Namibia Green Hydrogen Conference

16th - 17th August 2022

POST-EVENT REPORT

economic association of namibia ean

NIPDB

Hanns Seidel Foundation

Background

"Namibia has arrived!"

The development of the Green Hydrogen sector requires lower-cost energy inputs for the movement of a sustainable pathway built on hydrogen as an energy source. Namibia's world-class solar and wind resources give it a long-term competitive advantage in producing green hydrogen and green ammonia.

Namibia is subjected to the effects of Climate Change including extended drought periods and erratic weather patterns which add to the challenge of sustainable development.

Green Hydrogen is expected to play a central role in sustainable development and the meeting of the Sustainable Development Goals (SDG's). It will undoubtedly help transform global industries as countries worldwide seek to decarbonise their economies.

EXPECTED OUTCOMES

"A new beginning for Namibia"

- Demystifying Green Hydrogen
- Legal Framework requirements
- Economics of Green Hydrogen and Decarbonization
- Human Resources and Capital Development needs
- Identification of Value Chain opportunities
- Industry financing needs and sourcing

WHAT THE CONFERENCE AIMED TO ACHIEVE

- Gain insights for a better understanding of the fundamentals of green hydrogen.
- Identify the potential opportunities and risks of establishing a green hydrogen industry in Namibia.
- Understand the industry markets and regulatory framework.
- Understand the human resource & infrastructural requirements of a green hydrogen industry.
- Understand the investment opportunities for the green hydrogen industry in Namibia.
- Identify the opportunities for MSMEs, employment creation, and economic participation of local communities in the green hydrogen industry towards a strategic roadmap.

Executive Summary

Spearheaded by the Economic Association of Namibia (EAN), Namibia Investment Promotion and Development Board (NIPDB), and the Hans Seidel Foundation (HSF), the groundbreaking Conference held over two days (August 16 - 17, 2022), addressed several points including the nascent nature of the Green Hydrogen industry. With a hybrid format having attendance in person of some 500 attendees and around 400 persons tuning in online.

The well-attended conference brought a clear focus on the need for collaboration and awareness raising, thus the **Green Hydrogen Conference, 2022** ticked all the expected boxes.

With a conference format designed to explore as many facts about this industry as possible and mitigate misconception, it provided attendees with themes to gather around and explore. The Conference took a balanced approach to exploring:

- What is Green Hydrogen?
- The benefits of Green Hydrogen in decarbonization
- The role of Namibia in the global production context
- Impact of this nascent industry on the Namibian economy
- Potential impact on Jobs and Human Capital Development

It was clear from the well-structured and thoughtful presentations and panel discussions, that Namibia is "competitively positioned" to be a production hub with a potential capacity of upwards of 15 - 20 million tons of Green Hydrogen per annum by 2030. This is based on the country's natural resources of sun, wind, and access to seawater which provides a "Competitive Advantage" bringing targeted pricing of Hydrogen well within market expectations.

Government support was very evident at all stages of the Conference with the Prime Minister, Rt. Hon. Saara Kuugongelwa-Amadhila giving Government's commitment to a competitive market framework. The PM pointed out that Namibia was "open for business" and placing itself strategically to be a part of the estimated USD 9.8 Billion Green Hydrogen market by 2028.

Further Government commitment was in attendance through the Minister (Hon. Tom Alweendo) and Deputy Minister (Hon. Kornelia Shilunga) of the Ministry of Mines and Energy. They both pointed out to attendees that the Government was under no illusion in light of being a net energy importer, that structural matters such as legislation, vocational training and funding need to align to this vision.

This view was echoed through the keynote addresses and presentations given by the experts who gave guidance, indicators and economic realities around Namibia's outlook for the future.

The Conference was also informed that Namibia has set up a "Private Sector Green Hydrogen Task Force" to support the participation of Namibian interests in the sector. Pilot projects were awarded grants at the event and showcased to the public as to what is aspired and what can be achieved. **The Four (4) pilot projects will give insight** into applications of Green Hydrogen for agriculture development (**Dâures** project), logistics (**TransNamib** and **NamPort** projects and a refueling project (**Cleanergy** project) through these various applications.

Interest was raised even further with insights as to how green hydrogen as an energy carrier could facilitate balancing for the intermittency of renewable energy generation. With this firming of renewables and the refueling potential for logistics, stakeholder attraction is high.

The main takeaways are thus:

- The world is going through an energy transition and Green Hydrogen will play a critical role.
- Namibia is well-placed to be a major producer and early adopter.
- Development of a Green Hydrogen Industry can help meet Namibia's "poverty eradication" ambitions.
- Spin-off sectors will be created around desalination, green ammonia, and related products.
- Major funding will be required along with legislative support.

Organizers

economic association of namibia ean

NIPDB Namibia Investment Promotion & Development Board Office of the President

Hanns Seidel Foundation

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Introduction

The Fuel of the Future

Rt. Hon. Saara Kuugongelwa-Amadhila
Prime Minister of the Republic of Namibia

After extensive planning and coordination with partners, The Namibia Green Hydrogen Conference, 2022 created a platform to bring together the makers and shakers of this nascent industry. Bringing together all the various sectors, Government, Industry players, academia, financiers, and the public at large, the level of investor interest in Namibia is now at an upward trajectory.

The Hydrogen industry globally is undergoing major transformations based primarily around the energy sources driving its provision. It is accepted that Hydrogen can provide energy that is abundant and sustainable in the form of the defined Green Hydrogen. Namibia's world-class renewable energy resources of wind and solar along with access to seawater provide for a perfect complement to the world's needs for sustainable fuels and the government's efforts to create jobs, alleviate poverty and enhance development.

The new round of scientific and technological revolution is expected to drive society towards a new industry based around Green Hydrogen. Green Hydrogen is becoming a critical source of energy in global energy markets, playing an increasingly central role in the transition to a green energy future.

Green Hydrogen is expected to play a central role in transforming global industries as countries around the world are seeking to decarbonize their economies.

Highlights

Namibia aims to become a global or continental Green Hydrogen hub

- Need to find ways to mitigate risk for financial institutions
- Emphasized collaboration and not competition
- A Just Transition focused on meeting the energy needs
- Showcasing of Pilot Projects

Key Note Speech

Government Committed

Pilot Projects Launched

Overview

929 Delegates

506 Delegates in Attendance

423 Virtual Delegates

6 Namibian Media Companies

11 Green Hydrogen Experts

4 Universities Represented

4 Pilot Projects Launched

Euro 30 Million Committed Grant Fund

Various High Level Deals Discussed

Prime Minister in Attendance

Namibian Government Committed

Public Support galvanized

DAY ONE

Hydrogen ECONOMICS

Hydrogen MARKETS

LEGAL and REGULATORY

Opening Remarks

Mr. Jason Kasuto Chairperson, Economic Association of Namibia

"Hopefully, Green Hydrogen as a new industry will help us not only to change the economic structure but should be able to address the two-dimensional problem Namibia faces."

Mr. Kasuto opened the Conference with a reminder of the economic realities facing Namibia. He noted that Namibia was a haven for "pipe dreams" and had what he identified as a 2-dimensional problem or "Our Pollution", namely:

1. Unemployment
2. Poverty and Inequality

These he elaborated, *were most evident in local urban/peri-urban and rural communities.* With this in mind and setting the scene, the creation of a nascent industry such as a Green Hydrogen industry in Namibia has the potential to address this "evil".

It was evident also he pointed out that with local and international players showing keen interest with a commensurate commitment, this shows the "work has started"

He feels that Green Hydrogen presents an opportunity to tackle the 'pollution" and progress can be made by activating four key drivers:

1. Forward Thinking Submissions and Contributions
2. Robust Dialogue
3. Practical solutions
4. Broad public participation

Unemployment **33.4%**

Introduction

Ms. Nangula Nelulu Uaandja CEO, Namibian Investment Promotion and Development Board

"My Green Hydrogen Story"

"This industry is a new beginning for Namibia because this industry presents an opportunity for the country to flourish as it has the potential to help the government fight inequality, poverty and unemployment,"

Having envisioned a platform that would explore the ecosystems existing and required for the development of a Green Hydrogen industry, Ms. Uaandja emphasised that the main objective of the conference was to:

- Bring together key role players to exchange views
- Give the audience a 101 understanding of Green Hydrogen
- Help harness this resource to tackle poverty, thus presenting Green Hydrogen as a solution to economic, social, and carbon challenges faced by society
- Discuss the opportunities and risks – not only opportunities but also the downsides that need to be addressed through regulation

The opportunities and risks to be addressed include Market opportunities and regulation, Investment opportunities – debt and equity, Human resource requirements, and infrastructure needs which will require adequate financing (*Opportunity for funders / MSME funding*).

Potential employment

15,000 Jobs

Namibia's Strategy

Mr. James Munyupe, Presidential Economic Advisor and Hydrogen Commissioner

Conducive environment created

"We are of the opinion that Namibia has the potential for two to three green hydrogen valleys, with the one in the south being the most prominent one,"

Mr. Mnyupe in his roles of Presidential Economic Adviser and Green Hydrogen Commissioner, introduced the Conference to the current landscape and vision. With this, he laid out the pathway for Namibia to be a part of meeting the energy transition. This was even more potent in the face of Europe having energy shortages and Namibia relying on its neighbours. Shaping of a Namibian synthetic fuels strategy was in the works.

In a contract with the Namibian government, the German Federal Ministry of Education and Research (BMBF) is providing funding for the identification of suitable sites for green hydrogen production. It is being realised through a 40 million Euros Grant of which 30 million Euros are assigned through investment into research at university levels and the implementation of pilot projects in Namibia.

The Four (4) pilot projects focussed on the Erongo region of Namibia are:
1)**Dâures project** (agriculture),
2)**TransNamib project** (logistics)
3)**Namport applications** (logistics)
4)**Cleanergy project** (refuelling)

Decarbonization in Action

4 Pilot Projects

Boosts and Barriers

Dr Hans Dieter
Vice President - Hydrogen
Worley

Boosts and Barriers for Decarbonization

Governments, developers, investors, suppliers, engineers, researchers, traders, off-takers, and societies, need to cooperate

Dr. Dieter noted that Hydrogen has the ability to reach industrial sectors and areas where green electricity is unable to currently. There are many projects happening globally that will allow for the needed learning and faster ramp-up.

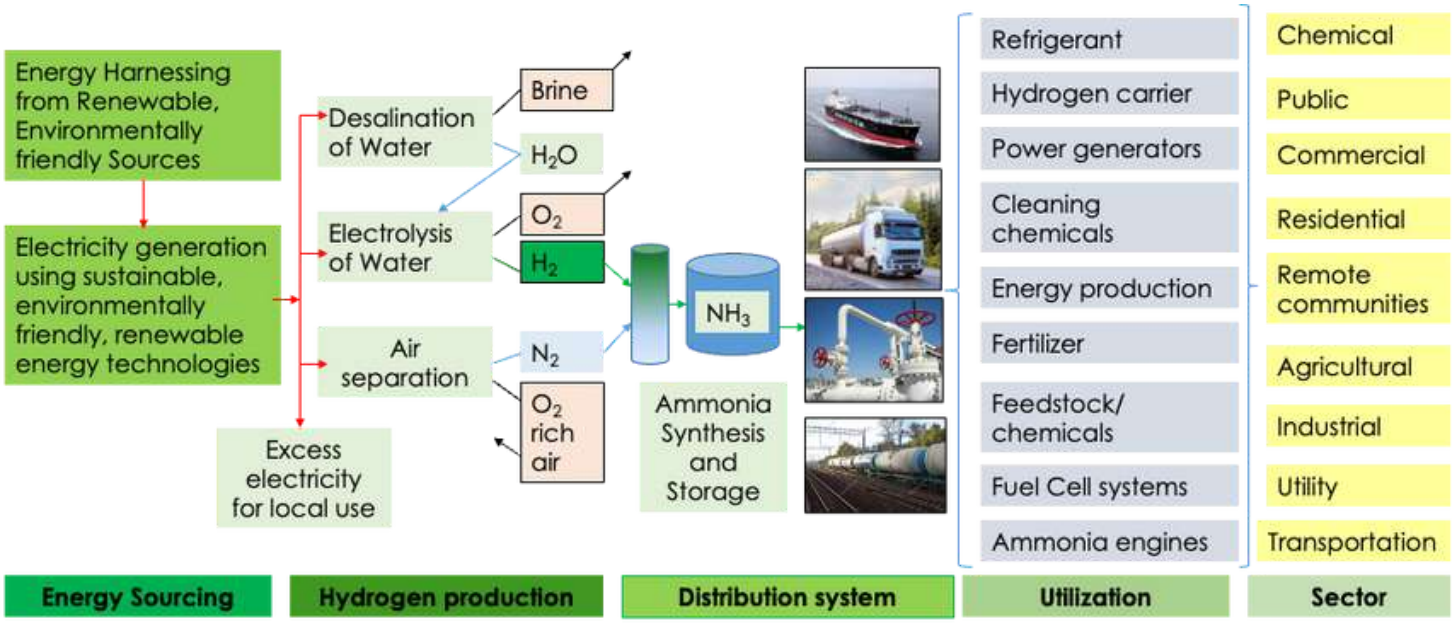
Europe leads the way in green hydrogen projects but will scale up post-2025. With 70 percent of capital investment costs going to wind and solar electricity for projects, this high level of investment costs is the biggest roadblock.

He indicated that by concentrating on renewable electricity to stabilize current and new projects coming and feed green energy into the grid, great opportunities exist there. Collaboration was key to achieving this.

Takeaway Points

- Europe: 30% of Renewable Energy connected to the grid – took 20 years
- Focus on decarbonizing the transport sector
- Focus on supplying Green Hydrogen fuel to heavy car fleets
- Look at heating sector

Private Sector Support



A Green Hydrogen Task Force has been established to engage with public and private decision-makers and relevant players while promoting and showcasing Namibian companies' solutions, offers, and projects;

Stakeholders are invited to collaborate with the Task Force

Session I

Dr. Zivaya Chiguvare

Namibia's Private Sector and the Green Hydrogen Industry

Namibia Private Sector Green Hydrogen Task Force
The core mandate of the Green Hydrogen Task Force is to ensure inclusive participation by Namibian players in the hydrogen sector across the entire value chain.

- **Hydrogen uses are more pervasive than we realize**
- Presently there are cars and heavy vehicles running on hydrogen

Mr. Klaus Schade

Social Impact of Green Hydrogen in Namibia

Create three new industries and three new products:

- Renewable energy sector (wind & solar) / product
- Desalinated water sector / product
- Green hydrogen sector / product

Identify potential areas of policy interventions

- Strengthen backward- and forward linkages, increase value chains
- Mitigate undesired impacts on household income distribution

Panel Discussion

Panel Discussion

Moderator:
Ms. Florette Nakusera

Panelists:
1. Mr. James Mnyupe, Green Hydrogen Commissioner
2. Dr. Hans Dieter Hermes, Vice President of Worley International
3.Dr. Zivayi Chiguvare, Chairperson of Namibia Private Sector GH2 Task Force
4. Mr. Sylvester Mbangu, National Planning Commission
5. Mr. Jason Kasuto, Chairperson of Economic Association of Namibia

Green Hydrogen allows us to tap into areas that solar and wind can't do alone due to intermittency, thus "firming" up energy security.
Namibia is positioning itself to fit into a global supply chain: Harambee Prosperity Plan is a key driver, making Namibia part of the larger Market, which in of itself requires regional and international partnerships.

- Namibia's Synthetic fuels Strategy to launch by November 2022 (Completed)
- First Draft of Synfuels Strategy in place by COP27
- 100 million Namibian Dollars to be allocated and spent on these projects
- The website at https://gh2namibia.com/ will share economic opportunities- will track pilot projects and highlight other GH projects.
- Excellent opportunity for Namibia to develop her own place in the Green Hydrogen scene while decarbonising the economy and preparing for long-term activity with lots of learning

Green Hydrogen Opportunities

- Hydrogen is an energy carrier and there is still a need for solar and wind resources to provide the energy needed in the process. (*Namibia has abundant resources*)
- Namibia has the advantage of being a stable environment with a robust regulatory framework- (*this needs to be framed by frank discussions between investors and GRN*)
- The Private Sector can benefit from the financial sector coming on board and there was a clear emphasis on the need for all private sector members to take ownership.
- Namibia focuses on the reduction of poverty and inequality and has identified GH2 as a way to achieve objectives by being inclusive in creating employment down the labour market and value chains. GH2 will help attract investments, and narrow the existing gap between imports and exports (*reduce the import of energy from neighbouring countries and GH2 will allow us to be an exporter of energy*).
- Namibia has had several unrealised projects but this time our Head of State has committed the State, and pre-feasibility studies are underway with reputable local partners.
- Half a billion Namibian Dollars availed to pilot projects currently
- Local, regional and international players are onboard and very keen

Session II

Green Hydrogen Fundamentals

Dr. Shafudah

Hydrogen Quiz

The Conference was educated and entertained during the information exchange by Dr. Shafudah on key characteristics of Hydrogen such as:

- Hydrogen is colourless
- Hydrogen has no smell
- Hydrogen is not an energy source, but an energy carrier
- ***10 litres of water is needed to produce 1kg of pure hydrogen***
- 1 kg of Hydrogen is needed to drive 100km

Ms. Mutschler

The Basics of Hydrogen

Ms. Mutschler provided further insights from Industry to the Conference

- Desalination in the form of Reverse Osmosis would be used in Namibian context for feedstock (Water).
- Emphasised the nature of hydrogen not being dense and therefore requiring space or compression, while also emphasising the volatility of GH2 and thus the need for reliable storage systems.

A Key point made was that it takes approximately 55 kW of energy to produce 1 kg hydrogen

Dr. Zivayi Chiguvare

Maximising GH2 benefits for the local market

- Hydrogen uses are more pervasive than we realise.
- ***Presently there are some 30 000+ cars and heavy vehicles in parts of the world running on hydrogen.***
- Several countries will be importers of GH2

Session II

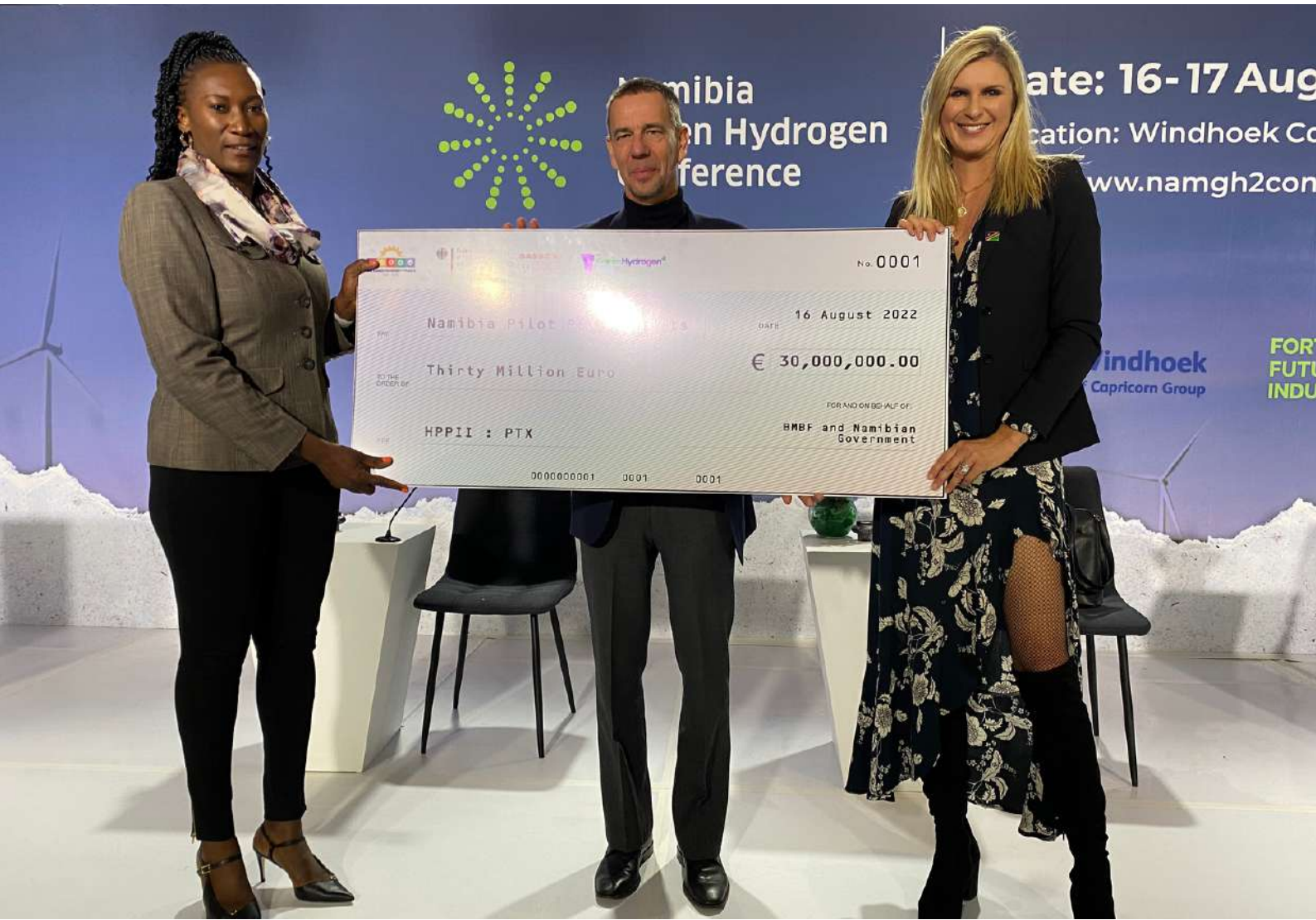
Green Hydrogen Fundamentals

Mr. Rajend Govender

Experiences on H2 Production, Marketing and Utilisation

Prioritising "Net Zero" is accelerating globally and Namibia is well placed to take part.

- Namibia's energy production is 10 percent lower cost than its closest competitor, Saudi Arabia.
- Green hydrogen can create a suite of products for Namibia and Africa.
- Electrolysis is the process of using electricity to split water into hydrogen and oxygen. This reaction takes place in a unit called an electrolyzer.



Panel Discussion

Panel Discussion

Moderator:
Prof. Anicia Peters, Pro Vice-Chancellor of Research, Innovation & Development at UNAM

Panelists:
Dr. Natangue Shafudah, Namibia Green Hydrogen Research Institute
Dr. Zivayi Chiguvare, Namibia Green Hydrogen Research Institute
Ms. Margaret Mutschler, Namibia Green Hydrogen Association (NamGHA)
Mr. Rajend Govender- CEO ThyssenKrupp Industrial

The Panelists all agreed that Green Hydrogen can address our water scarcity issues. The gain of water from the desalination process which can be used by locals for different purposes is a benefit. Green Hydrogen can also support food production as Hydrogen is an energy carrier that allows us to utilise it for usage/enabler support for bringing food to the table. It aids with a reduction of the carbon footprint and skipping/exempting the need for shipping to other countries like China for further processing.
Entire ecosystems are required to sustain Green Hydrogen production thus various value chains are benefited outside of the core value chain.

Key challenges:

- Production of Green Hydrogen is very capital intensive since it has a long value chain. Are we ready for this?
- The need for a huge amount of Capex means Namibia will perhaps face challenges such as a shortage of skills and investors from within its borders.
- The Green Hydrogen industry is expected to produce about 300 000 tons of output per annum. Therefore, we need to create a market for exports and also build storage for future use.
- Green ammonia is the most viable way of transporting Green Hydrogen in liquid form also research is ongoing to find the extent of the danger of water in the ozone layer through the process of producing Green Hydrogen.
- Safe handling of Green Hydrogen needs consideration of material compatibility for Hydrogen transportation due to its degradation characteristic and it can seep out if not properly sealed to hold hydrogen sustainably.
- Transportation: the lack of density of hydrogen, low melting point - difficulty transporting and storing it.
- Importance of legislative and regulative framework for the GH industry

Possible solutions:
1) UNAM can work in collaboration with others to look at the materials capable of transporting Green Hydrogen and the process of separating oxygen from carbon dioxide.
2) Liquify hydrogen and transport it as a liquid instead of in its gaseous state
3) Business cases are being examined in Namibia vs South Africa, and European partners have indicated Namibia as the ideal location.

Session III

THE LEGAL AND REGULATORY FRAMEWORK

Dr. Kerry-Ann Adamson

Why are regulatory frameworks a key success factor

"There is a Regulatory void due to the newness of GH which will result in self-governing markets".

- Regulation needs to be better understood on how markets operate in areas such as the flexibility and adaptability, so will constantly be updated due to changes in the market.
- Looking to bring industry in Namibia in 6-10 years and multiple business models would work.
- Technology is not yet standardised within the hydrogen market but regulation happens as tech and markets evolve.
- Commercial readiness model is key in the discussion

2030 Milestones:

- Liquid Market in Europe
- Multiple Buyers and Users
- Open forward pricing for Europe
- Large-scale industry distribution

Ms. Corina Van Wyk

A domestic perspective on the legal and regulatory framework – an overview

"A management plan is needed, and getting the communities involved is important"

The Environmental Management Act is the most relevant Act for the discussions around Green Hydrogen. Any Regulation for biodiversity and dealing with issues of implementation of laws, who and how it should benefit people as needed.

The focal points of such changes will surround the Constitution and the various Acts of Parliament along with agreed International Conventions. Changes will also be needed in the areas of Energy and Environmental Policies.

Session III
THE LEGAL AND REGULATORY FRAMEWORK

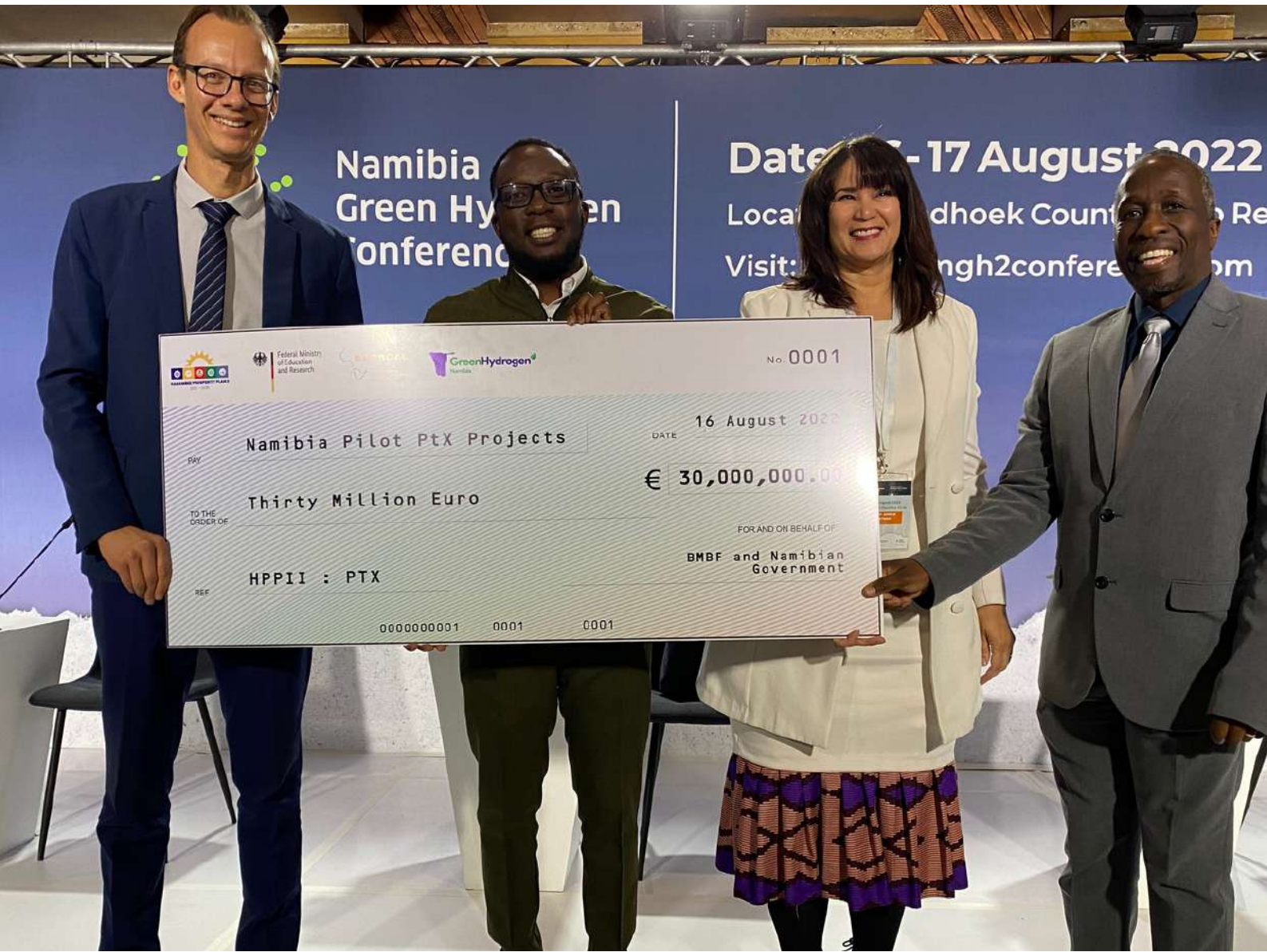
Prof. Oliver Ruppel

Green Hydrogen - Environment Law and Policy Perspective

The legal imperatives in terms of environmental law

Professor Ruppel concurred with Ms. Van Wyk that Namibia's Environmental Laws need to be considered as well as other commitments under the Paris Agreement, the Harambee Prosperity Plan, and Sustainable Development Goals.

His recommendation is to formulate regulation with research institutions, public and private, and focused on decarbonisation.



Panel Discussion

Panel Discussion

Moderator:
PMs. Elise Shakalela: Lecturer Environmental Law, University of Namibia

Panelists:
1) Dr. Kerry-Ann Adamson D.I.C.: Global Strategic Advisor, Hydrogen Growth Unit, Worley
2) Ms. Corina Van Wyk- Coordinator of Land, Environment & Development Project, Legal Assistance Centre Representative
3) Prof. Oliver Ruppel, University of Stellenbosch
4) Grant Muller
5) Ms. Stefanie Busch: Energy Lawyer

Key legislation factors to attract Foreign Direct Investment (FDI):

The panelists grappled with how do you ensure international compliance. Namibia, therefore, needs to begin the process for stable impacting policies for Hydrogen. There will be a need to avoid conflict of interest issues and needs to update laws as needed, with a cautious approach and assessment for the management of environmental risks.

We need to involve the community to express views and be legitimately involved in the decision-making process

Policy Formulation will need to incorporate Taxes and Customs Duties, maximising utilisation of common assets, safety, and technical standards resulting in separate Legislation, framework needs to balance between over and under regulation

Session IV

THE ECONOMIES OF GH AND GLOBAL DECARBONIZATION

Green hydrogen and Namibia: Has the future arrived?

Can Namibia export and produce hydrogen at the right price?

Mr. Robin Sherbourne

A look at the positives indicates that Namibia has first mover advantage but this comes with higher risks but also higher profits and results.

Disaggregation shows Desalination is tried and tested, with Renewable Energy commonplace. Namibia has the benefit of world-class Solar PV and Wind Energy. Splitting Hydrogen from Oxygen is the "new" component via an electrolyser for Namibia and would need better understanding.

There are also other specific matters to be understood such as Liquefaction which is very costly to make a liquid at -253 Celsius. Then matters for storage and transportation need consideration due to the volatile nature of hydrogen. Other are:

- Funding: Risks are very high: from a feasibility study to banks will only be ready within the next 2 years
- Profitability: Who bears the risk? Namibia or private investors, GRN must reduce risk

The Cost and Profitability of GH2 Production (A Microeconomic View)

Chile has Green Hydrogen activity dating back to 2015 and 4 years later (2019) had a framework/strategy

Pablo Tello

Chile has gone through a learning curve and come out on the other side with the cost of GH at USD 6 per kg to replace transport using diesel (*can be competitive when you are a local user*). Chile's Southern region is rich in wind and the north is rich in solar energy sources.

Market pricing for GH is still emerging since no one knows yet what it would cost in the market.....

"*Today, it is less costly to make green ammonia than it is to produce grey ammonia*".

Session IV

THE ECONOMIES OF GH AND GLOBAL DECARBONIZATION

Mr. Marco Rafinetti

Expected impact of Namibia's first Green Hydrogen Project

In the context that 90 % of the world has committed to net zero, Namibia has a competitive advantage that is largely untouched.

Namibia has 2x the advantage over a German proxy location on wind and 3x the advantage in regards to solar.

Hyphen is a stepping-stone project with a plan for 15 million tons of hydrogen annually in Namibia which is 3% of the global supply. The "Hyphen" Project will

- Have an environmental focus as a company and socio-economic development.

Panel Discussion

Panel Discussion

Moderator:
Mr. Solomon Hei, Chairperson of Namibia Statistics Agency

Panelists:
1. Mr. Pablo Tello – Technical Advisor on Green Hydrogen GIZ Chile
2. Mr Ebson Uanguta – BoN Dpty. Governer
3. Mr. Robin Sherbourne – International Economist
4. Mr. Marco Raffinetti – Chief Executive Officer: Hyphen

"We are not addressing how Namibia can reduce its carbon footprint since our current contribution is below 1%".

The panelists **noted that:**

- Pricing as a big determining factor is misunderstood as fossil fuels need to be replaced. However, USD 0.6/0.7 is the price level needed to replace local usage. Market pricing for Green Hydrogen is still emerging.
- Natural gas prices are now higher, so hydrogen prices can have a positive economic impact if Green Hydrogen takes off and so for the desired results do not underestimate going slow and getting it right!

Today, it is less costly to make green ammonia than it is to produce grey ammonia

- Projects developed on a 30-year concession are viable from day one. However there is no clear pricing around it yet. Green hydrogen blending helps create a price floor (cost of capital high but operations cost is very low).
- Namibia is making available the land and legislation but it would be good to have *GRN* equity in the Green Hydrogen industry.
- Within the first year it would mean that 15 000 people would be employed and an additional 1500 people per development phase.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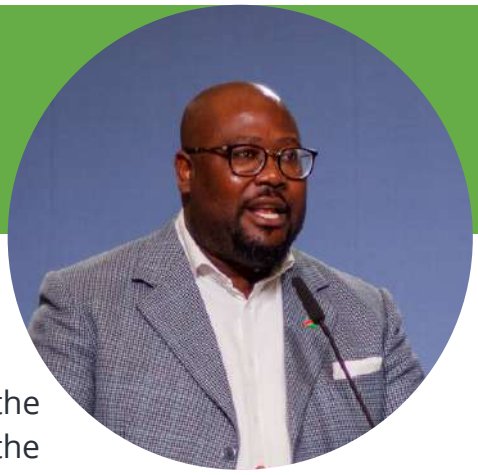
DAY TWO

Government Committed

Hydrogen and People

Infrastructure

Opening Speech



Introducing Day Two

"Namibia and Germany are now on equal footing

Ricardo opened the day by reminding all investors of the potential that Namibia possesses. He placed emphasis on the support seen from the Namibian government related to Green Hydrogen developments. This he said truly is the norm across the board, as Government support has been demonstrated across all industries.

He introduced the focus of the day for the Green Hydrogen industry as looking towards "Economic Development" especially in light of the Covid impacts on economies.

He then had the opportunity and privilege to welcome the Deputy Minister of Mines and Energy, Hon Kornelia Shilunga to stage.

Opening Speech

Hon. Kornelia Shilunga – Deputy Minister of Ministry of Mines and Energy

"Namibia is open for business"

The Hon. Deputy Minister was delighted to see the level of interest, noting clearly that "*Namibia is open for business*".

Green Hydrogen marks a new beginning and highlights the aspirations of Namibia such as job creation, capacity building, continuous advancement through research and development, and effective policy making. The Namibian government holds the responsibility of setting rules and encouraging an investor-friendly environment through measures such as decreasing tariffs and costs.

There is definitely a need for clarity surrounding investment opportunities as well as the role all Namibians have to play. This demands coordination and networking. The Namibian government is funding a study of the port expansion and has made Green Hydrogen Scholarships available through partnerships with the German government. The scholarships are being assessed And once started would have private German companies collaborate with Namibian universities.

- Additionally, discussions have started with Chinese dignitaries which will look into Chinese state-owned enterprises being able to invest and partner with Namibia's Green Hydrogen industry players.
- There is a need to have viable projects which would result in off-takers from the pilot projects being implemented.
- Countries such as Qatar and Germany have already shown an interest in being off-takers for the Green hydrogen market in Namibia.

Namibia is ready for business

GRN Committed

Opening Speech

His Excellency Mr. Herbert Beck, German Ambassador to Namibia

"It is important that Green Hydrogen is seen more than just a project of producing Green Hydrogen, that this is also about addressing inequality, hunger and unemployment".

Ambassador Beck highlighted the benefits of working together. There is a collaboration between Namibia and Germany, with a push to decarbonise our lives and Namibia has been a clear exemplar of that. This is apparent in the way it has pushed for the advancement of a hydrogen hub over the past 12 to 18 months.

The typical query surrounds "if there is a demand for Green Hydrogen"?

Given the context that currently 90 million tons are produced worldwide from non-green sources, the answer is yes. It therefore can't be emphasised strongly enough that the importance of the private sector is imperative for success.

- Green Hydrogen is an industry for long term profit.
- Long term investment needs to be in place (solar and wind generation assets that are not just quick profit related).

"*It is more than just producing Green hydrogen in Namibia, it is a project to bring people in Namibia to a different [economic] level, to address the question of inequality, to combat hunger and find jobs for people*".

Global Hydrogen Production

90

Million Tons

Key Note Speech

The Rt. Hon.
Saara Kuugongelwa-Amadhila,
Prime Minister
The Republic of Namibia

The government's ultimate goal therefore is to achieve large-scale, low-cost Renewable Energy development

The Prime Minister welcomed the opportunity to lay out the government's commitment to Green hydrogen development and supporting investments. She emphasised that the government is committed to putting in place a competitive market for Green Hydrogen production and development.

With the 2021 - 2028 Green Hydrogen market globally projected to reach USD 9.8 billion, the government understands that it will require an industry equipped with professional and vocational skills to make Green Hydrogen development possible. Make no mistake, the socio-economic impact is immense as jobs are created and in turn, a steady income for many homes is created. Namibia aims to move away from being a net energy importer, and instead create an energy surplus that meets not only local needs but also the needs of other countries.

The government's ultimate goal, therefore, is to achieve large-scale, low-cost Renewable Energy development and the designing of models for sustainably maximising fiscal revenue and local development in renewable energy investments and green hydrogen and or ammonia production.

Project Market Value 2021 – 2028

USD 9.8 Billion

Session V

HUMAN RESOURCES (HR) AND HUMAN CAPITAL DEVELOPMENT (HCD)

Jane Olwach

Green hydrogen and Namibia: Has the future arrived?

Dr. Jane Olwoch took attendees on a journey of how Human Resources and Human Capital Development impact development and industries:

Sasscal is well placed as a Regional Centre to address Climate change and Namibia was 1st country to ratify the international treaty with SASSCAL.

- Sub-Saharan Africa also has a number of research projects that are world-leading.
- Human capital development is a centre point of SASSCAL's approach.
- NUST Center of excellence – aims at building students that can create jobs
- This year, 1154 applications for Namibia were received and will be reviewed by end of the year.

There is a lack of skilled engineers in Namibia compared to other African countries "*we are the lowest*"

Session V

HUMAN RESOURCES (HR) AND HUMAN CAPITAL DEVELOPMENT (HCD)

Green hydrogen and Namibia: Has the future arrived?

Prof. Anicia Peters

The Green Hydrogen Research Institute: A look at the successful pilot projects of UNAM's desalination plant and solar projects in Henties Bay and wind turbines in Lüderitz. (Curriculum design)

Professor Peters echoed sentiments made by Dr. Olowoch noting that:
"*Green Hydrogen, Digital utilisation and other emerging technologies are still in their infancy and therefore very expensive*".

The Namibia Green Hydrogen Research Institute (NGHRI) hosts researchers and masters students as part of the Green hydrogen hub. The activities include:

- a curriculum under development for Blockchain use in collaboration with Rwanda
- a look at Green Hydrogen safe handling as well as materials capability.

Emphasis was placed on the need for pilot plants which the University of Namibia (UNAM) can develop to capacitate people and meet community needs for specialist training to train trainers and allow for up-skilling. Interestingly, three of the four pilot projects awarded at the event, have partnered with the UNAM Foundation. As a result, collaboration on hydrogen production with various institutions such as universities and businesses in Belgium are essential.

The NGHRI will host a joint research conference soon (1 - 2 December 2022) with the Namibia University of Science and Technology (NUST) which is an opportunity to hear from researchers in industry and academia. There are weekly seminars, held every Wednesday on various matters related to Green Hydrogen.

Session V

HUMAN RESOURCES (HR) AND HUMAN CAPITAL DEVELOPMENT (HCD)

Mr. Muvatera Ndjoze-Siririka

Attracting talent and knowledge to the green hydrogen industry, strengthening the development of career trajectories

Green Hydrogen has the potential of growing organically or has the potential for growth due to its wide range of applications in industry and society at large.

The Namibia Training Agency (NTA) has very few researchers and needs more to join up and strengthen its ranks. The NTA acknowledged the benefits of Green Hydrogen within the role of manufacturing thus allowing for an increased supply chain and the creation of jobs.

It is good that Namibia has declared its readiness to jump into the Green Hydrogen industry and the NTA echoes that sentiment. The NTA further echoed Dr. Peters's sentiment on the need for skills development and upskilling to meet the need of this nascent industry.

The NTA is working on introducing diploma courses and potentially partnering with others in the United Kingdom.

Panel Discussion

Panel Discussion

Moderator:
Ms. Julia Mwetudhana, GM Human Resources at Namibia Training Authority

Panelists:
1. Prof. Anicia Peters, Pro Vice-Chancellor of Research, Innovation & Development at University of Namibia
2. Mr. Muvatera Ndjoze-Siririka Acting CEO of NTA
3. Jane Olwach-Head of Sasscal
4. Mr Albius Mwiya- Director Ministry of Labour, Industrial Relation and Employment Creation

The mining sector would be an early adaptor. Whereas it would be an evolution in academia but a revolution in the larger Namibian context.

There is a need for a national skills audit as the Harvard Growth lab has investigated skills needed and current gaps. A National audit would benefit all sectors, in and outside the Green Hydrogen industry.

we need to focus on unemployed people and how upskilling can be done to grant them technical capabilities. **How do we address these challenges collaboratively?**

The University of Stellenbosch for example has a good retraining and upskilling program that the Rosh Pinah mining company is a part of. Something similar can be adopted when it comes to preparing for a Green Hydrogen industry development.

Actions needed in academia and training:

- Need to change curriculum as fast as we can.
- Need to up the training level to technician ability status in the first instance.
- Need to move curriculum to a more technical focus like how South Korea has done.
- TVET to be more responsive and agile - Needs to take an organized approach to ensure young people are ready.
- Labour laws are very flexible and are under review even as we speak and thus are ready to regulate the labour market.
- Employment impact assessment needs to be considered.

Session VI

INFRASTRUCTURE AND OTHER RESOURCES:

Mr. Paddy Padmanathan

Tomorrow's fuel: Case Studies from various Regions

- No cheaper way to generate energy from wind and solar than with hydrogen and no market pricing is attached to it
- Coal- 70-75% is related to market fluctuations but with Green Hydrogen, we can potentially lock the price
- USD 3 - 3.5 cents/kWh solar and wind can be produced.
- First at-scale plant being produced and can do it at USD 8 cents and can get to USD 2 cents by 2030
- Green hydrogen needs to come in fast to be competitive and meet the high demand
- ACWA Power - have led the reduction of solar power tariffs by 80% and are convinced hydrogen will come down similarly

Marco Alveras

"save the planet and improve the job prospects"

The Netherlands is the largest producer of Hydrogen globally, while the biggest Oil and gas companies are in Africa. Correspondingly, a large hydrogen-receiving facility is being built in Germany.

- Solution is to deliver synthetic methane.
- Build regional data systems and collaborate for iron and steel production
- Need to start from within schools to educate the young.

Session VI

INFRASTRUCTURE AND OTHER RESOURCES:

Mr. Francisco Neshila

Infrastructure requirements to meet the housing and other practical needs of Namibia's first large scale GH2 production project

Team working hard to address data issues (private sector). Luderitz, where *Hyphen* will be closest, has over the past 30 years only produced 10 000 land portions.

- Luderitz is part of the Urban Land policy being structured. There is a concept of affordability and establishing policy pillars.
- Namibia is the 2nd country in Africa to do urban land policy after Ghana.

Hope that in 2-3 years Namibia will have the best land policy.

Panel Discussion

Panel Discussion

Moderator:
Ms. Helvi Ileka, Head of Centre for Renewable Energy and Energy Efficiency at the Namibia Energy Institute

Panelists:
1. Mr. Paddy Padmanathan: NEOM Project
2. Mr. Francisco Neshila, Namibia Institute of Town and Regional Planning
3. Marco Alveras: CEO of TES H2 and author of the book The Hydrogen Revolution
4. Cllr. Phillipus Balhao -Member of the Management Committee, Luderitz Local Authority

This panel led by Ms. Ileka looked at industry and infrastructure requirements:

- 300 000 tons of Green Hydrogen translates to 6GW of energy needed between solar and wind (taking 10 square kilometres for land)
- 4-5 years planning, 7-8 thousand people employed for building and sustainable jobs of 900 - 1000.
- 100 000 tons should be towards industry capacity building and the rest through project pipelines
- There are established standards for Hydrogen cars and they are operational. Any country doing that should look at methane production as they do not need to change infrastructure or vehicles.
- Lots of learning by doing and these capabilities can be transferred. For example, there are 5 global companies working on one project
- Would rather have 4 collaborative companies as collaboration across the value chain is vital.
- Bottlenecks will be at factories and around people.
- Expect that there will be a shortage of skills - so partner up with companies and countries - local engineers need to come on board and learn.

How much will the town of Lüderitz contribute to this project?

- The town is ready but emphasized the need to address old and dilapidated infrastructure and seeks GRN help in dealing with those issues.
- Investment in vocational training centres in the town highlighted

Session VII

VALUE CHAINS – MAXIMISING LOCAL BENEFITS

Prof. Dr. Bernhard Lorentz

Tomorrow's fuel: Case Studies from various Regions

- Namibia's integration into the Green Hydrogen Market requires collaboration, investment, and innovation
- Namibia needs to ramp up supply and demand structure (*low carbon industrial hubs will help this locally, industry and geography have to work together*)
- Learning about clustering industries from Europe would be helpful in allowing this

Dr. Hina Muashekele

Green Hydrogen Value Chain including focus on export and domestic use of by-products

Disruptive technology may create a complete new industry

To meet this challenge, a Green Hydrogen Program document that is focused on approved pilot projects with appropriate timelines is needed.

He noted that Human Resource requirements should be identified to make reskilling and upskilling possible

Session VII

VALUE CHAINS - MAXIMISING LOCAL BENEFITS

Mr. Roy Campe

Will hydrogen trucks power the supply chains of the future?

Cleanergy is a partnership with Namibian company Olthaver &List. the focus is Walvis Bay as the best hotspot.
The project aims to open end of 2023 with re-fuelling hydrogen trucks that take 10-14 minutes and can drive up to 1000km - 30% emission savings, and 500km-60% fuel savings.

15 million litres are imported every month from Namport so there is an enormous amount of savings possible.

Mr. Thomas Wu

Representing DSE, their first fully localized plant in partnership with other African countries would be in Namibia. Localizing Green Hydrogen Production could look like:

- Large-scale PV Field in Namibia
- Electrolysis plant in Botswana
- Desalination plant in South Africa

Production of PV panels could happen in Namibia with the potential to replace steam through hydrogen at Van Eck and therefore making the grid power in Namibia green.
Possible to make GH at less than 2 dollars a kilogram from 2025

Panel Discussion

Panel Discussion

Moderator:
Ms. Margaret Mutschler, Namibia Green Hydrogen Association (NamGHA)

Panelists:
1. Dr. Hina Muashekele (retired) University of Namibia" Science, Technology & Innovation Division
2. Mr. Roy Campe, Chief Technology Officer at O&L - CMB Tech
3. Thomas Wu- DSE
4. Mr. Peter Amadhila - Vice President of NALOBA

Aptly led by Ms. Mutschler, the panelists grasped the issues and suggested various mitigation points.
Any main project should encapsulate Namibian and investor interests through inclusion based on;

- Bottom-up type approach like today's conference and should be allowed to raise concerns and solutions.
- Investor companies should have to prove 40% local content to then go on and build-latest technology projects.
- Locally owned companies need to take part and benefit.
- Challenge businesses to get themselves ready and present during the next Green Hydrogen conference.
- Advice to any local Namibian business is to pay attention to this specialised project. Individuals should come forward and receive upskilling.

Session VIII

FDI, FINANCE AND PUBLIC-PRIVATE COLLABORATION

Mr. Francois van Schalkwyk

Potential for Investment Opportunities in the new GH2 Sector

- Smaller scale pilot projects are where it is likely that we will see innovation from Namibian companies.
- Opportunities in Green Hydrogen are more like an Ecosystem, built up through Green mining, Green mobility, and Green Hydrogen Consumables (such as ammonia and construction)

Ms. Claire Hobbs

Financing and Funding instruments to boost hydrogen economy - SDG Namibia One Vision

The level of Capitalization needed is large. No one Namibian bank can fund everything but together banks can pull together to make it possible.
Bank Windhoek created the Green bond in 2021 as the first of its kind followed by FNB and Standard bank in 2022.

Mr. Benedict Libanda

Financing and Funding instruments to boost hydrogen economy - SDG Namibia One Vision

Namibia needs fiscal space to grow as a country but remains constrained as a developing country and therefore needs innovative approaches.

- SDG Namibia One Fund aims to raise about 1 billion USD for Green Hydrogen projects.
- Various international, regional, and national players would be involved in the different development stages.
- Need to develop tactical measures to de-risk the many risks in this new industry such as through private funds, grants, and more.


Date: 16-17 August 2022
Location: Windhoek Country Club Resc
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Panel Discussion

Panel Discussion

Moderator:
Mr. Jesaya Hano-Oshike, Vice-Chairperson at Economic Association of Namibia

Panelists:
1. Mr. Francois van Schalkwyk, Executive Director Investments at NIPDB
2. Ms. Claire Hobbs, Chief Treasurer at Bank Windhoek
3. Mr. Benedict Libanda - Chief Executive Officer, Environment Investment Fund
4. Leake Hangala- Namibian Chamber of Commerce and Industry (NCCI) EXCO Member

Foreign Direct Investment (FDI) of USD 6 billion through Green Hydrogen industries is needed, where will FDI come from?

- Can be derived from Institutional investors through the domestic market but they will be a bit more conservative than international markets when it comes to financing.
- There will be appetite but will have to look at risks closely
- Various banks are looking at SMEs and not only availing capital but also advice in terms of creating a robust business plan
- SDG Fund 1 will be launched during COP 27, Quarter 3 of 2023 hope to have 1 Billion USD
- FDI's have deployed capital at early-stage development.
- Banks could potentially and collectively unlock about 7-10 billion Namibian dollars for the Green Hydrogen industry
- Desire expressed to participate in all sectors of Namibia's economy not just including Green Hydrogen.

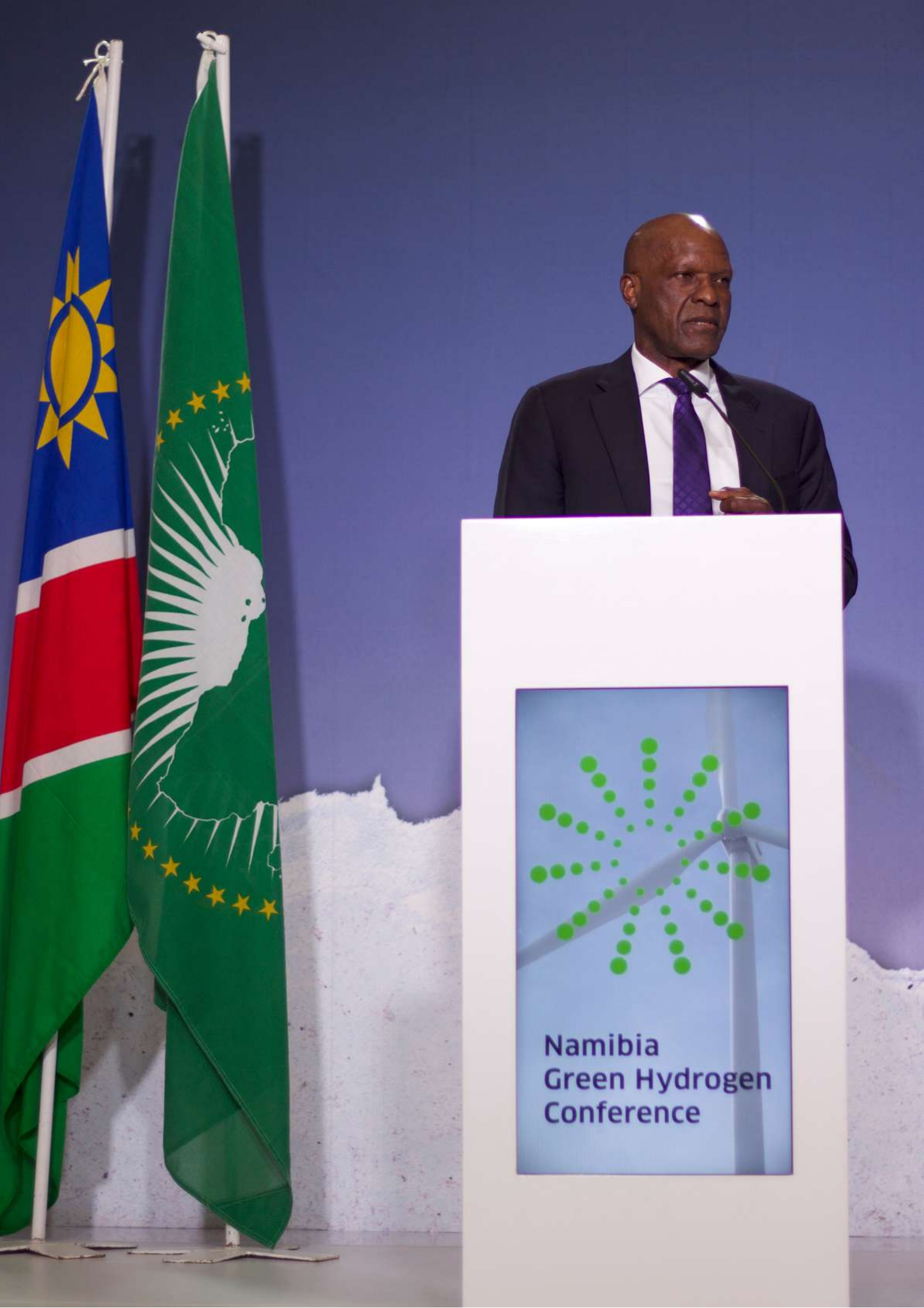
Summary of Event

Cons Karamata
Chief Executive Officer
Economic Association of Namibia

Mr. Karamata did an apt summary of the past two days, in advance of the closing, noting that the Prime Minister had emphasised the steps already taken by the government to lay the groundwork for Green Hydrogen.

Key Points introduced or highlighted:

- Namibians are encouraged to get involved at all levels.
- Practical steps are now needed on the ground and a framework to be available to allow for Green Hydrogen to have broad-based results in the Namibian economy as discussed.
- Human Capital Development was emphasised with the massive need for people to be involved. The upskilling of the youth to make Green Hydrogen possible in Namibia was essential.
- Infrastructural elements were highlighted focusing particularly on the need for serviceable land.
- Value chains session emphasised the possibility to produce solar panels and other much-needed components
- The financing session allowed us to hear about work done and needed to attract FDI and that the local banks are clearly on board.


Namibia
Green Hydrogen
Conference

Closing Remarks

Hon. Tom Alweendo,
Minister of Mines and Energy

"investors should know they have a true partner and investments will be granted the desired return".

The Minister did not mince words, noting that the Government will give investors everything they need to allow the development to happen. One key and rational requirement are that the investment is mutually beneficial.

Investors were asked to take the question of local content seriously. Value chain capturing through local content will allow it to be resilient and sustainable.

- Possible to make changes quickly with the right attitude and people in place.
- Ambition in Namibia is to become a global or continental hub.
- About to conclude collaboration with EU - allows us to become a GH hub.
- Want to convey thanks for the recent donation from Germany.
- Need to find ways to mitigate risk for financial institutions.
- Emphasized collaboration and not competition.

Thus it is no secret that fossil fuels will be phased but it needs to be a ***Just Transition*** and Namibia is in a better position to meet its energy needs and cannot move at the same pace as other countries.

Inclusion of Local Content

Just Energy Transition


mibia
en Hydrogen
ference
Federal Ministry of Education and Research
SASSCAL
GreenHydrogen
No. 0001
PAY
Namibia Pilot [illegible] Projects
DATE
16 August 2022
TO THE ORDER OF
Thirty Million Euro
€ 30,000,000.00
FOR AND ON BEHALF OF:
BMBF and Namibian Government
REF
HPPII : PTX
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Namibia Pilot PtX Projects
Thirty Million Euro
€ 30,000,000.00
NPPIE : PTX

1.5 GW

Daures Project

Euro 15,1 million

Project Partners:
NGHRI, University of Stutgard, Enapter, Windwise, Enersense Nam

The project will realize the production of green hydrogen & ammonia and utilization of its derivatives.

1. Sustainable production of green hydrogen based on renewable energies,
2. Establish of green scheme program for ammonia nitrate crops
3. Storage and transport of green hydrogen, ammonia and related derivates,
4. Integrated application technologies for utilization of green hydrogen in agriculture, ammonia nitrate and cleaning detergents
5. Fuel Cell operated Centre pivots, boreholes and houses

5 MW

NamPort Applications

Euro 5.66 million

Project Partners:
Cleanergy Solutions Namibia, CMB Germany GmbH & Co. KG, Namport, UNAM

The strategic targets of this project,

- To convert an existing tugboat to operate on hydrogen dual fuel technology
- To convert existing port equipment to operate on hydrogen dual fuel technology
- To develop green hydrogen bunkering and refuelling infrastructure at the port
• To develop safety and operation procedures for use of hydrogen at ports
• To elevate the Germany-Namibia partnership, covering the whole value chain for green hydrogen and to promote the technological solutions proposed

5 MW

Cleanergy Project

Euro 25 million

Project Partners:
CMB.TECH, Ohlthaver & List Group (JV = Cleanergy Solutions Namibia)

The plant consists of a 5 MW photovoltaic solar system, a 5 MW electrolyser and a H2-refuelling station. The purpose of the plant is to test technologies, to develop offtake applications within the transport sector, mining sector and port activities and to facilitate technology transfer and skills development into Namibia.

Building upon the lessons learned with the pilot plant, a second phase with a bigger commercial plant including ammonia production is planned.

50
locomotive fleet

TransNamib Project

Euro 7.63 million

Project Partners:
CMB.TECH, UNAM, Hyphen Technical, TransNamib, NGHRI, Nicholas Holding

The following major components to be developed, implemented during the course of the project to achieve the project goal:

1. 1x Locomotive converted for the use of H2 as fuel, through repowering of the locomotive with a new rail engine that is H2-ready.
2. 2x H2 Valve Bank close to each locomotive engine with control valves, actuators, gauges, sensors, relief values and cut off valves
3. 1x H2 fuel tender car, a modified flat-bed container wagon for transporting the 40ft, half height H2 fuel skids.
4. 2x 40ft half-heighttube skids, with8x Type 1 steel cylinder searchable to storeH2 as compressed gas at>200 bar.

Green Hydrogen Conference Preparatory Team

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Lorran	Akwaake	Organising Team
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Green Hydrogen Conference Preparatory Team

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Bornface	Mabakeng	Volunteers
Simasiku	Sibeya	Volunteers
Angela	Twalingatji	Volunteers

"The earth is not ours.
It is a treasure we hold in trust for the future generations"

A Namibian Proverb

Acknowledgements

The event organisers, the Economic Association Namibia (EAN), the Namibia Investment Promotion Development Board (NIPDB), and Hanns Seidel Foundation (HSF), would like to express our sincere gratitude to all the stakeholders who made the first Namibian Green Hydrogen Conference possible. We recognise the invaluable contribution of the Namibian Government officials, diplomatic guests, the speakers, and moderators. We extend a special note of gratitude to all the virtual participants whose attendance added to the wealth of the conference.

The exceptionally successful event was the culmination of all stakeholder's and participants' dedication to excellence.

A special thanks to the Green Hydrogen Council, the Green Hydrogen Commissioner, and the technical experts who provided invaluable insights into the concept and coordination of the Conference.

We would also like to extend our sincere gratitude to the Ministries and their respective Honourable Ministers and Deputies present and represented at the Conference. Namely;

- The Right Honourable Saara- Prime Minister
- Honourable Tom Alweendo -Minister of Mines and Energy
- Honourable Kornelia Shilunga -Deputy Minister of the Ministry of Mines and Energy

economic association of namibia ean

NIPDB Namibia Investment Promotion & Development Board Office of the President

Hanns Seidel Foundation