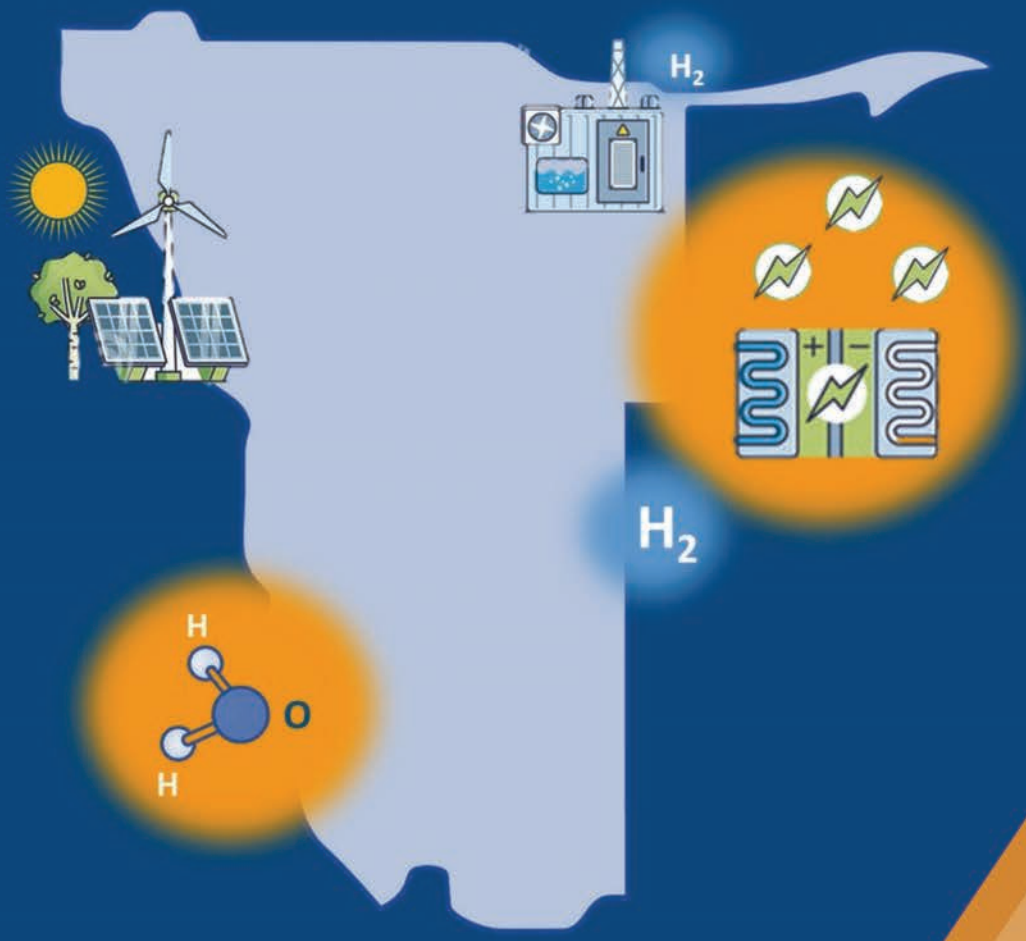
Konrad-Adenauer-Stiftung: Namibia-Angola Office

KONRAD ADENAUER STIFTUNG

Green Hydrogen Development in Namibia

FACT SHEET 2022/23



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Abbreviations and Definitions

N$ → Namibian Dollar

USD → US Dollar

EUR → Euro

CO_2 → carbon dioxide

GW → Gigawatt

MW → Megawatt

UN → United Nations

EU → European Union

UK → United Kingdom

US → United States

NDCs → Nationally Determined Contributions

SCDI → Southern Corridor Development Initiative

JCoI → Joint Communique of Intent

NAMPORT → The Namibian Ports Authority

COP 26/27 → United Nations Framework Convention on Climate Change

RFP → Request for Proposal

EIB → European Investment Bank

MoU → Memorandum of Understanding

NPC → National Planning Commission

FID → Final Investment Decision

O&L → Ohlthaver & List Group

IOs → International Organisations

NGOs → Non - Governmental Organisations

CSOs → Civil Society Organisations

EAN → Economic Association of Namibia

KAS → Konrad Adenauer Stiftung

HSF → Hanns Seidel Foundation

SASSCAL → Southern African Science Services Centre for Climate Change and Adaptive Land Management

NIPDB → Namibia Investment Promotion and Development Board

NAYoRE → Namibian Youth on Renewable Energy

GDP → Gross Domestic Product

DFIs → Development Finance Institutions

Request for Bids: Request for Tender means an offer made in response to an invitation to tender for the performance of a contract for the supply of services, labour or goods or materials at a specified price.

Fossil Fuels: When plants and animals decompose, they produce fossil fuels. These fuels are found in the earth's crust and contain carbon and hydrogen, which can be burned to produce energy. Examples of fossil fuels are coal, oil and natural gas.

Hydrogen Liquefaction: Gaseous hydrogen is made liquid by cooling it to below -253 Degrees Celsius. Once liquefied, hydrogen can be stored in large insulated tanks.

Megawatt: A unit of power equal to one million watts, used in particular as a measure of the output of a power plant.

Gigawatt: A watt is a measure of power. 1 GW is 1 billion watts.

Desalination Plant: A facility where salt is removed from seawater to make the water safe to drink and irrigate.

Electrolyser: Green hydrogen production is based on using renewable energy to power the electrolysis process that produces hydrogen from water. The machine responsible for this process is called an electrolyser.

Final Investment Decision: The FID is the point in the planning process of an investment project at which the decision to make a major financial commitment is made.

Hydrogen Valleys: A Hydrogen Valley is a geographic area where the complete hydrogen chain: generation, production, storage, transport and use are set up in such a way that it creates a completely new ecosystem. A sustainable Hydrogen Valley includes education and training and opportunities for regional development.

Introduction

Top number one long-term and short-term risk[1] in the world and biggest threat our planet has ever faced, is **climate change**.[2] Extreme temperature changes, droughts, floods, biodiversity and habitat loss, serve as evidence.[3]

Not long ago, **Namibia experienced an extreme drought**. The country is very sensitive to the effects of climate change, because amongst other factors, a large amount of the Namibian population is highly dependent on the agricultural sector.[4]

In 2016 the Government of the Republic of Namibia signed the **Paris Agreement**[5] and is thereby legally bound to fulfill the United Nations long-term, climate neutrality goal. By 2050 Namibia aims to achieve carbon neutrality, as stated in the Nationally Determined Contributions[6] (NDCs) publication. On top of that, Namibia also aspires to become a **producer and global exporter of green hydrogen**, as well as its derivatives.[7]

Excellent sunshine and wind conditions, combined with the advantage of being located next to the Atlantic Ocean, provide Namibia with a **great potential** of developing a green hydrogen industry.[8]

What is needed to produce Green Hydrogen?

1. Renewable energy sources:
   - → Sun (solar electricity)
   - → Wind power (on/ off-shore)
   - → Water (hydroelectricity)
2. An electrolyser

Figure 1.

Figure 2.

Why is it called "Green" Hydrogen?

It is called **green** hydrogen, because the energy needed to produce green hydrogen stems from renewable energy sources and has **NO** carbon footprint.

Please turn to page 17 and 18 for all figure references.

Why Green Hydrogen?

Hydrogen is a chemical element, a natural gas, that serves as an energy carrier. It can be used for multiple purposes such as a **zero-emission fuel source** for cars, trains or buses but it can also be used as a **power or heating source**.

On an industrial scale, steam reforming is the main method used today, to produce hydrogen.[9] There are many paths how to process hydrogen, resulting in **different types**, known as: blue, green, pink and grey hydrogen. While the latter stems from a process that uses fossil fuels, hence the grey colour grading, blue hydrogen originates from a downstream carbon capture process, a method in which CO_2 emissions from the manufacturing process are contained and permanently stored underground. Pink hydrogen is produced by electrolysis using nuclear energy. Different from these methods, is the way how green hydrogen is produced. **Green hydrogen** is either won from steam reforming or from the more advanced and appealing process called, **electrolysis**, by which water is split into oxygen and hydrogen. Since the electricity that is needed for the electrolysis is solely generated from **renewable energies**, the hydrogen produced is titled 'green'.

Renewable Energies in Namibia

Transportation, in terms of liquid fuel consumption, constitutes Namibia's biggest carbon dioxide (CO_2) emitter,[10] followed by the fishing industry.[11] Besides that, Namibia is fully dependent on the import of all liquid fuels and the import of more than 50% electricity[12] from countries such as South Africa, Zambia, Zimbabwe and Mozambique.[13] Given these facts, and

TIMELINE

September 2020: Namibia attends the 75th United Nations General Assembly meeting, to discuss decarbonisation strategies.

08 December 2020: The World's biggest green hydrogen project developers launch the global Green Hydrogen Catapult Initiative. The aim is to drive production cost of green hydrogen down to below US$ 2.00 per kg.

21 March 2021: Launching of the Harambee Prosperity Plan II. For the first time 'green hydrogen' is mentioned as a development opportunity under pillar II (Economic Advancement), goal 3 (Developing Complementary Engines of Growth), activity 2.

23 May 2021: The Inter-Ministerial Green Hydrogen Council is appointed.

June 2021: The international consulting company McKinsey publishes a report: "Namibia – The Green Hydrogen Opportunity". The report concludes that Namibia has the potential to produce green hydrogen at a cost of USD 1.50 per kg by 2030.

3 August 2021: Tender for the Green Hydrogen opportunity within the Southern Corridor Development Initiative (SCDI) is issued.

25 August 2021: Namibia signs a Joint Communique of Intend (JCoI) with the German Government to the value of € 40 million, for supporting green hydrogen pilot plants, feasibility studies and scholarships.

16 September 2021: The bid for SCDI tender closes. 9 applications were received.

4 October 2021: Namibia identifies HYPHEN Hydrogen Energy as the preferred bidder from 6 bidders.

2 November 2021: The Namibian Ports Authority (NAMPORT) signs a memorandum of understanding with the Rotterdam Port for the export of green hydrogen and Rotterdam becoming a green hydrogen hub in Europe.

4 November 2021: At the COP26 meeting in Glasgow, HYPHEN is announced as the preferred bidder for the SCDI to the value of USD 9.4 billion or 85% of Namibia's GDP. This announcement surprises many member countries.

Namibia's obligation towards the Paris Agreement, renewable energies are an imperative consideration. Based on the country's **excellent solar and wind resources**,[14] green hydrogen production promises great potential. Additionally, Namibia offers **vast tracts of land**, especially in the Southern region, that can be used as hydrogen production sites. Due to the country being located next to the Atlantic Ocean, **desalination of salt water**[15] for the electrolysis process of green hydrogen, offers a tactical possibility. These conditions provide Namibia with a comparative advantage to competitors like Chile, Saudi-Arabia, Morocco, Brazil or Australia.[16]

Shifting to **clean energy** can prevent the catastrophic impacts of fossil fuels on climate change, communities and the ecosystem. Namibia possesses the potential to redirect its course towards a green energy future and with that, the prospect that more than the prevailing 56% of all Namibians, can have access to electricity.

As previously mentioned, the Namibian government pledged a commitment to the **transition from fossil fuels** to renewable energies in 2016. Subsequently, the Minister of Mines and Energy of Namibia, Hon. Tom Alweendo, issued an international request for proposal (RFP) in 2021, to attract the private sector and international investors.

Introducing Namibia's Green Hydrogen Council

The Namibian Government recognises the potential of green hydrogen and established a **Green Hydrogen Council**[17] in May 2021. The Council consists of the following members (see Figure 4):

- **March 2022:** A joint Declaration of Intent (JCol) is signed between Namibia and Germany, by Minister Tom Alweendo (Namibian: Ministry of Mines and Energy) and Minister Robert Habeck (German: Minister for Economic Affairs and Climate Action).
- **11 April 2022:** The Hydrogen Council appoints a 21-member negotiating team to negotiate the implementation agreement with HYPHEN (the preferred bidder). Once the implementation agreement has been signed; the project can take focus on the feasibility study. According to the terms of references, the feasibility study must be finished by 2024 as well as the financial closure of the project.
- **May 2022:** The closing bids of the JCol and 31 more bids were received.
- **2 June 2022:** HYPHEN reports progress of the green hydrogen project 1. The project costs have risen from USD 9.4 to USD 10.0 billion. Hyphen plans to produce 125 000 tons of green hydrogen by the end of 2026. It was also announced that the pre-feasibility study will include a port master plan for Namport in collaboration with the Port of Rotterdam. According to Hyphen the construction phase will commence in January 2025.
- **16 until 17 August 2022:** The Namibia Green Hydrogen Conference takes place at the Windhoek Country Club under the theme 'Towards a Green Hydrogen Hub in Africa'.
- **18 August 2022:** Hyphen announces that they expect the implementation agreement with the Namibian Government will be signed by the end of 2022.

Figure 3: Wind energy turbine in Namibia.

1. **Honourable Obeth M. Kandjoze** (Director General of the National Planning Commission)
2. **Mr James Mnyupe** (Economic Advisor to the President of Namibia)
3. **Honourable Iipumbu W. Shiimi** (Minister of Finance)
4. **Honourable Thomas K. Alweendo** (Minister of Mines and Energy)
5. **Honourable Pohamba P. Shifeta** (Minister of Environment, Forestry and Tourism)
6. **Honourable Carl-Hermann G. Schlettwein** (Minister of Agriculture, Water and Land Reform)
7. **Mr Johannes !Gawaxab** (Central Bank Governor)
8. **Mrs Nangula N. Uaandja** (CEO: Namibia Investment Promotion and Development Board (NIPDB))

Figure 4: *Members of the Green Hydrogen Council.*

9 November 2022: Namibia attends COP27 in Egypt. The EU announces support - President of the European Commission, Ursula von der Leyen, states that the EU sees Namibia as a frontrunner in renewable hydrogen production. A facility was approved at the European Investment Bank (EIB) for €500 million in support of the HYPHEN project in Namibia. The EIB also provided a €10 million grant for the N$ 3 billion construction of a hydrogen-to-power plant near Swakopmund. Furthermore, it was announced that an infrastructure fund in Namibia will open, with grant funding of USD 40 million from the Dutch development bank 'Invest International'.

2 December 2022: The German power supplier RWE, a German multinational energy company, signs a Memorandum of Understanding (MoU) with Hyphen, to source up to 300 000 tons of green ammonia per year.

5 December 2022: The German Minister for Economic Affairs and Climate Action, Robert Habeck, visits Namibia to, amongst other things, discuss green hydrogen advancement plans.

6 December 2022: The Director General of the National Planning Commission (NPC), Obeth Kandjoze, announces that government is 'still far apart' from an implementation agreement with Hyphen. In August Hyphen announced that they expect the implementation agreement to be signed by the end of 2022.

First quarter of 2023: In the 2023 New Year's message the Namibian President His Excellency Dr. Hage Geingob stated that the implementation agreement for the planned N$ 170 billion HYPHEN hydrogen energy project is expected to commence

End of 2023: The Namibian Ohlthaver & List (O&L) Group and the Belgian CMB.Tech company have agreed to start the construction of a hydrogen plant in Namibia. They aim for first production by the end of 2023.

Figure 5: *Electricity network in Namibia.*

Figure 6: Architectural impression of the HYPHEN plant in the South of Namibia.

Green Hydrogen Projects in Namibia – Plans and Proposals

Following the open Request for Bids (RFP), President of Namibia, His Excellency Dr. Hage Geingob, surprised many nations in Glasgow in 2021 during COP26 (United Nations Framework Convention on Climate Change), by announcing **HYPHEN Hydrogen Energy** as the **successful bidder**.[18] HYPHEN was established as a joint venture between Nicholas Holdings of the United Kingdom (UK) and ENERTRAG of Germany.[19] The company is expected to develop Namibia's first high-capacity hydrogen project at **Tsau//Khaeb National Park** in the //Kharas Region, valued at USD 9.4 billion which roughly rounds up to N$ 160 billion.[20] It is estimated that the full scale project will annually produce 300,000 tons of raw hydrogen for domestic and global markets which would **cut 5-6 million tons of CO_2 emissions per annum**. The first phase of the project is planned to start at the end of 2026 and would produce 125,000 tons of green hydrogen.[21] In total, the HYPHEN project has been calculated to **operate for 40 years**, setting forth an important role in Namibia's **development plans** with regard to the Southern Corridor Development Initiative (SCDI) under the Economic Advancement Pillar of the Harambee Prosperity Plan II. After having completed a pre-environmental assessment, the Namibian Government and HYPHEN are currently in the process or drawing up an **Implementation Agreement**, with assistance by the law firm: Clifford Chance Europe LLP.[22] Upon the agreement's finalisation, a **feasibility study** is planned to commence which HYPHEN is aiming to conclude by 2024.[23]

Apart from the HYPHEN project, four further green hydrogen projects are being planned. According to Namibia's Green Hydrogen Council,[24] these projects will focus on Walvis Bay in the Erongo Region. The first project, named **"Green Hydrogen Application in the Port Environment"**, aims to decarbonise Namport's logistics by using green hydrogen as fuel for tugboats and other equipment. The project is valued at EUR 5.6 million. The second project aims to construct a **"Hydrogen-Diesel Dual Fuel Locomotive"**, from Walvis Bay to the Kranzberg corridor (through TransNamib). As per the project's title, the goal is to build a diesel-hydrogen locomotive that will reduce the annual 11 million litres of diesel that are being used to fuel the industry. This project is valued at EUR 7.63 million.

The third project plans to develop Africa's first Green Village, in which local communities make use of green hydrogen based ammonia fertiliser or solar powered boreholes. The **"Dauras Village"** project will be located in the Dauras Constituency in the Erongo Region and is valued at EUR 15.1 million (for phase 1). Lastly, the fourth project, **"H2 Pilot Plan – Refueling Station in Walvis Bay"**, valued at EUR 25 million, intends to produce green hydrogen based ammonia at Gigawatt-scale. The purpose of the plant is to develop green hydrogen technologies within the transport, mining and port sectors in Namibia.

Opportunities: Socio-Economic Potentials of Green Hydrogen for Namibia

Green hydrogen development in Namibia presents **several opportunities**, reaching from potential employment possibilities to economic growth, to energy independence.[25] After the success of the **Green Hydrogen Conference**[26] hosted in August 2022 and Namibia's representation at the **COP27** in Egypt in November 2022, green hydrogen development plans took off. International and national green hydrogen development incentives have increased and Namibia's green hydrogen ambitions have reached global news.

Namibia as an International Green Hydrogen Exporter

Exporting pure hydrogen will be uncompetitive for most of Namibia's potential key markets, since transporting hydrogen over long distances requires the hydrogen to be compressed through a complex **liquefaction process**. Liquefaction of hydrogen is very expensive and energy-intensive, hence why **derivatives of green hydrogen** are planned to be exported at a lower cost. Such products consist of green ammonia, zinc, methanol, e-kerosene and hot briquetted iron (HBI). According to the Green Hydrogen and Derivatives Strategy,[27] by the Ministry of Mines and Energy, Namibia could become a global low-cost supplier of such products. As a result, Namibia expects to supply some of Europe's and India's ammonia demand, as well as export green hydrogen derivatives to China. Additionally, the country aspires to create green transport corridors with its neighbouring countries, in particular with South-Africa, Botswana, Angola and Zambia.

International Investment

In August 2021, the **Namibian and German governments** signed a Joint Communique of Intent (JCoI)[28] introducing funding of the value of EUR 40 million, provided by the German Federal Research Ministry. This amount is to be allocated for a three-part programme of which EUR 5 million are intended for scholarships, EUR 5 million to develop a national synthetic fuels strategy and EUR 30 million (roughly N$ 540 million) to drive four pilot projects.[29]

Figure 7: Former Federal Research Minister, Anja Karliczek, and the Director General of the Namibian Planning Commission, Hon. Obeth M. Kandjoze, signed a Joint Communique of Intent (JCoI), concluding a green hydrogen partnership between Namibia and Germany.

Furthermore, at the COP27 in Egypt, Namibia also signed a Memorandum of Understanding (MoU) with the **European Union (EU)**.[30] Coupled with that, the European Investment Bank (EIB)[31] will provide a EUR 500 million low-cost loan and a EUR 25 million[32] grant to support a green hydrogen power plant in Swakopmund, Erongo Region.[33]

Figure 8: *Namport and the Port of Rotterdam sign a Memorandum of Understanding (MoU) on how to best become green hydrogen export hubs.*

Additionally, the **Dutch Government** offered the Namibian government US$ 40 million via Invest International.[34] Through the Namibian Port and Port of Rotterdam Partnership, Namibia also signed MoUs with **Belgium and the Netherlands**,[35] and several **Japanese companies**.[36]

Employment Possibilities

Following an estimation of ENERTRAG, the renewable energies sector will create about 200,000 jobs in Namibia.[37] On top of that, the HYPHEN project's job estimations lie at about 15,000 direct jobs in the first four years of construction and 3,000 jobs over a long-term period of 40 years.[38] **90% of all employees** are envisaged **to be Namibians**.[39] The total green hydrogen industry in Namibia aims to generate **280,000 jobs by 2030** and **600,000 jobs by 2040**.[40]

Other On-Sight Green Hydrogen Supporters in Namibia – IOs and NGOs:

Numerous International Organisations (IOs), Non-Governmental Organisations (NGOs) and Political Foundations whose offices are stationed in Namibia, are actively participating in the green hydrogen development course, including:

- United Nations (UN) → In connection with the Energy Compact Action Network
- European Union (EU)
- Economic Association of Namibia (EAN)
- Hanns Seidel Foundation (HSF)
- Southern African Science Services Centre for Climate Change and Adaptive Land Management (SASSCAL)
- The Institute for Public Policy Research (IPPR)
- The Southern African Institute of International Affairs (SAIIA)

Civil Society Organisations (CSOs) in Namibia linked to Green Hydrogen development:

- Namibian Youth on Renewable Energy (NAYoRE)
- YOUTH4CAN (Climate Action Namibia)
- Wakapinya Environmental Education

Some of Namibia's Governmental Entities that support and promote the Course:

- Office of the President
- The Namibia Green Hydrogen Council
- Namibia Investment Promotion and Development Board (NIPDB)

Private Sector Opportunities

Green Hydrogen development and projects such as HYPHEN, also offer benefits for **Namibia's private sector**. This will especially concern companies dealing with wind turbines, solar panels, water management, consulting, IT services, port and railway construction, as well as producers of fertilisers such as green ammonia and green zinc.[41]

Economic Benefits

Namibia has the potential to become a green hydrogen **exporter for Southern Africa, Europe and several Asian countries**.[42] On a local level, Namibia hopes to be **8% self-sufficient by 2029**, in primary energy generation of solar, wind, hydro and gas energy, with low-cost energy prices.

Figure 9: Ruacana Power Station in the North West of Namibia. A hydro energy source.

As for the **gross domestic product** (GDP) estimation, the Green Hydrogen and Derivatives Strategy[43] states that by 2030 green hydrogen could contribute USD 4.1 billion towards Namibia's GDP, which is 32% more than the GDP estimated end of 2030, excluding calculation of the hydrogen industry contributions.

In line with **Namibia's Gini coefficient** (a statistical measure of inequality), the first phase of the HYPHEN project will have *no* impact on the Gini coefficient. However, later stages of the project which are based on the projected employment published by McKinsey up to the year 2040, could have a positive impact on the country's current Gini coefficient of 0.56.[44]

Challenges and Risks of Green Hydrogen Development in Namibia

Legal Framework and Policies

In order to establish a safe and stable **investment climate**, stakeholders and experts alike have pointed out that Namibia is in need of a favourable legal framework that secures investment,[45] as well as policies and regulations that allow the government to attract green hydrogen investment. Currently, such frameworks do not exist.[46] Moreover, it is crucial to enhance **environmental policies** that prevent any violation of environmental and social standards.[47] Lastly, it is necessary to create a regulatory framework which provides **neutral methods** for the Namibian government to manage stakeholder resource conflicts.[48] Currently, efforts are well under way to address the above.

Transport and Infrastructure

As previously mentioned, transporting hydrogen over long distances can only be done by liquefaction, a costly procedure. Even for short or medium distances, hydrogen needs to be compressed so it can be transported via a **pipeline**.[49] Nevertheless, pipelines that could transport green hydrogen through Namibia still have to be build. Apart from that, ships or trucks have to be equipped for transporting green hydrogen, although

such a **cargo shipment method** poses a challenge, as there is still international uncertainty on how to transport green hydrogen. [50] [51] Given that green hydrogen could be transported via trucks or ships, it causes another problem; namely that such transport would not be carbon neutral, as ships or trucks will most likely run on petrol or diesel engines.[52]

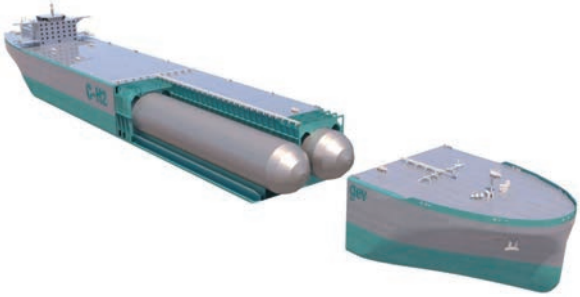

Figure 10: *An illustration of Global Energy Ventures (GEV) developing a C-H2 Ship with Cargo Capacity of 430 Tonnes of Hydrogen.*

Water Scarcity

In order to produce green hydrogen, large amounts of water are needed. Not only does the production as such require water but also the cooling of the electorlysers.[53] In Namibia, a country consisting of **large desert landmasses** and semi-desert plateaus, water is scarce. Even if alternatives such as **desalination plants** along Namibia's coast could minimize this challenge, another concern arises: desalination plants are not only expensive to set up and maintain[54] but also **environmentally damaging**.[55]

Figure 11*: Brine water flowing into the Mediterranean Sea, passing through a desalination plant in the coastal city of Hadera, Israel.*

Too much salt and brine are being pumped back into the sea, causing high risk of intoxicating the oceanic environment and at the same time hindering local blue economic development.

Investment and the Private Sector

Another point of concern is the difference between **proposing projects vs. final project investment**. As reported by a McKinsey study for the Namibian Hydrogen Council,[56] a total of 680 green hydrogen projects worldwide were announced with a total value of USD 240 billion, however only USD 22 billion (9.2%) have reached final investment decision. Those projects where final investment was reached, the government of the country to be invested in, always offered to financially support the development of either for example infrastructure or desalination plants - a driving factor to why investment was finalised. In the case of Namibia, the **government does not have funding** available for green hydrogen development, only the funds of the European Investment Bank, German, Dutch and Belgian Governments. Additionally, it is estimated that the size of investment would equal the 2020 GDP budget of N$ 9.4 billion.[57] [58] This would mean that Namibia would have to be supported by **large amounts of capital from the private sector,** as well as national and international Development Finance Institutions (DFIs).

Supply Chain Problems

Since the production of green hydrogen is directly linked to renewable energies, a potential challenge with the **delivery** of solar panels and/or wind turbines has been identified.[59] Also pinpointed, are the exuberantly high costs of the electrolysers

to produce green hydrogen, not to mention a **worldwide lack** of capacity to manufacture them, with regard to necessary raw materials and other critical components. [60]

Political Pressure

In their submission during the bidding process, HYPHEN indicated that they will pay an annual rent of N$ 100 million during the feasibility time and once the project starts, the rental cost would increase to N$ 330 million. The average cost of salaries is envisioned at N$ 152 000, 00 with 15.000 people to be employed during the construction period alone. This means, that the average monthly wage of an employee will be around N$ 15 000, 00.[61]

These are very **ambitious targets** and should they not materialise, one could expect possible **internal political questions by voters** in the South of Namibia (//Kharas Region).

Oil Discovery – Focus Diversion?

Approximately 11 billion barrels in oil reserves have been found off Namibia's coast (see map).[62]

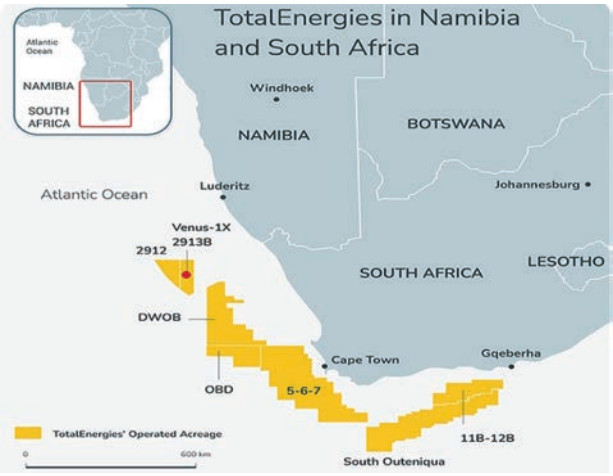

Figure 12: Oil discovery by Total Energies in Block 2913B of the Orange Basin, located off the coast of southern Namibia.

Shell and Total Energies are the two leading oil companies currently involved in negotiations with the Namibian Government to set up operations in **Lüderitz,** //Kharas Region.[63] Should the oil business begin to boom in Namibia, it could divert the current green hydrogen focus.

International Competition

Aside from Namibia, many other countries are also competing in the green hydrogen market - the financially well-equipped **Gulf States** being on the top of the list.

Figure 13: NEOM Green Hydrogen Company (NGHC) signed a Commitment Letter with the Saudi Industrial Development Fund (SIDF) to build a mega green hydrogen plant to produce green ammonia in NEOM, Saudi Arabia.

Moreover, the **United States** (US) recently passed an **Inflation Reduction Act**[64] that amongst other things, includes an incentive package to provide tax credits of USD 3.00 per kilogram of green hydrogen produced. Such generous incentives aim to stimulate the green hydrogen production in the US.[65]

KAS Interviews with Green Hydrogen Stakeholders

International Insights

To gather further insight into future green hydrogen- and renewable energies development endeavors in Namibia, **interviews** were conducted with two selected, international stakeholders based on their emerging involvement in the green hydrogen space in Namibia: **"Impact Hydrogen" and "Natura Energy"**. Questions touched on topics such as the green hydrogen investment climate in Namibia, challenges the industry could face in the near future, and examples of future projects (see below):

Figure 14: Company logo.

Impact Hydrogen

About: Impact Hydrogen is a Dutch project development company that tackles sustainability from multiple angles. Not only does their focus lie on a 'green' mission but also on how their green hydrogen development projects can sustainably benefit the region they are set up in. Together with local private sector businesses, governments, international businesses and investors interested in sustainable green hydrogen development, Impact Hydrogen helps develop and organise Sustainable Hydrogen Valleys - a concept somewhat similar to a green hydrogen ecosystem that comes with great hydrogen value chain benefits. Besides that, Impact Hydrogen also advises governments, regions, and private sector companies on how to make green hydrogen production useful throughout the entire value chain.

Projects and Objectives: Currently, Impact Hydrogen is working on a Hydrogen Valley set-up in Namibia and hopes for further investment contribution to their "Coalition of the Willing", an investment coalition consisting of private sector, as well as other firms. Addressing Namibia's civil society will be part of the central focus of their Hydrogen Valley project. Next to the large scale set-up of for example the HYPHEN project, Impact Hydrogen will start as a small, decentralised project that aims to achieve as much as possible under Namibia's current regulatory framework.

"*Taking people along*" on the journey of developing a Hydrogen Valley in Namibia is important, according to Ann Abheiden, one of the directors at Impact Hydrogen. She also commented that eventually, it is up to Namibian citizens to grow accustomed to a new green hydrogen economy, "*to make it a project that fits the region*." That is why Impact Hydrogen works through local project offices and connects to local project leaders in the region.

Ann's tip: Now is the time for the Namibian Government to carefully choose who enters the country as investors.

Figure 15: Company logo.

Natura Energy

About: Natura Energy is a South African based company that deals with the development of power projects, third party project development services and consulting, as well as limited recourse project finance. In short, the company acts as a catalyst in project implementation of renewable energy projects. As can be deduced, their focus lies on renewable energy development but further aiming to expand, with the upcoming green hydrogen market boom.

Projects and Objectives: At present, Natura Energy's short-term goal, considering the Namibian green hydrogen market, is to provide green electrons that are needed to power the green hydrogen production value chain. This includes the essential electrolyser plants, air separation units, and water desalination systems. Furthermore, the company is considering to invest in the manufacture of Green Ammonia, depending on the state of the global market. As for renewable energies investment, Natura Energy, in co-partnership with the UK based company Globeleq Africa[66], expects to implement the first phase of their 80MW TeraSun Energy Power Park, located in the town of Arandis (Erongo Region) by 2023. Additionally, the company is also developing two solar PV sites of 350MW in the //Kharas Region which could contribute significantly to the green electrons production. While praising Namibia's excellent natural wind and solar resources, Ezio Vernetti, the Managing Director of Natura Energy, is concerned about Namibia's price competitiveness, in connection with the international hydrogen market.

An "*additional effort of finding strong and committed export market offtake*", according to him, is required to ensure that the competitive cost drivers of Namibia's green hydrogen bid remain convincing for capital investors and the international market. Besides that, the Namibian Government has to be ready to support this new industry on a national infrastructure basis, given the large investments required.

Ezio's tip: Good governance, government incentives and support, as well as infrastructural development are underlying but important factors to be taken into consideration when addressing international investor climate in the Namibian green hydrogen market.

Additional Stakeholders:

Please note that the selection of the candidates interviewed is merely based on the notion of **introducing the reader to other insights and projects** aside from the HYPHEN project, and the four green hydrogen pilot projects currently in the spotlight.

So far, the Namibia Investment Promotion and Development Board (NIPDB) is still in the process of compiling a list of local and international firms relevant to the green

hydrogen or renewable energies development and investment in Namibia. Further companies to mention a few, include: The Ohlthaver & List Group, HopSol Solar Power Plants, NEC Power and Pumps, and ALENSY (Alensy Energy Solutions Pty Ltd).

Concluding Statement

Overall, green hydrogen development in Namibia could bring the country one step closer to becoming **carbon neutral**. Coupled with that, other countries could improve their carbon neutrality too, with the help of Namibia's green hydrogen exports.

Furthermore, possible employment opportunities and economic benefits shape a **prosperous future perspective** for Namibia's economy.

It should nonetheless be taken into consideration that, **many other developments** such the establishment of a legal framework, infrastructure development, environmental policies, a functioning Southern African power pool, conducive investment climate and scientific research, still **need the full attention** of policy makers and the Namibian Government, before a green hydrogen industry can truly flourish.

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