A regulatory green hydrogen framework for Namibia

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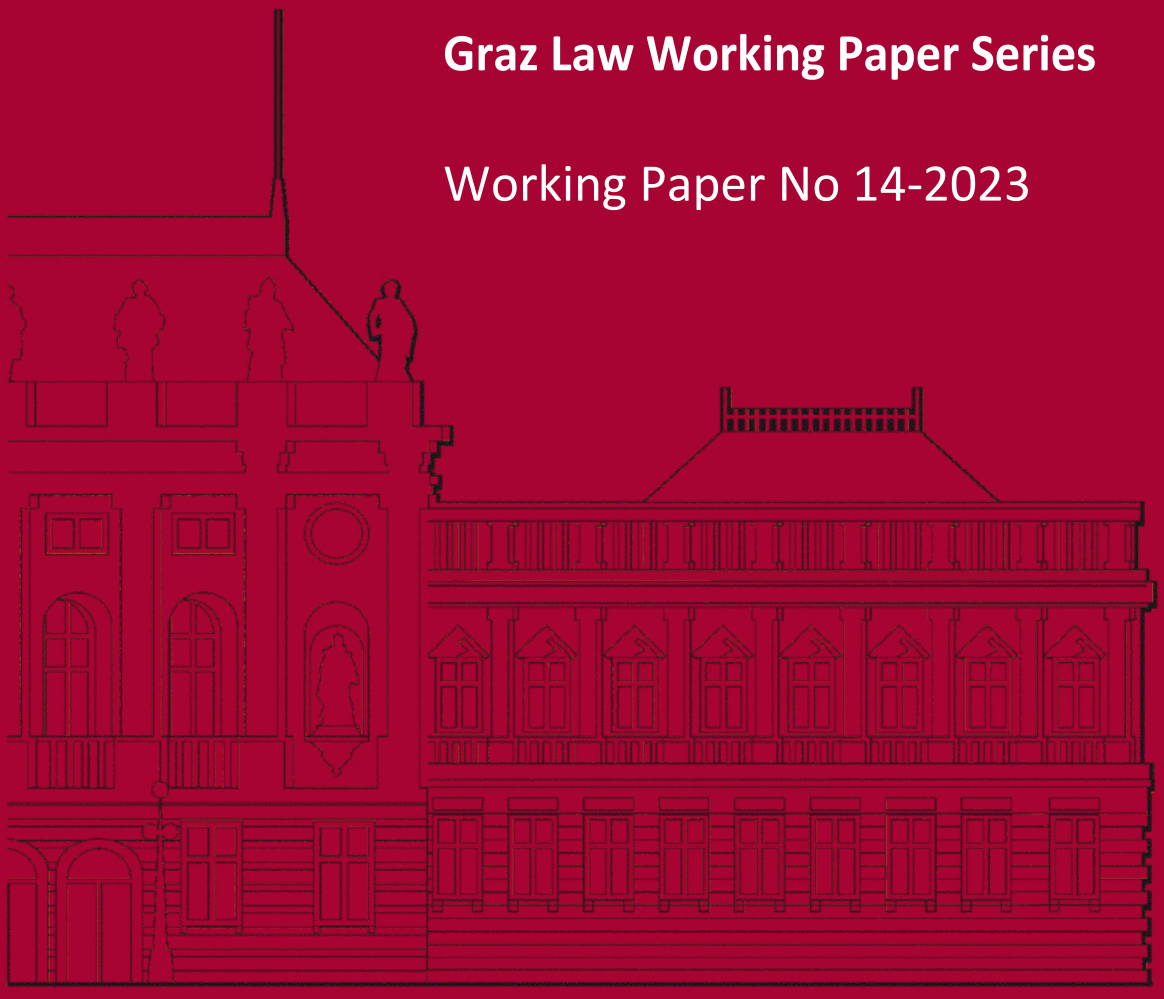

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Abstract

Green hydrogen has been identified as a modern source of energy that can significantly improve the socio-economic development of the African continent towards improved energy security. Green hydrogen production is expected to foster economic growth, contribute to more environmental sustainability and the reduction of the use of carbon. However, in order to achieve this, an effective regulatory framework plays a key role in governing and monitoring green hydrogen production, transportation, trade and investment. Given this, the overarching aim of this paper is to critically and comparatively analyse Namibia's current renewable energy regulatory framework in support of green hydrogen and as a new and sustainable source of renewable energy in Namibia.

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Keywords: Namibia, Regulation, Renewable Energy, Sustainable Development, Comparative Law

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Acronyms and abbreviations

ACER	Agency for the Cooperation of Energy Regulators
AfCFTA	African Continental Free Trade Area
AfDB	African Development Bank
AU	African Union
BNetzA	Bundesnetzagentur / Federal Network Agency
CCS	Carbon Capture and Storage
CNE	Comisión Nacional de Energía / National Energy Commission
COP	Conference of the Parties
CORFO	Corporación de Fomento de la Producción de Chile / Chilean Economic Development Agency
ECB	Electricity Control Board
ECJ	European Court of Justice
ECT	Energy Charter Treaty
EEG	Erneuerbare-Energien-Gesetz / Renewable Energy Sources Act, 2021
EMA	Environmental Management Act
EnWG	Energiewirtschaftsgesetz / Energy Industry Act, 2021
EU	European Union
FIT	Feed-in tariff
GDP	Gross domestic product
GH	Green hydrogen
GH Strategy	Green Hydrogen and Derivatives Strategy
GHG	Greenhouse gases
GHS	GH Standards
HPP-II	Harambee Prosperity Plan II
ICSID	International Centre for Settlement of Investment Disputes
IPCC	International Panel on Climate Change
IRENA	International Renewable Energy Agency
ISO	International Organization for Standardization
MDGs	Millennium Development Goals
Namport	Namibian Ports Authority
NamPower	Namibia Power Corporation

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NAMREP	Namibian Renewable Energy Programme
NamWater	Namibia Water Corporation
NCRE	Non-conventional renewable energy
NDC	Nationally determined contribution
NDP	National Development Plan
NEP 2050	National Energy Policy 2050
NERA	Namibia Energy Regulator Authority Bill, 2019
NIRP	National Integrated Resource Plan
NPC	National Planning Commission
NREP	National Renewable Energy Policy
NWCA	Namibia Water Corporation Act 12 of 1997
RE	Renewable energy
RED	Regional electricity distributor
SADC	Southern African Development Community
SAPP	Southern African Power Pool
SDGs	Sustainable Development Goals
SIC	i Sistema Interconectado Central
SING	Sistema Interconectado del Norte Grande
UN	United Nations
WRMA	Water Resources Management Act 24 of 2004
WTO	World Trade Organization
ZEV	Zero-emission vehicle

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1 Introduction

In response to the challenges posed by climate change and in pursuit of energy security to improve their populations' quality of life, most countries have been investing in clean energy. Renewable energy (RE) in general, and green hydrogen (GH) in particular, has been identified as a modern source of energy that is improving the socio-economic development prospects of the African continent while also ensuring a clean environment and energy security.

GH production in Namibia is expected to contribute substantially to economic growth, create employment and foster environmental sustainability by reducing carbon usage. However, to achieve this, there must be a comprehensive and effective legal and regulatory framework that will help to steer production, trade and investment in green energy. The overarching aim of this paper is to analyse the current legal and regulatory framework pertaining to the production of GH as a source of RE, against the backdrop of a drive towards sustainable development in Namibia.

The Namibian Constitution and other pieces of legislation, policies and strategies constitute the foundation of RE production in Namibia. However, while these legal instruments refer to RE, no specific framework exists for the development of and trade in GH. The lack of a clear and harmonised legal and regulatory framework for GH belies the benefit of GH production to Namibia, a developing country that seeks to encourage trade and investment in the hope of achieving sustainable development. What needs to be analysed, therefore, is whether the existing legal and regulatory framework provides a sufficient basis for the emerging field of GH production or whether additional legal instruments and specialised laws must be developed to adequately regulate the entire GH value chain.

This study therefore seeks to critically analyse the factors impeding the development of GH in Namibia in the context of the country's quest to increase energy trade and investment and energy access. To this end, the study examines the existing legal and regulatory framework pertaining to RE and GH production in Namibia. It then performs a comparative analysis of the legal positions in Germany and Chile with a view to identifying the strengths and shortcomings of the applicable laws in Namibia. Germany is one of the most established countries in terms

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of RE and GH on a small scale. Chile is of particular relevance because, like Namibia, it is rich in RE sources and hence has an advantage in GH production. It has also taken steps to ensure GH development and usage by reforming its legislation to, inter alia, accommodate GH-fuelled vehicles.

2 Setting the scene

2.1 Renewable energy and sustainable development

Energy is an essential feature of the modern world and is critical for economic and social development.[1] Notably, energy influences many actors in the broader economy, such as businesses, schools and industries, all of which rely on energy to function at even the most basic level. As early as 1987, the United Nations (UN) published the Brundtland Report, known as *Our Common Future*, which stated: 'Energy is necessary for daily survival. Future development crucially depends on its long-term availability in increasing quantities from sources that are dependable, safe, and environmentally sound. At present, no single source or mix of sources is at hand to meet this future need.'[2]

Energy demand has increased in line with the growth of the world's population and urbanisation.[3] However, scientific evidence has illustrated that global energy consumption patterns are not sustainable. This realisation, together with recent political developments, has prompted the world to seek alternative methods to improve the energy trajectory.[4] A substantial amount of the energy consumed is dominated by fossil fuels which are associated with emissions that cause environmental problems. The use of fossil fuels, in particular, is considered to be one of the drivers of climate change. The International Panel on Climate Change (IPCC) suggests that a reduction in greenhouse gas (GHG) emissions across the full energy sector requires a substantial reduction in overall fossil fuel usage, among other major transitions.[5]

[1] N Wohlgemuth & F Missfeldt 'The Kyoto mechanisms and the prospects for renewable energy technologies' (2000) 69 *Solar Energy* 305 305.
[2] United Nations *Our common future* (1987) <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf> (accessed 13-3-2023).
[3] B McLellan, G Corder, D Guicoro & K Ishakara 'Renewable energy in the minerals industry: a review of global potential' (2012) 32 *Journal of Cleaner Production* 32.
[4] P Ekins, J Gupta & P Boileau (eds) *Global environment outlook-GEO-6: healthy planet, healthy people* (2019) 25.
[5] IPCC *Climate change 2022. Mitigation of climate change, summary for policy makers* (2022) 28.

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Owing to the increased focus on the protection of the environment, many countries have been creating enabling environments for the expansion of renewable power generation.[6] RE is a promising substitute energy solution because it is considered to be environmentally safe.[7] The IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation[8] confirms that if RE is implemented properly, it may concurrently 'contribute to social and economic development, energy access, and a secure energy supply, while reducing the negative impacts on the environment and health of the people'.[9] Access to secure and green energy can therefore support sustainable development as well as energy security. GH, in turn, has been identified as a modern source of energy with the potential to enhance countries' socio-economic development.

2.2 Green hydrogen in perspective

Before proceeding to discuss the study covered in this paper, it is worthwhile outlining what GH is and briefly explaining how GH functions as an RE source. It is critical to emphasise the convergence between GH as an RE carrier and the factors that are driving it, such as climate change mitigation, energy security and sustainable development. The reason for clarifying these factors in this context is to understand the policies and laws involved, as examined in this study.

Hydrogen is a non-metallic, gaseous chemical element, the lightest element in the periodic table and the most abundant element on earth. Despite hydrogen being the most common element in the universe, it is usually bound with other molecules, thus creating a combination of elements;[10] hence the need to split hydrogen from other elements, such as water or hydrocarbons like methane. Hydrogen can store energy because the molecules can easily be encouraged to form bonds with other elements through chemical or combustion processes.[11]

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[6] D Jooste *Towards a workable renewable energy framework in South Africa* LLM Thesis, University of Cape Town (2010) 1.

[7] A Demibras 'Global renewable energy projections' (2009) 4(2) *Energy Sources, Part B: Economics, Planning, and Policy* 212 224.

[8] W Moomaw, F Yamba, M Kamimoto, L Maurice, J Nyboer, K Urama & T Weir *Special report on renewable energy sources and climate change mitigation* (2011) 163.

[9] W Moomaw, F Yamba, M Kamimoto, L Maurice, J Nyboer, K Urama & T Weir *Special report on renewable energy* (2011) 191.

[10] P Roy 'Hydrogen is the most common element: here's the reason why' (2017) *The Science Times* <https://www.sciencetimes.com/articles/11524/20170403/hydrogen-is-the-most-common-element-heres-the-reason-why> (accessed 29-8-2022).

[11] ESMAP *The World Bank report on green hydrogen opportunities for Namibia. Phase 1* (2021) <https://documents1.worldbank.org/curated/en/953571597951239276/pdf/Green-Hydrogen-in-Developing-Countries.pdf> (accessed 14-12-2022).

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Emanating from these processes are water and energy in the form of electricity and/or heat. Hydrogen is produced through a process called electrolysis where water is split into hydrogen and oxygen.

Hydrogen is considered 'green' when 100 per cent renewable sources are used to create pure hydrogen and oxygen. GH is produced through a process of electrolysis where water is split into hydrogen and oxygen using RE sources such as hydropower, wind, solar, waste or reformed biogas.[12]

There are other types of hydrogen, such as blue and grey hydrogen. This classification is dependent on the manner in which the hydrogen is produced. Grey hydrogen, for example, the most common type of hydrogen produced globally, is made from fossil fuels, especially natural gas which causes carbon dioxide emissions.[13] Blue hydrogen, in turn, is produced from a natural gas, using a process in which natural gas is mixed with hot steam and a reaction occurs, whereby hydrogen is then separated from carbon dioxide.[14]

Different types of hydrogen, depending on the production method used[15]

- **Green hydrogen** is produced through electrolysis of water. Electricity from RE sources is used for this. Green hydrogen is therefore CO_2-free.
- **Grey hydrogen** is produced through steam reforming, usually from fossil natural gas. This process produces around 10 metric tons of CO_2 per metric ton of hydrogen. The CO_2 is released into the atmosphere.
- **Black hydrogen** is produced from coal via coal gasification and extraction.
- **Brown hydrogen** is produced from lignite.
- **Blue hydrogen** is grey hydrogen, but during its production the CO_2 is partially captured and stored in the ground (carbon capture and storage (CCS)). A maximum of 90 per cent of the CO_2 can be stored.

[12] ESMAP *The World Bank report on green hydrogen opportunities for Namibia. Phase 1* (2021) <https://documents1.worldbank.org/curated/en/953571597951239276/pdf/Green-Hydrogen-in-Developing-Countries.pdf> (accessed 14-12-2022).
[13] A Ajanovic, M Sayer & R Haas 'The economics and the environmental benignity of different colors of hydrogen' (2022) 47 *International Journal of Hydrogen Energy* 24141.
[14] TR Kunjumon, & RB Cheruvil *Feasibility study of green hydrogen power generation in Kavaratti Island India* Master's Thesis in Engineering, Halmstad University (2021) 5.
[15] ESMAP *The World Bank report on green hydrogen opportunities for Namibia. Phase 1* (2021) <https://documents1.worldbank.org/curated/en/953571597951239276/pdf/Green-Hydrogen-in-Developing-Countries.pdf> (accessed 14-12-2022).

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- **Turquoise hydrogen** is hydrogen produced through the thermal cracking of methane (methane pyrolysis). Instead of CO_2, solid carbon is produced in the process. The process of methane pyrolysis is still under development.

GH is considered to be a source of RE because, first, its generation does not produce harmful emissions into the environment and, second, when GH is burned, it only produces water vapour. Although hydrogen is abundant, it does not exist naturally in its pure form. Hydrogen exists in a gaseous form and therefore its movement and storage require specialised technologies. Hydrogen is not produced via extractions, such as drilling or mining, but rather through an industrialised process. This is because hydrogen is not a primary energy source but a secondary energy source, similar to electric power.[16]

Producing hydrogen through electrolysis of water requires an abundance of cheap electricity, clean water and access to land.[17] GH production requires a large amount of RE, land and water (which is scarce). In addition to the resources required, hydrogen development requires a substantial financial outlay, policy support and infrastructure systems to achieve wide deployment. Judging from past experiences, many RE projects have resulted in land-use conflicts, forced resettlements and expropriation. Fresh water required for electrolysis may, if not properly considered, become even scarcer in the face of accelerating climate change.

Besides the questions surrounding what GH is and how it is produced, it is also important to consider the circumstances under which GH is an energy carrier. Hydrogen is highly flammable and therefore needs to be carefully handled. Compared to other gases, such as propane and gasoline, hydrogen is more flammable in the air. This is because it is light and therefore easily disperses into the atmosphere. Its light nature, however, makes it difficult to transport; thus, it needs to be liquified in order to be delivered as a compressed gas. This is an expensive procedure and to date the use of liquified hydrogen has been limited due to its complexity and high cost.[18] Ultimately, a successful hydrogen economy is dependent on the availability of proper infrastructure and technologies to ensure it does not present any health hazards.

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[16] J Lafarague & G Moser *Hydrogen energy: the fuel of the future?* (2020) <https://privatebank.barclays.com/content/dam/privatebank-barclays-com/en-gb/private-bank/documents/news-and-insights/2020/october/hydrogen-article/hydrogen-fuel-of-the-future-ibim10162.pdf> (accessed 15-1-2023).

[17] D von Oertzen *Issues, challenges and opportunities to develop green hydrogen in Namibia* (2021) 16.

[18] TR Kunjumon & RB Cheruvil *Feasibility study of green hydrogen power generation in Kavaratti Island India* Master's Thesis in Engineering, Halmstad University (2021) 13.

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2.3 Green hydrogen production: A new pathway to sustainable development in Namibia

Access to affordable energy, and specifically clean energy, is accepted as being essential for socio-economic development.[19] GH has been identified as a commodity that contributes to economic growth and creates employment. Thus, the development of GH would be a positive factor in terms of development and economic transformation. Achieving sustainable development in Namibia will require access to affordable energy and increased energy capacity.

Namibia is at the very beginning of its GH production journey, but it has a potential competitive advantage as a key hub in the production of GH due to its abundant RE sources and geographical location which gives it easy shipping access to markets in Europe, Asia and other continents. This improves the prospects of Namibia participating more actively in international trade through exports. In this regard, Namibia would potentially compete with countries such as Morocco, New Zealand and Chile, among others.

GH has been recognised as a viable option for RE which could transform Namibia's energy sector and economy. Given this potential, and bearing in mind the other legal and regulatory frameworks currently in place, there is a need to assess the ability of the country's RE framework and other related pieces of legislation to arrive at an effective, investor-friendly framework for exploring and producing GH in Namibia.

Namibia is endowed with abundant renewable natural resources, such as wind, solar and vast land area, which can be leveraged to make the country energy self-sufficient. However, to date these natural resources have not been optimally utilised. GH has, as previously mentioned, been identified as a modern source of energy with the potential to improve the socio-economic development of the African continent, while also ensuring a clean environment and energy security. At a national level, GH production is expected to improve and steer Namibia's economic growth trajectory, create employment and contribute to the country's environmental sustainability by ensuring that Namibia takes active steps towards reduced carbon usage.

There is a growing interest in GH in Africa, particularly in Namibia, due to an increased demand for cleaner energy in the European Community[20] and a desire to honour the

[19] M Bernard *Nuclear energy in Africa: a legal framework for sustainable energy access* LLD, North-West University (2014) 5.
[20] A Van Wijk & F Wouters 'Hydrogen – The bridge between Africa and Europe' in M Weijnen, Z Lukszo & S Farahani (eds) *Shaping an inclusive energy transition* (2021) 91 92.

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commitment under the Paris Agreement 2015[21] to reduce carbon dioxide and other GHG emissions. 'The Paris Agreement commits the world to limit the rise in global temperature to below 2°C and pursue efforts to limit it to 1.5°C.'[22] GH production aligns perfectly with the global approach to reducing GHG and creates an opportunity for the world to decarbonise several industrial sectors, while offering an avenue for boosting economic growth.

The world is engulfed in a critical climate emergency.[23] To mitigate the potential climate risk associated with the use of non-renewable energy, the world is shifting to cleaner energy, with GH regarded as one way of addressing energy security and enhancing climate change mitigation efforts. In addition to the Paris Agreement, the UN's 2030 Agenda sets out sustainable development goals (SDGs) and demands for member countries to play their part in combatting the climate concerns of today and protecting the planet for future generations.[24] To achieve SDG 7,[25] which is 'access to affordable, reliable, sustainable and modern energy', Namibia is looking to be a provider of clean RE through trade. SDG 13 is also important, as it encourages all nations to take urgent action to combat climate change and its impacts.[26]

The envisaged transition to a green economy through RE demonstrates a concerted effort on the part of different stakeholders, strong political will, and substantial investment and modernisation of infrastructure systems to help overhaul a crippled Namibian economy. The deployment of GH 'will bridge the energy transition between Europe and Africa on the one hand, and climate and development targets on the other'.[27] The novelty of GH energy has produced some excitement because of the potential it holds. However, the Namibian

[21] Paris Agreement to the United Nations Framework Convention on Climate Change (adopted 12 December 2015, entered into force 4 November 2016) *T.I.A.S. No. 16-1104*.
[22] Article 2 of the Paris Agreement.
[23] M Fischetti 'We are living in a climate emergency, and we're going to say so' *Scientific American* (2021) <https://www.scientificamerican.com/article/we-are-living-in-a-climate-emergency-and-were-going-to-say-so> (accessed 19-11-2022).
[24] K Chege 'The potential of green hydrogen as a source of clean energy for South Africa in the energy transition era' *Electronic Newspaper* of *University of Cape Town* (2021) <http://www.mlia.uct.ac.za/news/part-one-potential-green-hydrogen-source-clean-energy-south-africa-energy-transition-era> (accessed 9-8-2022).
[25] UN General Assembly *Transforming our world: the 2030 agenda for sustainable development*, 21 October 2015, A/RES/70/1 <https://www.refworld.org/docid/57b6e3e44.html> (accessed 20-9-2022).
[26] K Chege 'The potential of green hydrogen as a source of clean energy for South Africa in the energy transition era' *Electronic Newspaper* of *University of Cape Town* (2021) 10. <http://www.mlia.uct.ac.za/news/part-one-potential-green-hydrogen-source-clean-energy-south-africa-energy-transition-era> (accessed 9-8-2022).
[27] E Sadik-Zada 'Political economy of green hydrogen rollout: a global perspective' *Sustainability* (2021) <https://www.mdpi.com/2071-1050/13/23/13464|> (accessed 20-9-2022).

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government must not overlook the risks associated with GH production. Namibia must therefore face various policy choices before it can embark on GH production.

Although GH energy is perceived to be environmentally beneficial because it is 'renewable', the production thereof has the potential to both positively and negatively affect Namibia in terms of local soil and water quality, biodiversity, human health and climate, depending on the practices followed. A negative effect would be compromised safety as hydrogen is more flammable than other fuels, such as petrol. Since hydrogen can be produced using excess RE through wind farms, a positive effect would be the excess energy from these wind farms being converted into hydrogen, which is then stored for future use. Whether the impacts will end up being positive or negative will largely depend on how well-informed the supporting policies are.

The use of GH synchronises with different sectors as the production thereof represents an amalgamation of different processes which all need to be regulated. GH production is considered to be suitable for Namibia because of the availability of land, the proximity to the ports and to (ocean) water, and the good road system.[28] Despite the presence of these factors, there is still a need for proximity to a grid, for specialised pipeline infrastructure to supply ocean water to the plant, for transportation services and for access to a labour pool, none of which is currently in place.

It should be borne in mind that the production of GH energy has a significant impact on the environment. The various environmental consequences include water and air pollution, changes in the ecology, and the emission of certain hazardous chemicals.[29] However, if the legal and regulatory framework and other factors are properly considered, the development of a GH sector in Namibia could result in the country becoming the next exporter in the GH market.[30] It could also result in much-needed job creation, foreign direct investment and skills development, while also delivering a clean domestic energy supply.

The hype and excitement surrounding Namibia as a potential GH exporter will be out of reach and will remain a dream if the pivotal policies aimed at leveraging the benefits of GH are not implemented. As such, this study argues that the hype – its specific nature and complex dynamic – surrounding foreign investment in GH in Namibia has been

[28] D von Oertzen *Issues, challenges and opportunities to develop green hydrogen in Namibia* (2021) 16–18.
[29] A Wildermuth 'The next step: the integration of energy and environmental law' (2011) 31 *Utah Environmental Law Review* 369 375.
[30] Ministry of Mines and Energy *Namibia Green Hydrogen and Derivatives Strategy* (2022) 15.

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misunderstood. The study therefore aims to improve and promote the adoption of a legal and regulatory framework to steer the development of GH and thereby support the whole production process.

Considering the imminent environmental danger posed by GH production, the Namibian government must prioritise the protection of its ecosystems and implement and if necessary, adopt laws and policies that compel the GH sector to maintain or improve current management practices for land, water and other resources.

In 2021, Namibia announced a GH project valued at approximately US$9.4 billion, with production scheduled to commence in 2026.[31] The initial target was to generate 300,000 tonnes of GH capacity per year by 2030, which would be available for regional and global markets.[32] During the UN Climate Change Conference (COP26), held in 2021 in Glasgow, Namibia embarked on a journey to explore the production of hydrogen, appointing Hyphen Hydrogen Energy as the preferred bidder to develop the country's first large-scale GH project in the area of the Tsau //Khaeb National Park. It is understood that the national park was considered an ideal location because of its combination of solar and wind resources and proximity to water resources (ocean) and the port of Lüderitz for export purposes.[33]

Namibia does not presently have any legislation that specifically addresses the implementation of GH.[34] In the absence of such, the Namibian government is investing considerable effort in introducing the relevant laws and policies to ensure the success of GH production in the country. To this end, the President of Namibia has appointed a GH Commissioner, whose overall duty is to ensure the feasible development of GH in the country.[35] Furthermore, Namibia has indicated its intent to sign a memorandum of understanding (MoU) with the European Union (EU) to capacitate the nation in the area of

[31] D von Oertzen *Issues, challenges and opportunities to develop green hydrogen in Namibia* (2021) 24.
[32] United Nations 'Green hydrogen: a viable option to transform Africa's energy sector?' <https://www.un.org/osaa/news/green-hydrogen-%E2%80%93-viable-option-transform-africas-energy-sector> (accessed 20-8-2022).
[33] E Baldessin, J Tschopp & L Maio 'Will Africa become the new GH "El Dorado"?' *S&P Global Commodity Insights Blog* (5-4-2022) <https://ihsmarkit.com/research-analysis/africa-green-hydrogen.html> (accessed 17-3-2022).
[34] OC Ruppel 'Climate change de facto and de jure: legal and regulatory aspects relevant to Namibia' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 399 409.
[35] B Weidlich 'Namibia Optimistic about new GH industry' (2021) *The Namibian* (8-11-2021) <https://namibian.org/news/economics/namibia-optimistic-about-new-green-hydrogen-industry> (accessed 17-3-2023).

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GH. An MoU between Namibia's port operator, the Namibian Ports Authority (Namport), and Europe's largest port operator, the Port of Rotterdam Authority, has also been signed.[36]

A GH conference took place in August 2022 where the legal and regulatory framework and other topical issues relating to GH were discussed. The GH Commissioner stated at the conference that various pilot projects had been identified to mobilise other forms of GH production.[37] However, all these projects are being carried out in the absence of a substantive framework that deals with the implementation of GH.[38]

The world economy's transition to a sustainable, low-carbon regime is critical for the physical environment. As a result, countries are finding themselves under growing pressure to find new sustainability solutions. In this regard, there is an urgent quest to find countries with natural resources to produce GH, with Namibia being an obvious target. The key concern at present is the potential impact of GH on the environment and its inhabitants. The absence of an RE policy that harmonises all energy policies and accommodates an endless stream of new discoveries may lead to Namibia not maximising its potential as a hydrogen export hub. Consequently, the potential for investment in GH should be linked to sustainability measures and the protection of the environment for future generations in Namibia.

2.4 The challenge: Creating a legal and regulatory framework for future hydrogen infrastructure

While Namibia is endowed with RE, the potential of RE to become a lucrative sector for the country has not been fully explored.[39] Furthermore, Namibia could face challenges due to the absence of a harmonised legal and regulatory framework applicable to GH production, which is critical for an efficient trading system. In short, a lack of a legal and regulatory framework may constrain trade and investment in GH.

A reasonable assertion is that although there is sufficient RE, the legal and regulatory framework implemented to give effect to the investment and production of RE is not sufficiently conducive to maximising the use of GH as a form of RE. The current provisions of

[36] OC Ruppel 'Climate change de facto and de jure: legal and regulatory aspects relevant to Namibia' in OC Ruppel & K Ruppel-Schlichting *Environmental law and policy in Namibia* (2022) 399 408.
[37] J Mnyupe *Main Pilot Plants* (2022) Conference paper presented at a conference on *Namibia Green Hydrogen* Windhoek, 16-8-2021 – 17-8-2022 <https://namgh2conference.com/wp-content/uploads/2022/08/Mr.-James-Mnyupe-Main-Pilot-Plants-Presentation-2022.pdf> (accessed 17-3-2023).
[38] OC Ruppel 'Climate change de facto and de jure: legal and regulatory aspects relevant to Namibia' in OC Ruppel & K Ruppel-Schlichting *Environmental law and policy in Namibia* (2022) 399 409.
[39] C Zivayi & H Ileka 'Challenges and opportunities for increased energy access in sub-Saharan Africa, with special reference to Namibia' in OC Ruppel & B Althusmann (eds) *Perspectives on energy security and renewable energies in sub-Saharan Africa* (2016) 21.

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the energy sector were not drafted specifically for a certain type of energy source; therefore, they might not give adequate consideration to the different circumstances surrounding RE.

In view of the above, this study analyses whether the current legal and regulatory framework pertaining to RE as a whole is sufficient to cover the production of GH as an RE source. While projects for the development of GH are in their infancy, it is necessary to critically analyse the current legal and regulatory framework to envisage an appropriate (new) framework for GH. Since GH is a new energy avenue that is being explored, there is a lack of jurisprudence on the legal and regulatory framework for GH production in Namibia and other, comparable jurisdictions.

The primary aim of this study is to critically analyse the legal and regulatory framework governing RE with a view to determining whether it is sufficient to regulate the production of and trade in GH in Namibia. The study also sets out to propose a legal and regulatory framework for GH in Namibia that will attract more investment in GH, promote responsible and sustainable development, ensure Namibian communities' socio-economic survival, and protect the environment. Furthermore, the study seeks to extract key lessons from Germany and Chile, which will be crucial for the design and implementation of a legal and regulatory framework for GH in Namibia.

To encourage the development of the GH sector, the legal and regulatory framework must be attractive to investors and offer opportunities for the sharing of knowledge. Evaluating the existing legal and regulatory framework is aimed at determining how a balance can be struck between the interests of the investing companies that will exploit the natural resources to produce GH and the interests of the Namibian people whose elected representative government acts on their behalf.

This study sets out to establish how a new or refreshed legal and regulatory framework will rectify any existing deficiencies that are likely to impede GH production and trade and will help to entice investment geared towards sustainable development. Importantly, GH will contribute to the development of the energy sphere, to socio-economic development and to the transformation of Namibian society as a whole. Furthermore, the study aims to fill the gap in the existing literature on the prospective benefits and challenges of developing a legal and regulatory framework for GH in Namibia.

Central to achieving the objectives outlined above, the study addresses the main question as to whether the existing legal and regulatory framework governing RE in Namibia would be

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suitable for the production of and trade in GH as a non-renewable energy carrier with a view to ensuring sustainable development.

To answer this question, the following sub-questions are addressed:

- How does one describe the regulatory framework for RE in general and GH in particular in Namibia?
- Are the laws and policies in place sufficiently well implemented and do they constitute an adequate framework for the introduction of GH production?
- Does the legal and regulatory framework promote investment in the development of GH production?
- What are the barriers to GH production in Namibia's energy sector?
- What lessons can Namibia learn from best practices in Germany and Chile in terms of GH?

Namibia's legal and regulatory framework for RE is broken up into various pieces of sectoral legislation, policy directives and regulations. For a country to attract investment in green energy production, with the ultimate goal of achieving sustainable development, it needs a high-quality and efficient legal and regulatory framework. Owing to the barrage of policies and laws that govern RE in Namibia, it is useful to explore the legal and regulatory pathways that can encourage both local and foreign direct investment in the energy sector.[40] In this regard, this study reveals the opportunities and challenges associated with a legal and regulatory framework for GH that is both comprehensive and inclusive.

The study focuses in part on the production of GH as a form of RE in Namibia, with sustainable development being the ultimate goal. The study critically analyses the factors that may impact investment in GH production and sustainable development in Namibia. The analysis is conducted on the basis that GH is, first and foremost, a type of RE and that a harmonised framework is needed to specifically address the issue of GH regulation.

3 Existing legal and regulatory framework pertaining to green hydrogen in Namibia

This section provides a broad conceptual and theoretical framework. It does this by offering an overview of the regulatory landscape of RE in Namibia and how it interfaces with sustainable development. The aim is to investigate the current legal and regulatory framework in Namibia to determine whether it is sufficient to enable the implementation of GH

[40] Y Oke 'The pathway to energy liberation' in OC Ruppel & B Althusmann *Perspectives on energy security and renewable energies in sub-Saharan Africa – practical opportunities and regulatory challenges* (2016) 99 100.

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production or whether it is necessary to develop a framework that addresses GH energy policy gaps, while ensuring that the environment is protected and the rights of communities are not adversely affected by such development.

3.1 Introduction

Energy deficiency is one of the biggest impediments to a country achieving sustainable development. Most of Namibia's electricity supply is imported from South Africa;[41] meanwhile, South Africa continues to experience shortages in the supply of locally produced electricity.[42] It is therefore time for the Namibian government to consider a new approach to ensuring energy security – by establishing a clear framework that could help address these challenges. Energy is crucial for socio-economic growth. However, the absence of an effective framework to promote the use of sustainable RE could hamper such growth.[43]

Owing to the nature and origin of RE, and specifically the nature of GH, Namibia has a complex array of statutes that are directly or indirectly relevant to RE. This section provides a critical analysis of the relevant constitutional dispensation and relevant sectoral laws that purport to have the most direct implications for the regulation of GH in Namibia. In this regard, the section discusses the policies pertaining to RE that are vital for the promotion of GH in Namibia. Thereafter, the section discusses how GH could be used to achieve sustainable development and the critical role that the law plays in bringing about such development.

3.2 Legal framework for energy in Namibia

3.2.1 Constitution of the Republic of Namibia Act 1 of 1990

An analysis of the legal framework must commence with the Constitution of the Republic of Namibia Act 1 of 1990 (Constitution) as it is the supreme law of Namibia and therefore all laws promulgated must be consistent with it.[44] The Constitution impacts all segments of the Namibian government through the Bill of Rights,[45] legislative competencies[46] and enforcement of the law through the judiciary.[47]

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[41] Ministry of Mines and Energy *Namibia green hydrogen and derivatives strategy* (2022) 35.
[42] Al Jazeera News 'South Africa's persistent power cuts: what you need to know' (1-6-2022) <https://www.aljazeera.com/news/2022/7/1/power-cuts-in-south-africa-what-you-need-to-now> (accessed 29-11-2022).
[43] J Goldemberg 'Development and energy' in AJ Bradbrook & RL Ottinger (eds) *The law of energy for sustainable development* (2005) 37 42.
[44] Article 1(6) of the Namibian Constitution, 1990.
[45] Chapter 3 of the Constitution.
[46] Article 44 of the Constitution.
[47] Chapter 9 of the Constitution.

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The Constitution provides an extensive list of human rights, among which socio-economic rights are not explicitly provided for but are implied.[48] Socio-economic rights are, however, dependent on the availability of natural resources for their fulfilment.[49] Article 1 states that 'all power shall vest in the people of Namibia who shall exercise their sovereignty through the democratic institutions of the state'. This provision creates a standard that, whenever the government performs any duty or function, it must be in the best interests of the people of Namibia. Therefore, it ought to act in the best interests of every person it represents. By implication, the laws governing the ownership and distribution of GH should benefit everyone in Namibia.

The ownership and control of natural resources in Namibia are vested in the state.[50] Strydom ACJ confirmed in the Supreme Court case of *Namibia Grape Growers and Exporters Associations and Others v Ministry of Mines and Energy and others*[51] that Article 100 of the Namibian Constitution vests mineral rights in the state, in so far as they are not privately owned.[52] Heathcote AJ in *Rostock CC and Another v Van Biljon*[53] offered a different opinion, however. He ruled that the state simply has a duty to administer the rights to natural resources on behalf of the Namibian people, which is in contrast to Strydom's position that ownership of natural resources vests in the state.

Article 95(l) of the Constitution is the foundation of a legal and regulatory framework for RE. Article 95(l) confers responsibility on the government 'to promote the welfare of the people by adopting policies aimed at maintaining the ecosystems and biological diversity and utilising natural resources on a sustainable basis for the benefit of all Namibians, both present and future'. The government is thus obligated to adopt, *inter alia,* policies that will lead to the conservation of energy resources for future generations. Everyone has the right to a protected environment, effected through reasonable legislative measures, both for present and future generations.[54] Article 63(1) of the Constitution, in turn, makes provision for a legislative duty on the part of the National Assembly to make and repeal laws to ensure that the government acts in the best interests of the people of Namibia. This legislative duty includes the duty to

[48] *Likuwa and Others v Municipality of Windhoek and Others* 2017 NAHCMD 113.
[49] *Likuwa and Others v Municipality of Windhoek and Others* 2017 NAHCMD 113; *Confederation of Namibian Fishing Associations v Environmental Commissioner Teofilus Nghitila and Others* 2021 NAHCMD 308.
[50] Article 100 of the Constitution.
[51] 2004 NR 194 (SC) 209.
[52] Article 100 of the Constitution.
[53] 2011 2 NA 751 (HC) 9.
[54] Article 95(l) of the Constitution.

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legislate on matters such as GH, within the defined jurisdiction, in the best interests of Namibians.

Consequently, it is a submission of this study that for GH projects to be successfully implemented, the holders of legislative power must exercise their duty and enact GH legislation that considers the GH operation and the technologies used. However, this legislation must first consider the interests of the Namibian people and not simply those of investors, to the population's detriment – as happens with most African countries' energy legislation. Moreover, the Constitution provides for the appointment of an ombudsman,[55] an independent body with the constitutional duty to 'investigate complaints regarding irritational exploitation of non-renewable resources, living natural resources, the degradation and destruction of ecosystems, and failure to protect the beauty and character of Namibia'.[56] Furthermore, the Constitution permits 'general rules of public international law and international agreements binding upon Namibia' to form part of Namibian law.[57] Thus, where there is a gap in Namibian law, customary international law relating to the development of GH will apply to the extent that it is not contrary to domestic law.

3.2.2 Electricity Act 4 of 2007

The Electricity Act 4 of 2007 (Electricity Act) is the primary legal instrument for the provision of electricity in Namibia. The Electricity Act gave effect to the White Paper on Energy Policy, 1998. The Electricity Act provides for the establishment of the Electricity Control Board (ECB) as the regulatory authority for the electricity sector. The ECB has the duty to, *inter alia*, oversee the functioning and development of the electricity sector and the security of supply and to promote private-sector investments in the electricity sector.[58] The ECB is further empowered to administer tariffs and licences. Although the Electricity Act is predominantly administrative, the Act establishes a foundation for electricity-related activities, including the application for and granting of electricity generation licences.[59] However, the final decision as to whether a licence should be granted lies with the Minister of Mines and Energy.[60]

[55] Article 89 of the Constitution.
[56] Article 91(c) of the Constitution.
[57] Article 144 of the Constitution.
[58] Section 3 of the Electricity Act 4 of 2007.
[59] D von Oertzen 'Energy law and policy in Namibia' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2021) 347.
[60] Section 20(6); J Kisting 'Opportunities in the renewable energy sector in Namibia' *Baobab Equity Management (Pty) Ltd, Namibia, Final Report* (2008) 29.

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Section 43[61] of the Electricity Act empowers the Minister to implement regulations for the installation and use of RE technologies. This empowering provision is not sufficient *per se* to encourage RE. However, it is a good place to start in encouraging the use of those renewable technologies needed for the development of GH. The lack of energy security in Namibia is evident in the number of rural communities that still do not have access to power. Namibia remains reliant on South Africa and other Southern African countries for its electricity supply.[62] It is imperative, therefore, that Namibia makes use of readily available RE and becomes self-sufficient.[63]

The Electricity Act could be used to transform the energy sector by promoting renewable power generation – in particular, being more explicit about the intended use of RE. However, the Act has failed to provide for a specific commitment to incorporate RE into the energy mix. For example, there is no provision for connecting the new electrolyser technology to the grid.

3.2.3 Draft Gas Bill, 2001

Namibia's Draft Gas Bill, 2001 is designed to promote the establishment of a gas transportation and distribution network in the country, both for domestic supply and export purposes. The Draft Bill makes provision for the establishment of a national gas regulator as well as a system of licensing for the gas industry.[64] The Draft Gas Bill states that gas includes 'all hydrocarbon gases transported by pipeline, including but not limited to natural gas, artificial gas, hydrogen rich gas, methane rich gas, synthetic gas, coal bed methane gas, liquefied natural gas, compressed natural gas, regasified liquid natural gas or any combination thereof'.[65] This definition is sufficiently wide as it is not limited to natural gas but extends to other gases as well, including hydrogen. However, to make it more specific, it would be best to amend the Draft Bill to also make provision for GH.

It is submitted that if it is considered viable to use the piped-gas infrastructure to distribute GH, the Draft Bill needs to be reviewed for the following reasons: to gauge its suitability for hydrogen, to ensure that the appropriate powers and responsibilities are specified, to provide for standards that enable existing gas standards to cover a wider range of gases, and to

[61] Act 4 of 2007.
[62] KT Amesho, EI Edoun, T Kadhila, & L Nangombe 'An empirical analysis of the co-benefits of integrating climate change adaptation and mitigation in the Namibian energy sector' (2022) 33 *Journal of Energy in Southern Africa* 86 102.
[63] D von Oertzen *Namibia's energy future a case for renewables in the electricity sector* (2012) 7.
[64] Preamble to the Draft Gas Bill, 2001.
[65] Clause 1 of the Draft Gas Bill, 2001.

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provide for the establishment of a hydrogen regulator that could assist the authority in developing the hydrogen area or review the functions of the authority to include such a function. It is further submitted that the Draft Bill needs to be brought up to standard to make provision specifically for the deployment of GH into the piped-gas network. Moreover, the safety and security features in the production and use of GH must be critically assessed and provided for to ensure safety and security in its production, storage and transportation.

3.2.4 Environmental Management Act 7 of 2007

Namibia's Environmental Management Act 7 of 2007 (EMA) is based on international law principles relating to sustainable development and environmental management, which have direct and indirect implications for RE. This piece of legislation gives effect to Article 95(I) of Namibia's Constitution by serving as a framework for the management of the environment and natural resources. Section 3(2) of the EMA[66] imposes a duty of care on all citizens to prevent environmental degradation. The objectives of the EMA are to prevent and/or mitigate the significant effects of people's actions on the environment by ensuring that any operational activities performed on land are carefully considered through an approved impact assessment which must be conducted before the energy-related operation commences.[67] The EMA also provides for the coordination and harmonisation of environmental policies and plans of relevant ministries to ensure consistency and minimise duplication.

The EMA applies to all projects relating to environmental management and the use of natural resources. It is thus applicable to energy-related operations, including GH projects, as it mandates that before a project commences, an environmental impact assessment must be conducted.[68] Government Notice No. 29 of February 2012[69] provides a list of activities that may not be undertaken without an environmental clearance certificate. Item 3.4 of that notice lists energy projects, including green energy projects. An impediment to GH production in Namibia, as far as the promotion of RE is concerned, is the misalignment between the older energy laws and the provisions under the EMA. Most of the technologies provided for under the former energy laws were not regulated. However, this has been redressed with the introduction of the EMA.

[66] Environmental Management Act 7 of 2007 (EMA).
[67] Section 2 of the EMA.
[68] Sections 27–48 of the EMA.
[69] Government Gazette 4878 of 6 February 2012.

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The impact assessments that must be conducted under the EMA do, however, have shortcomings. First, since land use requires licensing or permission from different administrative bodies in the form of, for example, an environmental clearance certificate or a leasehold, delays in the commencement of these projects can be expected, which may lead to poor service delivery. An example (although not energy related) is the recent but long overdue decision taken regarding a phosphate mining project which, because of an issue with the environmental clearance certificate, stretched back to 2013.[70]

Second, GH projects require vast areas of land. The EMA therefore needs to be amended to incorporate strategic environmental access, as such assessments help to create a better environment through informed and sustainable decision-making. If these strategic environmental assessments are included as mandatory provisions in the Act, they would complement impact assessments in environmental management and address any shortcomings that may exist in efforts to ensure sustainable development.

Third, for the purposes of due diligence and accountability, these impact assessments need to be conducted by registered environmental practitioners. The current regulations under Section 56 are the Environmental Impact Assessment Regulations, 2012.[71] Although the regulations do make provision for environmental assessment practitioners in regulation 3, these practitioners are required to have some basic competency in conducting such assessments. However, in addition to the general requirements in regulation 4, for quality assurance purposes these practitioners should have certain core competencies, should undergo continuous professional development and should adhere to professional conduct and standards, among other things.

Given the marked impact that GH production could have on the environment, the regulation of energy and the environment must be sufficiently integrated to manage the environmental impacts of energy projects and to uphold constitutional rights as they pertain to sustainable development. Although RE is regarded as more sustainable than energy from fossil fuels,[72] it needs to be treated carefully to ensure it delivers on its goal of providing secure, safe and reliable energy. Therefore, with impact assessments already provided for under the EMA, there is no need to separate the assessments to be conducted under the

[70] *Namibian Marine Phosphate (Proprietary) Limited v Minister of Environment and Tourism and Others* (2018) NAHCMD 122.
[71] Environmental Impact Assessment Regulations, 2012.
[72] T Murombo 'Regulating energy in South Africa: enabling sustainable energy by integrating energy and environmental regulation' (2015) 33 *Journal of Energy & Natural Resources Law* 320–348.

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proposed law. In the case of hydrogen projects, it would be necessary – for value addition purposes – for the Minister responsible for the environment to afford the authority in charge of GH the opportunity to engage proactively with the project assessment process and related conditions.

3.2.5 Other related legislation

The Petroleum (Exploration and Production) Act 2 of 1991 (Petroleum Act) regulates and promotes the downstream petroleum industry. The Petroleum Act generally provides for the reconnaissance, exploration, production and disposal of, and the exercising of control over, petroleum.[73] The Petroleum Act defines petroleum as 'any liquid or solid hydrocarbon or combustible gas existing in a natural condition in the earth's crust and includes any such liquid or solid hydrocarbon or combustible gas (...).'[74]

It is submitted that although the Petroleum Act broadens the definition by indicating that 'petroleum' includes any liquid or solid hydrocarbon,[75] there is a contradiction with the definition of fuel in the regulations under Section 2 where fuel means 'petrol or diesel'. The inclusion of gaseous hydrocarbons in the definition of petroleum is limited to combustible natural gas.[76] Such a limitation of the definition narrows the scope and relevance of the Act in terms of GH and its operation. The production or extraction of gas from natural resources from a landfill site requires a production licence.[77]

The Namibia Water Corporation Act 12 of 1997 (NWCA) and the Water Act 54 of 1956 (Water Act) are particularly relevant as they prescribe water usage and outline the requirements for the authorisation of water usage. GH projects, by their nature, require the use of water which is well known to be a scarce commodity in Namibia. However, the National GH Strategy,[78] which is discussed below, specifically states that there is an expectation that sea water will be used.

The production of GH by electrolysis requires large volumes of water, which could necessitate a water usage licence in terms of the Water Act.[79] Several water activities, such as

[73] Preamble to the Petroleum Act, 1991.
[74] Section 1.
[75] M van den Berg & P Koep 'Mining law and policy in Namibia' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 321 328.
[76] Section 1 of the Petroleum (Exploration and Production) Act, 1991.
[77] Section 43.
[78] Ministry of Mines and Energy *Namibia green hydrogen and derivatives strategy* (2022) 1–52.
[79] Sections 4–9B.

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the abstraction of water as well as storage and disposal of water or water waste are all procedures that require clear approval. The success of GH projects depends to some extent on effective time management. In view of this, the periods for granting relevant licences in the current legal and regulatory framework may have to amended. Such amendments must consider the overarching goal of the law and not simply cater blindly to the development in question.

The NWCA states that the available water resources should be utilised sustainably and be protected from pollution caused by any operation.[80] It is on this premise that any development of RE that involves hydro energy should consider the goal of the NWCA in terms of conserving and protecting water resources. There is a duty of care imposed on the Namibia Water Corporation (NamWater) 'to take appropriate steps to conserve and protect the environment from damage, destruction or degradation and, among others, to protect the flora and fauna, and geological and physiographical features of special interest'.[81]

Namibia is regarded as one of the driest countries in Sub-Saharan Africa.[82] With water climate change posing a significant risk to the achievement of SDG 7 and SDG 13, it is argued here that the regulation of water has repercussions for the adoption of GH technologies. Notwithstanding the implementation of supporting policies, the notable challenges associated with the coordination of Namibia's already-stressed water resources mean that their availability for the energy sector cannot be guaranteed.

The water legislation discussed above could help to enable GH technology by ensuring that hydrogen projects are given preference when it comes to authorising non-renewable energy activities in the water-protected areas. This may, however, be difficult to achieve considering the country's liberal constitution which allows freedom to practise business, in Article 21(j).

The Water Resources Management Act 24 of 2004 (WRMA) was promulgated to ensure that the country's water resources are developed, managed, protected and used sustainably for the benefit of all Namibians.[83] In terms of the WRMA, one needs to apply for a permit to abstract sea water.[84] The WRMA was, however, repealed by the Water Resources

[80] Section 11.
[81] Section 12.
[82] K Ruppel-Schlichting 'Namibia and its environment' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 23–29.
[83] Section 1.
[84] Section 32.

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Management Act 11 of 2013 which is not yet active.[85] Sections 44 to 55 of the Act provide for the licensing and usage of seawater. There are, however, shortcomings in these pieces of legislations as both the Water Act of 1956 and the WRMA have failed to make provision for the marine water quality associated with brine. The purpose of these targets would be to ensure that the quality of water discharged back is in alignment with marine environmental protection goals.

3.2.6 Namibia Energy Regulator Authority Bill, 2019

The Namibia Energy Regulator Authority Bill, 2019 (NERA) makes provision for the establishment of an energy regulatory authority whose functions are to regulate the energy sectors, administer licensing, impose tariffs and other charges, promote energy sources and access to energy, and promote private-sector investments, among others.[86] The authority has the mandate to regulate downstream gas and petroleum, renewable energy, energy conservation and efficiency, and electricity.[87] If NERA is passed in its current form, it will have an important role to play in determining the prices at which GH can be sold and the licensing of downstream gas activities, including hydrocarbons (GH).

3.3 National policies for renewable energy in Namibia

Namibia's national policies relating to RE are distributed across various sectors of government. However, in this paper, the focus is on policies that are deemed most appropriate for the promotion of and investment in RE. Policies are sources of law but are not necessarily binding. However, they do have a consequential effect in that they influence the development of law and provide for procedures to be used in the absence of a legal framework.

3.3.1 White Paper on Energy Policy, 1998

The White Paper on Energy Policy of 1998 is the sole basis for the energy laws in Namibia and is therefore crucial for any discussions relating to the creation of a legal framework and regulatory framework for energy in Namibia. The policy was promulgated with the primary

[85] P Heyns & S Bethune 'Water related policy and statutory law' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 198.
[86] D von Oertzen 'Energy law and policy in Namibia' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 351.
[87] Clause 2 of the Namibia Energy Regulator Authority Bill, 2019.

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goals of 'effective governance, security of supply, social upliftment, investment and growth, economic competitiveness and efficiency and sustainability'.[88]

The core theme of the white paper which is relevant to this study is that RE is recognised in Namibia as a source of energy. The white paper addresses both the upstream and the downstream energy sectors in Namibia and provides guidance on how RE and energy efficiency projects should be implemented in Namibia.[89] The key responsibilities addressed are the creation of public awareness about RE and energy efficiency, the implementation of Namibia's Off-Grid Energisation Master Plan, and the provision of incentivised loans for solar energy technology products. The government is mandated to promote the use of RE by establishing an adequate institutional and planning framework to tackle the development challenges through improved access to RE.

The white paper recognises that the development of energy sources is a challenge and that to overcome the challenges, Namibian upstream policy should aim to attract adequate investment in exploration and production, especially in view of the limited capacity of the local petroleum exploration and production sector.[90]

The Namibian government, in line with its commitment to promoting RE, launched the Namibian Renewable Energy Programme (NAMREP) with the aim of removing any barriers to the delivery of RE.[91] Although the White Paper on Energy Policy expresses its support for the promotion of RE, the policy has failed to visibly provide any financial support to ensure a more level playing field for RE, such as providing incentives, including tax breaks, for all RE-related projects or eliminating subsidies for conventional energy products. The alleged prioritisation of RE in Namibia is questionable as there is little evidence in the white paper that a corresponding legal policy has been formulated to facilitate the transition to an energy mix in which renewable sources such as GH have a substantial share. Rather, it reflects a position in which non-renewable energy, such as fossil fuels, is still indispensable.

[88] D von Oertzen 'Energy and policy in Namibia' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 343.
[89] D von Oertzen 'Energy and policy in Namibia' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 343 345.
[90] Paragraph 3.2.1 of the White Paper on Energy.
[91] United Nations Development Programme. *Namibian Renewable Energy Programme* <https://bit.ly/3Lg2tEd> (accessed 20-4-2023).

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3.3.2 National Integrated Resource Plan

The National Integrated Resource Plan (NIRP) is another national policy intended to 'identify the mix of energy resources that should be required to meet the short- and long-term electricity needs in Namibia'.[92] The aim of the plan is to ensure sustainable electricity generation while integrating renewable energies into the mainstream energy economy. The NIRP refers to selected studies that have highlighted the potential of wind generation and hydro resources as well as high solar radiation levels, thus pointing to the potential of GH development, which should inspire at least some confidence among investors.[93] In addition, the plan sees opportunities for the country to export the generated RE to neighbouring countries that have large populations and are facing power shortages.

The plan offers a certain amount of hope that the Namibian government will be able to realise its vision of creating an enabling environment for RE to meet the country's demand for electricity, with the support of independent power producers.[94] Central to this vision is the procurement method used by independent power producers to procure energy under a competitive bidding process.[95]

Namibia's energy framework allows the identification of opportunities for RE development, thereby helping to stream GH policies into the wider context of the framework. However, the main policy challenge remains funding and insufficient progress being made in reforming the framework to facilitate private investments and public–private partnerships. The NIRP acknowledges the risks associated with foreign investment (if not well managed) and therefore encourages the Namibian government to invest in renewables to avoid such risks.[96] Clearly, the NIRP is playing an important role in shaping the investment atmosphere of RE in Namibia.

[92] Government of the Republic of Namibia *National Integrated Resource Plan* (2016). Windhoek. Ministry of Mines and Energy 5.
[93] National Integrated Resource Plan 6.
[94] D von Oertzen 'Namibia's electricity sector' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 367.
[95] D von Oertzen 'Namibia's electricity sector' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 367.
[96] Government of the Republic of Namibia *National Integrated Resource Plan* (2016). Windhoek. Ministry of Mines and Energy.

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3.3.3 National Renewable Energy Policy, 2017

The National Renewable Energy Policy (NREP)[97] is the policy that guides the Namibian government in the development of the country's RE sector. It is broken down into policy goals, objectives and strategies. The NREP has taken a different approach from that of the White Paper on Energy Policy,[98] which focuses predominantly on fossil fuels. The NREP recognises the need for sustainable consumption of resources and access for all Namibians to 'clean, environmentally sustainable and affordable energy'.[99] Furthermore, its policy objectives are to boost investor confidence in the growth of RE, to create an enabling environment for the development of RE and to enable Namibia's participation in the RE sector.[100]

The policy is, broadly, centred on the uptake of RE sources while considering Namibia's climate mitigation efforts, which are dependent on the future of the country's energy sector.[101] The policy also encourages the transparency of regulatory mechanisms and good governance.[102] Moreover, it provides for procurement mechanisms to be utilised for new generation capacity, which would include new renewable generation capacity, such as GH. The recognised procurement system comprises three categories, namely net metering rules (which apply to electricity supplies generating electricity supplies of less than 500kW), competitive auctions of electricity projects (which have a capacity in excess of 5MW), and RE feed-in tariffs (FITs) (which are for projects with a generation capacity in excess of 500kW but less than 5MW, and include solar and wind, among others).[103] Furthermore, the policy prioritises RE generation projects. An important objective that is relevant to this study is to develop an institutional and regulatory framework to align with the policy.[104]

Although the NREP has promoted the uptake of RE in Namibia, it has failed to achieve a harmonised RE law in Namibia, which, it is submitted in this paper, is due to a lack of interest or effort on the part of the government to address RE issues.

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[97] GRN *National Renewable Energy Policy for the Republic of Namibia* (2017).
[98] 1998.
[99] GRN *National Renewable Energy Policy for the Republic of Namibia* (2017) 12.
[100] NREP, 12.
[101] D von Oertzen 'Energy law and policy in Namibia' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 351.
[102] Renewable Energy Policy, 19.
[103] D von Oertzen 'Energy law and policy in Namibia' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 351–352.
[104] GRN *National Renewable Energy Policy* (2017) 26.

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3.3.4 National Independent Power Producer Policy, 2018

The National Independent Power Producer Policy, 2018[105] is an expression of the government's commitment to broadening private–sector participation in the power sector. The government has recognised the need to streamline independent power producer regimes and open up the market to both local and international investors. This policy outlines the government's commitment to encouraging investment in the power sector of Namibia.[106] The predominant themes in the policy are providing an enabling setting for independent power producer deployment; ensuring financial viability, equitable energy resource usage and sustainable power development; and, most importantly, developing a market framework to promote competition in the supply of electricity in Namibia.[107]

The policy's reform process introduced a horizontal alliance of electricity distributors which are divided into five regional electricity distributors (REDs) that distribute electricity in the five regions. The Electricity Control Board (ECB), which is the industry regulator, is responsible for overseeing the tariff levels that these REDs set to ensure transparency. These structures and initiatives are an indication of Namibia's commitment to ensuring energy security and a stable investment environment.

GH could benefit from both the National Independent Power Producer Policy and the White Paper on Energy Policy, if properly regulated. As regulations should consider the ever-changing circumstances surrounding GH development, they should not be too rigid.

3.3.5 Vision 2030 and the Harambee Prosperity Plan II

Namibia's development plans and strategies are outlined in Vision 2030, which was adopted in 2004.[108] Vision 2030 is a long-term plan aimed at enhancing the general welfare of Namibian communities to a level enjoyed in developed countries.[109] Namibia envisages being 'largely self-sufficient with reliable and competitively priced energy, meeting industry demands, plus some export of energy'.[110] The key long-term objective of Vision 2030 is to ensure that

[105] GRN *National Policy for Independent Power Producers in Namibia* (2018) <https://www.mme.gov.na/files/publications/1b7_NATIONAL_IPP_POLICY_OF_NAMIBIA2018.pdf> (accessed 29-12-2022).
[106] D von Oertzen 'Energy law and policy in Namibia' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 352.
[107] GRN *National Policy for Independent Power Producers in Namibia* (2018) <https://www.mme.gov.na/files/publications/1b7_NATIONAL_IPP_POLICY_OF_NAMIBIA2018.pdf> (accessed 29-12-2022).
[108] GRN *Namibia Vision 2030* (2004).
[109] GRN *Namibia Vision 2030* (2004) 7.
[110] GRN *Namibia Vision 2030* (2004) 33.

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Namibian communities have access to affordable energy.[111] This objective is to be achieved through five years of successive National Development Plans (NDPs),[112] with each comprising intermediate targets geared towards the realisation of Vision 2030.[113]

As Namibia moves closer to the target date of 2030, the need has arisen to harness new energy sources. GH may offer the solution in this regard. Vision 2030 stipulates that the country must create an environment that promotes regional and international peace, security and development cooperation, which are centred mainly on mutual exchange of opportunities and trade. This is an indication that Namibia aims to mobilise regional cooperation and collaborate with other countries in the areas of trade and investment. Regarding GH, Namibia could foster enhanced trade relations and partnerships with other Southern African Development Community (SADC) member countries, such as South Africa which has technical knowledge of RE.

The Harambee Prosperity Plan II[114] is another targeted action plan designed to accelerate the development of Namibia, with clearly set goals for realising prosperity for all. The plan aims to complement the five-year NDPs by fast-tracking development in priority areas. Regarding energy, the plan has the goal of increasing local electricity generation capacity, providing electricity to schools and health facilities, and increasing the electrification rate in the rural areas. When it comes to GH specifically, the plan considers GH to be of strategic importance and key to the attainment of the fourth pillar, namely infrastructure development. Infrastructure development, in turn, is regarded as the facilitator of economic growth, investment and employment creation.

Evidently, the plan has identified GH as an essential form of energy that should be used to deliver on the country's energy-related goals and objectives. However, the ability to provide a sustainable electricity supply to the bulk of the Namibian population, which is underpinned by the relevant infrastructure development, is largely dependent on the existence of adequate GH legislation.

[111] GRN *Namibia Vision 2030* (2004) 87.
[112] GRN *Namibia's Fourth National Development Plan* (2012).
[113] OC Ruppel 'Environmental law in Namibia: An overview' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia – towards making Africa the tree of life (*2022) 33.
[114] GRN *Harambee Prosperity Plan II* (2021).

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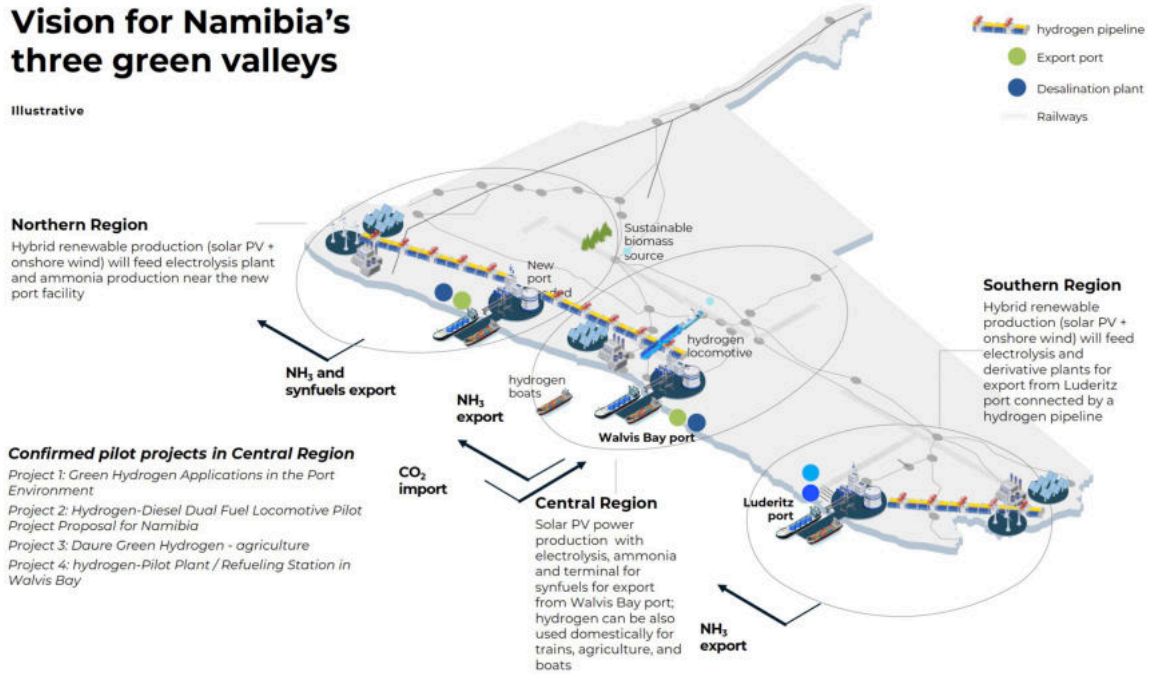
3.4 Namibia Green Hydrogen and Derivatives Strategy, 2022

The Namibia Green Hydrogen and Derivatives Strategy[115] (GH Strategy) was launched in 2022 by the Ministry of Mines and Energy. The GH Strategy describes what GH is and outlines Namibia's potential in the global GH market. The GH Strategy is ambitious: it sets out to create an at-scale green fuels industry in Namibia with three hydrogen valleys producing ammonia, synthetic fuels and hot briquetted iron in the southern region (Kharas), the central region (including Walvis Bay port and the capital, Windhoek) and the northern region (Kunene). The intention is to reach GH production volumes of 1 million to 2 million tons per annum by 2030, 5 million to 7 million tons per annum by 2040, and 10 million to 15 million tons per annum by 2050 (equating to 5–8 per cent of the expected international hydrogen-equivalent trade volume).



Source: Ministry of Mines and Energy, *Namibia Green Hydrogen and Derivatives Strategy* (2022), p. 24.

The GH Strategy also provides insights on how GH production in Namibia will contribute to the country's socio-economic development, namely by boosting gross domestic product (GDP), quality employment and local content manufacturing, which will in turn boost economic development, deliver broad-based prosperity to the country's residents and actively

[115] Ministry of Mines and Energy, *Namibia Green Hydrogen and Derivatives Strategy* (2022). <https://gh2namibia.com/wp-content/uploads/2022/11/Namibia-GH2-Strategy-Rev2.pdf> (accessed 15-3-2023).

Electronic copy available at: https://ssrn.com/abstract=4504076

serve Namibia's green growth goals. Moreover, the GH Strategy reveals the various steps that should be taken on the path towards GH production in Namibia. These steps include the development of a skills development strategy to create an adequate pool of talent, a fit-for-purpose regulatory and institutional framework, a modern delivery support system designed to help investors and project developers navigate Namibia's hydrogen landscape, and shared infrastructure that will enable the integration of hydrogen clusters and encourage lower costs.

A major focus of the GH Strategy is setting the bar for environmental and community-led development. In emphasising Namibia's credentials as a global leader in conservation and nature-based rural development, the GH Strategy mentions that Hyphen Hydrogen Energy was announced at COP26 as the preferred bidder for Namibia's first giga-scale green hydrogen project, involving a 40-year concession to develop a US$9.4-billion green hydrogen project on more than 4,000 km^2 of land. This will launch Namibia's hydrogen industry, with government ensuring that the 'highest environmental standards are adhered to' and that the security and safety of hydrogen facilities are monitored 'to ensure standards are met at all times'. Furthermore, it will ensure 'community engagement and local stakeholder support … including traditional communities'.

Finally, the GH Strategy outlines an action plan to March 2025 which, in terms of the legal aspects underpinning GH production, states that Namibia will set up a '[n]ational strategic and legislative framework' and enact 'the Synthetic Fuels Act as a comprehensive regulatory framework to create an enabling environment with legislation for hydrogen projects, and ensure compatibility with international green fuel, certification, health and safety, and environmental standards'.

3.5 In the pipeline: A Synthetic Fuels Act

As stated above, Namibia intends to establish a fit-for-purpose regulatory and institutional framework to unlock the country's hydrogen potential by drafting and enacting a Synthetic Fuels Act.

According to the GH Strategy, such an Act will 'define standards that conform to international guidelines to reduce operational uncertainty for developers and set quality levels to comply with international export market requirements'. Furthermore, it is envisaged to 'define clear oversight activities, e.g., transparent access to land and permit processes for renewables and hydrogen that guarantee fair treatment to investors and local populations while protecting the environment and ensuring safety'.

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It is suggested that provisions be made in the GH Strategy to advance development with stakeholders from the private and public sectors by, *inter alia*, 'modifying transmission and distribution fees for hydrogen producers to reflect ancillary services provided for the grid or introducing mechanisms to compensate developers for overbuilding renewable energy capacity in a specific area'. In addition, the GH Strategy states that in the case of pilot projects in which the relevant regulation does not feature, the Act will also introduce frameworks.

What has not yet been the subject of research and detailed discussion is the relationship between existing legal instruments (including framework legislation, such as the Environmental Management Act 7 of 2007, and in particular its provisions on environmental assessment, and specialised legislation relating to, for example, water or mining) and the proposed Synthetic Fuels Act. This will need to be carefully analysed and aligned during the drafting process to avoid further fragmentation and thus legal uncertainty.

3.6 National Parks Management Plans

An important issue for consideration in respect of all GH developments is the various national parks management plans that may impact such developments. Namibia has committed itself to environmental conservation through, inter alia, the establishment and management of protected areas. In this regard, 20 national parks have been gazetted as protected areas, covering approximately 17 per cent of the country's surface area. They are:

/Ai-/Ais Hot Springs Game Park	Mangetti National Park
Bwabwata National Park	Mudumu National Park
Daan Viljoen Game Park	Namib-Naukluft Park
Cape Cross Seal Reserve	Naute Game Park
Dorob National Park	Popa Falls Game Park
Etosha National Park	Skeleton Coast Park
Gross-Barmen Hot Springs	South-West Nature Reserve
Hardap Game Park	Tsau //Khaeb (Sperrgebiet) National Park
Khaudum National Park	Von Bach Game Park
Nkasa Rupara National Park	Waterberg Plateau Park

As outlined in Article 95(1) of the Constitution, these parks have been established to conserve biodiversity and ecosystems and to protect some of Namibia's most important habitats and species, which are of national and global significance, for the benefit of current and future

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generations. According to the National GH Strategy, all future projects that are planned in these national parks must – on a case-by-case basis – not only adhere to the Environmental Management Act 7 of 2007 and undergo the relevant environmental assessment, but also be in line with the management plans of the parks in question.

For example, if a GH development were planned in the Tsau //Khaeb (Sperrgebiet) National Park, the Management Plan for Tsau //Khaeb (Sperrgebiet) National Park 2020/2021–2029/2030[116] would have to be carefully analysed and applied before any activity could start as '[a]ll involved with the Park, including MET decision-makers and management staff, personnel of other Ministries and Parastatals, private sector companies and individuals, all contractors, partners, tourists, any entity and individual dealing in any way with the Park, must ensure that any actions and decisions relating to the Park are in strict accordance' with the park's management plan.[117]

The Management Plan for Tsau //Khaeb (Sperrgebiet) National Park 2020/2021–2029/2030 sets out the principles and management objectives, zonation issues, landscape connectivity, management of natural resources, adaptive management, management of historical sites, regional conservation, prospecting and mining, tourism and infrastructure as well as administration and compliance. Furthermore, the national park status of the Tsau //Khaeb National Park 'requires compliance with all relevant legislation administered by the Minister of Environment, Forestry and Tourism, including the Environmental Management Act 7 of 2007'.

To protect and maintain biodiversity, the environmental management plans established in terms of the Environmental Management Act for mining and infrastructure development therefore need to be monitored and enforced. An important section of the Management Plan for Tsau //Khaeb (Sperrgebiet) National Park 2020/2021–2029/2030 relates to environmental impact assessment and management – that is, activities associated with mining and infrastructure development (among others), 'including wind energy generation and transmission may degrade or change vegetation, disturb or alter animal populations, destroy archaeological artefacts and sites, and affect cultural habits and social systems'. In other words, the management plan regards the assessment and subsequent management of

[116] Ministry of Environment, Forestry and Tourism (2020) *Management Plan for Tsau //Khaeb (Sperrgebiet) National Park 2020/2021–2029/2030* <https://www.meft.gov.na/national-parks/management-plan-2-tsau-khaeb-sperrgebiet-national-park-/3280/> (accessed 16-3-2023).
[117] See Foreword by the Minister of Environment and Tourism to the *Management Plan for Tsau //Khaeb (Sperrgebiet) National Park 2020/2021–2029/2030*.

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potential impacts as key to ensuring that the park's resources are utilised in a sustainable manner.

All proposed projects that fall into one of the categories of activities in terms of Section 27 of the Environmental Management Act 7 of 2007 are subject to an environmental impact assessment which requires public participation as a requirement for obtaining an environmental clearance from the Environmental Commissioner. Proponents of any such project in the park and its neighbouring areas must (among other requirements) notify the public of their intentions, comply with all provisions to ensure public participation and, in most cases, draft and submit an environmental management plan.

One of the objectives of the Management Plan for Tsau //Khaeb (Sperrgebiet) National Park 2020/2021–2029/2030 is to keep infrastructure to a minimum. The plan has therefore stipulated that '[n]o new infrastructure is foreseen to be constructed by MEFT in the Park for the duration of this plan, except improvements to access control facilities, viewpoints and picnic sites'.[118]

3.7 Stakeholders in energy production and trade

The major players in energy production and trade in Namibia operate in the areas of governance, regulation, planning and supply, namely the Ministry of Mines and Energy, the Electricity Control Board (ECB), the Namibia Power Corporation and the Renewable Energy and Energy Efficiency Institute. The role of each of these players must be highlighted so as to determine where GH would be best suited to maximise production.

3.7.1 Ministry of Mines and Energy

The Ministry of Mines and Energy is both responsible for and the custodian of policymaking for the energy sector.[119] The Ministry exercises oversight in respect of energy regulators and planning and procurement determinations to identify and address any deficiencies in domestic electricity generation. In addition, the Ministry optimises the use of natural resources related to the energy supply.[120]

[118] Ministry of Environment, Forestry and Tourism (2020) *Management Plan for Tsau //Khaeb (Sperrgebiet) National Park 2020/2021–2029/2030* 140 <https://www.meft.gov.na/national-parks/management-plan-2-tsau-khaeb-sperrgebiet-national-park-/3280/> (accessed 16-3-2023).
[119] D von Oertzen *Namibia's Energy Future: A case for Renewables* (2012) 17.
[120] M Rämä, E Pursiheimo, T, Lindroos & K Koponen *Development of Namibian energy sector* (2013) 67 <https://publications.vtt.fi/julkaisut/muut/2013/VTT-R-07599-13.pdf> (accessed 20-4-2023).

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3.7.2 Electricity Control Board

The Electricity Control Board (ECB) is a statutory body established through the Electricity Act 2 of 2000. The mandate of the ECB is to supervise the control of the electricity supply in Namibia, which includes RE.[121] Moreover, the ECB is responsible for regulating electricity generation, transmission, supply, distribution, import and export in Namibia by setting tariffs and issuing licences.[122] The independence of the ECB is, however, limited by the fact that the Minister of Mines and Energy authorises the granting of licences. The ECB merely makes recommendations after evaluating the licence applications.

3.7.3 Namibia Power Corporation

The Namibia Power Corporation (NamPower) is a state-owned entity responsible for the generation, transmission and supply of electricity to mines, farms, REDs and local authorities where the REDs are not operational.[123]

NamPower is currently the sole buyer of electricity in Namibia, but with the amendments to the Modified Single Buyer Market Model, other players may come on board to procure and supply electricity. With the development of GH, NamPower could therefore lose its exclusivity as the only electricity trader.

3.7.4 Regional electricity distributors

Regional electricity distributors (REDs) are regional utilities that have the status of independent enterprises in their respective regions. They are established in terms of the Companies Act,[124] are regulated by the ECB and managed in line with market-economy principles.

3.8 International and regional instruments

3.8.1 Energy Charter Treaty, 1998

The Energy Charter Treaty, 1998 (ECT) is a multilateral investment agreement that establishes a legal framework to promote long-term cooperation in the energy field.[125] The ECT was established to improve and stabilise the energy sector by enhancing and streamlining long-

[121] Electricity Control Board *Annual report* (2021) 2.
[122] NA Renkhoff 'Namibia towards a conducive regulatory framework in renewable energy law and regulation' in OC Ruppel & K Ruppel-Schlichting (eds*) Environmental law and policy in Namibia* (2016) 233 239.
[123] See <https://www.nampower.com.na/About.aspx> (accessed 20-4-2023).
[124] Act 61 of 1973.
[125] Article 2 of the Energy Charter Treaty (adopted 17 December 1994, entered into force 16 April 1998) 2080 UNTS 100 ('ECT').

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term investment in energy projects.[126] Even though the ECT was primarily designed for the upstream oil, gas and electricity sectors, the text is sufficiently broad to include RE as well.

The main pillars of the treaty relate to the energy trade, the transit of energy,[127] investment promotion and dispute settlement[128] in the energy sector among member states. Although Namibia is not a member of this treaty, it is relevant to this study because of the economic threat that it poses to Africa – particularly insofar as it has the potential to obstruct countries' energy transition. With a view to Namibia implementing a just energy transition, it is undesirable for the country to accede to the treaty.

3.8.2 UN Sustainable Development Goals

The UN 2030 Agenda for Sustainable Development was adopted in 2015.[129] At its core are 17 Sustainable Development Goals (SDGs) which are universal goals aimed at ending poverty while preserving the planet and enhancing the lives of everyone.

SDG 17 is concerned with the provision of clean and affordable energy while SDG 13 is concerned with taking 'urgent action to combat climate change and the impacts of it'.[130] All 17 goals are interconnected and require countries' national legal and regulatory frameworks to have measures in place to facilitate the implementation of the goals. To this end, the existing frameworks must be revisited and new frameworks devised to enable the development and production of GH, with measures put in place that require government to prioritise its commitments under these frameworks, alongside any other frameworks that promote the transition to a green economy. Since GH has a significant role to play in decarbonisation, it is an enabler of the transition to a low-carbon economy using RE sources.

3.8.3 African Union's Agenda 2063

The African Union's (AU) Agenda 2063, adopted in May 2013, has the overarching objective of transforming Africa into a global powerhouse of the future.[131] Agenda 2063 underlines the

[126] E Sussman 'A multilateral energy sector investment treaty: is it time for a call for adoption by all nations?' (2010) *The International Lawyer* FALL 955.
[127] Article 7 of the ECT, 1998.
[128] Part III and V of the ECT, 1998.
[129] Paragraph 1 of the United Nations 2030 Agenda for Sustainable Development (adopted September 2015, entered into force 1 January 2016) A/RES/70/1 ('Agenda 2030').
[130] Paragraph 13 of Agenda 2030.
[131] African Union Commission Agenda 2063 (adopted September 2015) The Africa We Want. Addis Ababa, 2015.

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need for integration as one of the keys to ensuring that African countries attain their goals of inclusive and sustainable growth and development.

Namibia's Department of Energy is in charge of those programmes that are geared towards promoting and implementing energy services. In May 2022,[132] the AU advertised for consultancy services to develop a position on the development of GH in Africa which would ensure that the continent benefits from GH production and trading. SDG 7 dovetails with Agenda 2063's aim to establish measures to sustainably manage the continent's rich biodiversity, forests, land and water sources, and to use adaptive measures to address climate change risks.[133]

3.8.4 African Continental Free Trade Area Agreement

The African Continental Free Trade Area (AfCFTA) Agreement[134] is a treaty that was signed by all AU members except Eritrea. It came into force on 2 April 2019 and has since been ratified by 46 AfCFTA members.[135] The AfCFTA Agreement, through its objectives and operations, is expected to improve intra-continental trade by eliminating duties and other restrictive trade regulations which apply to practically all goods and services traded between the members of the AfCTFA.

The AfCFTA Agreement objectives that are relevant to this study are 'to progressively eliminate tariffs and non-tariff barriers to trade in goods; progressively liberalize trade in services; cooperate on investment, intellectual property rights and competition policy; … and establish a mechanism for the settlement of disputes'.[136] The AfCFTA Agreement could also be leveraged to promote a GH economy by using trade finance to support green industrial policy across the continent.[137] Furthermore, the AfCFTA Agreement could encourage trade in services (both of the human and technical variety) by facilitating the easier movement and

[132] See <https://au.int/en/bids/20220518/consultancy-services-developing-african-position-technical-economic-social-and> (accessed 4-8-2022).
[133] C Manduna & T Fundira *Tackling climate change and propelling a green transition under the African Continental Free Trade Area* (2022) 35.
[134] African Union Agreement Establishing the African Continental Free Trade Area (AfCFTA) (2018).
[135] TRALAC *AfCFTA Ratification Barometer* (2022) (1-3-2022) <https://www.tralac.org/documents/resources/infographics/2605-status-of-afcfta-ratification/file.html> (accessed 29-9-2022).
[136] See Article 4 of the AfCFTA Treaty.
[137] T Hale & K Mbeva 'Towards a green trade strategy for Africa' (13-6-2022) *Blavatnik School of Government Blog University of Oxford* <https://www.bsg.ox.ac.uk/blog/towards-green-trade-strategy-africa> (accessed 20-4-2023).

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mobility of engineering and financial sector professionals and other critical support services.[138] Since Namibia does not have extensive experience in research and development in RE, it should ensure that the legal and regulatory framework makes provision for technical capacity to be sourced and acquired from within the greater free trade area.

The AfCFTA Agreement makes provision for a dispute settlement mechanism, which should help to foster trust among member states. Until now, instances of mistrust have contributed to the underdevelopment of regional energy pools.[139] If this is satisfactorily addressed, it could create an intra-continental market for GH and lay the foundations of an African power pool. The AfCFTA Agreement therefore has the potential to be an enabler in the production, use and trade of GH between Africa and the rest of the world.

3.8.5 Southern African Development Community Treaty

The Southern African Development Community (SADC) Treaty aims to promote regional integration, sustainable economic growth and social development.[140] The SADC Treaty provides for the formulation of subsidiary legal instruments, such as the 1996 SADC Protocol on Energy which provides for a broad legal and policy framework for cooperation on energy matters among SADC member states.

The protocol's key objectives include the harmonisation of national and regional energy policies, strategies and programmes; cooperation in the development of energy strategies to guarantee the security and reliability of the energy supply and the minimisation of costs;[141] and assurances of 'the availability of sufficient, least-cost energy services that will assist in the attainment of economic efficiency and the eradication of poverty, while ensuring the environmentally sustainable use of energy resources'.[142] Relevant to this study is the specific recognition that the protocol gives to 'new and renewable energy'[143] which could be used to motivate support for GH in the region as a form of RE. However, there is a gap in the protocol

[138] G Neuma & N Lwazi Ensuring a just energy transition through hydrogen: how the G20 can support Africa (2022) <https://saiia.org.za/wp-content/uploads/2022/01/Policy-Insights-122-ED-grobbelaar-ngubevana.pdf> (accessed (20-4-2023).
[139] S Devarajan 'Why is regional integration so elusive?' (6-7-2017) *Brookings Institute Blog* (2017) <https://www.brookings.edu/blog/future-development/2017/07/06/why-is-regional-integration-so-elusive/> (accessed 16-3-2023).
[140] Treaty of Southern African Development Community (adopted 17 August 1992, came into force 30 September 1993) 99212-0-178-5.5.
[141] Article 3.1 of the SADC Protocol on Energy,1996.
[142] Article 3.3 of the SADC Protocol on Energy,1996.
[143] UNIDO *SADC Renewable Energy and Energy Efficiency Status Report* (2015) 61.

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as it does not provide for compliance or provide measures to deal with non-enforcement, which may constitute barriers to regional integration efforts.

In addition to the SADC Protocol on Energy, the Southern African Power Pool (SAPP) was created in 1995 following the signing of an MoU by 12 SADC member countries. The formation of the SAPP has prompted cooperation among members in meeting regional energy needs through unique financial and technical partnerships.[144] Despite the SADC region having abundant natural resources, RE has been underutilised. This has been attributed mainly to the absence of a legal and regulatory framework that supports the RE market.[145] Nevertheless, SADC has stressed the need to enhance energy security in the region and therefore supports the development of RE policies. Namibia could use the SADC platform as an anchor to develop a GH economy, despite the shortcomings of the regional framework.

3.9 Promoting sustainable development using renewable energy

Energy is critical for every aspect of the economic and social development of Namibia. Energy (whether in the form of fuel or electricity) must be generated using the natural resources of the country. According to Winkler,[146] depending on how energy is produced, used and transported, it can also contribute to local and global environmental degradation. It is therefore important that Namibia, in promoting investment in and use of RE for the purposes of achieving environmental goals, energy security or other economic reasons, does not lose sight of its vision of sustainable development. Namibia is fully committed to the 2030 Agenda for Sustainable Development, with SDG 7 and SDG 13 laying the foundation for the country's sustainable energy plans going forward. Meanwhile, NDP 5 reflects the country's aspiration to ensure that future generations thrive.[147]

RE is clearly a catalyst for development, with the law playing a significant role in stimulating the use of RE. Before analysing how the law promotes sustainable development, it is important to understand what sustainable development is, how it contributes to the energy sector and what the gaps are in the RE regulatory framework in Namibia. Filling these gaps will involve ensuring that the legal and regulatory framework not only promotes investment

[144] UNIDO *SADC Renewable Energy and Energy Efficiency Status Report* (2015) 26.
[145] T Murombo 'Regulating energy in South Africa: enabling sustainable energy by integrating energy and environmental regulation' (2015) 33(4) *Journal of Energy & Natural Resources Law* 320.
[146] H Winkler *Renewable energy in South Africa: policy options for renewable energy* (2005).
[147] OC Ruppel 'Trade, environment and sustainable development' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 515.

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in RE to satisfy current needs but also improves the lives of the Namibian population in a broad sense, while conserving resources for future generations.[148]

3.9.1 Sustainable development and its role in the renewable energy sector

There is no single, universally accepted definition of sustainable development. Different scholars and organisations have over the years supplied their own definitions, some of which have overlapped. The Brundtland Report of 1987, also known as 'Our Common Future',[149] defines sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. Principle 3 of the Rio Declaration on Environment and Development of 1992 asserts that 'the right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations'.[150] The Declaration defines sustainable development in terms of 27 principles.

Interestingly, the principle of sustainable development is explained in the noteworthy South African case of *Fuel Retailers Association of Southern Africa v DG Environmental Management*.[151] Ngcobo J acknowledged the 'tension between socio-economic development and the need to protect the environment', suggesting that this tension can be resolved within the context of sustainable development which, using the principle of integration, reconciles socio-economic development and environmental protection. Owing to rising environmental consciousness, the concept of sustainable development has been modified to imply development that, in the interests of future generations, considers and preserves the ecological balance by avoiding the depletion of the available natural capital upon which development is essentially based.[152] Sustainable development regulates how socio-economic development takes place. However, it is important to bear in mind that socio-economic development and the environment are interlinked; when socio-development is invoked, it impacts the environment.[153]

[148] Article 95 of the Namibian Constitution.
[149] World Commission on Environment and Development *Our Common Future* (1987) 24.
[150] United Nations Rio Declaration on Environment and Development of 1992.
[151] *Fuel Retailers Association of Southern Africa v DG Environmental Management, Department of Agriculture, Conservation and Environment, Mpumalanga Province and others* 2007 (10) BCLR 1059 (CC).
[152] J Coetzee *Sustainable development in South African environmental law and its relationship with the National Development Plan* LLM Thesis, North-West University (2016) 9.
[153] The Rio Declaration on Environment and Development (1992); UN HRC *Report of the OHCHR on the relationship between climate change and human rights* (2009).

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Generally, it is accepted that the energy sector has a significant effect both on the environment and on socio-economic development. The transitioning of energy production to renewables is necessary for industry, transportation and mining, especially in creating more employment opportunities, which addresses social development objectives. A sustainable energy approach, including the use of GH, could ensure a positive correlation between the livelihoods of the Namibian population and socio-economic growth. Therefore, the adoption of relevant laws, regulations and policies should give effect to sustainable energy. Sustainable development is pertinent to the regulation of RE and consequently has a role to play in GH legislation and governance.

In pursuing sustainable development, states are obliged – when exploring or exploiting natural resources – to manage these resources in a rational, responsible and safe manner while considering the needs of the future.[154] This means that any exploitation of natural resources must be done in a way that will benefit future generations and demonstrates that due consideration has been given to the environment.

The New Delhi Declaration of principles of international law relating to sustainable development of 1972[155] sets out seven legal principles pertaining to sustainable development, which have a certain persuasive force. Even though the New Delhi Declaration has no impact on Namibia, Chile and Germany, it is still relevant to mention it as it helps to clarify the principles of international law that underpin sustainable development. Despite most of the principles are not yet recognised as customary international law, they provide a normative context for framing a sound policy and law on sustainable development.[156] The main principles are 'the principle of the duty of states to ensure sustainable use of natural resources, the principle of equity and eradication of poverty, the principle of common but differentiated responsibilities, the precautionary principle, the principle of public participation and access to information and justice, and the principle of good governance'.[157]

[154] Principle 11 of the 1972 Stockholm Declaration states that: 'The environmental policies of all States should enhance and not adversely affect the present or future development potential of developing countries, nor should they hamper the attainment of better living conditions for all, and appropriate steps should be taken by States and international organisations with a view to reaching agreement on meeting the possible national and international economic consequences resulting from the application of environmental measures.'

[155] International Law Association *New Delhi declaration of principles of international law relating to sustainable development 70th conference report* (2002) 20.

[156] MC Cordonnier-Segger & R Rana S*electing best policies and laws for future generations* (2008) 19.

[157] MC Cordonnier-Segger & R Rana S*electing best policies and laws for future generations* (2008) 20.

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What is the legal basis of sustainable development in Namibia? Although the Namibian Constitution infers that there is an obligation on the national framework covering the exploitation of natural resources to ensure sustainable development, Namibia has also ratified trade agreements that support the concept of sustainable development, such as the agreement establishing the World Trade Organization (WTO).[158] The purpose of this analogy is to highlight why GH production should be of a sustainable nature. However, since no specific definition has been adopted, members may attempt to provide their own definition within the context of the WTO Agreement. If GH is properly implemented, it may, in addition to mitigating climate change, contribute to energy access, social and economic development, and energy security.

3.9.2 Relationship between renewable energy and sustainable development

What are the effects of sustainable development (from a global perspective) on the RE regime in Namibia? The recent policy development in Namibia recognises the interconnectivity between the implementation of RE and the promotion of sustainable development. In this regard, the policy on RE in Namibia suggests facilitating sustainable development through the implementation of RE.[159] In other words, it is evident that Namibia is committed to sustainable development as the laws and policies on RE give effect to the principles of sustainable development.

The UN 2030 Agenda for Sustainable Development was adopted in 2015.[160] The Sustainable Development Goals (SDGs) were formulated as successors to the Millennium Development Goals (MDGs) which mainly addressed people's living conditions, particularly in developing countries. The SDGs set out 'to improve the people's lives and protect the planet for future generations'.[161] SDG 7 is particularly important for this discussion as it focuses specifically on cleaner, modern and affordable energy for all, which is set to be achieved by 2030. Southern Africa is well endowed with natural resources. Hence, with an effective RE framework that is supported by a sustainable approach to the environment, Namibia could use GH energy to greatly improve the quality of life of the people in SADC and the rest of the world. In addition, SDG 13 calls for urgent action to combat climate change and its various impacts. To achieve

[158] The concept of sustainable development appears in the chapeau in the preamble to the Marrakesh Agreement establishing the World Trade Organization in1994.
[159] GRN National Renewable Energy Policy 4.
[160] Paragraph 1 of the United Nations 2030 Agenda for Sustainable Development A/RES/70/1.
[161] United Nations *Transforming our world: The 2030 Agenda for Sustainable Development* (2015).

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this goal, there needs to be a transition from fossil fuels to RE; hence, more sustainable RE streams must be included in the energy mix.

GH can be an effective tool for the decarbonisation of industrial processes and the economy in general, as it reduces GHG emissions and addresses various SDGs, particularly if one considers the positive impact of reduced carbon emissions and RE credits. The blueprint for achieving sustainable development, as envisaged in the SDGs, calls for investment in RE, such as GH. It is important to bear in mind that achieving socio-economic growth comes with negative environmental consequences.[162] This is because natural resources are scarce, economically useful, unevenly distributed across countries and exhaustible.[163] Thus, the RE trade can only be sustainable if the environmental consequences are properly considered and steps are taken to ensure that overexploitation of natural resources does not take place.

The relationship between sustainable development and RE within the context of this study centres on how GH, as a sustainable form of energy, uses green technologies to drive sustainable development. The regulation of sustainable energy, the environment and sustainable development must be synchronised in line with the SDGs and related targets. SDG targets are 'defined as aspirational and global with each government setting its own national targets guided by the global ambition but taking into account national circumstances'.[164] There is an expectation that each government will decide how to best incorporate policies and strategies with a view to meeting the 2030 Agenda.

For Namibia to bring about sustainable development, it needs to implement the targets associated with NDP 5 together with the Harambe Prosperity Plan II, through an enabling framework. Once the legal and regulatory framework has been strengthened, it will allow the government, working through different sectoral regulators, to utilise RE to achieve sustainable development. Indeed, RE is the *sine qua non* for poverty alleviation, sustainable development and economic growth.[165]

RE usage and foreign investment significantly influence economic growth, both in the short term and longer term. As a result, it is expected that investment in the development of GH in

[162] V Spaiser, S Ranganathan, RB Swain & J David 'The sustainable development oxymoron: quantifying and modelling the incompatibility of sustainable development goals' (2017) 24 *International Journal of Sustainable Development World Ecology* 457.
[163] OC Ruppel 'Trade, environment and sustainable development' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2022) 554.
[164] United Nations *The 2030 Agenda for Sustainable Development* 55.
[165] C Flavin & M Hull Aeck 'The potential of renewable energy in meeting the millennial development goals' (2005) *REN21 Network Worldwatch Institute* 9 12.

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Namibia will ensure that the country achieves most of the SDGs. However, this will only happen if there are proper policies and laws governing the development of and investment in GH.

3.9.3 The role of the law

It must be acknowledged that the delivery of energy services depends on various factors, which stem from a robust legal and regulatory framework. Policies and laws are the essential frameworks within which society operates.[166] They are important for the promotion of sustainable development as they create the environment in which energy, as a tool to drive developmental growth, is applied.[167] The law is dynamic and must respond continuously to new social and economic priorities.[168] In other words, it must change as the needs of society change.

To bring about sustainable development, the Namibian government must implement a harmonised and coordinated legal and regulatory framework for RE that promotes the sustainable use of RE. However, the support provided by the existing energy law to conventional energy sources, such as fossil fuels, obscures the potential of RE. Most of Namibia's rural population still lacks access to electricity and water, which are basic services. Therefore, the law may play a role in promoting energy access to both rural and urban populations. A legal framework should also encourage the use of more efficient forms of energy.

The law is used as a tool for coordinating policies, creating a culture of compliance, and ordering change through constitutional and legal reforms and litigation. The rule of law promotes sustainable development by ensuring fair and sustainable management of natural resources.[169] The 2030 Agenda for Sustainable Development defines international trade as 'an engine for inclusive economic growth and poverty reduction, that contributes to the promotion of sustainable development'.[170] Of paramount importance in this regard is the delivery of energy services. International trade law can be an important conduit for the

[166] D Zillman, C Redgwell, Y Omorogbe & L Barrera-Hernandez *Beyond the carbon economy: energy law in transition* (2008) 39.
[167] Y Omorogobe 'Promoting sustainable development through the use of renewable energy: the role of the law' in D Zillman, C Redgwell, Y Omorogbe & L Barrera-Hernandez *Beyond the carbon economy: energy law in transition* (2008) 45.
[168] T Murombo *Law, regulation and promotion of renewable energy in South Africa* PhD Thesis University of Witwatersrand (2016) 304.
[169] Article 1(6) of the Namibian Constitution.
[170] United Nations *The 2030 Agenda for Sustainable Development* (September 2015) A/RES/70/ 63.

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financial resources needed to enhance the state's income-generating capacity, which in turn is a prerequisite for achieving sustainable development. The WTO plays a key role in creating a predictable environment which allows economic activities, such as GH trade, to flourish.

A legal and regulatory framework is of no effect if it is neither implementable nor actively implemented. Therefore, for Namibia to bring about sustainable development and promote GH usage, policies are required that are carefully planned and directed not only at production but also at the whole GH value chain. To improve human, economic, social and environmental conditions both in the short and longer terms, the country's energy supply must be sustainable.[171] For example, the government may opt to use non-tariff measures to ensure sustainable development. It is argued that there is no law dealing specifically with the implementation of GH. However, there are various pieces of legislation that could come into play. It is further argued that the role of law is to create certainty and predictable forms of governance. Consequently, there is a need to harmonise the GH legal and regulatory framework.

A study conducted by the African Development Bank (AfDB) indicated that harmonisation of the legal and institutional framework can provide both substantive benefits and 'improve the perception of the region as a stable and predictable area for investments and finally, harmonisation will underpin the institutional and political process of developing the Community'.[172] Various reports and data from the World Bank (among others) indicate that countries with an effective policy and regulatory framework attract the type of investment that is geared towards improving universal access to energy and ultimately satisfying SDG 7.[173] According to Ruppel,[174] 'the wealth of natural resources in Southern Africa can only promote sustainable economic growth and contribute to poverty alleviation if there is an effective legal framework for environmental protection in place'. It is therefore submitted that Namibia could alleviate poverty and achieve sustainable development by leveraging its natural

[171] MS Salvarli & H Salvarli 'for sustainable development: future trends in renewable energy and enabling technologies' in MA Qubeissi, A El-kharouf & HS Soyhan (eds) *Renewable energy – resources, challenges and applications* (2020) 18.
[172] African Development Bank *Group Study report on harmonisation of petroleum policies, legal, regulatory and institutional frameworks in the East African Community* (2018) 8.
[173] A Polack *Enabling frameworks for sustainable energy transition* (2021) <https://bit.ly/41KUdl9> (accessed 20-4-2023).
[174] OC Ruppel 'Trade, environment and sustainable development' in OC Ruppel & K Ruppel-Schlichting (eds) *Environmental law and policy in Namibia* (2016) 396.

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resources, such as engaging in GH production. However, this is not possible in the absence of a sound legal and regulatory framework.

3.10 Conclusion

Although Namibia's legislative framework for energy makes provision for RE, there is no framework that specifically covers GH. Although the current energy policies reveal the intention to develop RE, these policies have not been adequately translated into legislation that would serve to regulate RE. In theory, the existing laws provide for RE to include GH. However, these laws are not sufficient for the development of GH as they not only fail to define how oversight would be exercised, but also fail to incentivise the development of the sector and to provide the means to fast-track the approval processes. In short, the laws do not encourage an investment-friendly environment. Furthermore, the framework does not cater for hydrogen technology and infrastructure, which would support the whole value chain. For instance, within the existing impact assessment framework, GH projects (unlike solar power projects) carry the risk of hydrogen explosions, pollution of water resources and ecological damage to habitats as a result of land use – especially as the hydrogen infrastructure is currently not subsumed under the existing environmental impact assessments.

Despite the commendable administration by the EMA, the environmental impact assessment process in Namibia does not provide the level of protection that it was intended to. This is mainly attributed to the fact that, due to a lack of awareness, there is relatively little public participation, which makes impact assessments vulnerable to political interests. The environmental impact assessment process is mainly dependent on the consultants who administer it, as they determine the quality of the assessments performed. Assessment outcomes are often compromised in Namibia because the consultants have limited capacity and, moreover, the professional requirements for the environmental officers who perform the assessments are low.

Although environmental impact assessments are currently required, the possibility of granting licences on a larger scale in a designated area should be given careful consideration as it could negatively impact the area, such as the Hyphen project being carried out in a national park, which is a protected area.

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Investment is the key driver of RE. Yet investment can only yield positive benefits where there is a supportive legal and regulatory framework.[175] Environmental law can be an enabler of GH as it regulates access to and use of natural resources, such as water, solar power and minerals. The existing energy law in Namibia regulates conventional energy more than RE and has not necessarily made room for the development of RE technologies. However, policies such as the National Energy Policy, the Harambee Prosperity Plan II and the National Integrated Resource Plan all recognise the importance of different forms of RE and investment in the energy sector. Trade agreements such as those underpinning the AfCFTA, the WTO and SADC could generate investment opportunities and facilitate trade in GH. However, there are gaps in the framework as there is still a degree of uncertainty in terms of the provisions relating to GH.

Although GH has a place in the legal and regulatory framework for RE, there is a need to fast-track the development of a GH framework. This is because some of the existing laws relate to RE in general and have limited application to GH and its technologies, resulting in a lack of traction in the development of GH in Namibia. A holistic legal framework is required that clearly sets out the core policies and laws, the relevant actors, institutions and capacities, and the regulatory tools and processes that GH currently lacks. The framework must position sustainable development as a core value in public policies and legislation.

There are various pieces of legislation relating to RE in Namibia, but they are piecemeal, uncoordinated and often conflicting. Moreover, various entities are responsible for administering and implementing these policies and laws. It is therefore imperative to conduct a review of the existing RE policies and legislation in Namibia and, based on the findings, to craft an integrated law capable of steering a GH sector in the country.

4 Barriers to an effective legal and regulatory framework for green hydrogen development in Namibia

4.1 Introduction

Having examined the RE framework in Namibia in the last section, this section focuses mainly on the challenges that could potentially hinder the incorporation of GH into the RE sector in Namibia. To encourage the development of a GH market, there is an urgent need for the

[175] E Gachenga 'Legal and policy frameworks for climate-friendly energy generation in Africa: energy security for future development' in OC Ruppel & B Althusmann (eds) *Perspectives on energy security and renewable energies in sub-Saharan Africa: practical opportunities and regulatory challenges* (2016) 182.

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current barriers to be addressed so as to unlock the many opportunities that GH offers the country. Notwithstanding the existence of several broad barriers, the key concern here is the legal barriers. However, the other barriers are discussed in the context of how, if the legal framework challenges are addressed, they may be overcome.

From an energy regulation standpoint, the GH value chain is subject to a large number of administrative processes that are necessary for authorisation purposes. Authorisation, in the form of permits or licences, may be complicated by the fact that the various entities in the value chain require their own forms of authorisation. Ideally, a 'one-stop shop' type of licence would be ideal rather than several different licences.

While GH development in Namibia is in its infancy, this study critically analyses the barriers presented by the existing legal and regulatory framework for RE to determine whether to amend it and remove the barriers or to draft a fresh and progressive set of laws and regulations that will regulate the emerging sector effectively. Although some areas need more attention than others, the development of sound GH legislation is crucial as it could fill in the gaps in the existing framework. Furthermore, such legislation will enable the GH sector to gain traction and will dismantle the competitive advantage that fossil fuels have over renewables, which – if left unchecked – could hinder the growth of the GH market. Naidoo opines 'that the lower uncompetitive price of fossil fuels increases the barriers to entry of the energy market'.[176]

4.2 Existing barriers

4.2.1 Technology, infrastructure and technical standards

There is limited availability of RE technologies in Namibia, especially technologies that are required for GH. Despite the presence of natural resources, the costs of procuring the relevant technologies are quite high. According to the AfDB, Namibia has a GDP of US$10.2 billion.[177] This is roughly the investment value of the US$9.4 billion GH project in the Tsau //Khaeb National Park.[178]

[176] K Naidoo *Investment into renewable energy projects in sub-Saharan Africa: a South African perspective* LLM Thesis, University of Pretoria (2019) 64.
[177] African Development Bank *Namibia economic outlook* (2022) https://www.afdb.org/en/documents/southern-africa-economic-outlook-2022 (accessed 15-1-2023).
[178] T Creamer 'Namibia selects preferred bidder for pioneering $9.4bn GH project' (5-11-2021) *Engineering News* <https://www.engineeringnews.co.za/article/namibia-selects-preferred-bidder-for-pioneering-94bn-green-hydrogen-project-2021-11-05/rep_id:4136> (accessed 28-9-2022).

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Furthermore, since GH projects are expected to be located in remote areas, infrastructure is needed, such as transmission lines that are connected to the main grid, pipelines that convey desalinated water, and port facilities that facilitate the export of GH products and ammonia.[179] The development of such infrastructure will impact the local population's rights and livelihoods. There must therefore be an equitable transition to RE, which will also ensure that the local population benefits from the transition.

The Urban and Regional Planning Act 5 of 2018 states that 'spatial planning must be aimed at protecting and respecting Namibia's environment, its cultural and natural heritage, including its biological diversity, for the benefit of present and future generations'.[180] Section 17 of the Communal Land Act 5 of 2002, in turn, prohibits freehold ownership of communal land. This means that the government may not sell, transfer or dispose of any piece of community land or convert it into private land.

At present, the Hyphen GH project is expected to be developed in the Tsau //Khaeb National Park which, by law, is a protected area, as proclaimed under the Nature Conservation Ordinance 1975. The purpose of the Ordinance is to provide for the conservation of the natural resources, as the carrying out of this project in a protected area will fall outside the legal framework. Although GH projects are of great importance to the government, it should be noted that this law has been promulgated to protect the environment. While the Minister may, in terms of Section 82, exempt any person from the provisions of the Ordinance under certain circumstances, it must be done in the best interests of nature conservation. Therefore, undertaking a project that will essentially disturb the protected area would be in conflict with the environmental protection rationale. Such a conflict could only be resolved by arriving at an optimal balance between the right to environmental protection and the right to socio-economic development. It is not enough for socio-economic development to be justified – the justification for such development must be within the exemptions set out in Section 82 of the Ordinance.

In the event of disputes, there is recourse via the courts and via the Ombudsman. The Ombudsman could process the matter through the courts as he has a double duty in terms of Article 91 of the Constitution to protect the rights of communities and to protect the natural resources (or the exploitation thereof).

[179] GRN *Namibia GH Derivatives and Strategy* (2022) 26.
[180] Section 3 of the Urban and Regional Planning Act.

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According to the Africa Competitiveness Report released by the AfDB, the quality of Namibia's roads and ports is in keeping with advanced technologies.[181]However, the upfront capital costs of renewable resources equipment is very high, thus limiting the potential infiltration of renewables into the energy market.[182] Renewable technology is more expensive to purchase than fossil fuel technology, and GH is no exception in this regard. Additionally, grid integration is the biggest problem affecting RE development generally, and this is likely to be the case in Namibia as well.

Sound infrastructure is necessary for the industrial processes taking place in the RE sector. It has limited electricity transmission capabilities and does not have an established gas transport infrastructure, which needs to be built. Moreover, the lack of technical standards, codes and certification, and the weak technology culture constitute technical barriers.[183] Clearly, the government and private sector need to invest in the upskilling of the Namibian people if the country is to move successfully into the GH space.

4.2.2 Technical expertise

Namibia is classified as a non-industrialised country that outsources technology-related undertakings.[184] It is ranked 87th in the world in terms of technological readiness.[185] The lack of technical expertise poses a real challenge to the RE sector in Namibia.[186] To help address this weakness, the government has partnered with the German government to facilitate capacity building in the form of scholarships for individuals pursuing studies in the hydrogen sector.[187] In this regard, the government should ensure that capacity-building efforts and technical assistance are geared towards policy design for policymakers, grid upgrade and expansion, and management techniques and integration strategies for GH.

It is worth mentioning that the AfCFTA may encourage greater skills development and improved cooperation between Namibia and countries such as South Africa in tackling

[181] African Development Bank *Africa competitiveness report* (2017) 17.
[182] M Rämä et al. *Development of Namibian energy sector research report* (2013) 57.
[183] J Painuly 'Barriers to renewable energy penetration: a framework for analysis' (2001) 24 *Renewable Energy* 73 80.
[184] D von Oertzen *Issues, challenges and opportunities to develop GH in Namibia* (2021) 23.
[185] African Development Bank *Africa competitiveness report* (2017) 136.
[186] M Rämä et al. *Development of Namibia energy sector* (2013) 56.
[187] D Matthys 'Namibia Germany form GH partnership' (27-08-2021) *Namibian Economist* <https://economist.com.na/63997/general-news/namibia-germany-form-green-hydrogen-partnership/> (accessed 24-09-2022).

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technical barriers, which will position Namibia more favourably in the value chain and help to expand its local market.

4.2.3 Economic and political factors

There are limited financial instruments and organisations that support GH because, although it is 'in demand', it is technically still developing and therefore requires significant investment. Moreover, the capital costs associated with GH development are high because of the high technology costs involved and the potentially onerous lending conditions imposed by financers. However, Bank Windhoek Namibia is the first commercial bank to pioneer a green bond to support green financing.[188]

Another economic barrier to GH development is the cost of procuring renewable technologies. The most established method at present of producing GH is through electrolysis.[189] This process uses a device known as an electrolyser to split water into hydrogen and oxygen. The cost of renewable technologies is usually higher than that of fossil fuel-related technologies.[190]

The energy sector in Namibia is dominated by fossil fuels and has been for many years. It is cheaper to produce fossil fuels than GH. Moreover, fossil fuels have an advantage in that they are subsidised by the government, putting GH (a renewable form of energy) at a disadvantage. Therefore, there is a need to revisit the issue of fossil fuel subsidies as the comparatively higher cost of GH could lead to poor investments.

The National Energy Fund, which was established in terms of Section 11 of the Petroleum Products and Energy Amendment Act 16 of 2003, provides for, *inter alia*, energy subsidies for fossil fuels to improve the energy supply and quality of services. However, it is encouraging that the government has demonstrated a commitment to RE deployment in the form of the Solar Revolving Fund, a ministerial credit facility that was created to encourage the distribution of RE technologies in off-grid locations. This commitment is a sign that the Namibian government is trying to address the RE financing gap.

[188] United Nations 'Sustainable financing instruments for an inclusive recovery in Namibia' (1-4-2022) *United Nations Story* <https://namibia.un.org/en/176520-sustainable-financing-instruments-inclusive-recovery-namibia> (accessed 29-10-2022).
[189] Florence School of Regulation *GH: Bridging the Energy Transition in Africa and Europe* (2020) 6.
[190] International Energy Agency 'Energy subsidies: tracking the impact of fossil-fuel subsidies' (2020) <https://www.iea.org/topics/energy-subsidies> (accessed 25-9-2022).

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At present, the bulk of the financing for RE projects aimed at combating climate change comes from international organisations. A similar fund could, however, be created to encourage local companies to participate in GH projects. [191]

As investment decisions are influenced by political factors, the Namibian government has demonstrated its political support for GH development by introducing the Harambee Prosperity Plan. It is therefore submitted that, to ensure political stability and effective policy implementation, policymakers must design policies that embrace competition and cooperation, both domestically and internationally, especially where there is a lack of domestic funding. Von Oertzen reveals that in an energy-hungry world, investors have a wide range of investment locations to choose from, some with excellent short and long-time incentives in addition to favourable resource conditions.[192]

The development of the necessary infrastructure to support GH production in Namibia requires considerable financing through investment. However, the weak investment climate for the RE sector in Namibia is predominately due to the absence of supportive legal and regulatory frameworks.[193] Namibia must therefore urgently create a legal and regulatory framework that evokes reasonableness, equity and non-discrimination while taking steps to ensure that in the enforcement of its laws, any negative impact on investment in GH projects is mitigated.

4.2.4 Legal and regulatory factors

Laws and policies are the mechanisms that determine access to the norms and standards, the codes, and the cost and profitability of the electricity sector.[194] New GH projects are, from a policy standpoint, being rolled out in a regulatory vacuum, with the existing RE legal environment providing the broad backdrop. However, GH production cannot be expected to

[191] K Amesho & E Edoun 'Financing renewable energy in Namibia – a fundamental key challenge to the Sustainable Development Goal 7: ensuring access to affordable, reliable, sustainable and modern energy for all' (2019) *Electronic International Journal of Economics and Policy* 446 <http://hdl.handle.net/11159/5125> (accessed 15-1-2023).

[192] D von Oertzen *Namibian national issues report on the key sector of energy with a focus on mitigation* (2009) 15.

[193] E Gachenga 'Legal and policy frameworks for climate-friendly energy generation in Africa: energy security for future development' in OC Ruppel & B Althusmann *Perspectives on energy security and renewable energy in sub-Saharan Africa: practical opportunities and regulatory challenges* (2016) 182.

[194] T Murombo *Law, regulation and promotion of renewable energy in South Africa* PhD Thesis University of Witwatersrand (2016) 133.

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operate in a vacuum alongside fossil fuels, especially considering its high capital costs and technological complexities.[195]

Understandably, investment security can only be assured when there are appropriate enabling laws. However, to secure the necessary funding, investors need a fair measure of legal certainty, which will help to safeguard their investments. Mushelenga confirms that 'having legislation as an authority creates stability in interactions among stakeholders'.[196] This legislation must support the rule of law and there must be no discrimination in the enforcement thereof. Although investors are to some extent protected in Namibia, as Section 28 of Namibia's Investment Act 9 of 2016 allows investors to approach a competent court for relief, they would not enjoy any protection if a matter was referred to international arbitration. Namibia has ratified neither the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards, nor the International Centre for Settlement of Investment Disputes (ICSID). Therefore, none of these rules would apply in Namibia.

The current legal and regulatory framework on RE lacks adequate fiscal instruments to promote or incentivise its use among the general populace. There is therefore a need to explore more fiscal incentives to promote the uptake of RE by investors and to find sources of funding for companies that wish to embark on GH production but lack the resources to do so. The government could assist companies with funding which they could source by introducing a green energy fund for this purpose.[197] In addition, the government could issue government-backed green bonds or guarantees acquired through levy collection for green energy technologies.

For the above mechanisms and solutions to materialise, though, policies and laws are required that pertain to clean RE. The laws and policies that will give effect to GH development must be aligned to the institutional and technological requirements of the sector and must be accompanied by appropriate regulatory instruments to ensure that all participants enjoy access to the market and that the sector falls under the regulator's control. The existing legislation, in turn, should be used as a stepping stone in the development of better-informed and more responsive legislation, which takes into consideration new realities and modern technologies.

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[195] IEA *The Future of Hydrogen* (2019) 141.

[196] P Mushelenga *Investigator–prosecutor collaboration: a framework for improving Namibia's criminal justice process* PhD Thesis University of the Western Cape (2021) 174.

[197] Government may collect from the existing fuel levy additional levies that could be allocated to the green fund or may adopt other measures, such as using a proportion of the collected carbon taxes.

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There is no economic development that is not potentially harmful to the environment. Critically, the lack of an all-encompassing legal and regulatory framework aimed at addressing the various barriers to RE is proving to be costly to Namibia. Consequently, a legal framework premised on sustainable development would assist Namibia in realising its goals of carbon reductions and sustainability.

Since the RE framework is fragmented, addressing the barriers discussed in this section remains a challenge. In view of this, the framework must be reformed so that it recognises the important role that diverse RE sources can play. The changes should centre on a gradual transition towards RE which is sustainable, secure, and socially equitable, and is aligned with Article 95 of the Constitution which sets out the tenets of environmental justice, climate change policy and the Harambee Prosperity Plan II.[198] Pillar 2 of the Harambe Prosperity Plan II is concerned with economic advancement through the use of natural resources and assets. The plan outlines active measures to investigate the feasibility of GH and the steps that must be taken to ensure low-cost RE. In addition, incentives are needed and possibly also state support. Currently, most attention is being given to economic and technological feasibility, while the legal framework that is necessary for the effective implementation of renewable technologies has largely been forgotten.[199]

Legal and policy interventions can create both an efficient framework that delineates rights and obligations and a conducive environment in which industry players and investors can spearhead GH projects. The legal certainty arising out of such interventions can, in turn, boost social confidence and encourage citizens to participate enthusiastically in these developments. The International Energy Agency, while acknowledging the value of these legal and policy interventions to promote RE, asserts that the interventions can only be scaled through more effective and comprehensive policies.[200] Furthermore, the interventions must not expose Namibia to unforeseen risks.

Namibia should take note of a legal barrier that was created through the adoption of certain policies and laws in Spain which ended up posing a legal challenge to the Spanish

[198] Government of the Republic of Namibia *Harambee Prosperity Plan II* (2021) 36.
[199] R Ottinger 'Legal frameworks for energy for sustainable development' in AJ Bradbrook & R Ottinger (eds) *The law of energy for sustainable development* (2012) 103 123.
[200] B Motherway, K Klimovich, V Rozite & E Bayer (2022) 'Accelerating energy efficiency: what governments can do now to deliver energy savings' (17-3-2022) *IEA Commentary* <https://www.iea.org/commentaries/accelerating-energy-efficiency-what-governments-can-do-now-to-deliver-energy-savings> (accessed 16-3-2023).

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government. Spain adopted a policy under its RE programme that afforded investors in solar energy preferential prices through feed-in-tariffs for the electricity fed back into the national grid. This programme motivated investors to invest in the Spanish RE sector. However, Spain experienced an economic downturn and was no longer able to maintain its system of RE investment incentives. In an attempt to mitigate the effects of this regulatory provision, the Spanish government changed the policy retroactively by scaling down on the FITs and repealing the incentive altogether.[201] This amendment changed the legal regime that investors had relied on. In *Cube Infrastructure Fund and others v Spain,*[202] the ICISD ordered Spain to pay damages to the French and Luxembourgian investors, first, for breaching Article 10(1) of the ECT, which mandates the contracting party (Spain) to create a stable, equitable and favourable environment for the investor, and second, for breaching the investors' legitimate expectations.

It is clear from the discussion so far that there are numerous barriers to the deployment of GH. Administrative hurdles, such as a lack of coordination among the different authorities and delays in obtaining the necessary authorisations, are expected to impede the development of GH projects. The policies and laws must therefore take all necessary factors into account and ensure a smooth and less costly approach to obtaining relevant authorisations.

4.2.5 Environmental and social factors

GH development involves the establishment of solar and wind farms, which require vast tracts of land. Despite Namibia being a very large country, which is not densely populated,[203] some of the areas with the requisite amounts of sunlight used to belong to the indigenous people. This, however, is not the focus of this study. Suffice to say that energy projects can have a devastating effect on indigenous people, who may need to be relocated from their traditional lands.

Where people's formal rights to local resources are weak, investment projects may undermine the ability of local groups to access the resources on which they depend. This could take the form of expropriation or otherwise loss of access to resources, without adequate compensation, or environmental degradation, such as the pollution of water and other resources that are essential to the local population. Weak rights to local resources may also

[201] Royal Decree Law 1 of 2012.
[202] *Cube Infrastructure Fund and others v Kingdom of Spain*, ICSID Case No. ARB/15/20.
[203] GRN *GH Strategy* (2022) 32.

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undermine the position of users of local resources in their negotiations with incoming investors and diminish their prospects of benefiting from possible benefit-sharing arrangements.[204]

Socio-economic risks can be mitigated by following due diligence procedures. Furthermore, the places where these projects are to be undertaken are not geared towards accommodating an influx of labourers. Therefore, the government must remain cognisant of people's constitutional rights when formulating the relevant laws.

Another possible barrier to GH production is water scarcity. Namibia is a water-stressed country that relies heavily on underground water as its main source of fresh water.[205] The electrolysis process requires fresh water, which is in short supply. Sea water may be used although this process requires desalination.

For sea water to be used, production plants need to be situated in coastal areas, where there is access to ocean water. Using sea water, though, could be a challenge because if the electrolysis process is used to separate hydrogen molecules from water, the desalination process could add substantially to the cost of production. There may also be a need to pipe desalinated water to those plants that are to be located inland. Another disadvantage of the desalination process is that it impacts marine life in various ways.[206] The desalination process also complicates the legalities surrounding water ownership and usage, exclusive access and abstraction rights, and the recycling of water.

4.2.6 Public awareness

With Namibia having fallen short in terms of sensitising the public to the economic and environmental benefits of RE, most communities remain unaware of GH as an RE carrier. However, sustainable development is only possible if communities are satisfied with the developments in their areas and the regulatory amendments that are required. Key considerations are how projects will benefit the public (if at all) and the environmental impact that the projects will have.

For GH production to gain traction in Namibia, RE (and GH specifically) needs to be incorporated into the curricula of secondary and tertiary educational institutions, which will

[204] L Cotula *Legal empowerment for local resource control: securing local resource rights within foreign investment projects in Africa* (2007) 1.
[205] B Mapani, R Shikangalah & A Mwetulundila 'A review on water security and management under climate change conditions, Windhoek, Namibia' (2022) *Electronic Journal of African Earth Sciences* <https://www.sciencedirect.com/science/article/abs/pii/S1464343X22003016> (accessed 27-1-2023).
[206] D von Oertzen *Issues, challenges and opportunities to develop GH in Namibia* (2021) 18.

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be one way of alerting people to the benefits and opportunities associated with RE for Namibian society. A similar approach was followed in an initiative called the 'Promoting Renewable Energies in Namibia Project' which was established and funded by the German organisation, *Bundesministerium für Wirtschaftliche Zusammenarbeit*, with the aim of raising awareness and educating people (particularly in schools and start-ups in rural areas) about RE and resource efficiency in Namibia.[207]

4.2.7 Skills and skills transfer

GH production may have only a limited positive impact on rural labour and the poor. Highly industrialised production tends to be highly mechanised, thus reducing the need for a sizeable workforce. Furthermore, highly industrialised production on a large scale may, if not properly regulated, lead to expropriation of local communities' land, food insecurity, poor labour market conditions and social tension.

The challenge of a lack of skilled people in Namibia and a possible requirement for investors regarding a transfer of skills could be addressed through a review of the Namibia Investment Promotion Act (Investment Act).[208] The purpose of such a review would be to pave the way for an amendment to the Act whereby foreign investors would be obliged to ensure that projects provided for skills transfer with a view to building capacity among local communities.

To ensure an adequate level of socio-economic participation, the following objectives must be met: guaranteed support given to a certain share of the local workforce, the establishment of a local technology supply chain, direct investments in research and development, and local capacity building.[209] The achievement of these objectives will depend on a favourable investment climate, but the latter could be undermined by Section 12 of the Investment Act which empowers the Minister to approve or reject investors. This provision is undesirable as it places the administrative burden on the Minister, which may cause unnecessary delays.

[207] Worcester Polytechnic Institute *Report on The Development of an Interactive Data Portal for Rural Electrification in Namibia* (2019) 14.
[208] Namibia Investment Promotion Act No. 9 of 2016.
[209] C Heinemann & R Mendelevitch *Sustainable dimensions of imported hydrogen* (2021) <www.oeko.de/fileadmin/oekodoc/WP-imported-hydrogen.pdf> (accessed 20-8-2022).

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4.3 International environmental standards on green hydrogen

The GH Organisation (GH2), a non-profit organisation registered under Swiss law, has developed standards known as the GH Standard (GHS).[210] GH2 accredits and certifies GH producers around the world which have met the GHS and have agreed to be bound by them both in a local and international context. Namibia can either adopt the GH standards in their entirety or use them as a basis for creating their own local standards. Since Namibia intends to become an active player in the GH market, it must ensure that GH or related products produced in the country meet these universally accepted standards, which in turn will create a viable market for them.

Essentially, the GHS are a framework that corporations follow when undertaking GH projects. The GHS create certainty in that they specify minimum standards that developers must follow, but at the same time, they allow sufficient flexibility to accommodate any emerging opportunities and to address any challenges that GH projects present. The GHS provide for certification and accreditation of GH projects to ensure that they comply with international standards. However, these standards are voluntary and have no binding effect, unless they are a requirement under law or have been incorporated into a formal agreement between the parties. One of the drawbacks of the GHS is that, since they are merely a guide and not binding, organisations may choose to adopt the bare minimum of standards and use the GHS name simply to enhance their public image.[211]

GHS make provision for a wide range of measures (environmental, social and governance) to be used, which mostly focus on ensuring environmental protection. These measures include setting a maximum threshold for GHG emissions to support the ultimate transition to zero emissions, tracking the 'overall social, environmental and governance performance of GH production',[212] and requiring 'GH project operators to assess the project's development impact and contribution towards achievement of the SDGs'.[213] GHS are based on seven

[210] GH Organisation *The GH Standard* (2023) <https://gh2.org/sites/default/files/2023-01/GH2_Standard_A5_JAN%202023_1.pdf> (accessed 20-4-2023).
[211] K Latridis & E Kesidou 'What drives substantive versus symbolic implementation of ISO 14001 in a time of economic crisis? Insights from Greek manufacturing companies' (2018) 4 *Electronic Journal of Business Ethics* 859 877 <https://doi.org/10.1007/s10551-016-3019-8> (accessed 24-1-2023).
[212] GH Organisation *The GH Standards* (2023) 6 <https://gh2.org/sites/default/files/2023-01/GH2_Standard_A5_JAN%202023_1.pdf> (accessed 20-4-2023).
[213] Section 1 of the GH Standard.

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principles that should be applied for the purposes of accreditation and certification, including sovereignty and subsidiarity, proportionality, harmonisation and consultation.[214]

Although the GHS are still developing, they are the only GH standards currently available. The significant gap in GH standards has the potential to hinder international trade in hydrogen products and investment in hydrogen production. As the demand for cleaner RE gathers speed, Namibia – in its pursuit of GH production – would therefore need to either comply with the existing GH Standards or build into law its own technical GH standards with which all projects would need to comply.

In addition to the above, the framework must ensure that exports are certified as green, meet applicable international standards, and ensure safe production, transport, storage and usage. Notably, most of the Global North states are compliant with ISO standards on safety and are not willing to compromise on these standards when it comes to the protection of their environment. These ISO standards,[215] published by the International Organization for Standardization, reflect agreements reached by global experts regarding the manner in which certain activities must be carried out, either to reduce accidents in the workplace or to lessen the negative impact on the environment. These are outcomes that developing countries, including Namibia, must aspire to when developing a GH regulatory framework.

4.4 Conclusion

For Namibia to successfully develop a GH sector, it needs to develop a framework that is suitably tailored for GH production. Such a framework must incorporate comprehensive policies and initiatives to address the social, financial, legal and technological barriers that the country currently faces, which act as deterrents to investment. However, monetary investment on its own is not enough. The framework must fill the significant legal and regulatory gaps, while also ensuring that there is transfer of skills to the Namibian people and/or capacity building for the benefit of future generations. Moreover, consideration must be given to the rights and welfare of indigenous people and to the well-being of the environment in the design of the framework.

Some of the main barriers to GH development in Namibia are socially driven, with Namibian society having to change its perception of RE, particularly GH. The broader society needs to understand the benefits of GH production for the country, which can be enhanced through

[214] Section 2.
[215] See <https://www.iso.org/deliverables-all.html> (accessed 16-3-2023).

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information sharing and capacity building. International GH standards, or the GHS, have the power to increase investment and trade in GH. These standards ensure that the production of GH meets certain accreditation and certification requirements, which in turn enhances marketability, boosts consumer confidence and satisfies the market demand, among many other benefits.

Certain barriers to GH development, such as social, investment and legal compliance barriers, could be addressed through the GHS. However, they are merely 'soft law' instruments; thus, Namibia is not bound to comply with them unless they are embedded in the country's law. Having said that, they can act as a useful guide for corporations operating in the RE or GH sector. To give effect to these standards, however, Parliament would need to promulgate the necessary laws to bring into effect the necessary legal framework, supported by appropriate policy mechanisms, that would regulate the whole GH value chain.

5 Comparative study of the legal and regulatory frameworks for green hydrogen in Germany and Chile

This section provides a comparative analysis of the legal and regulatory frameworks for RE as an enabler of GH in Germany and Chile, respectively, from which Namibia can draw lessons.

The purpose of the comparative analysis is to lay the foundation for a conceptual framework against which the Namibian regime can be tested. The comparative study also establishes whether Germany's and Chile's legal and regulatory frameworks can be regarded as successful models that Namibia can by guided by when embarking on the potential reform of its own framework. Germany and Chile were specifically chosen because they both have an advanced GH framework which they have been rapidly updating. The choice of Germany is further justified by the fact that Namibia and Germany have historical ties.

Namibia is classified as an 'upper middle-income country' because of its 'political stability and sound economic management'.[216] Chile is also an upper middle-income country, while Germany is a developed country that is also highly industrialised. Although their legal systems are quite different in that Namibia follows a system of common law and Chile and Germany follow a system of civil law, all three countries are monists. Chile is currently undergoing a process of legal reform, with the Constitution gravitating towards an ecological perspective

[216] *The World Bank in Namibia* (6-10-2022) *World Bank* <https://www.worldbank.org/en/country/namibia/overview> (accessed 24-1-2023).

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and the country taking steps to incorporate the UN SDGs.[217] Meanwhile, Germany has reformed its laws to provide for green energy and sustainable development. Chile and Germany therefore make for interesting comparisons with Namibia.

Scrutinising the two jurisdictions helps to support the argument that developing countries are striving to foster RE not only as a mean to expand their energy portfolios but also to boost economic growth. This study investigates the regulations that are designed to promote the uptake of GH, commencing with Namibia and followed by Chile and Germany. In this regard, it identifies the strengths and weaknesses of the current policies and legislation and formulates recommendations on how policies and legislation can be effectively leveraged to promote investment in GH within the RE sector.

5.1 Introduction

Given the ongoing developments in RE, Namibia's energy sector continues to grow. However, with any legal framework that is designed to regulate a sector, there is room for improvement. The ultimate success of GH production is heavily dependent on the existence of a harmonised legal and regulatory framework that addresses all the barriers discussed in the previous section. In seeking a suitable framework for GH, it is therefore important to examine the experiences of other countries that have already enacted or are planning to enact legislation to this effect.

Chile and Germany have made considerable progress in developing diversified policies and legal and regulatory frameworks dedicated to ensuring the incorporation of GH into the energy mix. Drawing useful lessons from other (especially developed) countries on the development of RE is vital, although developed and developing countries' circumstances differ significantly. The comparative analysis reveals the similarities and differences in the laws and policies regulating RE, and particularly GH. It also highlights the common challenges that Namibia, Chile and Germany face in terms of regulating GH production and usage and offers suggestions on how identified shortcomings may be addressed.

The comparative analysis is intended to guide Namibia in developing a legal and regulatory framework that is inspired by lessons from developed countries, such as Germany, which

[217] Constitutional Convention of Chile *Working document: new Chilean Constitution* (2022) <https://www.chileconvencion.cl/wp-content/uploads/2022/07/Texto-Definitivo-CPR-2022-Tapas.pdf> (accessed 28-8-2022).

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started much earlier with the drafting of frameworks for RE and energy security.[218] The intention is not to provide an extensive analysis of Germany's and Chile's frameworks for GH production. Rather, it is to show broadly how the two countries' legislative policies and frameworks incorporate GH development into the RE landscape.

Owing to the complex nature of RE technologies and their high cost, Namibia's framework must be developed in a way that stimulates investor interest and boosts their confidence and thus their propensity to invest.[219] An enabling legal and regulatory framework, by its very nature, helps to overcome barriers and establish a predictable and stable investment environment, which ensures predictable revenue flows.[220]

5.2 Legal and regulatory framework for green hydrogen in Germany

5.2.1 Background

In Germany, the legal scope of RE, and GH in particular, is informed by the national jurisdiction. The point of departure in the analysis is the ideal of incorporating GH and how the legal system responds to this. Germany's overall RE policy, which is designed to regulate the RE industry, is largely captured in one piece of legislation, the Renewable Energy Sources Act (EEG). Germany is commonly considered to be a global leader in RE policy.[221] As a signatory to the Paris Agreement[222] and an EU member, Germany has pursued an RE route as part of its commitment to addressing the effects of climate change.

Germany has a two-level system of government, comprising the Federal Union (state level) and 16 federal states (national level). The Basic Law (referring to the German Constitution),[223] however, provides for a shared legislative competence at the national and state levels. Article 71 of the German Constitution vests the legislative power of the federal government in the

[218] OC Ruppel & K Ruppel-Schlichting 'Comparative legal aspects of the potential of renewable energies to promote energy security, sustainable development and climate change mitigation: Germany, South Africa and Namibia' in OC Ruppel & B Althusmann (eds) *Perspectives and renewable energy in sub-Saharan Africa on energy security* (2016) 135.
[219] Z Abdmouleh, R Alammari & A Gastl 'Review of policies encouraging renewable energy integration & best practices' (2015) 45 *Electronic Journal of Renewable and Sustainable Energy Reviews* (2015) 249 251. <https://econpapers.repec.org/scripts/redir.pf?u=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%2Farticle%2Fpii%2FS1364032115000453;h=repec:eee:rensus:v:45:y:2015:i:c:p:249-262> (accessed 25-1-2023).
[220] RC van Huyssteen *The regulation of renewable energy in South Africa* LLD Thesis Nelson Mandela University (2022) 222.
[221] IRENA *Renewable energy prospects: Germany* (2015) <https://www.irena.org/Publications/2015/Nov/Renewable-Energy-Prospects-Germany> (accessed 20-4-2023).
[222] The Paris Agreement was adopted on 12 December 2015 at the 21st session of the Conference of the Parties in the United Nations Framework Convention on Climate Change (UNFCCC CoP21) held in Paris in December 2015.
[223] *Grundgesetz* Basic Law for the Federal Republic of Germany, 23 May 1949.

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Senate (*Bundesrat)* and the House of Representatives (*Bundestag*), while Article 70 allows the federal government to legislate on matters in so far as the Constitution does not confer such legislative power to the federation. Legislative power is significant as it means that the federal government has the power to legislate in Germany, which is similar to the power held by the Namibian Parliament.

The duty of the federal government to legislate on RE policies stems from the constitutional obligation to safeguard the environment and be 'mindful of its responsibility towards future generations' and to safeguard the natural resources and 'protect the natural foundations of life and animals'.[224]

Although it is not explicitly stated, the Constitution of Germany provides for the right to sustainable development. This was evident in the German Constitutional Court case of *Neubauer et al. v Germany*[225] where the complainants challenged the German Climate Protection Act, 2019[226] which determined Germany's targets for GHG emissions. The claimants argued that the targets set out in the Act were too low and that they (the claimants) suffered from climate change effects as a result of the German government's failure to commit to its climate protection obligation. The Constitutional Court held that the state was obliged to take the necessary action to protect the climate and had a duty to adopt regulations to reduce GHG emissions. Moreover, the judge stated that Article 20a of the German Constitution 'is a justiciable legal norm that is intended to bind the political process in favour of ecological concerns, also with a view to the future generations that are particularly affected'.[227] Article 20a therefore imposes an obligation on the legislator to adopt environmental law which is consistent with the latest environmental and scientific developments. Indicatively, the court declared the Climate Protection Act partially unconstitutional since it did not protect the people against future infringements or assure them freedom from gradual climate change because it had failed to provide for GHG emission cuts beyond 2030.[228]

[224] *Grundgesetz* Basic Law for the Federal Republic of Germany, 23 May 1949.
[225] BvR 2656/18/1.
[226] Federal Climate Change Act of 2019.
[227] Article 20a *Grundgesetz* Basic Law for the Federal Republic of Germany.
[228] A Buser 'Of carbon budgets, factual uncertainties and intergenerational equity – the German Constitutional Court's climate decision' (2021) 22(8) *German Law Journal* 1409 <https://www.cambridge.org/core/journals/german-law-journal/article/of-carbon-budgets-factual-uncertainties-and-intergenerational-equitythe-german-constitutional-courts-climate-decision/0A37A6A3F150E4BE2AF1CDCE66CE0E24> (accessed 20-4-2023).

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The impact of this decision internationally is two-fold. First, it has given states an intergenerational duty to mitigate climate change in the interest of future generations, without creating intergenerational rights. In instances where there is no legal framework for climate action, this court decision reinforces the legal duty of states to engage in climate action on the basis of their inherent international obligations. Second, the decision recognised the role of the courts in providing guidance in respect of climate policies and the legitimacy of courts in exercising their judicial powers over national legislative powers. This matter set a precedent in terms of how the courts can respond to climate action claims without violating the legislative power of another centre of government. This has advanced climate action recourse at an international level. To pursue the recommendations of the court, Germany would have to review its Climate Protection Act and amend it to meet both its constitutional duty to protect the climate and its Paris Agreement duty to contain the rise in global temperatures.

Energy security challenges and an environmental protection obligation justify urgent attention being given to regulating for a just RE transition in Germany. The continued use of conventional energy could violate, first, Article 2 of the German Constitution which provides for the protection of life and integrity, including the duty to protect the life and health of people from the effects of climate change,[229] and, second, Article 20a of the German Constitution which provides for the protection of the environment (the natural foundation of life and animals) by the state.

In Germany, the main laws covering the field of energy, which are therefore central to GH, are the Renewable Energy Sources Act, 2021 (EEG)[230] and the Energy Industry Act, 2021 (EnWG).[231] Germany lacks a single, comprehensive statute that specifically recognises and regulates GH production.[232] However, Germany's regulators have improved the legal framework for GH by amending different pieces of legislation, such as that regulating

[229] OC Ruppel 'Climate change de facto and de jure: legal and regulatory aspects relevant to Namibia' in OC Ruppel & K Ruppel-Schlichting (eds*) Environmental law and policy in Namibia* (2022) 399 411.
[230] *Erneuerbare-Energien-Gesetz* (EEG).
[231] *Energiewirtschaftsgesetz* (EnWG).
[232] B Hoffmann, A Halbig, J Senders, JV Nysten, O Antoni & T Müller *Auf dem Weg zum Wasserstoffwirtschaftsrecht?* (2021) 54 <https://stiftung-umweltenergierecht.de/wp-content/uploads/2021/07/Stiftung_Umweltenergierecht_Wuerzburger-Studie-zum-Umweltenergierecht_21_Wasserstoffwirtschaftsrecht_2021-07-12-2.pdf> (accessed 24-1-2023).

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hydrogen grids,[233] developing a National Hydrogen Strategy,[234] and implementing other measures to give effect to the development of GH (as discussed in more detail below).

5.2.2 National Hydrogen Strategy

The National Hydrogen Strategy outlines how Germany can reduce GHG using GH. The strategy proposes 38 measures that take into consideration the entire value chain, from production to final hydrogen usage. The strategy sets ambitious targets for hydrogen demand and states that renewable hydrogen should be considered in Germany's long-term future.[235] Generally, the strategy addresses the regulatory barriers to GH and identifies measures that may be utilised to promote the development of a hydrogen market. These include carbon dioxide pricing for fossil fuels, surcharges for GH and exemptions from levies or taxes.[236]

The National Hydrogen Strategy identifies a number of limiting factors, namely a lack of access to finance, a lack of training and necessary skills within the workforce, and a low demand for GH. The strategy provides for extensive support for research,[237] pilot programmes and other studies.[238] According to measure No. 30 in the strategy, a standard such as the confirmation of the origin of electricity from RE sources and GH is important for the development of the hydrogen market. It is provided in measure No. 30 that in order to 'ensure that a market can develop which contributes to the energy transition and to decarbonisation, as well as boosting export opportunities for German and European companies, there is a need for reliable sustainability standards and for a sophisticated quality infrastructure, proof (of origin) for electricity from renewable energy and for green hydrogen and its downstream products.'

5.2.3 Renewable Energy Sources Act

The basis of the RE legal framework in Germany is the Renewable Energy Sources Act (EEG), which was passed on 1 April 2000 and has been amended several times.[239] The overall purpose

[233] Sections 28j–28q of the EnWG.
[234] Federal Republic of Germany *The National Hydrogen Strategy* (2020) see <https://www.bmwk.de/Redaktion/EN/Publikationen/Energie/the-national-hydrogen-strategy.pdf?__blob=publicationFile&v=6> (accessed 20-4-2023).
[235] Federal Republic of Germany *The National Hydrogen Strategy* (2020) 2.
[236] Federal Republic of Germany *The National Hydrogen Strategy* (2020) 17.
[237] A Curry 'Germany faces its future as a pioneer in sustainability and renewable energy' (2019) *Electronic Journal* of *Nature Career* Guide <https://doi.org/10.1038/d41586-019-00916-1> (accessed 22-1-2023).
[238] Federal Republic of Germany *The National Hydrogen Strategy (*2020) 13–14.
[239] The latest version, EEG 2023 provides that renewable energies are to account for 80% of gross electricity consumption in 2030.

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of the EEG is 'to enable the energy supply to develop in a sustainable manner in particular in the interest of mitigating climate change and protecting the environment, to conserve fossil energy resources and to promote the further development of technologies to generate electricity from renewable energy sources'.[240] The Act sets targets as part of its aim, as stipulated in § 1(2), which is to increase the electricity generated from RE sources.

The country's policy schemes in respect of RE have been evolving under the EEG. However, the EEG basically operates these policy schemes, which relate to RE auctions, the feed-in tariff (FIT) of cost coverage and cost sharing. The FIT policy provides the assurance that the local grid operator will purchase the electricity produced by the generator and will guarantee that no entity will prevent producers from connecting to the grid and selling the power generated using RE technology. It can therefore be argued that the FIT policy creates a sort of eco-friendly capitalist market that emphasises the value of the environment and ecosystem. Hence, it ensures that, through human power uptake, there is some sense of environmental consciousness. Considering Namibia's legal and regulatory framework, which is predominantly fossil fuel-based, there may be a need to follow a similar approach, but tailored to meet Namibia's needs.

Another interesting feature of the EEG is that it promotes social development. This is because the system of FITs makes provision for community ownership as it permits meaningful participation by local communities. FITs refer to the payments made to the energy generator for the electricity produced using RE technologies. FITs are designed to encourage the use of RE technologies. Namibia's approach is to a certain extent in line with global developments in this domain, as seen in the implementation of the Modified Single Buyer Market Model which enables independent power producers to supply electricity to providers other than the national utility.[241]

The take-away principle from Germany's energy procurement system is that the system is tailored such that the RE produced benefits the state in two ways: the energy is produced in an environmentally conscious manner and is feasible, yet it also meets socio-economic demands by driving social development and job creation. In the case of Namibia, feeding a certain portion of GH into the national grid would reduce the country's reliance on imported

[240] § 1 of the EEG.
[241] D von Oertzen 'Namibia's electricity sector' in OC Ruppel & K Ruppel-Schlichting (eds*) Environmental law and policy in Namibia* (2022) 359 364.

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electricity from neighbouring countries, such as South Africa, while also expanding Namibia's labour market.[242]

5.2.4 Energy Industry Act, 2021

The Energy Industry Act, 2021 (EnWG)[243] is not confined to RE but rather provides for the establishment of a general framework for an effective and competitive energy market, which is secure, affordable, environmentally compatible and consumer friendly.[244] Among its many roles, the EnWG regulates the operation of the electricity and gas infrastructure networks[245] as well as the tasks of the transmission system operator and distribution system operators. Furthermore, it provides for a safer electricity supply by ensuring that the generation of electricity is free from GHG.

Another approach to promoting RE is through the incorporation of GH under the EnWG with objectives that have been amended and expanded to include the supply of hydrogen[246] and with a broadening of the definition of gas to include hydrogen. § 3(19)(a) of the EnWG defines hydrogen as a gas. However, the definition is limited to the application of hydrogen that is produced from water electrolysis and injected into the gas grid. Hydrogen produced via water electrolysis using electricity predominantly from RE sources is defined as a biogas.[247] Given the adjusted definition of hydrogen, the latter is deemed to be 'energy', within the context of the EnWG only if it is used as a source of energy for the grid and not if it used for other purposes. Importantly, § 3(14) of the Act identifies hydrogen as a type of energy but only in so far as it is used for the grid-bound energy supply.

§ 33 of the Gas Network Access regulation applies in this regard. As for energy storage *via* GH, the amended Act now defines hydrogen storage plants in § 3(39)(b) 'as plants for the storage of hydrogen in ownership of, or in operation by, an energy supply undertaking'. The hydrogen storage plants used by grid operators for their tasks are not included in this definition; consequently, they are not hydrogen storage plants. The definition of natural gas

[242] P Schneider 'GH – a win-win for all?' (9-12-2022) *IPS Journal* <https://www.ips-journal.eu/topics/economy-and ecology/GH-a win-win-for all-6371/> (accessed 22-1-2023).
[243] *Gesetz über die Elektrizitäts- und Gasversorgung – Energiewirtschaftsgesetz* see <https://www.gesetze-im-internet.de/enwg_2005/index.html> (accessed 28-4-2023).
[244] § 1(1) of the Energy Industry Act, 2021.
[245] C Chance 'Focus on hydrogen: Germany implements first pure hydrogen midstream regulation and introduces definition for GH' (06-2021) <https://www.cliffordchance.com/content/dam/cliffordchance/briefings/2021/06/focus-on-hydrogen-germany-implements-first-pure-hydrogen-midstream-regulation.pdf> (accessed 25-1-2023).
[246] § 1 of the Energy Industry Act, 2021.
[247] § 3.

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or energy in relation to GH applies only in so far as it is fed into the grid or used for the grid-bound energy supply.[248] Energy storage facilities are defined as 'facilities consuming electrical energy for electrical, chemical, mechanical or physical intermittent storage and [that] reproduce it as electrical energy or in another form of energy'.[249]

A hydrogen network is defined in the EnWG and classified as a general supply network. This definition has thus given rise to a distinction whereby a pipeline supply is appropriately classified as a hydrogen network. Furthermore, a distinction is made between hydrogen network operators and hydrogen plant operators.[250] Operators are not allowed to build, operate or own facilities for the production, storage or distribution of hydrogen with the intention of preventing cross-subsidisation and discrimination.[251] The rationale for this restriction is to reduce the risk of exploitation by the network operators, which could have an impact on the market. There are, however, exceptions under which electrolysers may be owned.[252] The legislation also allows the option of paying a monetary subsidy to operators of hydrogen networks. The unbundling provisions promote investment in this type of business.

§§ 28j to 28q of the EnWG make provision for a hydrogen-only grid to promote GH through a price relief system. GH that is fed into the grid constitutes biogas[253] and therefore, to some extent, enjoys statutory privileges as it is not subject to mandatory regulations like electricity and natural gas grids.[254]

5.2.5 Climate Change Act, 2021

Germany amended its Climate Change Act by setting out the federal government's aim to reach climate neutrality by 2045 and the binding targets of GHG reductions. These amendments will discourage the use of conventional energy such as coal and consequently promote renewable energy uptake and specifically GH.[255]

[248] LM Ringsgwandl, J Schaffert, N Brücken, R Albus & K Görner 'Current legislative Framework for GH production by electrolysis plants in Germany' (2022) *Electronic Journal of Energies* 1786 <https://doi.org/10.3390/en15051786> (accessed 25-1-2023).
[249] § 3(15)(d) of the Energy Industry Act, 2021.
[250] Energy Industry Act, 2021.
[251] §§ 7 and 8 and 28 of the Energy Industry Act, 2021.
[252] § 11.
[253] § 3.
[254] M Fehling & L Bahmer 'Energy transition in Germany: what role for GH?' *Israel Public Policy Institute* (13-6-2022) <https://www.ippi.org.il/promotion-of-green-hydrogen-in-the-context-of-the-energiewende> (accessed 20-4-2023).
[255] F von Burchard 'Germany' in CMS *Facing the future of hydrogen: an international guide* (2021) 94 104.

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5.2.6 Definition of green hydrogen

The EEG is the central instrument used for the integration of RE into the electricity sector. The overall aim of the EEG is to expand electricity production from renewable sources and to keep the overall cost of energy at a low level.[256] What is relevant to this study is how RE is promoted and the policy instruments that are used to stimulate the RE sector, which could potentially also be used to promote the GH sector.

What is interesting is the recognition that GH receives within the German legal framework. It is therefore important to establish the definition of GH in terms of local legislation as this provides clarity on when green energy is regarded as GH and what distinguishes green energy from other forms of hydrogen. The EEG in § 3 (27a) defines green hydrogen as hydrogen produced electrochemically by consuming electricity from renewable sources, although the hydrogen may also be stored chemically or physically in other energy carriers for storage or transportation purposes. The EEG in § 93 furthermore authorises federal Government to determine the requirements for the production of green hydrogen in order to ensure that only hydrogen that has been produced exclusively with electricity from renewable energies and that is compatible with the goal of sustainable development of energy supply is considered green hydrogen. In this regard, it is provided that only electricity from renewable energy sources that has not benefited from financial support under the EEG may be used for the production of the hydrogen.

On EU level, the European Commission, in February 2023, has proposed detailed rules to define what constitutes renewable hydrogen in the EU, with the adoption of two Delegated Acts[257] required under the Renewable Energy Directive. It presented criteria for when hydrogen is considered green in the EU. The new definition will have a significant impact on the overall EU regulatory framework for hydrogen. This includes regulations on energy infrastructure investments and state aid, among others. The EU Commission's intention is to create legal certainty for investors with clear criteria and a certification system in order to achieve the targets under the European Green Deal and the REPowerEU plan.

[256] § 1(1) of the EEG.

[257] Delegated regulation on Union methodology for RFNBOs <https://energy.ec.europa.eu/publications/delegated-regulation-union-methodology-rfnbos_en> and Delegated regulation for a minimum threshold for GHG savings of recycled carbon fuels and annex, see <https://energy.ec.europa.eu/publications/delegated-regulation-minimum-threshold-ghg-savings-recycled-carbon-fuels-and-annex_en> (both accessed 29-4-2023). The Delegates Acts acquire legal force if the EU Parliament or Council does not object within two months.

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The first Delegated Act contains the criteria for when hydrogen is considered green in the EU. As a general rule, it is provided that hydrogen produced with electrolysers is only considered green hydrogen if it is produced with electricity from renewable sources. Hydrogen producers must therefore prove that the electricity they use comes from renewable sources. The first Delegated Act furthermore specifies how hydrogen producers can demonstrate that the necessary conditions are met. The second Delegated Act sets out the methodology to be used to calculate the lifecycle greenhouse gas savings of renewable fuels of non-biogenic origin. In addition, a minimum threshold is defined: renewable fuels of non-biogenic origin are only eligible for the EU renewable energy target if they achieve greenhouse gas savings of more than 70 percent compared to fossil fuels.

The above definition will be of great importance in the context of the respective national support systems. In Germany, this applies in particular to the Renewable Energy Sources Act and the Federal Immission Control Act. The German Federal Environment Ministry has announced that it will soon implement the Delegated Acts for the promotion of green hydrogen in the transport sector. An amendment to the 37th Federal Immission Control Ordinance is envisaged for this purpose as well as an adaptation of the existing criteria for green hydrogen to the European requirements within the framework of the Renewable Energies Act. The new definition will therefore have a timely impact on the national regulatory framework for hydrogen.

Altogether it can be stated that not defining the concept of GH is detrimental to the production and trade thereof. For instance, to ensure that GH is climate-friendly, Germany has established a standard to certify that hydrogen is green, using a certificate of origin. In Namibia, there is no standard yet. In its proposed legislation, Namibia should therefore look at comprehensively defining the circumstances that would render hydrocarbons ‘green’.

With the above in mind, the inclusion of GH in the definition of natural gas and biogas calls for GH production to be regulated. The EEG provides certainty that for hydrogen to qualify as biogas, it must be produced through electrolysis which uses electricity generated from RE sources. It is submitted that the inclusion of the definition of GH in energy laws amounts to regulatory innovation and helps to ensure the stability of GH in the RE sector.

5.2.7 Financial and regulatory policy mechanisms to support green hydrogen

The EEG was initially promulgated in 2000 to encourage the production of RE, such as electricity, which was initially done through the FIT scheme, priority grid access and the EEG

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surcharge.[258] Over the years, the framework has been amended, with the amendments seeking to promote a substantial increase in renewables generation and usage capacity in Germany.

The EEG has an overarching climate goal of emission neutrality for all electricity that is both generated and consumed in Germany by 2050 and a goal of 80 per cent of electricity consumption to be from renewable electricity generation by 2030.[259] One of the solutions provided is support for GH production. The expansion of GH, however, comes with serious challenges: first, high volumes of electricity are required for the electrolysis process to separate hydrogen from oxygen; and second, electricity in its current form remains very expensive in Germany,[260] although the EEG surcharge has been abolished in July 2022.[261]

The general purpose of the amendments to the RE framework has been to promote RE production by making it cheaper through the introduction of policy instruments such as tax allowances, direct subsidies, sponsored loans, FITs and direct investment in research and development.[262] Since this cost reduction is meant to ramp up the hydrogen market, a transition period has been granted for electrolysers that are commissioned before 1 January 2030.[263]

The issue of whether a surcharge constitutes state aid was raised in the matter of *Federal Republic of Germany v. European Commission.*[264] The court had to decide whether the surcharge applied under German law to promote electricity from RE sources constituted state aid. Germany had implemented a support scheme which guaranteed that the electricity provided by RE generators would be purchased at a tariff set out in terms of the law. The European Commission's position was that such a levy constituted prohibited state aid. The court initially upheld the EU's argument but, on appeal, overturned the decision. The court

[258] European Commission *Mission-oriented R&I policies, in-depth case studies: human brain project (EU): case study report* (2018) 1 27.
[259] § 1(2) EEG 2023.
[260] ACER *High Energy Prices* (2021) 6 <https://acer.europa.eu/en/The_agency/Organisation/Documents/Energy%20Prices_Final.pdf> (accessed 20-4-2023).
[261] See <https://www.bundesregierung.de/breg-de/suche/eeg-umlage-faellt-weg-2011728> (accessed 28-4-2023).
[262] G Bölük & R Kaplan 'Effectiveness of renewable energy incentives on sustainability: evidence from dynamic panel data analysis for the EU countries and Turkey' (2022) 29(18) *Environmental Science and Pollution Research* 26613 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8638798/> (accessed 21-4-2023).
[263] See European Commission 'Commission sets out rules for renewable hydrogen' *European Commission Press Release* (13-2-2023) <https://ec.europa.eu/commission/presscorner/detail/en/ip_23_594> (accessed 21-4-2023).
[264] C-405/16/P 28 March 2019.

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held that for the surcharge to constitute state aid, there must be either a direct or indirect transfer of state resources, which are imputable to the state. This judgment confirmed that states have some leeway to introduce support schemes for the purpose of promoting RE sources.

To effectively implement Germany's RE policies, there is a need for certainty in the relevant legal provisions. Like in Namibia, there are economic and legal barriers to the deployment of GH in Germany. However, unlike in Namibia, where these barriers are predominantly due to the exclusionary effect of the laws that were developed to promote conventional fossil fuels, in Germany these barriers are largely attributable to land scarcity and the climate change effects of RE uptake. Energy security challenges and environmental protection obligations provide the justification for urgently regulating for a just RE transition in Germany.

In terms of § 3 (27a) of the EEG, hydrogen is deemed green if it has been produced electrochemically and the electricity used meets the following criteria, which must be proven: the electricity used must stem from RE sources; a minimum of 80 per cent of the electricity generated must be from renewable power plants located in the German price zone; and the electricity used must not receive any support under the EEG schemes or the Combined Carbon Heat Power Act, 2015.[265]

Generally, the use of the grid places an obligation on final consumers or users to pay a network fee.[266] This is known as the 'user pays principle'. Using the grid either involves taking power from the grid or feeding power into the grid. An exemption from grid charges has been extended to electrolyser plants which take energy from the grid for energy storage purposes. This policy mechanism is intended to attract investments by reducing capital costs.

Namibia can learn from Germany in terms of how to regulate using measures that are flexible and do not create uncertainty in the industry, which may deter investors.

5.2.8 Competent authority

The Federal Network Agency, the Bundesnetzagentur (BNetzA), is the competent authority in charge of Germany's energy sector. It regulates electricity and gas and includes hydrogen if the hydrogen regulated concerns either the gas or electricity markets.[267] The agency is independent of the government and, likewise, carries out its duties independently of the

[265] *Kraft-Wärme-Kopplungsgesetz*.
[266] § 21(1) of the EnWG.
[267] Energy Industry Act, 2021.

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government. The question of independence was interrogated in the matter of *European Commission v. Federal Republic of Germany.*[268] The European Court of Justice (ECJ) adjudicated on whether Germany violated its obligations in terms of EU energy law which provides for independence from the national regulatory authority in the federal government. The ECJ ruled that the power of the federal government 'to issue regulations containing specific and detailed requirements for the decisions of the Federal Network Agency violates the political independence of the national regulatory authorities required by the directives in Article 37 of Directive 2009/72/EC and Article 41 of Directive 2009/73/EC'.[269]

The role of the BNetzA is similar to that of the ECB, which is the competent authority regulating the electricity sector in Namibia. However, it is unclear how GH is to be regulated in Namibia, considering the various areas in which it is currently found. Interestingly, in relation to hydrogen, the BNetzA only has the mandate to certify the unbundling of transmission operators. Therefore, similar to Namibia, the generation of GH plants (electricity plants) is subject to multiple environmental, safety and construction provisions. As a result, there are several layers to the permissions process.

5.2.9 EU framework

Although there is no consolidated framework at the EU level for GH, the EU has made provision under its laws (particularly the EU energy law) for the development of hydrogen schemes. This is evident in the Renewable Energy Directive 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources,[270] in which hydrogen from renewable energy sources plays an important role.

Moreover, Regulation EU 651/2014[271] provides for RE subsidies for GH projects to possibly be exempted if this supports common European interests.[272] To drive GH development, the EU (through the Renewable Energy Directive) has provided for GH to be quality controlled according to EU accepted standards for GH. These standards ensure that the hydrogen is clean by certifying the emissions generated during its production.

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[268] 718/18 16 November 2018.
[269] *European Commission v. Federal Republic of Germany* Case No. 718/18.
[270] See <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001> (accessed 29-4-2023).
[271] See <https://eur-lex.europa.eu/eli/reg/2014/651/oj> (accessed 28-4-2023).
[272] M Fehling 'Energy transition in Germany: what role for "green hydrogen"?' *Israel Public Policy Institute Spotlight* (13-6-2022) <https://www.ippi.org.il/promotion-of-green-hydrogen-in-the-context-of-the-energiewende/> (accessed 21-4-2023).

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In July 2020, the EU Commission published the EU Strategy on Hydrogen to support decarbonisation through hydrogen.[273] Against the backdrop of the European Green Deal, the Commission's New Industrial Strategy for Europe and its recovery plan, the EU Hydrogen Strategy 'sets out a vision of how the EU can turn clean hydrogen into a viable solution to decarbonise different sectors over time, installing at least 6 GW of renewable hydrogen electrolysers in the EU by 2024 and 40 GW of renewable hydrogen electrolysers by 2030.' It furthermore identifies the challenges to overcome, lays out the levers that the EU can mobilise and presents a roadmap of actions for the coming years. The strategy suggests policy action points in five key areas, namely investment support; support production and demand; creating a hydrogen market and infrastructure; research and cooperation and international cooperation. The EU strategy for energy system integration is another important document with regard to hydrogen.

A number of legislative proposals have been put forward that translate the European hydrogen strategy into a European hydrogen policy framework, including proposals to set targets for the uptake of renewable hydrogen in industry and transport by 2030 as well as the hydrogen and decarbonised gas market package,[274] which provides for proposals to support the creation of optimum and dedicated infrastructure for hydrogen and an efficient hydrogen market.

Of particular importance are the two Delegated Acts[275] recently proposed by the European Commission (namely the Delegated Regulation on Union Methodology for Renewable Fuels of Non-biological Origin and the Delegated Regulation for a Minimum Threshold for GHG Savings of Recycled Carbon Fuels).[276] The two sets of provisions are part of a broader EU regulatory framework for hydrogen, which, in addition to the definition of renewable hydrogen, also includes requirements for energy infrastructure investments and state aid rules, as well as legislative requirements for renewable hydrogen in the industry and transport sectors. The provisions aim to ensure that all renewable fuels of non-biological origin are

[273] See <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0301> (accessed 28-4-2023).
[274] See <https://ec.europa.eu/commission/presscorner/detail/en/ip_21_6682> (accessed 28-4-2023).
[275] See section 5.2.6 on the definition of green hydrogen.
[276] Delegated regulation on Union methodology for RFNBOs <https://energy.ec.europa.eu/publications/delegated-regulation-union-methodology-rfnbos_en> and Delegated regulation for a minimum threshold for GHG savings of recycled carbon fuels and annex, see <https://energy.ec.europa.eu/publications/delegated-regulation-minimum-threshold-ghg-savings-recycled-carbon-fuels-and-annex_en> (both accessed 29-4-2023). The Delegates Acts acquire legal force if the EU Parliament or Council does not object within two months.

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produced with electricity that comes from renewable sources. With criteria that are as clear as possible and a certification system, the EU Commission aims to create legal certainty for investors in particular and also achieve the goals of the European Green Deal and the REPowerEU plan.

5.2.10 Conclusion

In reforming the energy regulatory space, the German government has taken significant steps towards creating both a competitive and an investor-friendly regulatory environment. Germany's energy law explicitly defines and categorises GH, thereby affording operators in the sector legal certainty and predictability.

To promote greater use of GH, which had previously not gained much traction due to the high price of electricity, the German government made provision for various financial policy measures, such as exemptions from grid tariffs and the EEG surcharge. Furthermore, Germany introduced a number of policy and legislative instruments, such as the National Hydrogen Strategy (2020) and the European Hydrogen Strategy (2020),[277] which are playing a vital role in shaping the legislation on GH in Germany. Meanwhile, other legislation, such as the Climate Change Act, 2021, was amended to enshrine into law the goal of reducing GHG emissions and to impose legal obligations on parties through set targets. This is likely to accelerate GH production as the use of GH is justified. Moreover, Germany identified the need to regulate the hydrogen grid infrastructure and introduced a reporting obligation on the further development of hydrogen grids. Although there are rules for blending hydrogen for use in natural gas networks, there is currently no regulation for a pure hydrogen grid infrastructure.

While the EEG, EnWG and other pieces of legislation present the conditions under which investments in GH can be made, there is still a legal challenge surrounding the unbundling rules that apply to the gas transport network. The EnWG has not prioritised the introduction of any kind of RE technology but has rather provided general direction in this regard. This, however, is proving to be somewhat problematic for GH development. Thus, without the EEG, RE would not have grown exponentially as an energy source. Although not perfectly designed for GH, the decisive and predictable platform that these frameworks have created for RE have played a significant role in Germany's energy mix. Both the EEG and the EnWG offer investors a reliable and stable legal and financial base for investment purposes.

[277] European Union *European Hydrogen Strategy* (2020).

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5.3 Legal and regulatory framework for green hydrogen in Chile

5.3.1 Background

In November 2020, the Chilean government published the National GH Strategy[278] with the goal of becoming the world's cheapest GH producer and leading exporter by 2030. It is noteworthy that in 2018, Chile was ranked as one of the most attractive emerging markets for RE investment.[279] This Chilean success story is largely attributable to an effective RE framework, with the deployment of GH likely to be a success as well. Given its good track record, Chile is an ideal choice for the comparative analysis, particularly as both Chile and Namibia belong to the 'Global South' and hence face similar impediments to their development plans and prospects.[280]

Chile's renewables story started in the early 1990s when the country was faced with an energy crisis prompted by heightened demand for electricity in the face of a rapidly growing economy. The Chilean government, acknowledging its international environmental obligations and goals, recognised the role that RE would play in ensuring energy security in the country and realising its broader goals.[281] Chile is one of the first countries to have successfully incorporated RE into its energy mix without the help of fiscal incentives.[282] The government has used different policy schemes to create a stable framework that has attracted investors and in the process mobilised the deployment of RE. These schemes and their supporting legislation are discussed in detail below. Chile's commitment under the Paris Agreement has been another source of motivation for the government to pursue its climate change targets through the uptake of RE.

Chile's success on the RE front is the result of sound policies, which have stimulated investment, and a clear commitment to clean energy. These policies were not an overnight discovery; they were formulated over a number of years and were steered by the Chilean government's goal of ensuring energy security and sustainability, while also taking into account existing and potential barriers to such outcomes.

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[278] Republic of Chile *National Green Energy Strategy* (2020).
[279] M Allian & A Madariaga 'Understanding policy change through bricolage: the case of Chile's Renewable Energy Policy' (6-10-2019) <https://doi.org/10.1111/gove.12453 > (accessed 28-1-2023).
[280] K Naidoo *Investment into renewable energy projects in sub-Saharan Africa: a South African legal perspective* Mini Dissertation University of Pretoria (2019) 67.
[281] S Nasirov, C Silva & CA Agostini 'Investors' perspectives on barriers to the deployment of renewable energy sources in Chile' (2015) 8(5) *Energies* 3794.
[282] Y Simsek, A Lorca, T Urmee, PA Bahri & R Escobar 'Review and assessment of energy policy developments in Chile' (2019) *Energy Policy* 87 97.

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The Energy Roadmap 2050 is the cornerstone of the deployment of RE into the energy mix in Chile. It was later followed by the National Energy Policy 2050 (NEP 2050),[283] which sets out Chile's RE vision and the specific objectives and government measures for achieving that vision. The policy also lists mitigation goals in the energy sector and outlines how the implementation of these goals are to be transparently monitored. One of the goals of the NEP 2050 is to set targets to 'provide 60 percent share of renewable power and at least 70 percent by 2050'.[284] The NEP 2050 also explains the relationship between energy, sustainable development and the environment, acknowledging that competitive pricing within the energy sector is essential for sustainable development.[285]

GH in Chile is currently used in the refining, food, glass and power industries, among others, as a generator coolant and in thermal and thermochemical treatments.[286] As is the case in Namibia and Germany, Chile does not have a specific legislative framework that regulates GH production. However, the existing general RE legal and regulatory framework supports the adoption and utilisation of clean energy. There are numerous pieces of legislation in Chile within the RE space that are applied in different contexts and, in one way or another, refer to RE. It is evident that substantial changes have been made in support of clean energy as the Chilean government has amended their legislation in line with the SDGs, such as SDG 7 (clean energy) and SDG 13 (climate action). A report by Centro de Energía UC[287] identified the need for modern regulation that guarantees the safety of people, infrastructure and places when new hydrogen projects are developed and also speeds up the permit process.

5.3.2 National Green Hydrogen Strategy

Chile, like Namibia, has an ambitious goal to become one of the world's leading producers and exporters of GH. The National Green Hydrogen Strategy (Chilean Strategy)[288] sets targets for Chile to reach 5GW of electrolysis capacity by the year 2025 and to produce the world's cheapest GH by 2030, while making Chile one of the top three exporters of GH fuel by 2040. Furthermore, the Chilean Strategy acknowledges the instrumental role of the private sector

[283] Republic of Chile *Chile National Energy Policy 2050* (2015).
[284] International Energy Agency *Energy policies beyond IEA countries: Chile* (2018) 106.
[285] International Energy Agency *Energy policies beyond IEA countries: Chile* (2018) 33.
[286] CMS Hydrogen Law, Regulations & Strategy in Chile.
[287] Centro de Energía UC *Proposición estratégica regulatoria del hidrógeno para Chile* (2020) <https://energia.gob.cl/sites/default/files/proposicion_de_estrategia_regulatoria_del_hidrogeno_para_chile.pdf> (accessed 16-03-2023).
[288] Republic of Chile National GH Strategy (2020).

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in the development of GH. It also identifies price (due to high electricity costs) as a possible barrier to the proposed massive increase in production, which makes GH very expensive to produce. Challenges associated with the development of human capital and the creation of viable markets are the other identified barriers.

The Chilean Strategy provides that the Ministry of Energy, Division for Fuels and New Energy Carriers and the National Council of Green Hydrogen will 'be responsible for monitoring this Strategy, coordinating the execution of its action plan, and carrying out an update process every 3 years.'[289] The strategy commits the country to bridging 'of regulatory and standards gaps throughout the hydrogen value chain to ensure safety and give certainty to investors' while reviewing 'natural gas regulation and infrastructure to promote the introduction of green hydrogen quotas.'[290]

5.3.3 Transmission Law (Law 20.936) and National Electricity System

Law 20.936, commonly known as the Transmission Law, was promulgated in 2016 with the aim of encouraging RE generation. To encourage RE production, the necessary transmission infrastructure needed to be developed. To this end, the Chilean government enacted this law. The Transmission Law has enhanced and expanded the role of the Chilean government in the energy system and brought into effect a new system, the National Electricity System, which has two sources of electricity generation, namely the *Sistema Interconectado del Norte Grande* (SING), which predominantly serves the industry, and the *Sistema Interconectado Central* (SIC),[291] which serves the whole Chilean population.

Previously, Chile's electricity system was exclusively in the hands of the generators. However, the diversification of the energy system into two segments was deemed necessary for Chile to meet is energy security goals. The Transmission Law has brought profound changes to Chile's transmission network. Notably, the costs of transmission are not borne by the final consumers whereas with the previous system, both generators and consumers were responsible for these costs.[292] This arrangement, however, is foreign to Namibia as the

[289] National GH Strategy (2020).
[290] National GH Strategy (2020).
[291] K Naidoo *Investment into renewable energy projects in sub-Saharan Africa: a South African legal perspective* Mini Dissertation University of Pretoria (2019) 72.
[292] DW Casimis & RP Odeh *Non-conventional renewable energies in the Chilean electricity market* (2018) 35 <https://acera.cl/wp-content/uploads/2019/08/2018-Las-ERNC-en-el-Sistema-Eléctrico-Chileno-inglés.pdf> (accessed 21-4-2023).

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country's electricity system is entirely state controlled, with some participation by the private sector.

5.3.4 Non-Conventional Renewable Energy Law (Law 20.257)

When the Non-Conventional Renewable Energy Law was enacted in 2008, it set an incremental target of RE generation which was initially set for 2025. The law established a mandatory RE generation quota of 10 per cent and defined renewable sources in terms of non-conventional renewable energy (NCRE): biomass, hydropower with a capacity of less than 20MW, geothermal, solar, wind, marine energy and other means of generation, as determined by Chile's National Energy Commission (CNE). This NCRE Law was based on Chile's Policy on Renewable Energy with the aim of promoting the generation of electricity from RE, thereby differentiating it from conventional sources of energy in the energy mix. By contrast, Namibia still lacks a comprehensive law that promotes RE; references to RE are scattered across various provisions in Namibia's different energy laws.

The NCRE Law incorporates a quota obligation policy instrument, which greatly assists Chile in meeting its RE targets. In fact, this regulatory measure is regarded as the key to Chile's RE success as it has been effective in ensuring electricity generation from RE.[293] The quota system provides the 'electricity generators with a capacity of more than 200MW to certify that the percentage of the electricity they are selling is from a renewable energy source'.[294] This duty makes provision for penalties to be imposed on generation companies that have failed to meet their quota obligations. In addition to the quota system, there is a direct economic incentive that includes subsidies for pre-studies and implementation of projects as well as funding for research and development.

The amendments to the law have drastically opened up the energy market in Chile and created a channel for investment in new RE technologies. This can provide the basis for GH production as a source of electricity.

5.3.5 Auction system policy framework

Chile promotes an auction system policy framework, thereby enhancing competition in the electricity sector. Instead of generators having a purchase price set by the regulator, it applies

[293] International Energy Agency *Energy policies beyond IEA countries: Chile* (2018) 147.
[294] F Bahamondez 'The energy transition and renewable energy in Chile: Top points for foreign investors' (7-10-2020); *Dlapiper* <https://www.dlapiper.com/en/spain/insights/publications/2020/10/energy-transition-and-renewables-in-chile-points-for-foreign-investors/> (accessed 24-1-2023).

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the liberalised auction policy where the government specifies the volumes demanded and the bidders (generators) respond with price offers. This type of system encourages competitive pricing and provides a degree of certainty where RE is concerned due to the contractual obligations arising between the government and the distributors. Independent power producers normally enter into long-term (typically 20-year) power purchase agreements with the Chilean government.[295]

5.3.6 Net Billing Law (Law 20.517 of 2014)

The Net Billing Law is another piece of legislation relating to RE. This law provides for net metering as a regulatory instrument to promote RE. In terms of the law, 'an ordinary electricity consumer may produce their own electricity and sell their surplus back to the grid through the electricity distributor'.[296] The law also provides for the regulation of pricing for this form of energy. The duty to regulate pricing is, however, assigned to the CNE.

Simply put, this law encourages consumers to produce their own electricity derived from RE, with the regulation extending an exemption of grid access fees to consumers who generate under 9MW of electricity.[297]

5.3.7 Energy Efficiency Law (Law 21.305 of 2021)

The Energy Efficiency Law was drafted with the aim of making rational and efficient use of resources, such as through the decarbonisation of the transport system. The law establishes eight thematic areas, including efficiency standards for vehicles, energy management in the public sector and hydrogen regulation. The law can serve as a basis for promoting GH as it addresses issues such as achieving zero emissions from vehicles by giving vehicles three times the energy efficiency credits of traditional vehicles (see Article 7). This then encourages zero-emission vehicle (ZEV) adoption and helps to reach the corporate average fuel economy targets.[298] The Energy Efficiency Law treats hydrogen as an energy source, meaning that hydrogen is now regulated by the Minister of Energy. In addition, the law includes tax

[295] International Energy Agency *Energy policies beyond IEA countries: Chile* (2018) 148.
[296] International Energy Agency *Energy policies beyond IEA countries: Chile* (2018) 95.
[297] Y Simsek, A Lorca, T Urmee, PA Bahri & R Escobar 'Review and assessment of energy policy developments in Chile' (2019) *Energy Policy* 87 95.
[298] These targets are defined as the distance in kilometres travelled per litre of gasoline equivalent. See S Pettigrew *Fuel economy standards and zero-emission vehicle targets in Chile* (2022) <https://theicct.org/wp-content/uploads/2022/08/lat-am-lvs-hvs-chile-EN-aug22.pdf> (accessed 18-4-2023).

Electronic copy available at: https://ssrn.com/abstract=4504076

incentives for ZEVs and provides for the interoperability of recharging systems for electric vehicles.

The challenges impeding the successful implementation of a hydrogen project in Chile include the absence of a regulatory framework governing the production and usage of GH. As the gaps and legal uncertainty erode the appeal and potentially lucrative nature of the sector, they must be addressed, especially if the economy is to flourish.[299] Other challenges relate to inadequate financial support,[300] research and education.

5.3.8 Competent authority

The National Energy Commission (CNE) is a technical body established in terms of Decree Law 2224 of 1978. It is responsible for setting and monitoring the prices, tariffs and technical standards to which companies in the energy value chain (production, generation, transportation and distribution) must adhere, and advising the Chilean government on energy-related matters.[301]

5.3.9 Green hydrogen definition

Hydrogen was previously classified as a dangerous substance under *Regulation on Classification, Labelling, and Notification of Hazardous Chemicals and Mixtures,* as it belongs to the class of flammable gases in terms of Supreme Decree No. 43 of 2015. However, this has changed and GH is now classified as a fuel and not a hazardous substance.[302] Decree Law 2.224 grants Chile's Ministry of Mines and Energy regulatory powers in respect of the hydrogen industry.

Since GH is now defined as a fuel, certain fuel-related measures also apply to GH. Furthermore, standards apply to GH, such as those relating to the safety and marketing of fuel. Namibia is looking to take a similar route and classify GH as a synthetic fuel.

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[299] See CMS 'Hydrogen law, regulations & strategy in Chile' CMS Expert guide to hydrogen energy law and regulation – Facing the future of hydrogen <https://cms.law/en/int/expert-guides/cms-expert-guide-to-hydrogen/chile> (accessed 21-4-2023).

[300] According to a 2020 study by the *Deutsche Gesellschaft für Internationale Zusammenarbeit* and 4E Chilean Renewable Energy Program and Electric Efficiency, there are finance options available for energy projects in Chile, see <https://energia.gob.cl/sites/default/files/opciones_de_financiamiento_climatico_para_proyectos_innovadores_en_el_sector_energetico_en_chile.pdf> (accessed 16-3-2023).

[301] DW Casimis & RP Odeh *Non-conventional renewable energies in the Chilean electricity market* (2018) 185 <https://acera.cl/wp-content/uploads/2019/08/2018-Las-ERNC-en-el-Sistema-Eléctrico-Chileno-inglés.pdf> (accessed 21-4-2023).

[302] Supreme Decree No. 59 of 2019.

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5.3.10 Financial and regulatory policy mechanisms to support green hydrogen

It is noteworthy that the Chilean government, as part of its efforts to improve the uptake of RE in the country's energy mix, uses policy schemes that cover RE quota obligations, targets, auctions, certification systems, grid access and net metering, among others.[303] It is submitted that the Chilean approach – while not the most fashionable – has successfully encapsulated some not-so-popular policy instruments across several pieces of legislation.

The descriptions of the various laws discussed above show how Chile has used these policy instruments to create a stable framework that has attracted investors and boosted the deployment of RE. Moreover, the numerous reforms undertaken have increased support for RE in Chile, with the set targets in terms of the Energy Policy 2050 appearing to have accelerated this uptake. Relevant to GH is the regulatory policy mechanisms used to deploy RE into the country's energy mix and how they may be tailored to drive such deployment.

Chile's National Green Hydrogen Strategy incorporates some policy measures that the country may use to accelerate the deployment of GH, such as boosting research and development, providing government financial support for pilot projects (which is contrary to the mechanism that Chile initially adopted for RE in the electricity sector) and creating room for investors to invest in GH projects. Chile's Economic Development Agency, tasked with promoting GH in the country, has embarked on a process of providing both direct financial support and grants for research and development.[304] Furthermore, Chile aims (in the first wave) to incentivise domestic production through the adoption of policy measures, such as replacing 'imported ammonia and grey hydrogen that is locally used with GH specifically for heavy and long distance transportation'.[305]

At present, the only financial or regulatory incentive available to promote GH in Chile is financial aid from the government. However, the government is proposing offering the following measures in the proposed new legislation: tax benefits for the synthetic fuel industry (for instance) where tax relief is expected to be extended to hydrogen-powered vehicles;

[303] Y Simsek, A Lorca, T Urmee, PA Bahri & R Escobar 'Review and assessment of energy policy developments in Chile' (2019) *Energy Policy* 87 95.
[304] ML Ossa Daza, J Kamine, M Vitorla & J Perez-Marchant *Chile aims to win GH Race* (2021) <https://www.willkie.com/-/media/files/publications/2021/02/chile-aims-to-win-green-hydrogen-race.pdf> (accessed 16-3-2023).
[305] B Cortés Leiss 'Green hydrogen and Chile's Energy Transition' (23-4-2021) *Baker Institute for Public Policy* <https://doi.org/10.25613/ZDEG-WA55> (accessed 16-03-2023).

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(possibly) a GH tax holiday; and an increase in the carbon tax as a way of deterring the use of conventional types of energy.[306]

As indicated earlier, Chile has the experience of developing a sound legal and regulatory framework and successfully implementing such a framework for the purposes of regulating and promoting industries that require heavy investment. In the absence of an integrated regulatory approach to the hydrogen sector, various pieces of legislation end up applying – whose efficacy is likely to vary, depending on the circumstances.

5.4 Conclusion

This section provided a comparative analysis of the regulatory frameworks for RE in Germany and Chile respectively which shed light on how the two countries intend to intensify the uptake of GH. The analysis found that energy is an enabler of economic and social development and that the increased uptake of RE, and GH in particular, is driven by countries' climate mitigation commitments and socio-economic upliftment priorities and strategies.

In Namibia, RE uptake is driven by socio-economic development factors and not necessarily the quest for environmental sustainability, although Namibia must take the latter into account in the development of a legal and regulatory framework for GH. The Namibian government must recognise that it has a constitutional duty to address the adverse effects of climate change which have the potential to cause immense environmental distress.

This section established that arriving at a definition of GH lends some certainty to and strengthens the regulatory framework, which in turn helps to stimulate investment in the RE (and GH) sector. The analysis therefore revealed how crucial it is to look at GH strategies overall and the value of developing concise policies to shape the legal framework. Legislation must be passed to give effect to these policies. Although Chile's RE legislation is scattered, unlike Germany's, which is streamlined and harmonised, the assorted pieces of legislation relating to GH in Chile do actually speak to each other and are practical from an implementation perspective. Another key lesson emerging from the analysis is the importance of constantly reviewing policies and legislation to ensure their relevance in the face of new realities. The law is not, and cannot be, static.

[306] ML Ossa Daza, J Kamine, M Vitorla & J Perez-Marchant *Chile aims to win GH Race* (2021) 5 <https://www.willkie.com/-/media/files/publications/2021/02/chile-aims-to-win-green-hydrogen-race.pdf> (accessed 16-3-2023).

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In seeking a harmonised regulatory framework for GH, Namibia could follow a similar approach to that of Germany or, alternatively, emulate Chile in its use of legislative policy instruments to embed into law appropriate GH standards relating to safety and/or production. Although it is not advisable for Namibia to blindly copy another country, the review of Germany's and Chile's legal and regulatory frameworks for GH production has highlighted that amending the current RE framework to accommodate GH is the best approach pursued so far. However, the ultimate success of a GH strategy will depend on there being a well-informed and workable framework that clearly depicts all the links in the value chain, from production through to final consumption.

This section also indicated that the most significant difference between the three countries' frameworks is that Germany and Chile have gone further than Namibia in terms of incorporating RE into their energy mix. Having said that, Germany, Chile and Namibia are to a certain extent in the same predicament as they lack an overarching piece of legislation that governs GH. They also express similar sentiments in their national hydrogen strategies regarding the need for sound GH policies and laws.

The analysis highlighted the importance of encouraging RE generation and the implications of the costs of such generation for GH production. Because of its geographical location, Namibia is already well positioned to embark on GH production. Its newly launched GH Strategy and NIRP provide ample scope for the design of an effective framework for the generation of RE. Although Namibia's GH Strategy currently centres on production for export purposes, the government should encourage more players to produce GH (which can be fed into the grid) for local consumption, among other reasons.

Considering that GH production in Namibia is still in its infancy, developing a local market could prove challenging. However, with proper legislative benchmarking and government cooperation and support, it could in time become a reality. The key question remains: how should Namibia go about expediting GH production and trade?

6 Lessons for Namibia and recommendations on the way forward

This section provides a summary of the findings from this study as well as key recommendations for the establishment of a legal and regulatory framework for GH development that will attract investment and contribute to sustainable development in Namibia.

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6.1 Introduction

GH is a clean energy commodity that is expected to help facilitate the global transition towards sustainable energy usage and mitigate the effects of climate change, which is a product of growing economies. It is in this context that GH has become appealing as an energy solution. The primary aim of this study was to determine whether or not Namibia has an adequate regulatory framework to support GH production in the country. To this end, it was necessary to examine Namibia's current RE framework to determine how GH would fit into the energy mix.

Because of the established relationship between energy, the environment, and social and economic development, GH has the potential to promote sustainable development in Namibia. In this regard, the uptake of GH could improve the lives and livelihoods of the Namibian people, while also contributing to the country's international energy security and climate action obligations. However, this can only be achieved if there are well-informed and well-drafted laws that have also been effectively implemented. It should be stressed that the uptake of GH in Namibia must support the constitutional mandate of 'maintenance of the ecosystems, essential ecological processes and biological diversity of Namibia and utilisation of living natural resources on a sustainable basis for the benefit of Namibians, both present and future'.[307] In other words, the country has a duty to enact appropriate laws within the spirit of the principles expressed in Article 95(1) of the Constitution.

The examination of the current framework for RE in Namibia yielded some important findings. It can be argued that the existing RE framework is not optimal for the initiation and rollout of GH projects. Indeed, such projects could be hindered or at least slowed down by what is clearly a fragmented and complex legal and regulatory framework. In short, the current framework does not make adequate provision for GH and the technologies associated with it.

The RE framework does not adequately address the logistics surrounding the inclusion of RE in the energy mix of Namibia, as the policies are still focused on the promotion of fossil fuels, with insignificant progress having been made towards the development of an RE sector. As such, the uncertainty surrounding the deployment of GH would create doubt among investors and local communities. The absence of a suitable legal framework and inadequate investment could heighten risks, including the prospect of litigation if projects go awry. The

[307] Article 95(1) of the Namibian Constitution.

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law therefore has an important role to play in shaping the GH sector and elevating its position on the RE spectrum.

The national barriers potentially impeding the development of a GH sector were discussed in an earlier section. These barriers can be grouped into four main categories: social, technological, legal, and economic. However, it was emphasised that despite the presence of such barriers, they need to be addressed in a legal and regulatory framework that accommodates different policy instruments or mechanisms and is robust enough to overcome the impediments to the establishment of a viable and sustainable GH sector in Namibia.

What also emerged from the study is an urgent need for a harmonised RE regulatory framework. The study revealed that Namibia has a fragmented approach to regulating RE, which has caused unnecessary confusion and duplication of effort. Policymakers must therefore ensure that, in pursuit of economic growth, decarbonisation and sustainable development, broad national interests are upheld. As Namibia lacks a comprehensive framework for RE, it is vital that the relationship between other forms of RE and GH is recognised so as to create a foundation from which to drive energy security and an energy transition. It is also imperative that international standards of RE governance are considered in the drafting of appropriate legislation.

With a view to providing recommendations to support the development of GH in Namibia, Germany's and Chile's legal and regulatory frameworks for RE and GH were analysed and compared with that of Namibia. The analysis exposed the shortcomings of Namibia's RE framework and identified what Namibia needs to address in crafting a fit-for-purpose GH framework at the national level. The strong RE uptake in Germany and Chile is largely attributable to their robust RE frameworks and a national drive to implement their various policies and provisions. These frameworks were developed with consideration given to the countries' commitment to environmental protection, socio-economic development and climate action.

Ultimately, though, successful GH deployment can only be achieved with investment in the RE sector, which, according to Chile and Germany, goes hand in hand with sound and implementable policies and legislation.

6.2 Shortcomings of Namibia's legal and regulatory framework

Clearly, GH represents an important future source of RE which will have multiple benefits for Namibia – at the economic, environmental, technical and human levels. Yet in the absence of

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a coherent framework, several of the identified risks associated with GH could play out in costly and/or failed projects and initiatives. Namibia's existing RE legal and regulatory framework is fragmented and therefore does not offer a firm foundation for the development of GH. Some attempts have been made to introduce legal reforms. However, these have been piecemeal, often exacerbating the institutional misalignment.

As suggested in the Harambee Prosperity Plan II and Vision 2030, a robust and coherent legal and regulatory framework for RE, and GH in particular, is an important driver of sustainable development and economic growth. However, this study contended that the law is unclear on the regulatory issues surrounding GH production in Namibia. For example, there is legal uncertainty surrounding the ownership and protection of water resources, access to which is crucial for the development of GH. The Water Act, 1954 provides for private ownership of water, while Article 100 of the Namibian Constitution vests the right to the country's natural resources in the state. This is vexatious as it may lead to constitutional challenges, considering that water is a scarce commodity. Investors in hydrogen projects have an expectation that they will own some of the water resources (which will act as project security), just as they would own some of the land if investing in, say, a factory.

In addition, the law does little to actively encourage GH production as it currently favours fossil fuels, thus dampening the prospects of investment in the emerging GH sector. Governance arrangements underpinning GH deployment is another shortcoming. For example, the ECB is unable to promote the uptake of GH as its mandate is limited to electricity generation.

Namibia's current policies and laws pertaining to RE should be amended and reworked to form a framework that encourages the development of a GH sector that is well-funded and sustainable and balances the interests of all stakeholders. In the matter of *Namibia Marine Phosphate,*[308] the court was faced with the challenge of balancing the rights of presently affected parties with the rights of future generations. Specifically, the court had to consider the environmental impact of a decision to issue a licence for a project on future generations and make an appropriate ruling.

The same balanced approach is needed when designing a legal and regulatory framework for the development and operation of a GH sector in Namibia. Environmental protection will

[308] *Namibian Marine Phosphate (Proprietary) Limited v Minister of Environment and Tourism and Others* (CA 119 of 2016) [2018] NAHCMD 122 (11 May 2018).

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obviously be paramount; hence, the GH framework must reflect the protection that natural resources are afforded under the law. However, social development goals and the needs of affected communities, among others, cannot be overlooked or downplayed. Ultimately, the 'right' balance will be found within the exemption powers provided for under the applicable laws.

Financing is a crucial consideration when promoting RE (and GH). In addition to the finance needed for a specific project, infrastructural constraints may call for substantial additional funding to address such constraints. Obviously, if the GH sector in Namibia is shrouded in legal uncertainty or is lacking in appeal in the face of an ongoing fossil fuel mindset, it will fail to gain traction.

RE protocols and targets may appear onerous and inherently costly, leaving people with little appetite for embracing the concept of, and making the transition to, green energy. There is a strong need, therefore, for information and guidance on the benefits of GH and how affected parties (from government to businesses to communities) can contribute to its successful adoption. Even if people buy into the idea of GH, the Namibian government cannot, on its own, fund GH projects; the private sector also has a critical role to play in this regard.

6.3 Lessons for Namibia from Germany and Chile

During the analysis of Germany's and Chile's RE policies and initiatives, it was found that a common factor driving the growing popularity of RE in those countries was their legal and regulatory frameworks, which strike a careful balance between the need for environmental preservation and climate action, on the one hand, and for social development and economic upliftment, on the other.

Chile has succeeded in attracting investment into its fast-emerging RE sector and has been motivated to do so by the knowledge that its economy needs to grow – but in responsible ways – to improve the quality of life of the population but also to ensure the well-being of the environment in the future. Striking such a balance can be a significant challenge for a developing country where immediate economic priorities often cloud longer-term risks. Germany is distinctive in that it has a piece of legislation focusing specifically on RE (Renewable Energy Sources Act or EEG) which in turn is supported by other laws, thus helping to bring momentum and stability to the whole RE value chain.

Germany and Chile have both adopted RE laws and regulations that are clear, certain, secure and fair, and have opened up grid access to independent power producers in the

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private sector. Although Namibia has done this to a certain extent via the modified Single Buyer Market Model, its legal and regulatory framework could facilitate a far greater uptake of RE (and specifically GH). The mechanisms used by Germany and Chile encourage competition among energy producers, with the responsibility for maintaining the grid resting with the private sector through a system of levy payments. Furthermore, both Germany and Chile have used incentive policy mechanisms, such as FITs, and other financial policies, such as RE auctions and competitive bidding processes, to stimulate competition and ensure reliable supplies of RE into their national grids.

What is also interesting is that both Chile and Germany have privatised their electricity markets. Not only has this liberalised approach had positive social consequences, but it has also encouraged providers to improve their technologies and services.[309] Market liberalisation does not absolve the regulator from its duties; indeed, the regulator has a duty to ensure that these markets function in the best interests of the people and that they (the people) are shielded from possible abuse.

Germany and Chile have both incorporated targets into their RE legislation which are aligned with the goal of mitigating the impact of climate change through a reduction in GHG emissions. For example, Germany has a set a target of 80 per cent by 2050[310] and Chile has set a target of 10 per cent which is incremental every year until 2050.[311] As this approach imposes a duty to ensure that the targets are met, it encourages the state to pursue a decarbonisation strategy and provide mechanisms for the deployment of RE. Furthermore, Germany's and Chile's laws encourage behavioural change among participants, as non-compliance attracts penalties.

In an effort to create certainty and promote investment in its emerging GH sector, Germany has amended some of its laws. For example, Section 3(14) of the EEG classifies hydrogen as an energy carrier. Both the EEG and the EnWG have been amended to clarify when hydrogen is regarded as green (which, in fact, is when it is produced from RE), while the EEG has been further amended to allow for the formation of hydrogen networks. Other transitional provisions relate to the regulation of hydrogen networks.[312] Chile does not have a specific framework dedicated to GH, but the Chilean government has provided some financial support

[309] See generally in this regard FP Sioshansi 'Introduction: electricity market reform-progress and remaining challenges' in FP Sioshansi (ed) *Competitive electricity markets* (2008) 1–23.
[310] Section 1(2) of the EEG.
[311] Section 1 of Law 20, 257.
[312] F von Burchard 'Germany' in CMS *Facing the future of hydrogen: an international guide* (2021) 94 98.

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for pilot projects through its CORFO (*Corporación de Fomento de la Producción de Chile*) fund.[313]

While Namibia has similar RE aspirations to Germany and Chile, the countries' legal systems are different. As a result, Namibia must not simply follow the approach of amending pieces of legislation based on commonality. Moreover, Namibia should not necessarily amend legislation that already advocates RE and clearly outlines the roles of the different industry players. The three countries' infrastructure is not the same and Namibia's level of industrial production is nowhere near that of Germany. Although Chile and Namibia both belong to the 'Global South', Chile is well known for its heavy investment in RE.

Clearly, a strict 'copy-and-paste' approach will simply add more confusion to the existing uncertainty. However, there are many lessons that Namibia can extract from Germany's and Chile's experiences, which can help to inform the design of an effective legal and regulatory framework that will usher in a new era for GH development in the country.

6.4 Recommendations

This study suggests that for Namibia to compete in the global GH energy sector, it needs to increase its uptake of RE and embrace GH technologies. Whether or not it succeeds in this regard will depend on the quality and responsiveness of the legal and regulatory framework that is designed for this purpose.

This study revealed that other countries, such as Germany, are applying a range of technologies in the GH sector which are expected to be the same as those applied in Namibia once GH production in that country takes off. However, for GH production to get under way in Namibia, various regulatory gaps need to be filled to ensure that the country's legal and regulatory framework for GH is fit for purpose.

Importantly, the framework should allow for environmental and climate protection and for socio-economic development. Of course, a framework for GH cannot function in isolation. Therefore, the barriers that are currently impacting the effectiveness of RE policies and legislation in Namibia must be concurrently addressed, either by effecting the necessary amendments or by designing and implementing a harmonised framework, as Germany has done.

[313] S Barros & T Barro 'Chile' in CMS *Facing the future of hydrogen: an international guide* (2021) 53.

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An example of a provision needing amendment is the Single Buyer Market Model, falling under the Electricity Act of 2007, which requires independent power producers to sell at least 30 per cent of their generated power to the domestic market. This provision could act as a deterrent to other local producers attempting to penetrate the local market. For Namibia to overcome potential financing hurdles, both public and private financing options must be fully explored. In addition, the GH market must be made attractive to investors by creating legal certainty. There is a lack of clarity on what GH production entails, how it is expected to occur and how it fits into the energy mix in Namibia. Moreover, there needs to be certainty as to how the ownership, operation and storage of GH facilities will be aligned.

Several recommendations emerged from the study. An overarching recommendation is that a new piece of legislation should be drafted for Namibia, which will focus specifically on GH and fully address all the actual and potential barriers identified during the course of the study. To satisfy this objective, the legislation must introduce regulatory measures that support the domestic uptake of GH.

One of the barriers identified in the study is the licensing process, which is expected to be tedious and to cause delays in GH projects. An institutional body should therefore be established to manage the transition to GH and be responsible for the issuing of GH production licences. A production licence would, *inter alia*, enable a licensee to establish and operate infrastructure or facilities to generate GH for commercial gain and would afford the licensee land rights in the area covered by the licence. An environmental impact assessment, conducted under the auspices of the EMA, is expected to be a condition of the granting of a license. The institutional body would also conduct regulatory reviews, monitor projects for compliance and advise the responsible minister on related matters. Additionally, the body would be responsible for collecting relevant licensing fees for the government. These fees may be used by the government either to top up the green energy fund or to cover any administrative work supporting the development and promotion of GH in the country.

National standards should be introduced for the production, storage, transportation and use of GH, which are based on international standards and best practices, such as those promoted by the GHS and ISO. National standards help to create an enabling GH environment and to instil confidence in investors. For GH to have a competitive advantage in the foreign market, the government must introduce supportive GH standards that are aligned to the relevant international standards. Concurrently, the government must develop technical

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health and safety standards that, in respect of GH, can be incorporated into law to ensure consistency across the sector.

The legal and regulatory framework must be designed in such a manner that it makes provision for financial support and/or regulatory incentives. It could incorporate state aid, either in the form of direct subsidies or tax incentives. In this regard, the framework may introduce marginal levies on existing carbon fuel consumption at pumps, while in the case of tax incentives, the framework could build on the existing tax incentives under the Income Tax Act 24 of 1981 and reduce import duties on equipment to be used in these projects, such as electrolysers.

Furthermore, the government must set targets for reducing GHG emissions, which should be incorporated into the legal and regulatory framework. As previously discussed, in *Neubauer et al. v. Germany*, Germany's Constitutional Court highlighted the intergenerational duty that arises out of a country's commitment to protect the climate. To ensure that Namibia honours its commitment in this regard, the proposed new GH legislation could domesticate this duty and incorporate the related targets. Moreover, since Namibia is working towards diversifying its energy mix while also meeting its Paris Agreement commitment, the government must consider introducing a carbon tax to reduce carbon emissions and encourage a stronger GH uptake.

Fiscal incentives should be introduced to support infrastructure development and fiscal mechanisms, such as 'green public procurement', should be used. Strong attention needs to be given to training and capacity building, creating public awareness and mobilising public participation in the GH space. Importantly, too, the legislation must encourage cooperation with foreign countries, which should go a long way towards acquiring the necessary resources and technologies and building the right infrastructure and skills to support a GH transition.

As has been emphasised before, the proposed legal and regulatory framework must work in such a way that it balances a range of complementary interests and supports both short and longer-term priorities (from creating or maintaining economic momentum in affected communities to preserving the physical environment as a source of natural resources and harmony – all against a backdrop of escalating and increasingly unpredictable climate change). A key ingredient in this process is ensuring that stakeholders (government, businesses and individuals) are able and willing to work together to deliver on their respective commitments.

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Globalisation and climate change have caused the world to look for safer RE to ensure energy security. Many of the challenges surrounding GH are linked to the lack of a legal framework that regulates its production and use. Since there is no model international legal and institutional framework for GH production, countries are left to develop their own. This means that each country needs to consider the various provisions that will best facilitate the development and implementation of GH production, as GH technologies cannot be subsumed under most of the existing frameworks.

Namibia, like many other countries, does not have a regulatory framework designed specifically for GH. If not addressed, this is likely to hinder the country's plan to become one of the world's largest producers and exporters of GH. Going forward, Namibia should adopt a two-pronged approach: first, amend and/or expand its current legal and regulatory framework for RE to encourage more RE uptake and investment; and second, develop a fit-for-purpose legal and regulatory (including institutional) framework for GH, as envisaged by Namibia's GH Strategy in the form of a Synthetic Fuels Act.[314] Such a fit-for-purpose framework for GH needs to be legally certain and contain policies that attract commercial interest and investment, while at the same time serving the broader purpose of protecting the country's natural assets against harm inflicted by climate change or unfettered economic growth and expansion.

7 Summary and concluding remarks

7.1 Green hydrogen, climate neutrality and regulatory challenges

President Geingob announced during the launch of Namibia's Harambee Prosperity Plan II early in 2021 that the government had already been working hard to establish a GH production industry.

'Given our world class renewable energy resources, Namibia will develop a national strategy for developing green hydrogen and ammonia. As we pursue this strategy, we have the opportunity to become the first country in Africa to achieve carbon neutrality and utilise the African Continental Free Trade Area (AfCFTA) to export clean energy to our neighbours,' he said. Meanwhile, the Director General of the National Planning Commission (NPC), Obeth Kandjoze, announced the establishment of the Green Hydrogen Council of Namibia, which has eight members and is supported by a 15-member technical committee. The economic advisor

[314] Namibia Green Hydrogen Strategy 39.

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to President Geingob, James Mnyupe, has been appointed Namibia's Green Hydrogen Commissioner.[315]

Green hydrogen is hydrogen that is produced using an electrolyser and powered by RE, such as wind, solar, hydraulic power or biomass. In an electrochemical reaction, the electrolyser splits water into dihydrogen and dioxygen and produces hydrogen. Until now, green hydrogen has been far more expensive than energy produced using fossil fuels, including the dominant 'grey' hydrogen that relies on natural gas. However, high gas prices due to strong demand and lower stocks have driven up the cost of producing the carbon-emitting energy type, meaning that the cleaner technology can start to compete.[316]

Opponents of the hydrogen drive say it is inefficient because to scale up, it will require vast amounts of clean energy to be produced and future cost reductions are uncertain. Yet hydrogen is expected to play a key role in a future climate-neutral economy, enabling emission-free transport, heating and industrial processes as well as inter-seasonal energy storage. Clean hydrogen produced with RE is a zero-emission energy carrier but is not yet as cost-competitive as hydrogen produced from natural gas.[317]

In 2020, the European Commission adopted a new, dedicated strategy on hydrogen in Europe (the EU's Hydrogen Strategy). It brings together different strands of action – from research and innovation via production and infrastructure to the international dimension. The strategy explores how producing and using renewable hydrogen can help decarbonise the EU economy in a cost-effective way, in line with the European Green Deal, while also contributing to post-COVID-19 economic recovery.

The EU's Hydrogen Strategy aims to accelerate the development of clean hydrogen, ensuring its place as a cornerstone of a climate-neutral energy system by 2050. To reach this goal, the strategy envisions a gradual upward trajectory, initially including blue hydrogen projects. Several key actions are to be implemented over the course of three strategic phases between 2020 and 2050. The strategy points to the existing status quo, concluding that

[315] Cf. B Weidlich 'Namibia optimistic about new green hydrogen industry' *The Namibian* (8-11-2021) <https://namibian.org/news/economics/namibia-optimistic-about-new-green-hydrogen-industry> (accessed 16-3-2023).
[316] See Euractiv 'Let's reach for the stars': EU aims for green hydrogen below €2/kg by 2030' *Euractiv* (30-11-2021) <https://www.euractiv.com/section/energy/news/lets-reach-for-the-stars-eu-aims-for-green-hydrogen-below-e2-kg-by-2030/> (accessed 16-3-2023).
[317] European Parliament *EU hydrogen policy – Hydrogen as an energy carrier for a climate-neutral economy* (2021) <https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689332/EPRS_BRI(2021)689332_EN.pdf> (accessed 16-03-2023).

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hydrogen (and, in particular, renewable hydrogen) plays only a minor role in the overall energy mix today, with challenges in terms of cost-competitiveness, scale of production, infrastructure needs and perceived safety.

The Hydrogen Strategy sees the development of renewable hydrogen as a priority for the region, while recognising that low-carbon hydrogen (nuclear and fossil-based hydrogen with carbon capture) will be necessary in the short and medium terms to rapidly reduce the GHG emissions of existing hydrogen production facilities and accelerate infrastructure development.[318]

According to the European Commission, cooperation across the entire supply chain and between the public and the private sectors is essential for creating an enabling legal and regulatory framework as well as the critical mass needed in hydrogen research and deployment investments to ensure scaling.[319] With the launch of the European Clean Hydrogen Alliance, which brings together industry, public authorities and civil society, a forum has been established to coordinate investments to increase demand and scale production. A key focus area of the alliance is ensuring that clean hydrogen projects are afforded priority and proper access to finance. The alliance is also expected to deliver an investment pipeline and ensure adequate policy coordination.[320]

Germany has put particularly strong emphasis on the role of hydrogen in the country's decarbonisation programme. Germany has signalled its intention to rely only on fossil-free hydrogen to meet its climate policy goals and direct state support only at GH technologies. Germany's National Hydrogen Strategy has a production capacity goal of 5GW by 2030 and 10GW by 2040. Significant funding has been earmarked for research and technology transfer (from lab to market), including separate funding for industry. Given the known limitations of

[318] With further references to IISD 'Making green hydrogen a global trade commodity for enhanced climate ambition' <https://sdg.iisd.org/commentary/guest-articles/making-green-hydrogen-a-global-trade-commodity-for-enhanced-climate-ambition/> (accessed 16-3-2023).
[319] Cf. European Parliament *EU hydrogen policy – Hydrogen as an energy carrier for a climate-neutral economy* (2021) <https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689332/EPRS_BRI(2021)689332_EN.pdf> (accessed 16-3-2023).
[320] Cf. European Parliament *EU hydrogen policy – Hydrogen as an energy carrier for a climate-neutral economy* (2021) <https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689332/EPRS_BRI(2021)689332_EN.pdf> (accessed 16-3-2023).

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producing the requisite amount of hydrogen in Germany, a budget of €2 billion has been proposed for the purpose of fostering international partnerships.[321]

Germany has also signed a deal with Namibia to offer the latter assistance, including €40 million to boost its GH production in return for cheap future supplies of the gas. 'There is already a race around the world for the best hydrogen technologies and the best locations for hydrogen production. From our point of view, Namibia has particularly good chances in this competition. To produce clean hydrogen, electricity is needed from a renewable source to split water into oxygen and hydrogen. The resulting hydrogen is carbon-free and can be used to decarbonise industries such as steelmaking and aviation which rely on fossil fuels. Hydrogen is seen as a key energy source that will play a pivotal role in helping countries become carbon neutral. Germany wants to lead the way in this regard, becoming a world leader in clean hydrogen, but it has few of the RE resources needed for this to happen.[322]

For Namibia, the new partnership with Germany means investment, jobs and the chance to become a future leader in the hydrogen market, while making its mark on the continent.[323] Desalination will be a major focus of the partnership. The cooperation between Namibia and Germany in the energy space could be the result of the historical ties between the two countries,[324] with the lessons learned from their partnership likely to inform clean hydrogen production in other parts of Africa and the world.[325]

7.2 Climate neutrality and the Paris Agreement

To comply with the Paris Agreement on climate change, an increasing number of countries are setting ambitious GHG emission reduction targets for the coming decades to achieve climate

[321] See Cf. European Parliament *EU hydrogen policy – Hydrogen as an energy carrier for a climate-neutral economy* (2021) <https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689332/EPRS_BRI(2021)689332_EN.pdf> (accessed 16-3-2023).
[322] See Science Business 'Namibia and Germany join forces in green hydrogen race' (26-8-2021) <https://sciencebusiness.net/news/namibia-and-germany-join-forces-green-hydrogen-race> (accessed 16-3-2023).
[323] See Science Business 'Namibia and Germany join forces in green hydrogen race' (26-8-2021) <https://sciencebusiness.net/news/namibia-and-germany-join-forces-green-hydrogen-race> (accessed 16-3-2023).
[324] See Science Business 'Namibia and Germany join forces in green hydrogen race' (26-8-2021) <https://sciencebusiness.net/news/namibia-and-germany-join-forces-green-hydrogen-race> (accessed 16-3-2023).
[325] See Science Business 'Namibia and Germany join forces in green hydrogen race' (26-8-2021) <https://sciencebusiness.net/news/namibia-and-germany-join-forces-green-hydrogen-race> (accessed 16-3-2023).

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neutrality.[326] While mid- and long-term climate commitments have become more and more ambitious in many parts of the world, policymakers are searching for the right blend of policies and technologies to deliver on their announced pledges.

The versatility of hydrogen as a form of chemical storage, energy carrier and feedstock for industrial production is compelling for politicians and businesses alike. Increased hydrogen usage can substantially reduce GHG emissions in hard-to-abate sectors, particularly steel and cement production, heavy-duty transportation, shipping and aviation. It can also help to address the challenge of balancing intermittent supplies of renewables and to reduce air pollution.[327]

As world leaders have come under growing pressure to tackle climate change, green hydrogen is gaining traction as an important part of the solution. The potential of this carbon-neutral energy source to satisfy up to 25 per cent of the global power demand made it a key topic for debate at the UN Climate Change Conference (COP26) in Glasgow in November 2021.[328]

In the wake of COP26, Namibia submitted its nationally determined contribution (NDC) which sets out its goals for tackling climate change over the next five years.[329] In the global context, Namibia views its contribution to the fight against climate change as a 'strategic bet'. President Geingob and the Namibian government understand that Namibia has a once-in-a-generation opportunity to significantly reduce its emissions – and those of its neighbours – by leveraging its natural endowments to attract much-needed foreign direct investment.[330]

In the Statement by his Excellency, Dr Hage Geingob, on the Occasion of the High-Level Segment of COP 26 on 2 November 2021, it is explicitly mentioned that:[331]

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[326] IISD 'making green hydrogen a global trade commodity for enhanced climate ambition' <https://sdg.iisd.org/commentary/guest-articles/making-green-hydrogen-a-global-trade-commodity-for-enhanced-climate-ambition/> (accessed 16-3-2023).

[327] IISD 'making green hydrogen a global trade commodity for enhanced climate ambition' <https://sdg.iisd.org/commentary/guest-articles/making-green-hydrogen-a-global-trade-commodity-for-enhanced-climate-ambition/> (accessed 16-3-2023).

[328] N King 'Hydrogen: what's the big deal?' *Deutsche Welle* (25-8-2022) <https://www.dw.com/en/hydrogen-whats-the-big-deal/a-59076741> (accessed 16-3-2023).

[329] With further references to GC Thomson 'Climate change in Namibia part 3: national actions' *Conservation Namibia* (3-11-2021) <https://conservationnamibia.com/blog/b2021-climate-change-pt3.php> (accessed 16-3-2023).

[330] Cf. World Economic Forum 'Namibia's energy transition: moving from policy climate action' (31-10-2021) <https://www.weforum.org/agenda/2021/10/namibia-is-betting-on-green-energy-to-grow-its-economy/> (accessed 16-3-2023).

[331] See <https://unfccc.int/sites/default/files/resource/NAMIBIA_cop26cmp16cma3_HLS_EN.pdf> (accessed 16-3-2023).

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> Namibia has amplified its 2015 pledge in the Nationally Determined Contributions, we now aspire to reduce our emissions by 91% before the end of this decade. The estimated investment required to achieve this target is approximately USD5.3 billion, 10% of which is unconditional. These ambitions are matched by the highest levels of political commitment. The green and blue economy, including a green hydrogen industry, are cornerstones of the Second Harambee Prosperity Plan (HPP-II). Green economy initiatives such as our Southern Corridor Development Initiative will drive a more sustainable, post-COVID recovery. (...) We will announce how Namibia is unlocking over 5,700 square kilometres in our Karas region for the potential development of green hydrogen and ammonia assets, expected to double the region's employment and triple the installed renewable energy generation capacity for the entire country. We are taking these bold steps to enhance our energy security, decarbonise our country, assist our regional and global peers to reduce their emissions and build a more resilient economy.

Green hydrogen and Namibia's development are intrinsically linked. In November 2021, a letter of intent was signed by the Netherlands' Ministry of Economic Affairs and Climate Policy and Namibia's National Planning Commission, confirming the two countries' commitment to cooperate in the field of energy resources, based on their common interest in the energy sector – and specifically green hydrogen (sourced from renewable energy) as an energy carrier. The letter of intent was premised on the countries' goal of decarbonising their economies and meeting their respective emission reduction targets and commitments under the Paris Agreement. It also outlined the benefits of working together and made provision for the creation of an international market, the development of appropriate technologies, the deployment of infrastructure, and the setting up of export–import corridors for green hydrogen between Namibia and the Netherlands, as a gateway to Europe.

Moreover, Namibia's port operator, Namport, signed an MoU with Europe's largest port operator, the Port of Rotterdam Authority, to build the necessary infrastructure to transport these clean fuels to Europe. In this way, Namibia is making a meaningful contribution to a just and equitable energy transition in Southern Africa and beyond.[332]

[332] World Economic Forum 'Namibia's energy transition: moving from policy to climate action' (31-10-2021) <https://www.weforum.org/agenda/2021/10/namibia-is-betting-on-green-energy-to-grow-its-economy/> (accessed 16-3-2023).

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Namibia is uniquely gifted when it comes to land availability. Given its territory of more than 824,000 km^2 and population of just 2.5 million people, Namibia has recorded an annual energy-demand density score of 3 megawatt hours per square kilometre. Therefore, land availability does not constitute a constraint to developing large-scale RE systems.[333]

Ultimately, at COP 27 held in Sharm el Sheikh, Egypt in 2022, the European Union concluded a strategic partnership with Namibia on sustainable raw materials and renewable hydrogen. The partnership aims to ensure the development of a secure and sustainable supply of raw materials, refined materials and renewable hydrogen to support the green and digital transformation of the partners' economies. The partnership is aimed to promote local value addition in Namibia by supporting the development of the mining and renewable hydrogen value chains.

7.3 Hydrogen regulation challenges to be addressed

So far, Namibia has no law in place that speaks directly to the implementation of GH projects, thus highlighting the need for government to fast-track a suitable governance framework. Developing guidelines on how the government will regulate this sector would be a useful starting point. GH represents a new sector in Namibia, with unique components that are not provided for under existing laws. Provision must therefore be made for the control, growth and diversification of the sector to ensure that every Namibian benefits from renewable resources.[334]

As hydrogen is an explosive and flammable gas, it adds to the risk of production, storage and transport. For optimal protection of the Namibia's environment, hydrogen needs to meet strict regulatory requirements, including being subject to impact assessment and classified installations. The same precautionary measures must be taken when using hydrogen or tackling problems that may arise, so as to protect public health and safety and the environment. In addition, a number of international standards apply to hydrogen and hydrogen-powered equipment which are designed to ensure efficiency and safety during production, storage and transportation. While certain elements of hydrogen production,

[333] World Economic Forum 'Namibia's energy transition: moving from policy to climate action' (31-10-2021) <https://www.weforum.org/agenda/2021/10/namibia-is-betting-on-green-energy-to-grow-its-economy/> (accessed 16-3-2023).
[334] *Namibia News* 'Kandjoze calls for implementation of law in green hydrogen project' (5-12-2021). <https://www.namibianewsdigest.com/kandjoze-calls-for-implementation-of-law-in-green-hydrogen-project/> (accessed 16-3-2023).

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transport, storage and distribution fall within the remit of designated sectors in Namibia, other elements lack any clear regulation.

Germany is one jurisdiction that has already passed dedicated legislation (by updating its Energy Act) to regulate its hydrogen networks. Namibia may consider such an approach, having determined its legislative needs and exploring best practices. A sound legal and political framework is essential, which should also incorporate technical and customs regulations and transmission fees. This is a multisectoral initiative that should accompany a proper planning exercise for GH development in Namibia, the ultimate objective of which is to overcome regulatory gaps and uncertainties, which can be powerful deterrents to investors.

While it has been estimated that global energy demand will increase by up to 47 per cent by 2050,[335] the successful development of a clean hydrogen economy depends on sound policies, predictable regulations and secure hydrogen infrastructure. It also constitutes an international project, where cross-border cooperation is key. Moreover, a fully functional hydrogen economy needs to be tailored to fit a country's circumstances.

GH has the highest potential to fuel trains, cars, planes and industrial parks worldwide with zero emissions. Encouragingly, Europe is likely to import more and more GH from Africa. This puts Namibia in a good position to contribute towards the mitigation of climate risks and the preservation of the environment while also enhancing its economy in sustainable ways. It could be the ultimate win-win for the country.

[335] See US Energy Information Administration 'EIA projects nearly 50% increase in world energy use by 2050, led by growth in renewables' *Today in Energy* (7-10-2021) <https://www.eia.gov/todayinenergy/detail.php?id=49876> (accessed 22-4-2023).

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