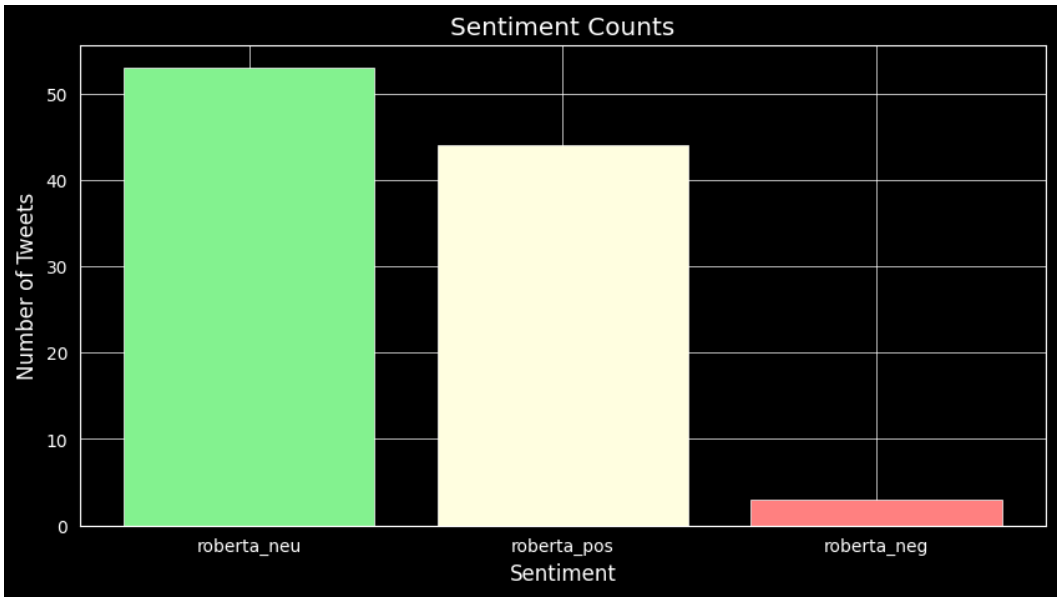
Data of recent 100 X's thread comments with tags: Green Hydrogen, Saudi Arabia and NEOM. We developed a Sentiment Analysis model using the RoBERTa model to determine social acceptance of the project.

Word cloud attribute to analyse the frequently used words in the tweet.
Mean score:
- Positive: 0.475 with SD of 0.3
- Neutral: 0.444 with SD of 0.2
- Negative: 0.08 with SD of 0.1

Overall evaluation:
- Positive tweets: 53
- Normal tweets: 44
- Negative tweets: 3

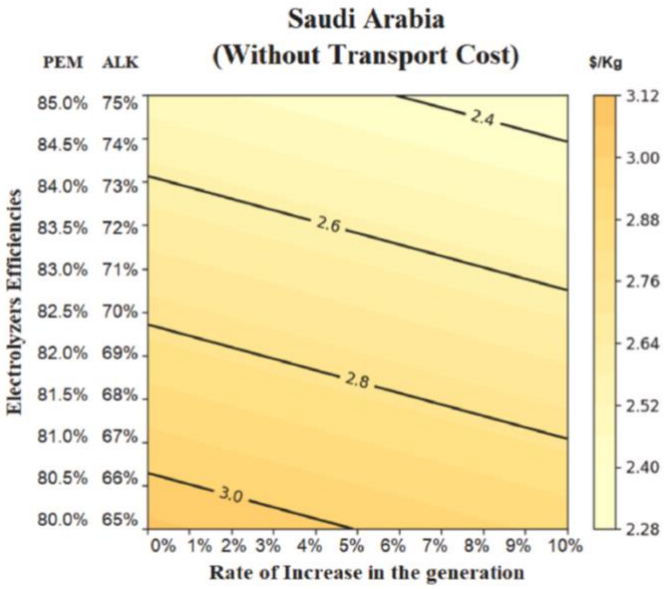






Technological & Environmental

Based on the study by Khalid Alhadhrami et al., The NGHC project is estimated to consume up to 4 GW of solar energy capacity to produce 600 tonnes of carbon-free hydrogen per day by reducing carbon dioxide emissions by 5MT annually. The facility aims to produce 1.2MT of green ammonia – equivalent to 600T of hydrogen – per day for export once in operation. The efficiency varies between 65% and 75% for the alkaline electrolysers, which is lower than Proton Exchange Membrane (PEM) electrolysers, 80% to 85%, but alkaline electrolysers are more economically more feasible driving the per kg cost down to 0.79–1.94 $/kg from 2.34–3.08 $/kg in 2030 for the levelized cost of hydrogen (LCOH). The LCOH production cost varies with the economies of scale; higher volume gives lower costs and higher efficacies.



Source: International Journal of Hydrogen Energy: Modelling green hydrogen production using power-to-x: Saudi and German contexts

Learning from a study by Oxford Business Group, in May 2023, NEOM Green Hydrogen Company (NGHC) closed a deal with a consortium of 23 local, regional and international banks and financial institutions to fund $6.1bn of the estimated cost of $8.4bn to build the Helios carbon-free green hydrogen plant. This arrangement garnered recognition from ratings firm Standard & Poor's (S&P) Global Ratings, which certified its alignment with green loan principles, making it one of the largest project-financing deals concluded under a green loan framework.

Legal

Saudi Arabia is developing a dedicated regulatory framework for licensing and implementing hydrogen projects. The country's Basic Law (Royal Decree No. A/90, issued on 1 March 1992) grants the government ownership of all oil and gas resources. The Ministry of Energy, Industry, and Mineral Resources (MEIM) oversees policy development and implementation related to oil and gas and represents Saudi Arabia in international discussions on production and pricing. MEIM also supervises Saudi Aramco, a state-owned entity with exclusive rights to explore, drill, and produce oil and gas in the country.

Illustration of the major power-sector bodies relevant to hydrogen projects in Saudi Arabia:

Regulatory Body	Role
The Ministry of Energy, Industry, and Mineral Resources ("MEIM")	the government agency that handles policy and planning in the power sector.

The Saudi Electricity Company ("SEC")	a government-owned Public Investment Fund ("PIF") (holding over 80% of shares) that currently provides most of Saudi Arabia's electricity, with a generation capacity of 78GW in 2018. It also carries out all transmission and distribution activities.
Aramco	the government owned company that manages Saudi Arabia's oil and gas production. It is involved in power generation alongside SEC, as the primary supplier of feed stock.
The Electricity and Co-Generation Regulatory Authority ("ECRA")	the Kingdom's independent regulatory body for Saudi Arabia's energy sector
The Power and Water Utility Company ("MARAFIQ")	a government-owned entity that currently provides most of the power to the two industrial cities of Jubail and Yanbu, found in the Eastern and Al-Madinah Provinces, respectively

Lobbying

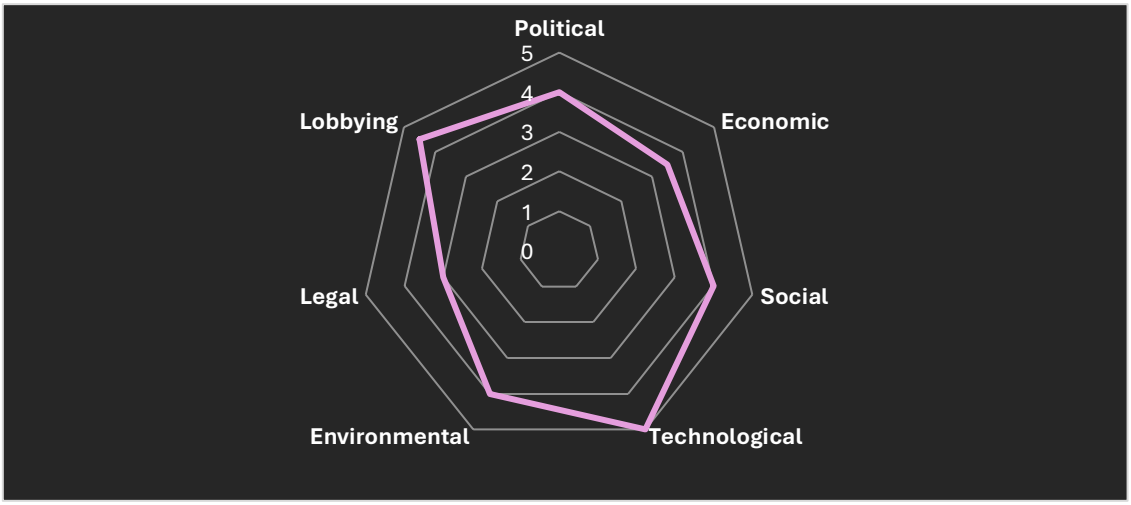
The state's control over its resources strongly shapes lobbying in Saudi Arabia's energy sector. As a state-owned entity, Saudi Aramco has significant leverage over policy decisions, reducing the need for traditional lobbying as seen in Western markets. The Law of 1992 gives government ownership over all oil and gas resources.

Observations

Using PCA for dimensionality reduction in the industry (against other hydrogen and other renewable and non-renewable energy sources that were affected in the past) and studying the same factors, we identified the uncertain/ sensitive factors:

	Data	Rating	Weights
P	- Helios project in NEOM is the world's largest green hydrogen project. (also, only green hydrogen investment) - Saudi Arabia has committed $6.1 billion in funding for the Helios project, which totals $8.4 billion. - It is a joint venture between ACWA Power and US-based Air Products. - Royal Decree No. M/85 (2016): This decree covers the regulation of renewable energy production and trade, including provisions on the export of green hydrogen. - Energy Law (2020): Published under Royal Decree M/23, this law establishes guidelines for hydrogen exports in line with international standards and bilateral agreements.	4	0,15
E	Saudi Arabia's economic stability reduces investment risk. - The country aims to achieve economies of scale to reduce the cost of hydrogen production. - Projected cost of hydrogen production by 2030 (LCOH): $0.79–$1.94/kg.	3,5	0,12
S	Use of Sentiment Analysis to determine social acceptance of the project. Mean score: - Positive: 0.475 with SD of 0.3 - Neutral: 0.444 with SD of 0.2 - Negative: 0.08 with SD of 0.1	4	0,22
T	- NEOM Green Hydrogen Company (NGHC) will produce 600 tons of hydrogen per day. - The plant will use 4 GW of solar energy. - Reduction of 5 million tons of CO2 emissions annually. - Production of 1.2 million tons of green ammonia annually. - Alkaline electrolysers are more cost-effective but have a lower efficiency (65-75%) compared to PEM electrolysers (80-85%).	5	0,13
E	- NGHC aims to significantly reduce CO2 emissions and aligns with the vision of zero emissions. - Saudi Arabia has vast land, low renewable energy costs, and reduced water costs, which favours green hydrogen production.	4	0,16

L	- Developing regulatory framework for hydrogen projects. - MEIM (Ministry of Energy, Industry, and Mineral Resources) plays a key role in planning and policy. - Aramco controls production and distribution.	3	0,14
L	- Law of 1992 gives government ownership over all oil and gas resources. - Saudi Arabia does not follow a traditional lobbying structure. - Government control and ownership minimize the influence of external lobbying.	4,5	0,07



Porter's Forces

Buyers

The world's largest oil company, Saudi Aramco, is struggling to find buyers for its blue hydrogen due to the high costs involved, according to its CEO, Amin Nasser. The low product differentiation of green hydrogen leads to increased buyer bargaining power. Buyers may switch suppliers as other nations, like Australia or Chile, ramp up green hydrogen production. Buyers will focus on price and sustainability standards, even though green hydrogen isn't particularly distinctive, they'll pay attention to its price and whether it meets their sustainability requirements (e.g., carbon neutrality). Other low-carbon energy alternatives include wind, sun, or blue hydrogen (hydrogen produced with carbon capture technology), boosting their bargaining power.

Suppliers

Aramco controls production and distribution.

Years	Metrics	Renewable production in saudi arabia (TJ)	Wind generation in Saudi Arabia(GWh)	Solar PV generation in Saudi Arabia (GWh)
2023				
2022		9,100	1588	939
2021		3,600	73	927
2020		3,299	0	916
2019		1,152	0	320
2018		234	0	65

Entrants

The large-scale projects on H2 ongoing in Saudi Arabia create barriers for new entrants. The largest players have power due to their technological capabilities, financial backing, and control over critical infrastructure.

Substitution

The cost per barrel for other renewable energy has been discounted over the years due to innovation and development. For example-

- Solar is $10.4 (Dh38) per megawatt-hour.
- Wind energy is $15.6 (Dh57) per megawatt-hour.

When the cost of crude oil per barrel seems to be increasing, this increase is due to following compliance with the ISO standards set by international organisations.

Years	Metrics	Oil refining (TJ)	Oil generation (GWH)	Natural gas generation (GWH)	Cost of Saudi Arabia cost crude oil ($/Barrel)
2023					
2022		5,907,527.00	172,318.00	243,932.00	95.58
2021		5,401,497.00	168,805.00	238,876.00	68.43
2020		4,765,250.00	164,077.00	229,485.00	35.35
2019		5,434,950.00	168,219.00	219,121.00	63.48

2018		5,602,632.00	163,398.00	225,639.00	68.23

Competitors

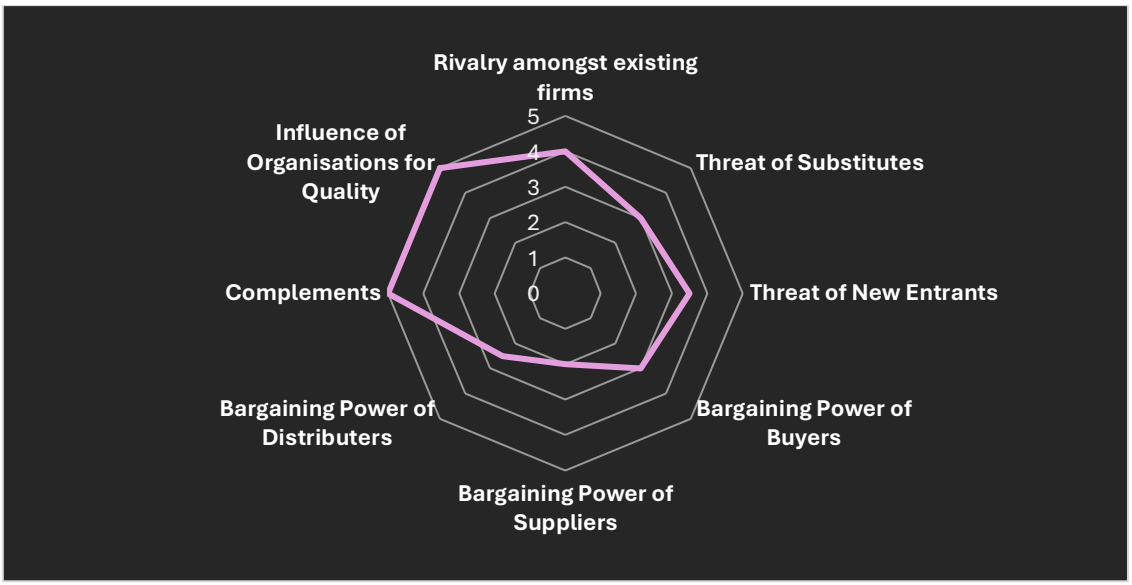
In July 2020, Air Products & Chemicals ("Air Products"), whose principal business is selling gases and chemicals for industrial use, announced plans to build a green hydrogen plant in Saudi Arabia. The plant will be powered by 4 GW of wind and solar power, making it the world's largest project. The USD 5 billion plant will be jointly owned by Air Products, Saudi Arabia's ACWA Power, and Neom, a new mega-city planned near Saudi Arabia's borders with Egypt and Jordan. Due to being operational in 2025 and situated in the city of Neom, the completed facility will produce 650 tons of green hydrogen daily, enough to run around 20,000 hydrogen-fuelled buses. There is also a hydrogen distribution system in the industrial city of Yanbu built by Air Liquide. If these projects succeed, it will likely lead to a new era of hydrogen developments in the country and throughout the Middle East.

Observations

Using PCA for dimensionality reduction in the industry (against other hydrogen and other renewable and non-renewable energy sources that were affected in the past) and studying the same factors, we identified the uncertain/ sensitive factors:

	Data	Rating	Weights
Rivalry amongst existing firms	- Although there is only one project in development in Saudi Arabia. There is an international threat from Australia, the USA, China, Germany, and other countries in the race to produce feasible green hydrogen. - An example is Air Products & Chemicals' investment in NEOM also in Egypt.	4	0,17
Threat of Substitutes	- The threat of substitution from other renewable sources is very high. - Exponential R&D on green hydrogen production, like PEM, can threaten the alkaline electrolyser production method. - Green hydrogen has various specific implementations, for example, in the steel and aviation industries. - Green Hydrogen is currently irreplicable for heavy-duty applications.	3	0,17

Threat of New Entrants	- Still in the development phase. - Moderate threat as the CAGR for the industry by 2050 is 10%. Potential Foreign Direct investments in partnership with the government are a moderate threat as huge capital investment is needed. - Example, Air Products & Chemicals investment in NEOM.	3,5	0,21
Bargaining Power of Buyers	- Struggling to find buyers for its blue hydrogen due to the high costs involved. - Buyers will focus on price and sustainability standards because green hydrogen isn't particularly distinctive. - Moderate buying power as there are not green hydrogen producers.	3	0,09
Bargaining Power of Suppliers	- The speculative assumption that the Law of 1992 gives government ownership over all oil and gas resources will be extended to sustainable energy, giving FDI suppliers little to no power. - Due to the vision of Saudi 2030, there are tariffs and government support for renewable energy.	2	0,1
Bargaining Power of Distributers	- ARAMCO controls production and distribution in Saudi Arabia, which will have moderate/ no bargaining power over distribution. - Need for infrastructure for economical transportation of ammonia and LCOH gives ARAMCO less power.	2,5	0,08
Complements	- Strong complements, including technological advancements, renewable energy sources (solar, wind), policy support, and export infrastructure development, enhance green hydrogen's viability.	5	0,09
Influence of Organisations for Quality	- Promoting green hydrogen garnered recognition from ratings firm Standard & Poor's (S&P) Global Ratings, which certified its alignment with green loan principles, making it one of the largest project-financing deals concluded under a green loan framework.	5	0,09

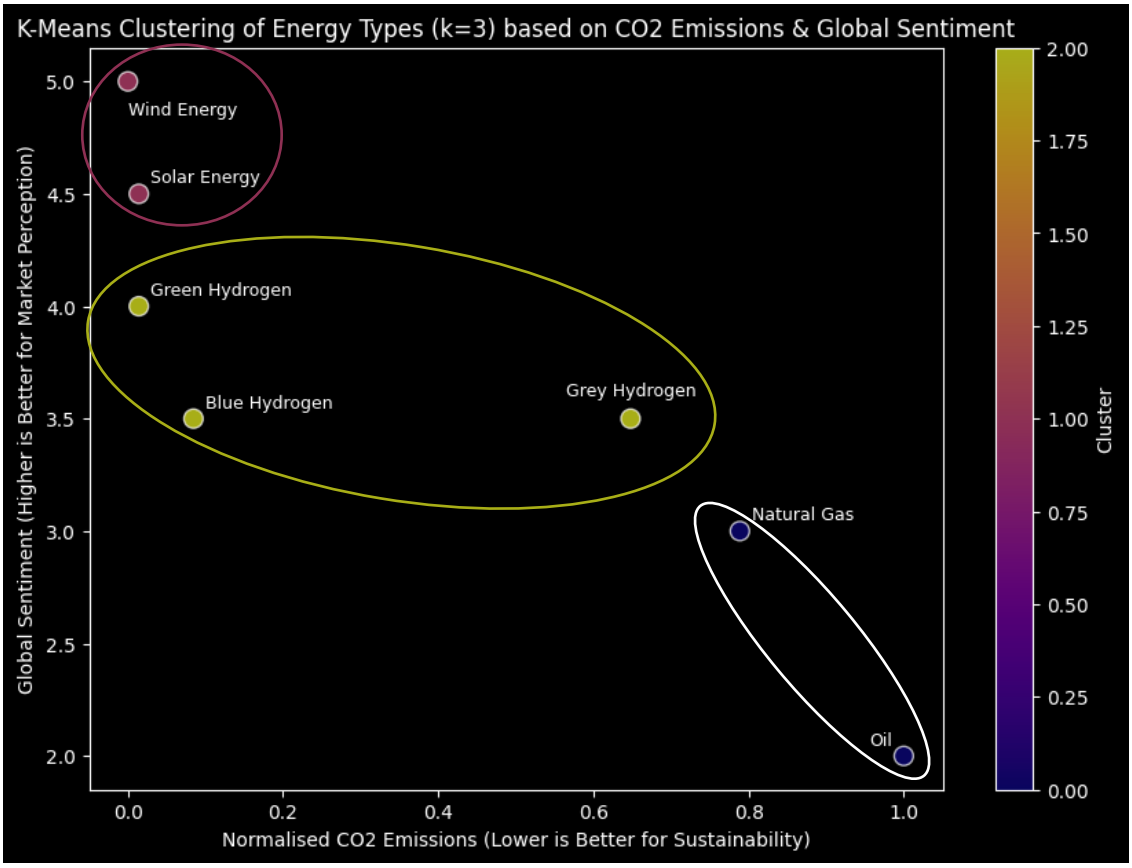


Strategic Grouping

According to the IEA- Comparison of the emissions intensity of different hydrogen production routes in 2021, we can find data for CO2 (kg) emissions/kg Hydrogen.

	Wind Energy	Solar Energy	Green Hydrogen	Blue Hydrogen	Grey Hydrogen	Natural Gas	Oil (Petroleum)
CO2 (kg) emissions / kg Hydrogen	0,4-0,8 kg	1 kg	0-1kg	0-2 kg	9-12kg	9-12 kg	10-15kg

Using K-Means Clustering for the strategic grouping:



Benchmarking

The benchmarking has been done based on the impact of success factors on the environment a future goal for improvement was set to understand the gaps in the performance and sensitivity of important factors.

We use a gradient-boosting regressor to analyse the gaps and assign the weights.

		Green Hydrogen		Other Hydrogen		Other Renewables		Other Non-Renewables	
Success factors	*Weight*	*Rating*	*Score*	*Rating*	*Score*	*Rating*	*Score*	*Rating*	*Score*
CO2 Emission	0,24	2	0,48	3	0,72	1,5	0,36	5	1,2
Government Tariffs & Support	0,04	4	0,16	4	0,16	5	0,2	3	0,12
Global Sentiment	0,11	4	0,44	3,5	0,385	5	0,55	2	0,22
Government Policies & Economic Leverage	0,27	2	0,54	2,5	0,675	2	0,54	3,5	0,945
Initial Cost of Establishment	0,1	3,5	0,35	3	0,3	3,5	0,35	2	0,2
Current Market Size	0,03	2,5	0,075	2,5	0,075	3,5	0,105	4	0,12
Availibilty of Substitutes	0,21	3	0,63	4	0,84	2	0,42	4	0,84
Total			2,68		3,16		2,53		3,65

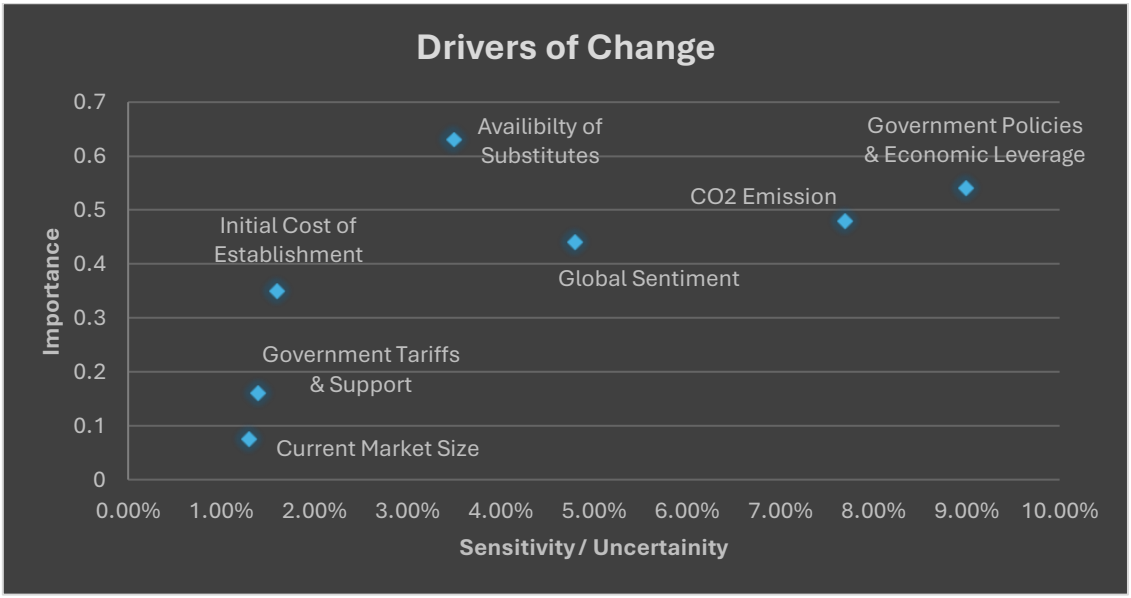
Using the permutation importance model from sklearn.inspection, we identified the sensitivity for each factor:

	Sensitivity
Sensitivity (Permutation Importance) of CO2 Emission:	0.0769 ± 0.0628
Sensitivity (Permutation Importance) of Government Tarrifs and Support:	0.0144 ± 0.0118

Sensitivity (Permutation Importance) of Global Sentiment:	0.0476 ± 0.0388
Sensitivity (Permutation Importance) of Government Policies and Economic Leverage:	0.0900 ± 0.0735
Sensitivity (Permutation Importance) of Initial Cost of Establishment:	0.0158 ± 0.0129
Sensitivity (Permutation Importance) of Current Market Size:	0.0129 ± 0.0105
Sensitivity (Permutation Importance) of Availibility of Substitutes:	0.0349 ± 0.0285

Drivers of Change by Importance and Sensitivity

	Sensitivity	Importance
CO2 Emission	7,70%	0,48
Government Tariffs & Support	1,40%	0,16
Global Sentiment	4,80%	0,44
Government Policies & Economic Leverage	9,00%	0,54
Initial Cost of Establishment	1,60%	0,35
Current Market Size	1,30%	0,075
Availibilty of Substitutes	3,50%	0,63



SWOT

Strength

- The government supports green hydrogen and other renewable energy policies for its Vision 2030.
- The country's geographic positioning complements-

    - The distribution to Europe and Asia.
    - The abundance of solar and wind power provides an opportunity to power green hydrogen production.
- Government Investment of $8.4bn to build the Helios carbon-free green hydrogen plant with international support makes it one of the largest project-financing deals concluded under a green loan framework.
- Saudi Arabia's current position as a global energy producer and exporter gives an economic leveraging power to influence and participate in global green hydrogen markets.

Weakness

- The current value of total assets in Oil and Natural gas production can impact the economy in the short term.
- The short-term global demand for green hydrogen is low, making transportation and distribution expensive.
- The investment in alkaline electrolysers faces a low return threat from advanced PEM green hydrogen electrolysers in a low-demand scenario. The efficiency of alkaline is 65%-75%, whereas the efficiency of PEM is 80%-85%, but with growing demand, alkaline is more economically feasible.
- ARMACO is the major distributor, giving distributors higher power in a mature market, leading to disadvantages of transactional cost of economies.
- The government is the majority shareholder of all the companies who wants to invest/ benefit from energy production. (the Law of 1992 gives the government ownership in the energy sector). Giving abiding high- Micro Political and Control risks.

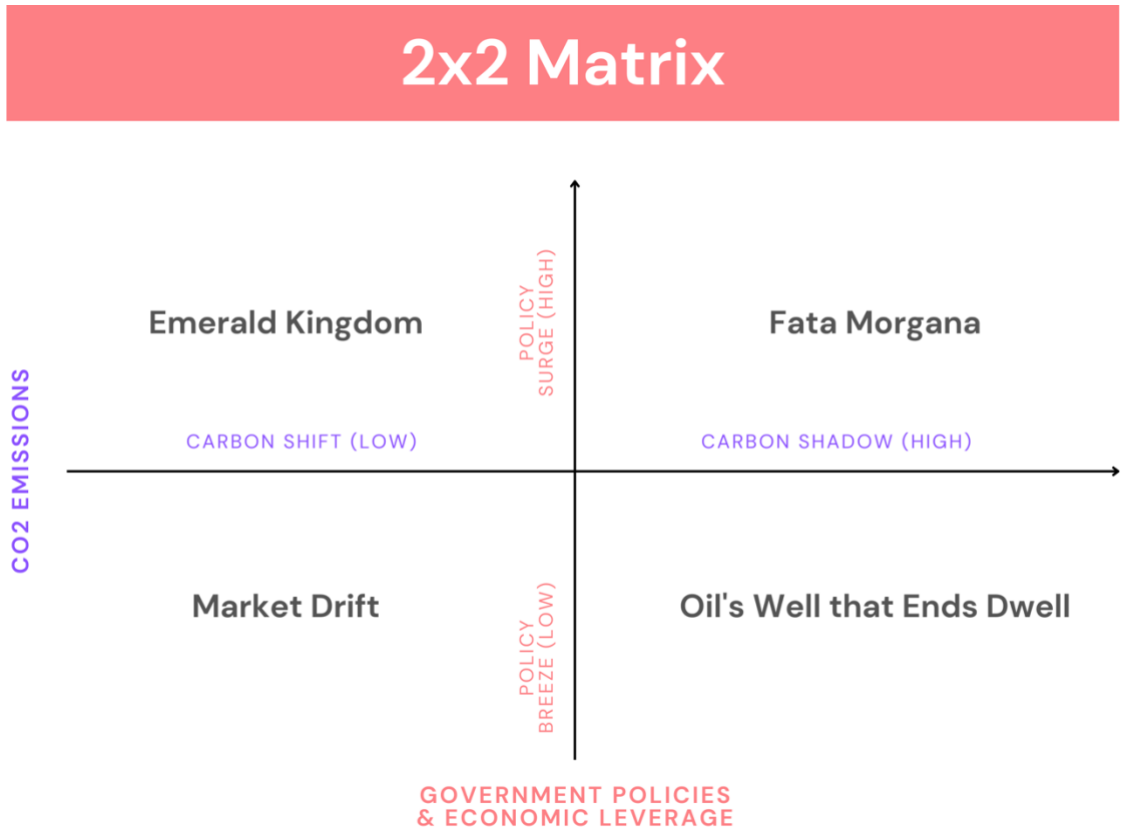
Opportunities

- The strengths give rise to the development of a green hydrogen market, attracting FDI and driving the transition from traditional oil and gas demand to more green and sustainable demands.
- In a scale and scope of economies scenario, the production cost will be as low as $0.79/kg of green hydrogen.
- Global target and domestic reduction target- for carbon dioxide emissions by 5MT- will push industries toward adopting green hydrogen, offering a chance to develop a sustainable energy sector.
- Investment in research and development will optimise higher efficiency at a lower cost.

Threats

- The investment in alkaline electrolysers faces a low return threat from advanced PEM green hydrogen electrolysers in a low-demand scenario. The efficiency of alkaline is 65%-75%, whereas the efficiency of PEM is 80%-85%, but with growing demand, alkaline is more economically feasible.
- Geopolitical tensions in the neighbouring regions are a threat to low investment in R&D.

Scenarios Development using a 2x2 matrix



Scenario 1: Emerald Kingdom (Policy Surge & Carbon Shift)

The government and the population of Saudi Arabia embrace green hydrogen and other renewable energy. Foreign Direct Investments benefit from government policies, funding and tax benefits. These efforts will lead to a significant reduction in carbon dioxide levels, aligning with the goals of Saudi 2030.

Implications:

- Saudi Arabia will become a key supplier of green hydrogen with a Global Market Share. This scenario will also help increase the efficiency of electrolysers by almost 20% and lower the production cost of $1/kg due to economies of scale.
- This policy surge will help further develop renewable sources, achieving economies of scope.
- Tax benefits will lower the entry and exit barriers, and the market can benefit from cost competition.
- The new infrastructure need for green hydrogen will create jobs in the construction, technology, and energy sectors. This will increase the GDP and decrease the unemployment rate.
- The policy surge will reduce the threat of other substitutes.
- A strong focus on CO2 reduction aligns with global climate goals, positioning Saudi Arabia as a leader in sustainable development. Helping the government stimulate economic growth, technological advancement, and sustainability by reducing CO2 emissions

Strategy adjustment for companies- Strengthen R&D and build alliances with firms from different sectors to benefit from complementary forces.

Scenario 2: Market Drift (Policy Breeze & Carbon Shift)

The government is on policy breeze for green hydrogen, which means no assistance by government policies and taxation. There might be policy support for other sustainable renewable energy but not for green hydrogen in this scenario, as the CO2 emission is low. However, there is a high probability that public sentiment and International organisations like the ISO and UN will intervene in the FDI or the company's long-term sustainable strategy goal aligning with the geographical positioning of Saudi Arabia, leading to the drift in the market for the production of green hydrogen.

Implications:

- Public sentiment and demand for cleaner energy grows organically as FDI and joint venture companies promote green hydrogen and the cost benefits of green hydrogen (and/or) other renewable energy.
- The economies of scale and scope will lead to delayed economic feasibility of transportation and distribution of green hydrogen.
- The low economic feasibility and scalability raise the threat from substitutes like blue hydrogen, solar energy and wind energy.
- Moderate environmental regulations will encourage CO2 reductions and offer some tax incentives for green hydrogen, making a gradual shift away from fossil fuels results in steady CO2 emission reductions, improving environmental sustainability over time.
- Low tax support over the years will raise the entry barrier and lower the R&D process.
- Buyers will enjoy competitive prices due to market competition and growing low-carbon energy demand.

Strategy adjustment for companies- Monitor market trends and focus on optimisation of cost-efficient production and transportation.

Scenario 3: Fata Morgana (Policy Surge & Carbon Shadow)

The government sets ambitious policies and tax reductions in compliance with their Paris Agreement of 2015. However, some market risks (black swan event or war in the region) will decrease the FDI, resulting in high infrastructure and establishment costs in high production costs, leading to reliance on the cash cows- fossil fuels resulting in high CO2 emissions. This situation will create an oasis of superior sustainable image (Fata Morgana), causing the fall of one of the pillars of Saudi Arabia’s vision of 2030.

Implications:

- High entry barriers due to lack of profitability slowing down green hydrogen adaption.
- Strict regulations on CO2 emissions and taxes compared to minor development in the field of green hydrogen and other green energy sources can result in an economic collapse. Easing regulations on CO2 emissions along with green hydrogen promotion could be seen as greenwashing.
- Public sentiment will be in alignment with the government policies, although failure on this scale can lead to an emerging public serendipity event.
- Grey hydrogen and blue hydrogen (mostly grey because of low establishment costs) will remain more competitive than green hydrogen. Traditional Oil and Gas will have a majority in the local market.
- Buyers are hesitant to adopt green hydrogen, given the price premium and limited availability.
- Weak coordination between government policy and market players hampers progress in the green hydrogen sector.

Strategy adjustment for companies- Geographical and market diversifying investments and hedging against policy failure.

Scenario 4: Oil's Well that Ends Dwell (Policy Breeze & Carbon Shadow)

Saudi Arabia maintains its focus on fossil fuels with minimal policy intervention to drive green hydrogen adoption. CO2 emissions remain high, and the economy enjoys the short-term benefits of oil revenue. However, as the global market shifts toward sustainability, this over-reliance on oil begins to hurt the economy.

Implications:

- Limited environmental regulations will fail to promote green hydrogen or other renewable energy, leaving CO2 emissions high without penalties or strong incentives. Lowering the threat of substitutes.
- Traditional Oil and Natural gas will have the majority of local market share.
- Renewables suppliers have limited power, as demand for green hydrogen is stunted by policy and market constraints.
- Public sentiment and demand for cleaner energy grows organically as FDI and joint venture companies promote green hydrogen and the cost benefits of green hydrogen (and/or) other renewable energy.
- The Red Queen Effect of global adaption and demand for green hydrogen will create economies of scale and scope, causing divestment from Saudi Arabia because of the negative global image of the energy sector in the country.
- The country failing to adapt will suffer from the incumbent's curse.

Strategy adjustment for companies- Explore alternative markets or geographical diversification to prepare for compliance with future international standards shifts.

Potential Indicators:

Following are the potential indicators that will navigate and predict the strategic scenario path being followed:

- Government Support for Green Hydrogen
- Investments in Green Hydrogen Energy
- Investment in Energy Infrastructure
- Rate of Expansion of Renewable Energy Sources
- CO2 level reports
- Investment in Non-Renewable Energy
- Energy Dependency reports
- Geopolitical tensions

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