



**NGHRI**

Namibia Green Hydrogen Research Institute

<https://www.nghri.com/>



# Maximising GH<sub>2</sub> benefits for the local market

**Dr. Zivayi Chiguvare (Chairperson)**

Namibia Private Sector

GH<sub>2</sub>

Task Force

Namibia Green Hydrogen Conference 2022

... large industrial groups, SMEs, start-ups, laboratories and R&D centers, clusters and territorial authorities, etc.

- Hydrogen can be produced from diverse, domestic resources
- Electricity—from the grid or from renewable sources such as biomass, geothermal, solar, or wind—can be used to produce hydrogen.
- Electrolysis separates the H<sub>2</sub>O molecule into oxygen and hydrogen
- Hydrogen is an energy carrier, not an energy source, and can deliver or store a large amount of energy
- Hydrogen is a clean fuel that, when consumed in a fuel cell, produces only water, electricity, and heat



**broad range of applications** —transportation, commercial, industrial, residential, and portable (distributed or combined-heat-and-power; backup power; systems for storing and enabling renewable energy; portable power; auxiliary power for trucks, aircraft, rail, and ships; specialty vehicles such as forklifts; and passenger and freight vehicles including cars, trucks, and buses)



... drive Namibia's private sector involvement in, and beneficitation from, the Green Hydrogen industry

- Hydrogen can be produced from diverse, domestic resources

| ... .. HYDROGEN        | PRODUCTION METHOD   |
|------------------------|---|
| Green                  | Generated using electrolysis powered by renewable electricity                     |
| Blue                   | Production is based on fossil fuels but with CO <sub>2</sub> emissions captured   |
| Gray                   | Made using fossil gas with no emissions captured                                  |
| Black                  | Made using coal   |
| Brown                  | Made using lignite  |
| Turquoise              | Heat is used to split fossil gas in a process known as "pyrolysis"                |
| Purple, pink or yellow | Electricity and heat from nuclear reactors could both be used to produce hydrogen |

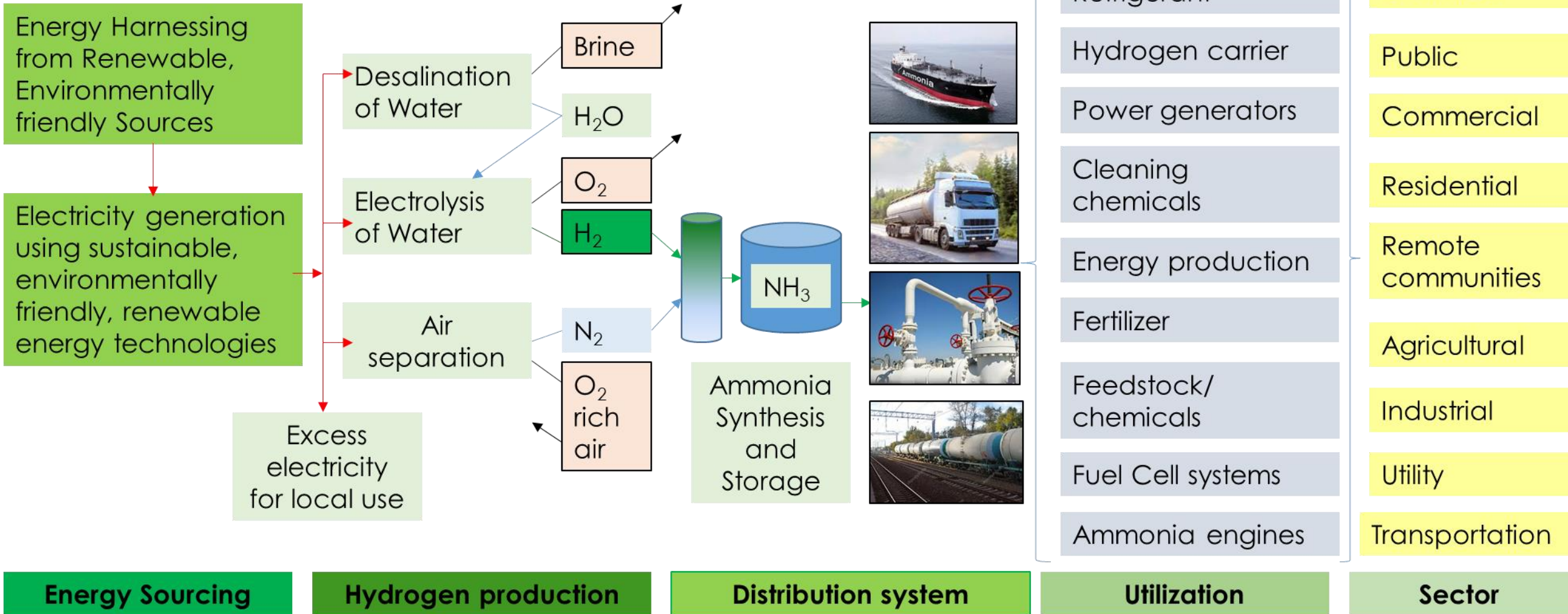
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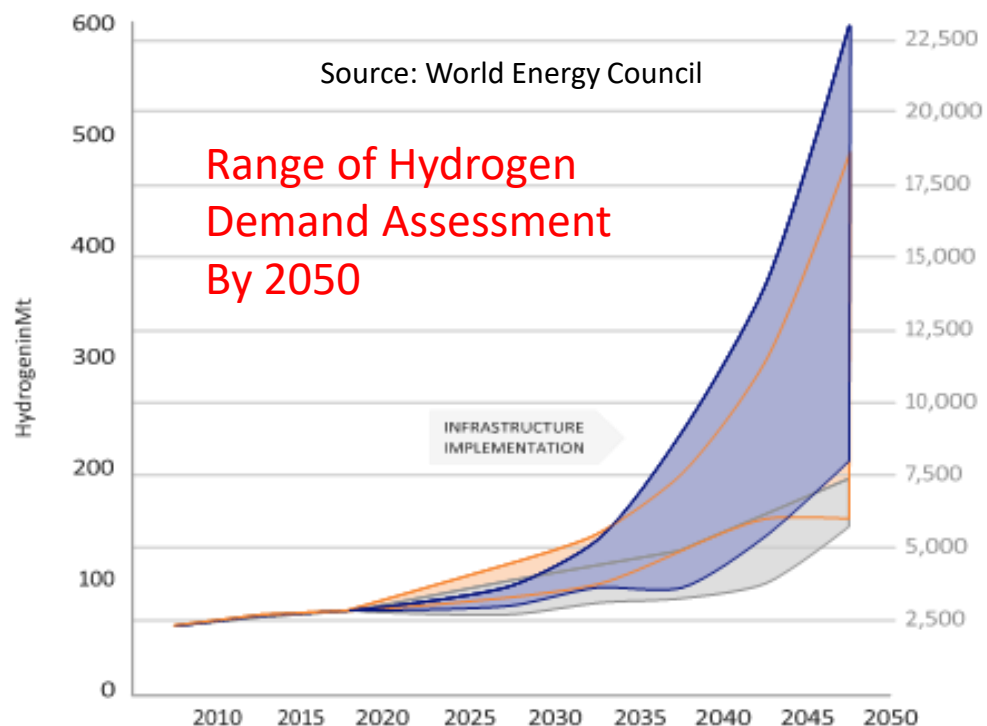
**... drive Namibia's private sector involvement in, and beneficitation from, the Green Hydrogen industry**

# Green Hydrogen energy system

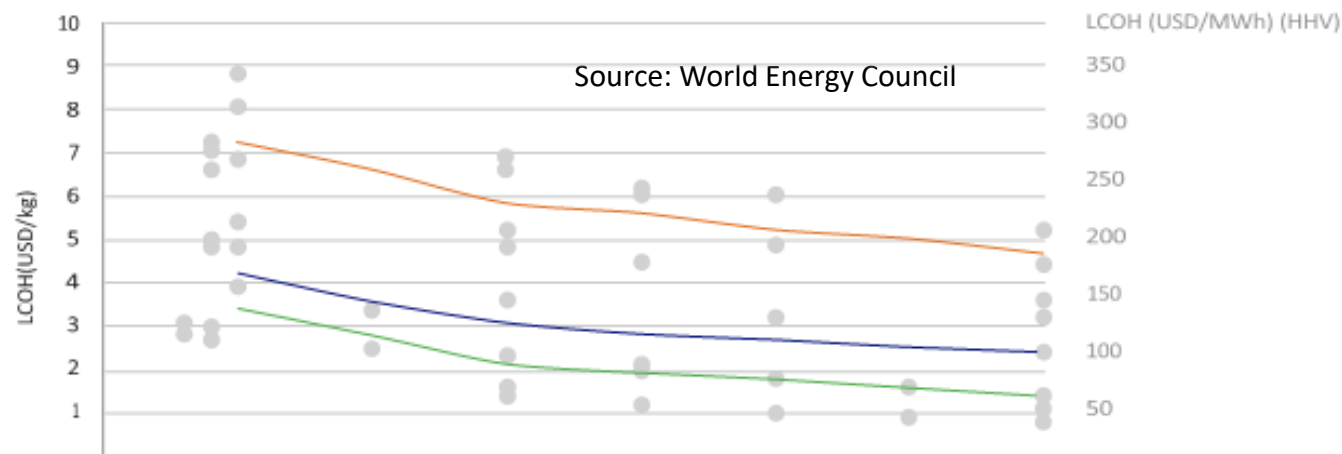


**Local opportunities? Raw material sourcing... Production ... Storage ... Transport ... Utilization (must be economically, and environmentally, viable and safe)**

- Hydrogen demand is expected to increase rapidly



- Hydrogen costs are expected to drop commensurately



Renewable Hydrogen Cost Dynamics By 2050

● < 1.8°C

Acil Allen Report - High  
BP Energy Outlook 2020 - Net Zero  
IEA Energy Technology Perspectives 2020 - SDS  
Shell - Sky Scenario  
Powerfuels in a Renewables World  
Hydrogen Economy Outlook - Strong Policy

● 1.8 - 2.3°C

Acil Allen Report - Medium  
BP Energy Outlook 2020 - Rapid  
Hydrogen Council - 2DS  
World Energy Council - Unfinished Symphony

● > 2.3°C

Acil Allen Report - Low  
World Energy Council - Modern Jazz  
Hydrogen Economy Outlook - Weak Policy

- Hydrogen as large scale energy storage can enable higher penetration of intermittent renewables

[chrome-extension://efaidnbmninnbpcajpcgclefindmkaj/https://www.worldenergy.org/assets/downloads/Working\\_Paper\\_-\\_Hydrogen\\_Demand\\_And\\_Cost\\_Dynamics\\_-\\_September\\_2021.pdf](https://www.worldenergy.org/assets/downloads/Working_Paper_-_Hydrogen_Demand_And_Cost_Dynamics_-_September_2021.pdf)

## Executive Committee Namibia Private Sector Green Hydrogen Task Force

### GH<sub>2</sub> Value Chain Opportunities

- Namibia Petroleum Operators Association
- Chamber of Mines of Namibia
- Federation of Namibian Tourism Associations
- Namibia Logistics Association
- Impact Tank
- NCCI

### Namibian Business Promotion

- StartUp Namibia
- Namibia Association for Metal Fabrication
- Namibia Travel & Tourism Forum
- Launch Namibia
- Glowdom
- Namibia Institute of Manufacturing and Commerce
- NCCI
- NamGHA

### Regulatory Framework Review

- HDF Energy
- Women in Mining Association of Namibia
- Fuel and Franchise Association
- NamGHA

### Stakeholder Engagement

- National Agricultural Business Association of Namibia
- Hospitality Association of Namibia
- Black Business Leaders Association
- Institute of Chartered Accountants of Namibia
- NCCI
- NamGHA

### Research & Development

- Namibian Society of Engineers
- United Entrepreneurs Association of Namibia
- Namibia Chamber of Commerce and Industry (NCCI)
- Namibia Green Hydrogen Association (GHA)

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## Namibia Green Hydrogen Research Institute (NGHRI)

Centre for  
clean  
Hydrogen  
Production

Centre for  
Hydrogen  
Storage,  
New  
Materials,  
and Delivery

Centre for  
Hydrogen  
Fuel Cell  
Technology,  
and Mobility  
Applications

Centre for  
Hydrogen  
Energy Use,  
Economics,  
Law,  
Environment  
and Society

Centre for  
Hydrogen  
Capacity  
Building,  
Competence,  
and  
Standards

Centre for  
Hydrogen  
Digital and  
Emerging  
Technologies

Formulation of enabling policies, end use and environmental sustainability options for  
widespread hydrogen energy usage

Collaboration with government and private sector partners, International academic and research institutes,  
identified as key for success

Namibia has a part to play in the world, for production and distribution of Green Hydrogen

# Some identified projects

|    |   |
|----|---|
| 1  | GREEN HYDROGEN PRODUCTION TECHNOLOGIES AND THE HYDROGEN VALUE CHAIN                 |
| 2  | SEAWATER DESALINATION   |
| 3  | SOLAR AND WIND POWER (for desalination of sea water)                                |
| 4  | ELECTROCHEMICAL WATER SPLITTING FOR HYDROGEN GENERATION (WATER ELECTROLYSIS)        |
| 5  | CATALYSIS: ROUTE TOWARDS GREEN HYDROGEN   |
| 6  | DEVELOPMENT OF HYDROGEN FUEL CELLS  |
| 7  | COMBINING HYDROGEN STORAGE, AMMONIA AND LIQUID HYDROGEN ORGANIC CARRIER             |
| 8  | NEW MATERIALS DEVELOPMENT   |
| 9  | PHOTOVOLTAIC AND WIND ELECTRICITY GENERATION AND STORAGE IN HYDROGEN                |
| 10 | WATER RESOURCE MANAGEMENT   |
| 11 | REGULATORY FRAMEWORK, POLICY FORMULATION AND ETHICS                                 |
| 12 | STRATEGIC ENVIRONMENTAL ASSESSMENT, AND ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENTS |
| 13 | SKILLING, RESKILLING AND UPSKILLING THE WORKFORCE FOR A GREEN HYDROGEN FUTURE       |
| 14 | EMERGING TECHNOLOGIES AND DIGITAL SOLUTIONS   |

**Namibia has a part to play in the world, for production and distribution of Green Hydrogen**



- NGHRI has partnered with multiple international universities, research institutes and companies for collaboration on Green Hydrogen.
- Partnerships are operationalized through R&D collaborations, placement of students, academic programme development and offerings, and pilot projects.
- Since January 2022, the Institute has hosted a number of international researchers including academics and postgraduate students pursuing diverse research projects.
- Academic programmes and courses are undergoing development and revision
- We will ensure that identified research projects and pilot projects on green hydrogen production and usage are properly implemented.
- We will also ensure that opportunities for participation are extended to the larger Namibian population.

Namibia Private Sector

$\text{GH}_2$   
Task Force



**THANK YOU**