



Green Hydrogen in Namibia: Tackling the Difficult Questions

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A Personal Note

- Independent Freelance Economist (not beholden to particular government or commercial interests!)
- Following Namibian Economic Developments for over 30 years (founder of IPPR, IPPR QER and forthcoming book Guide to the Namibian Economy!)
- Doing What Analysts Do: Asking the Difficult Questions (and maybe helping to answer them too!)

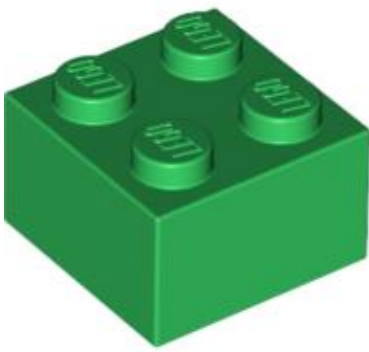
Putting My Cards on the Table



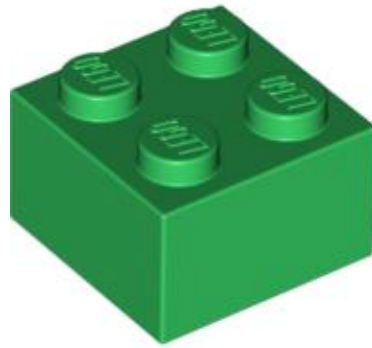
- Belief that man-made climate change is happening and world needs to act to reduce GHGs
- Highly supportive of what Namibian Government is trying to achieve
- Never seen Government act in such a visionary, coordinated and effective manner
- But enthusiasm should not stop one asking the difficult questions or blind one to challenges

Six Challenging Questions

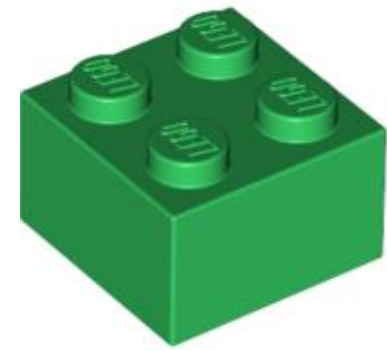
Question 1: Can Namibia Produce and Export Green Hydrogen at the Right Price?



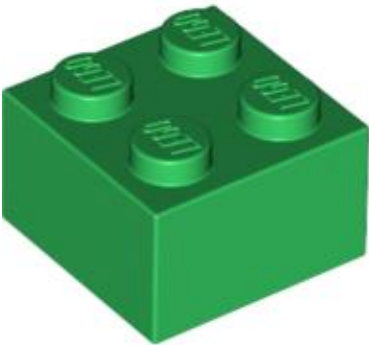
Water Desalination –
tried and tested
technology and
Namibia has
experience



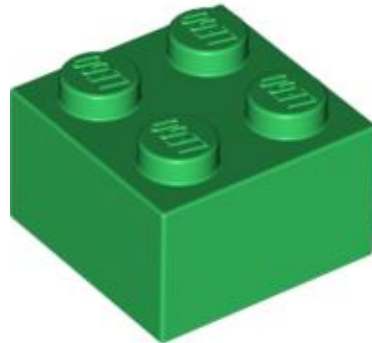
Electrolyser – needs to scale
up (150MW alkaline +200MW
solar array Baofeng Energy)



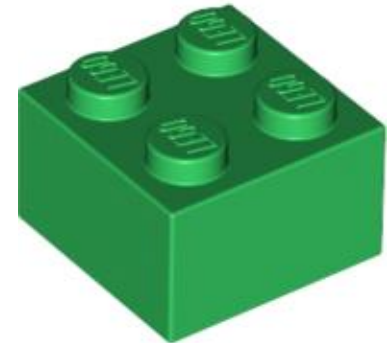
**Renewable Energy (Solar PV or
Onshore or Offshore Wind)** -
huge scale but Namibia has
advantage



Liquefaction (minus 253°C)
or conversion to Ammonia
NH₃ via Haber-Bosch?

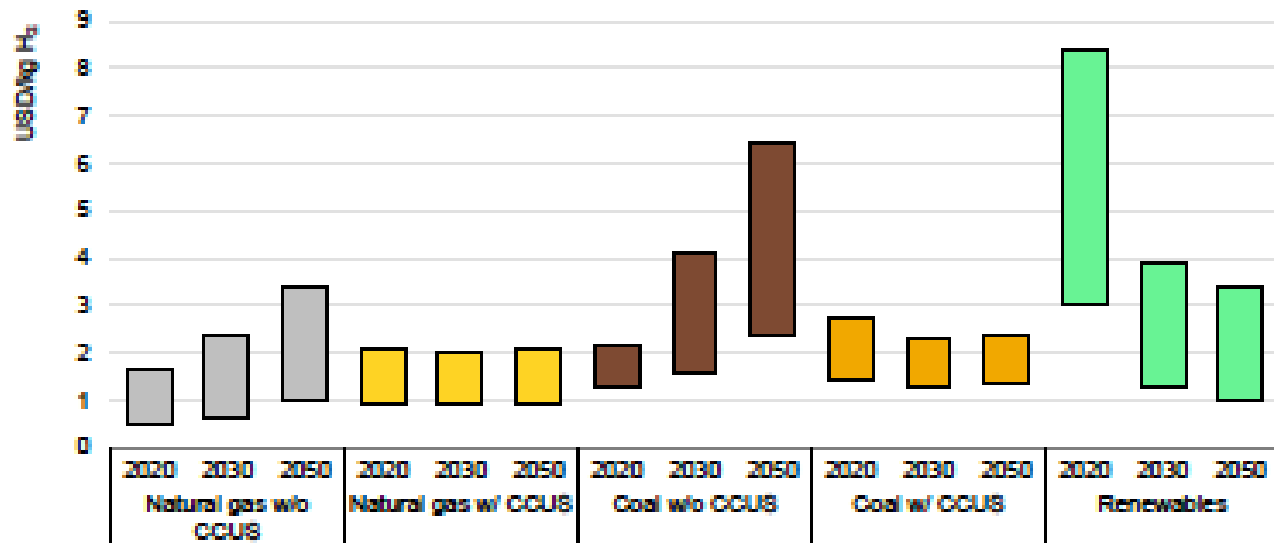


Storage – how will
hydrogen be stored?



Transport – will hydrogen or
ammonia be transported and
how? Suiso Frontier

Levelised cost of hydrogen production by technology in 2020, and in the Net zero Emissions Scenario, 2030 and 2050



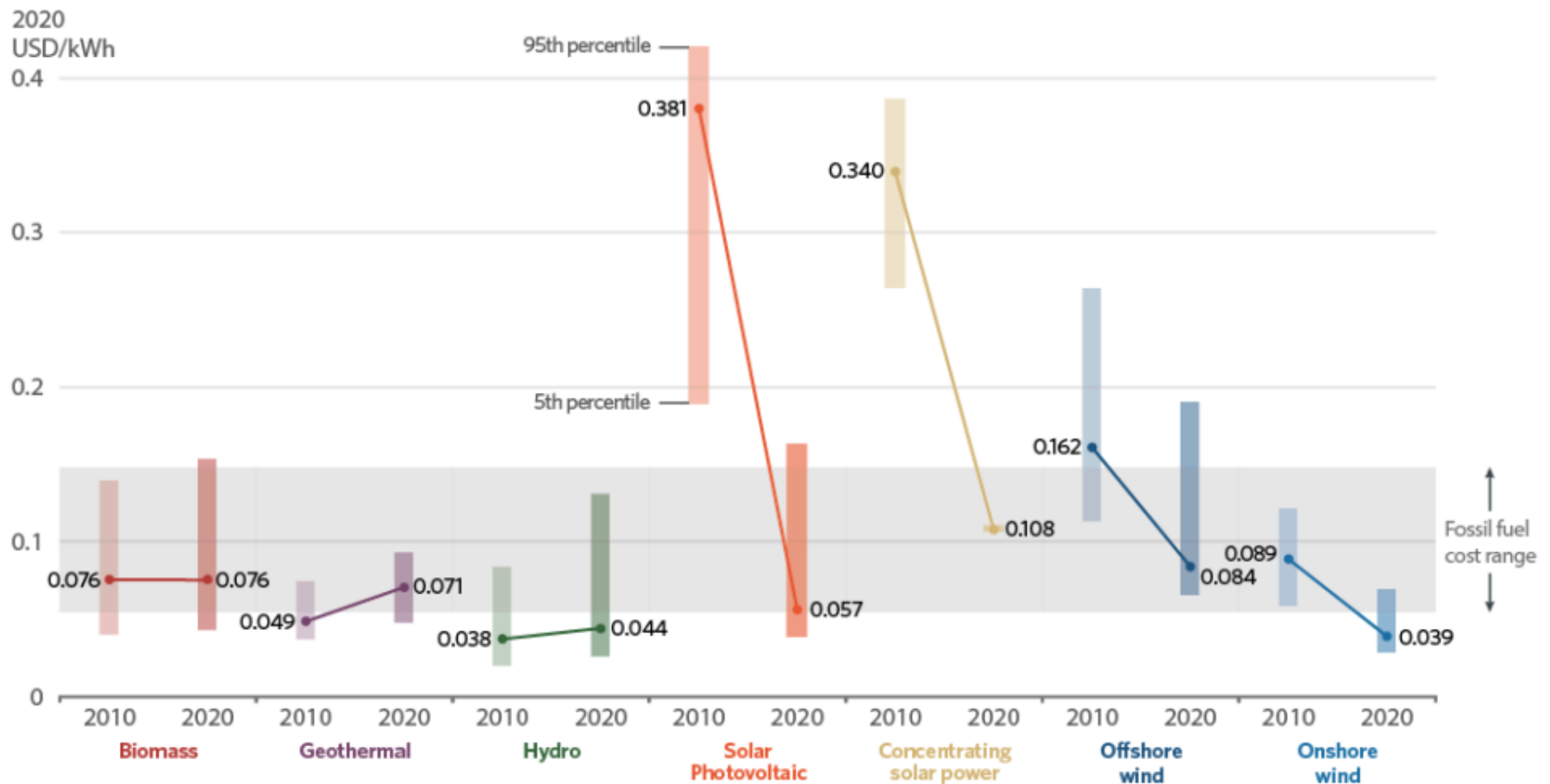
IEA. All rights reserved.

Notes: CCUS = carbon capture, utilisation and storage. Ranges of production cost estimates reflect regional variations in costs and renewable resource conditions.

Sources: Based on data from the Hydrogen Council; [IRENA \(2020\)](#); [IEA GHG \(2014\)](#); [IEA GHG \(2017\)](#); [E4Tech \(2015\)](#); [Kawasaki Heavy Industries](#); [Element Energy \(2018\)](#).

US 1:1:1
Moonshot
of USD1 per
1kg within 1
decade

Figure 13: Global LCOEs from newly commissioned, utility-scale renewable power generation technologies (2010-2020)



Source: Climate Policy Initiative

Question 2: Is there an important first mover advantage or might it be better to take our time?

First Mover Advantage or Disadvantage?

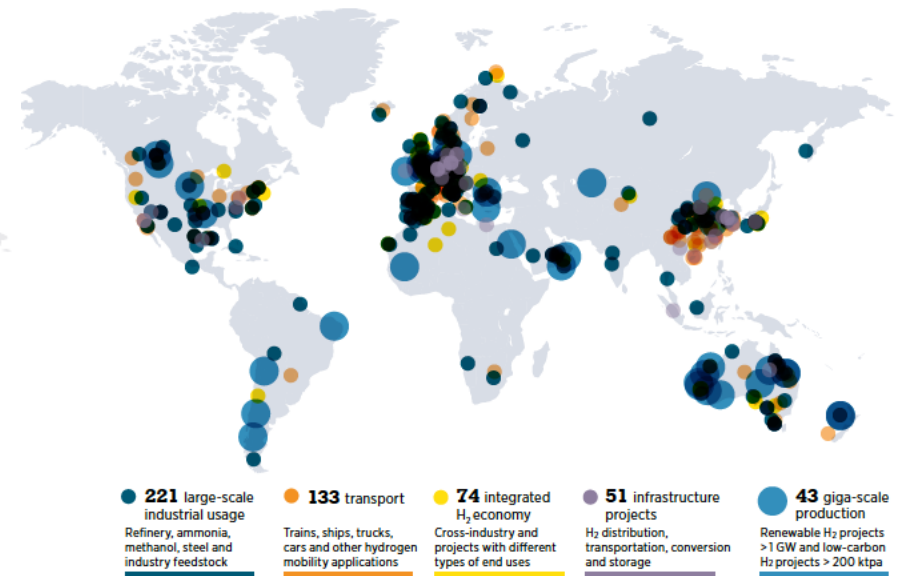
- In most markets first mover takes risks but enjoys higher prices and profits as a result
- But in this case we are trying to produce a new product at as low a cost as possible
- USD4.4 billion investment in 2GW of renewable energy and production by 2026 (2024?)
- USD9.4 billion investment in 5GW of renewable energy and 3GW of electrolyser capacity by late 2020s producing 300,000 tonnes of GH_2
- But so much still unknown (technology, markets, costs)! Net Zero by 2050 is important for the world but so is getting it right for Namibia (rather than getting it wrong)

Figure 3.1 Hydrogen strategies and those in preparation, October 2021



Source: Bloomberg (2021b) and WEC (2021). Map source: Natural Earth, 2021
 Disclaimer: This map is provided for illustration purposes only. Boundaries and names shown on this map do not imply any endorsement or acceptance by IRENA.

Figure 3.3 Clean hydrogen projects and investment as of November 2021



Source: Hydrogen Council (2021). Map source: Natural Earth, 2021
 Note: The figure describes large-scale projects only, including commissioning after 2030. It does not include more than 1000 small-scale projects and project proposals. GW = gigawatt; H₂ = hydrogen; ktpa = kilotonnes per annum.
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Question 3: Can Namibia Attract the Investment Required to Realise Its Green Hydrogen Potential?

Funding...What's That Word That Begins With R?

- Only at initial stages (no BFS for two years)
- Involves creation of supply and demand
- Likely to involve large sums (USD9.4 billion = GDP)
- “Entirely financed by Hyphen” but likely to involve IFIs and long-term finance
- So big that Namibian State will need to be involved (24%?)
- Namibia highly indebted with deteriorating credit rating
- How profitable is it likely to be?
- Who bears the risk?

Government Role in Reducing (Not Increasing) Risk

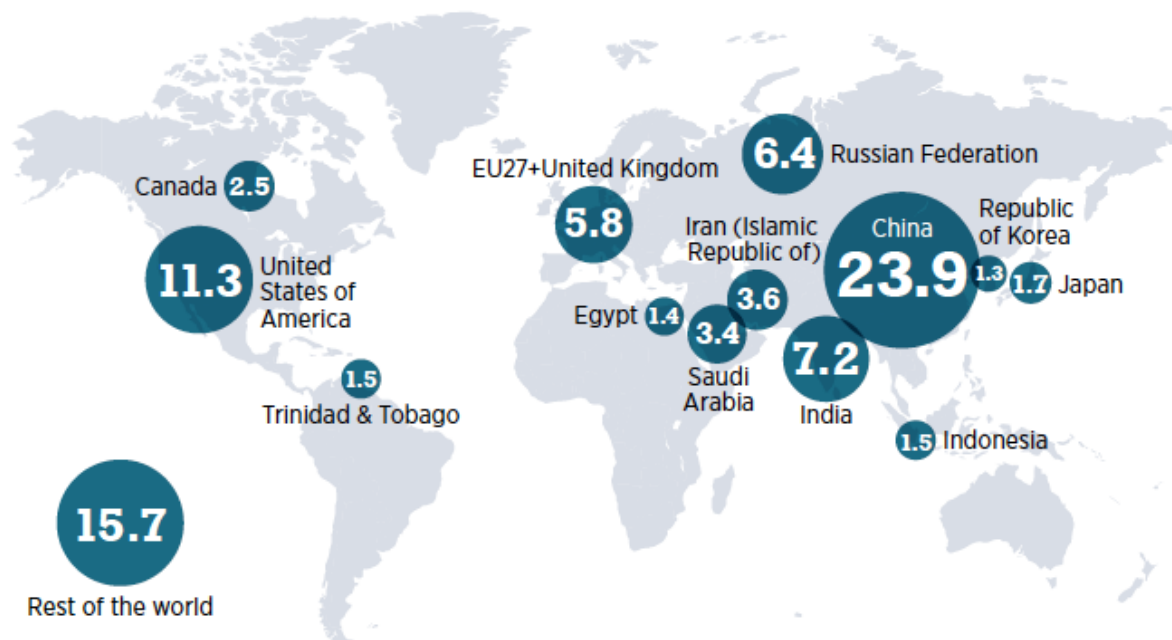
- Taxation and Regulation
- Namibian Investment Promotion Act 2016
- Namibian Equitable Economic Empowerment Bill (latest draft?)
- No one is going to invest USD9.4 billion unless long-term investment environment is clear and credible
- Namibia must have reputation as reliable supplier
- It will be important to be able to bring in skills whilst Namibia is developing its skilled personnel
- This will help oil and gas sector and rest of the economy too!

Mining Sector Example

Diamond Mining	Other Mining
No change since Diamond Act 1999	Change from formula to single rate
	Royalty taxes on gross sales
	Windfall royalty
	Proposals on CPT, VAT and Exports
	Withholding tax on services
	Export levy
	"Additional Conditions"
	Tax deductibility of royalty taxes
	Dimension stone
	EPZ incentives

Question 4: Can Namibia Deliver Green Hydrogen to the Markets that Demand It?

Figure 2.1 Hydrogen consumption in 2020 (million tonnes per year)



Map source: Natural Earth, 2021

Note: Values are derived from current production of ammonia, methanol, refining and direct reduced iron for steel.

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Transport by specialised ships, by pipelines or as green ammonia or some combination of all three?

If storage and transport costs are high enough it may make more sense to move the industries rather than the green hydrogen and relocate certain industrial clusters to Namibia or use Namibia as a green hydrogen refuelling station

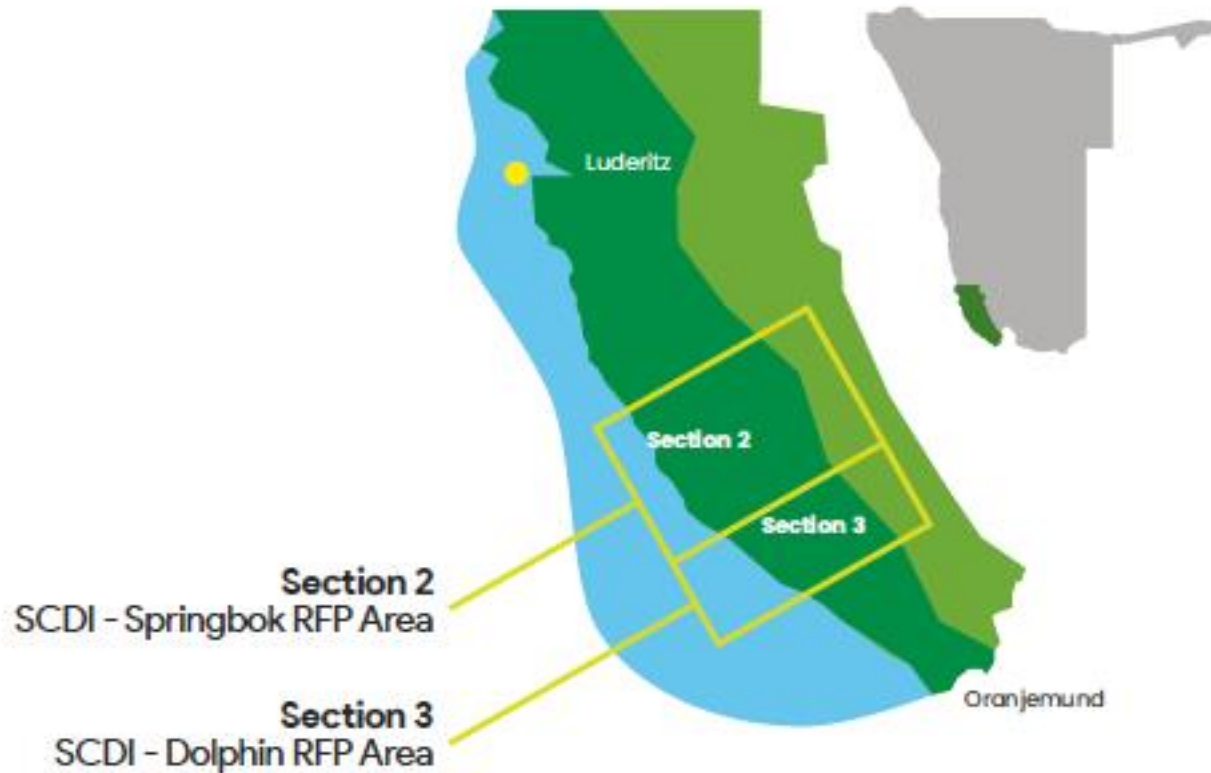
Question 5: Are There Industries Which It Would
Make More Sense to Relocate to Namibia?

Should Muhammed Go to the Mountain?

- Aluminium smelters near dams
- Green steel
- Fertilizer
- Synthetic fuels

Question 6: Can Namibia Produce Green Hydrogen
in a Way that Does Not Damage the Environment?

Tsau /Khaeb National Park (Sperrgebiet)



Above: Post- Market sounding SCDI Layout

Sperrgebiet fragile and ecologically highly sensitive area

Minimising environmental impact will play a key role in shaping Namibia's Green Hydrogen brand

How will minimising environmental damage add to costs?

What happens if things go wrong?

Who is responsible for site rehabilitation?

Six Questions Summary:

1. Cost Competitiveness
2. First Mover Advantage
3. Investment and Investment Environment
4. Storage and Transport
5. Industrial Relocation
6. Environmental Impact

Further Information:

Accelerate the free energy transition newsletter from Upstream and Recharge:
<https://www.rechargenews.com/energy-transition/accelerate-hydrogen-e-weekly-launched-on-sector-set-to-rewrite-global-energy-map/2-1-1033328>

IRENA (2022), Geopolitics of the Energy Transformation: The Hydrogen Factor. International Renewable Energy Agency, Abu Dhabi

Energy Transitions Council (April 2021), Making the Hydrogen Economy Possible: Accelerating Clean Hydrogen in an Electrified Economy.

International Energy Agency (2021), Global Hydrogen Review.

Hydrogen Council (20 January 2020), Path to Hydrogen Competitiveness: A Cost Perspective

ESMAP. (2020). Green Hydrogen in Developing Countries, Washington DC: World Bank.

Detlof von Oetzen, Issues, Challenges and Opportunities to Develop Green Hydrogen in Namibia, www.voconsulting.net

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