



# Balancing Economic Competitiveness with the Just Energy Transition: The Case of South Africa's Green Hydrogen Policy

Rachel Lekunze <sup>1</sup> 

<sup>1</sup> Department of Public, Constitutional and International Law, College of Law, University of South Africa, South Africa.

## ABSTRACT

This study examined the development of green hydrogen policy in South Africa. It argues that while it is framed within the country's Just Energy Transition and related climate commitments, its true driver is economic competitiveness. The study was based on a qualitative and interdisciplinary methodology that combines policy analysis, legal-institutional critique and socio-economic contextualisation to assess the stated objectives of key hydrogen policy documents against South Africa's climate change agenda. It draws on legislative texts, national strategies and government policies to expose the instrumental use of climate discourse to justify export-oriented hydrogen initiatives. Key recommendations include amending relevant legislation on green hydrogen development, production and transportation, integrating green hydrogen into national development strategies, and promoting green hydrogen infrastructure through public-private partnerships. The study contributes to knowledge by offering an understanding of how green hydrogen policy in a Global South context serves as both an economic lever and a symbolic climate commitment.

*Keywords: Green Hydrogen, Energy Transition, South Africa, Economic Competitiveness*

## Correspondence

Rachel Lekunze

Email:

[angwerach@gmail.com](mailto:angwerach@gmail.com)

## Publication History

Received: 16<sup>th</sup> April, 2025

Accepted: 10<sup>th</sup> October, 2025

Published online:  
29<sup>th</sup> December, 2025

## To Cite this Article:

Lekunze, Rachel. "Balancing Economic Competitiveness with the Just Energy Transition: The Case of South Africa's Green Hydrogen Policy." *E-Journal of Humanities, Arts and Social Sciences* 6, no. 14 (2025): 3603 - 3615, <https://doi.org/10.38159/ehass.20256147>.

## INTRODUCTION

South Africa's energy sector is the subject of an increasing debate on how best to balance environmental sustainability, economic development, and energy sovereignty.<sup>1</sup> Given its traditional reliance on coal, which accounts for more than two-thirds of its energy, South Africa faces the increasing burden of protecting its energy sovereignty while meeting its climate change commitments under the Paris Agreement. This burden is particularly acute in light of the negative implications of the country's agenda to close its coal power stations, including load shedding and the decimation of economic activities in towns in which these power stations are located.<sup>2</sup> Despite these challenges, South Africa's policy is to continue its energy transition. Hence, it adopted the Just Energy Transition Investment Plan. This plan sets a firm policy foundation in terms of which South Africa would accelerate its efforts towards achieving

<sup>1</sup> Mark Swilling et al., "Linking the Energy Transition and Economic Development: A Framework for Analysis of Energy Transitions in the Global South," *Energy Research & Social Science* 90 (August 2022): 102567, <https://doi.org/10.1016/j.erss.2022.102567>; Harald Winkler et al., "Just Transition Transaction in South Africa: An Innovative Way to Finance Accelerated Phase out of Coal and Fund Social Justice," *Journal of Sustainable Finance & Investment* 13, no. 3 (July 3, 2023): 1228–51, <https://doi.org/10.1080/20430795.2021.1972678>.

<sup>2</sup> Angwe Rachel Lekunze, "Rethinking the (Un) Just Transition: A Review of the Impact of Neoliberal Approaches to Energy Governance in South Africa," *Journal of Law, Society and Development* 11, no. 1 (2024): 1–18.

‘Net Zero’ carbon emissions by 2050.<sup>3</sup> Among other aims, the Just Energy Transition Investment Plan seeks to increase the share of renewable energy sources such as wind, solar, and green hydrogen in the energy mix. This policy position is further expressed in the enactment of the Climate Change Act (2024), which regulates several issues related to climate change mitigation and adaptation, including phasing out fossil fuel emissions.

This paper posits that while the Just Energy Transition offers an ideal justification for green hydrogen policies, climate considerations are not the true drivers of this initiative. Instead, the climate change discourse merely provides a further (and perhaps belated) justification for the pursuit of green hydrogen. The study also argues that from the onset, economic competitiveness has always been the main driver of green hydrogen policy in South Africa and that to understand the rationale for investment in green hydrogen, it is imperative to look into the country’s ambitions for economic competitiveness as opposed to climate change justifications. Hence, the climate change agenda has now become a tube into which to fit any energy-related policy.

To achieve its argument, the analysis is organised as follows: the second section discusses the qualitative and interdisciplinary methods used. The third section presents the findings and discussions, which include the evolution of the general and specific energy policies relevant to the pursuit of green hydrogen in South Africa. These include the White Paper on Energy Policy (1998), National Hydrogen and Fuel Cell Technologies Research, Development and Innovation Strategy (2007), Hydrogen South Africa Research Programme (2007), Hydrogen Society Roadmap for South Africa (2021), and Green Hydrogen Commercialisation Strategy (2022). These are analysed alongside relevant projects and policies that inform green hydrogen policies, such as the Low-Emission Development Strategy 2050. The third section also examines the factors that drive policy support for green hydrogen development and places them in the context of sustainability, economic development, job creation, and energy sovereignty. In the third section, the study further analyses risks to green hydrogen policy development and attempts to explain why these can only be explained in the context of economic competitiveness, as opposed to the protection of the climate. The fourth section proffers several policy and legislative recommendations to increase the growth of the green hydrogen economy in South Africa. The final section concludes the analysis.

## **METHODOLOGY**

This study is based on a qualitative and interdisciplinary research method that derives from policy analysis and legal-institutional critique to examine the main policy documents, national strategies, legislation and government documents that inform the evolution, motivations and socio-political implications of green hydrogen policy formulation and implementation in South Africa. The core data sources include official documents such as the White Paper on Energy Policy (1998), the National Hydrogen and Fuel Cell Technologies Strategy (2007), the Hydrogen South Africa Research Programme (2007), the Hydrogen Society Roadmap (2021), and the Green Hydrogen Commercialisation Strategy (2022). These were purposively sampled alongside supplementary documents such as South Africa’s Low Emission Development Strategy (2020) and the Just Energy Transition Investment Plan (2022) in order to contextualise hydrogen policy within broader national and global climate commitments. These documents were subjected to qualitative content analysis to identify key themes, policy objectives, and discursive shifts.

Broadly viewed, the documentary analysis described above deconstructs the narrative framing of South Africa’s official policy instruments on green hydrogen by assessing their stated objectives and assumptions against actual political-economic drivers. To achieve this, the study also employed a critical policy discourse framework, which involves examining the relationship between language, power, and policy orientation. In this manner, the study critiques the reality that the South African government uses climate discourse not necessarily as a genuine environmental commitment but as a strategic justification for promoting green hydrogen in pursuit of economic competitiveness. The study evidenced this by

---

<sup>3</sup> The Presidency, *South Africa’s Just Energy Transition Investment Plan (JET Plan)* ( Pretoria: Government of the Republic of South Africa, 2022).

exposing the framing of hydrogen policy as a tool for industrial expansion, job creation, and export market access, as opposed to being a climate mitigation priority.

Given that the study also discusses the legal implications of green hydrogen policy and laws that are relevant to the translation of green hydrogen policy into law, principles from legal hermeneutics and policy interpretation were used to understand how regulatory instruments, such as the Climate Change Act (2024) and the Gas Act (2001), align or conflict with the objectives of the green hydrogen agenda. These legal texts were assessed not only for their explicit provisions but also for their omissions and interpretative implications, particularly in relation to hydrogen infrastructure, safety standards, and environmental compliance mechanisms. This uncovered regulatory bottlenecks and areas where policy intent and legislative support diverge in the implementation of green hydrogen policy.

## PRESENTATION OF FINDINGS AND DISCUSSIONS

### Evolution of green hydrogen energy policies in South Africa

*White Paper on the Energy Policy of the Republic of South Africa, 1998*

The blueprint for energy in post-apartheid South Africa was established in the White Paper on the Energy Policy of the Republic of South Africa in 1998. Although it did not make any stipulations regarding green hydrogen, the White Paper on Energy Policy recognised the importance of harnessing energy sources for sustainable development and economic growth. It set five objectives regarding energy policy: increased access to affordable energy services; improving energy governance; stimulating economic development; managing energy-related environmental impacts; and security of supply through diversification.

Perhaps the most relevant objective when it comes to green hydrogen is managing energy-related environmental and health impacts. To this end, the White Paper on Energy Policy stipulated that the “government will work towards the establishment and acceptance of broad national targets for the reduction of energy-related emissions that are harmful to the environment and to human health.”<sup>4</sup> To this end, the White Paper on Energy Policy recognised the importance of renewable energy sources such as solar, wind, and hydroelectricity. However, it did not mention green hydrogen, although the government can be excused for this for the simple reason that at the time of the adoption of this White Paper, there was no tangible scientific debate on the future role of green hydrogen. This omission did not last long, as discussed in the following section.

### *National Hydrogen and Fuel Cell Technologies Research, Development and Innovation Strategy, 2007*

The development of green hydrogen energy policy in South Africa can be traced to 2007, when the Department of Science and Innovation developed the National Hydrogen and Fuel Cell Technologies Research, Development and Innovation Strategy (2007). When the Hydrogen Strategy was adopted, South Africa had not started to experience the energy crisis as exemplified by load shedding, although it was clear at the time that its future, like the rest of the world, would need it to reinforce its energy security through environmentally friendly energy sources, promote sustainable development, and increase its competitiveness. As such, the adoption of this strategy was not a response to a crisis but “part of a global move towards developing sustainable energy systems and reducing greenhouse gas emissions” as envisaged by the United Nations Framework Convention on Climate Change.

The South African government realised that green hydrogen and fuel cell technologies carried considerable potential in producing electricity and that, given the increasing interest in it from governments across the world, international bodies, and the private sector, it was necessary to set out the country’s position with regard to these technologies. Given this potential, the government identified hydrogen and fuel technologies as one of the “frontier science and technology initiatives, which is to foster proactive innovation and create knowledge and human resource capacity” For this reason, the Hydrogen Strategy sought to develop human capital in universities through research chairs, funded bursaries and knowledge centres, among others, to increase research interest in this technology.

The main goal of the strategy was to leverage local resources and knowledge available at the time to accelerate the development of human capital to harness commercial activities based on hydrogen and

<sup>4</sup> Department of Minerals and Energy, “White Paper on Energy Policy of the Republic of South Africa,” Government of the Republic of South Africa, 1998, [https://www.gov.za/sites/default/files/gcis\\_document/201409/whitepaperenergypolicy19980.pdf](https://www.gov.za/sites/default/files/gcis_document/201409/whitepaperenergypolicy19980.pdf).

fuel cell technology. Among other objectives, the Hydrogen Strategy sought to establish “a base for hydrogen production, storage technologies and processes” Besides the commercialisation aspect, the government envisaged that the Hydrogen Strategy would enable it to diversify the energy supply by introducing an environmentally friendly source into the energy mix. The Hydrogen Strategy reproduced the following extract on the need to:

...create a path toward the extensive use of hydrogen in the energy sector, with the somewhat erroneous title of the “hydrogen economy”, a term coined in the 1980s. Such an energy system will be independent of energy sources because both hydrogen and electricity can be produced from all of the available primary energy sources. Even if new energy sources are discovered and added to the energy supply mix, the energy system will not have to change.<sup>5</sup>

This extract was relevant to South Africa in 2007 and in 2025 (at the time of writing), given the highlighted potential of hydrogen to help South Africa transition to cleaner and more sustainable energy sources. The Hydrogen Strategy further illustrated that an energy transition that embraces hydrogen would contribute to energy diversity, economic development, and fulfilment of international obligations that existed at the time.

One of the most important aspects of the Hydrogen Strategy was that it recognised the importance of integrating social and economic activities for sustainable development and that this would only be possible if it was implemented alongside other policies on energy, industrial development, and sustainability, such as the Energy Efficiency Strategy (2005), National Renewable Energy Strategy (2005), Integrated Energy Plan (2006), and the National Energy Research and Development Strategy (2006). In the context of these policies, the government envisaged the development of “cost-effective methods for hydrogen generation...[and] that will improve production and storage methods, and reduce costs and environmental impact.”<sup>6</sup>

The implementation of the Hydrogen Strategy was funded through operational and capital investment from the private sector, international programs, foreign governments, and the South African government. However, it was also noted that this strategy was ‘ambitious’ and that the country did not have the human resource capital to carry it out at the time.<sup>7</sup> To secure the country’s energy supply, protect the environment, ensure energy equity and maintain relatively cheap electricity prices, the Hydrogen Strategy noted that it was necessary to invest in human capital to drive research and development into hydrogen and related technologies.<sup>8</sup> Between 2008 and 2018, various projects were undertaken to promote green hydrogen in partnership with universities.

The Council for Scientific and Industrial Research took a particularly keen interest in hydrogen and argued that there were four elements to attaining sustainable development through hydrogen energy (i) environmental resources and capacity to absorb pollution, (ii) social development out of poverty to productivity, (iii) economic growth requires to ensure technology development and trade; and (iv) institutional capacity to develop and implement new technologies. This approach paved the way for the development of a South African hydrogen research programme, as discussed below.

### ***Hydrogen South Africa Research Programme, 2007***

After the adoption of the Hydrogen Strategy, the South African Department of Science and Technology established a 15-year program for hydrogen development. This program was named Hydrogen South Africa (HySA) and was implemented in partnership with the Hydrogen Strategy. This program aimed to develop “intellectual property, knowledge, human resources, products, components and processes to

<sup>5</sup> Department of Science and Technology, “National Hydrogen and Fuel Cell Technologies Research, Development and Innovation Strategy,” Government of the Republic of South Africa, 2007, [https://www.hysa-padep.co.za/wp-content/uploads/2022/02/Document-2\\_National-Hydrogen-and-Fuel-Cell-Technologies-Research-Development-and-Innovation-Strategy.pdf](https://www.hysa-padep.co.za/wp-content/uploads/2022/02/Document-2_National-Hydrogen-and-Fuel-Cell-Technologies-Research-Development-and-Innovation-Strategy.pdf).

<sup>6</sup> Department of Science and Technology, “National Hydrogen and Fuel Cell Technologies Research, Development and Innovation Strategy.”

<sup>7</sup> Department of Science and Technology, “National Hydrogen and Fuel Cell Technologies Research, Development and Innovation Strategy.”

<sup>8</sup> M. Mathe, “South African Hydrogen Economy Activities - National Hydrogen Energy & Fuel Cell R&D Strategy Development,” *The Hydrogen Economy for Sustainable Development, Reykjavik, Iceland*, September 2006.

support the South African participation in the nascent, but rapidly developing international platforms in Hydrogen and Fuel Cell Technologies.”<sup>9</sup> It envisaged taking advantage of the country’s vast mineral deposits for renewable energy and hydrogen development in order to achieve profitable commercialisation ventures in green hydrogen. Hence, the Hydrogen South Africa research programme aligned with the government’s stated objective “to make South Africa a global player in fuel cell technology, through prototyping, demonstration and commercialisation of fuel cell technologies.”<sup>10</sup>

At its inception, this program was aimed at achieving 25% of the global share of the Hydrogen and Fuel Cell markets. As such, it was implemented in partnership with universities such as the North West University, the University of Cape Town, and the University of the Western Cape. This led to some success. For example, in 2020, the Department of Science and Innovation partnered with Hydrogen SA and North-West University to develop the country’s Hydrogen Society Roadmap, while the University of the Western Cape developed its fuel cell generator for lights under this project.<sup>11</sup> In addition, more than 10 patents have been registered under the Hydrogen South Africa project pursuant to the development of various prototypes. This project has also seen several PhD candidates complete their research on various hydrogen projects, including nanostructured lightweight hydrogen storage materials, metal hydride for hydrogen separation and purification, and advanced Ti-based AB and AB<sub>2</sub> hydride forming materials.<sup>12</sup>

However, the Hydrogen South Africa Programme was time-limited, as the government had set it a lifespan of 15 years, which was running out. Hence, in 2020, the government accepted that it was necessary to extend this programme in view of the need to support the development of sustainable green hydrogen in South Africa, as articulated in the policies discussed above. Hence, the Cabinet extended the program for another 10 years on 14 September 2021.<sup>13</sup> This move was intended to continue to support research, development, and innovation. The establishment of the Hydrogen Society Roadmap for South Africa can be traced directly to the Hydrogen South Africa research program, as discussed in the following section.

### ***Hydrogen Society Roadmap for South Africa, 2021***

Several policy developments occurred between 2020 and 2023 as part of South Africa’s initiative to bring green hydrogen to the fore. These included the establishment of the Green Hydrogen Panel in 2021; mobilisation of funds for supporting decarbonisation through green hydrogen at COP26 in 2021; approval of the Just Energy Transition Investment Plan by the Cabinet in 2022 and its presentation at COP27; inaugural Green Hydrogen Conference in Cape Town in 2022; and the signing a memorandum of understanding with the International Development Corporation for the deployment of £23 million grant funds for catalytic hydrogen projects in 2022. Also, the government gazetted green hydrogen projects, nine of which had Strategic Integrated Projects status in 2022. It also released the Green Hydrogen Commercialisation Strategy for public comment in 2022.<sup>14</sup> Some of these policy initiatives are discussed in the following section to provide a better view of policy approaches to green hydrogen in South Africa.

The Hydrogen Roadmap was adopted to achieve several objectives, such as building upon the momentum created with the establishment of the Hydrogen South Africa Programme “to position South Africa as a global player in the green hydrogen...markets.”<sup>15</sup> The Hydrogen Roadmap noted that South Africa owed itself a duty to capitalise on the hydrogen opportunity to achieve its Economic Reconstruction and Recovery Plan in light of the National Development Plan (2030), the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) and the Integrated Energy Plan of 2019. It further noted that this roadmap will form part of the policy and regulatory shift towards reducing emissions in order to meet the National Determined Contributions under the Paris Climate Agreement. While this is evidently an ambitious policy shift, it is worth noting that the emphasis of the Hydrogen Roadmap is the

<sup>9</sup> University of the Western Cape Hydrogen South Africa, “Hydrogen South Africa,” HySA, 2007,

<https://www.hysasystems.com/index.php/about-hysa#:~:text=The principal strategy of HySA,the world’s known PGM reserves.>

<sup>10</sup> Hydrogen South Africa, “Hydrogen South Africa.”

<sup>11</sup> Presidential Climate Commission., “Green Hydrogen (GH<sub>2</sub>) Commercialisation in South Africa,” 2023.

<sup>12</sup> Hydrogen South Africa, “Hydrogen South Africa.”

<sup>13</sup> Department of Science and Innovation, “Hydrogen Society Roadmap for South Africa. Government of the Republic of South Africa,” 2021, [https://www.dsti.gov.za/images/South\\_African\\_Hydrogen\\_Society\\_RoadmapV1.pdf](https://www.dsti.gov.za/images/South_African_Hydrogen_Society_RoadmapV1.pdf).

<sup>14</sup> Presidential Climate Commission., “Green Hydrogen (GH<sub>2</sub>) Commercialisation in South Africa.”

<sup>15</sup> Department of Science and Innovation, “Hydrogen Society Roadmap for South Africa. Government of the Republic of South Africa.”

economic incentives arising out of it with the added benefit that harnessing the hydrogen potential will create sustainable green jobs, move “the country towards secure and low-cost sustainable energy, promoting broader national competitiveness...[and make] South Africa...a catalyst in the transition of its Southern African neighbours from fossil fuels to renewable energy (RE) systems through increased intra-Africa trade.” Although the feasibility of transitioning South Africa’s neighbours at a time when it cannot transition itself is open to doubt, it is evident that the Hydrogen Roadmap is set in the context of the bigger picture of the energy transition, as seen below.

The Hydrogen Roadmap envisages that its implementation will enhance the transition to a just and inclusive economy that has net-zero carbon emissions by the year 2050 and achieve the following outcomes: “decarbonisation of heavy-duty transport; decarbonisation of energy-intensive industries (cement, steel, mining, refineries); enhanced and green power sector (main and micro-grids); Centre of Excellence in Manufacturing for hydrogen products and fuel cell components; creating an export market for South African green hydrogen; and increase the role of hydrogen (grey, blue, turquoise and green) in the South African energy system in line with the move towards a net-zero economy.”<sup>16</sup>

The Hydrogen Roadmap envisages that pursuing these high-level outcomes would rebrand South Africa into an investment destination that not only pursues economic objectives but also incorporates environmental, societal, and good governance principles. In this regard, the Hydrogen Roadmap notes several catalytic projects, including the Platinum Valley Initiative (also known as the South African Hydrogen Valley).<sup>17</sup> The catalytic projects “are expected to produce approximately 500kt of hydrogen and create at least 20,000 jobs annually by 2030 and a Gross Domestic Product (GDP) contribution of at least USD5 billion to the economy by 2050.”<sup>18</sup>

Furthermore, the Hydrogen Roadmap indicated a stronger emphasis on the role of the private sector in its implementation. This is an indication of the government’s desire to partner with the private sector and civil society to create a policy environment that enables the development of green hydrogen as soon as possible. Hence, the Hydrogen Roadmap envisages that the government will review the regulatory, environmental, and fiscal spaces to ensure that the adoption of green hydrogen is supported. Part of this entails determining and making contact with relevant stakeholders in the international project funding space to find support for the hydrogen economy.

### ***Green Hydrogen Commercialisation Strategy, 2022***

In October 2023, the government published the Green Hydrogen Commercialisation Strategy (Hydrogen Commercialisation Strategy). This is a comprehensive document spanning 186 pages. It spells out many aspects of hydrogen in South Africa, including the following: “the need for the adoption of green hydrogen within the context of the electricity crisis in South Africa; market factors driving the commercialisation of green hydrogen; assessment of the demand for green hydrogen; large scale and industrial opportunities presented by the green hydrogen economy; the value chain, local supply chain and hydrogen hubs within South Africa; regulatory incentives; financing of green hydrogen research, development, production, storage, transportation and distribution; and strategic implementation of the green hydrogen strategy.”

Given the extensiveness of this Hydrogen Commercialisation Strategy, this paper focuses only on the strategic elements of this strategy, which entail the following: prioritisation of exports, stimulation of the domestic market, supporting localisation, securing finance, proactive socio-economic development, and policy and regulatory support from the government. It has already been observed above that the idea of pursuing research and development on hydrogen was to capitalise on its export potential to generate money. The Hydrogen Commercialisation Strategy envisages targeting green hydrogen exports by leveraging global finance mechanisms (grants, concessional debt, contracts of difference, and price subsidies) to make the research and development of green hydrogen viable.<sup>19</sup>

Given that South Africa is also transitioning its energy mix from a predominantly coal one to a climate-friendly one that uses renewable energy and pursues cleaner sources of power, the Hydrogen Commercialisation Strategy envisages the stimulation of the domestic market to increase demand for

<sup>16</sup> Department of Science and Innovation, “Hydrogen Society Roadmap for South Africa. Government of the Republic of South Africa .”

<sup>17</sup> Department of Science and Innovation, “Hydrogen Society Roadmap for South Africa. Government of the Republic of South Africa .”

<sup>18</sup> Department of Science and Innovation, “Hydrogen Society Roadmap for South Africa. Government of the Republic of South Africa .”

<sup>19</sup> Presidential Climate Commission., “Green Hydrogen (GH2) Commercialisation in South Africa.”

green hydrogen in order to produce green steel, green transportation, and sustainable fuels for aviation. This will evidently accelerate the Just Energy Transition from these high-carbon-emitting industries. The experience of China and the European Union shows that green hydrogen can play a positive role in reducing the emissions of the steel-making industry.<sup>20</sup>

The Hydrogen Commercialisation Strategy also envisages creating enormous support for localisation by leveraging the platinum group of minerals. This strategy fits within the overarching climate goal of reducing emissions to zero by 2050 and should be understood within the context of the Low-Emission Development Strategy, 2050, which mentions green hydrogen as one of the “research activities that are already setting the basis for the low carbon transition [and that it] “aims to make South Africa a global player in fuel cell technology prototyping, demonstrating and commercialisation of fuel cell technologies.”<sup>21</sup>

### Factors driving policy support for green hydrogen development

Some of the reasons for South Africa’s pivot towards policy and regulatory support for the development of green hydrogen have been noted above and include commercial reasons, energy transition goals, and the need to diversify the energy mix. In addition, the adoption of green hydrogen is supported by renewable energy and other economic, developmental, and societal reasons. These are discussed in this section, starting with energy transition goals. It must be noted at the outset that the South African economy is powered by electrical energy, derived from a combination of legacy fuels and renewable sources. Legacy fuels include coal, diesel, and nuclear energy, whereas renewable energy sources include solar and wind energy. At the time of writing, coal dominates the energy supply chain, as it provides 71% of the country’s energy needs.<sup>22</sup> The dominance of coal is attributable to its abundance, ease of access underground through open-cast mining, and ease of combustion for electricity generation.<sup>23</sup> For this reason, South Africa has 15 coal-fired power stations.<sup>24</sup> Although coal provides a cheaper and abundant source of energy, it is becoming a liability for the country because of its conflict with South Africa’s climate change commitments to the international community under the Paris Agreement. Through its Nationally Determined Contributions, it committed to reducing emissions by 31% and committed to “a fixed target for greenhouse gas emissions levels of 398-510 MtCO<sub>2</sub>e by 2025, and 350-420 MtCO<sub>2</sub>e by 2030’ (NDC Partnership, 2024). For a country that relies heavily on coal, this is a toll order, particularly given that South Africa is committed to net-zero emissions by 2050.<sup>25</sup>

In addition to international considerations for the transition from coal, domestic legislation obliges South Africa to look beyond coal. The first consideration is the National Environmental Management Act 107 of 1998, which is the environmental framework legislation that has been enacted to give effect to the constitutional right to a healthy and clean environment in section 24 of the Constitution of the Republic of South Africa, 1996.<sup>26</sup> Given the huge amounts of emissions from coal and the resultant negative impacts on the environment, South Africa was initially committed to the closure of its power stations.<sup>27</sup> This process commenced with the closure of the Komati coal-fired station.<sup>28</sup> However, it had to be shelved

<sup>20</sup> Chengzhe Li et al., “Towards Low-Carbon Steel: System Dynamics Simulation of Policies Impact on Green Hydrogen Steelmaking in China and the European Union,” *Energy Policy* 188 (May 2024): 114073, <https://doi.org/10.1016/j.enpol.2024.114073>.

<sup>21</sup> Li et al., “Towards Low-Carbon Steel: System Dynamics Simulation of Policies Impact on Green Hydrogen Steelmaking in China and the European Union.”

<sup>22</sup> Mohamed Beidari, Sue-Jane Lin, and Charles Lewis, “Decomposition Analysis of CO<sub>2</sub> Emissions from Coal - Sourced Electricity Production in South Africa,” *Aerosol and Air Quality Research* 17, no. 4 (2017): 1043–51, <https://doi.org/10.4209/aaqr.2016.11.0477>; N. Makgetla and M. Patel, “The Coal Value Chain in South Africa. Trade & Industrial Policy Strategies: Pretoria, South Africa,” 2021, <https://tips.org.za/research-archive/trade-and-industry/item/4161-the-coal-value-chain-in-south-africa>.

<sup>23</sup> Chris J.H. Hartnady, “South Africa’s Diminishing Coal Reserves,” *South African Journal of Science* 106, no. 9/10 (September 17, 2010), <https://doi.org/10.4102/sajs.v106i9/10.369>.

<sup>24</sup> Eskom, “Coal Fired Power Stations,” Eskom, 2024, <https://www.eskom.co.za/eskom-divisions/gx/coal-fired-power-stations/>.

<sup>25</sup> South Africa, “South Africa’s Low Emission Development Strategy 2050,” 2020.

<sup>26</sup> Johan Nel and Willemien du Plessis, “An Evaluation of NEMA Based on a Generic Framework for Environmental Framework Legislation,” *South African Journal of Environmental Law and Policy* 8, no. 1 (2001): 1–36.

<sup>27</sup> Eskom, “Decommissioning/End of Life Dates and MES Applications Per Coal-Fired Power Station,” 2019, <https://cer.org.za/>.

<sup>28</sup> Y. Groenewald, “Komati Shutdown: Future Bleak for Communities as People Lose Jobs, Money,” *The Citizen*, March 30, 2023, <https://www.citizen.co.za/news/komati-shutdown-future-bleak-for-communities/>.

because of the worsening energy shortage crisis.<sup>29</sup> However, it must be noted that the halted closures of coal-fired power stations are merely a temporary plan until new, cleaner energy sources, including hydrogen, can be procured.

In addition to coal, other energy sources for electricity generation in South Africa include nuclear, wind, and solar energy sources – all of which contribute a relatively small amount to the national grid. Nuclear energy comes from one power station, Koeberg, which produces 1860 MW when running at full capacity.<sup>30</sup> This is a small amount compared with the needs of the country. Given that Koeberg was constructed in 1976 and finalised in 1985,<sup>31</sup> there are concerns that the power station has run its course, and that if South Africa is to secure an energy-resilient future, it will have to retire Koeberg, build more power stations, or simply find other sources of energy, such as hydrogen. These concerns arise even though the Koeberg operating licence was extended for two decades from 2024.<sup>32</sup>

Wind power also contributes to the electricity grid in South Africa, albeit to a limited extent, similar to nuclear power, as it contributes 3,442 MW.<sup>33</sup> Wind power comes from standalone windmills in farms across the country, as well as from dedicated wind farms such as the Klipheuwel Wind Farm and Darling National Demonstration Wind Farm.<sup>34</sup> Wind power has recently increased in the past few years due to the establishment of the Renewable Energy Independent Power Producer Procurement Programme, which mainly entails the procurement of solar and photovoltaic (solar) energy.<sup>35</sup> Solar energy appears to be the main beneficiary of this program and is estimated to add just a few megawatts to the grid compared to wind power.

However, South Africa's attempts to relegate coal as a source of energy, difficulties with nuclear procurement, and challenges of intermittency that are present in generating energy through wind and solar energy necessitate a search for new and cleaner sources of energy, including green hydrogen. Without these alternative sources, it is unlikely that South Africa will meet its Nationally Determined Contribution and net-zero emissions by 2050.

One of the renewable energy-related reasons for the adoption of green hydrogen policies in South Africa is that the country has an abundance of wind and solar power, both of which are renewable energy sources that aid in the production of green hydrogen.<sup>36</sup> These renewable energy sources can lower the costs associated with the production of green hydrogen and create a renewable energy outlook for the project, thereby attracting investors.<sup>37</sup> The use of solar and wind energy to produce green hydrogen eliminates the need to use carbon-emitting fuels, such as coal, in power systems. In addition, green hydrogen can be combined with carbon dioxide to produce synthetic hydrocarbons such as diesel, jet fuel, and methane. This means that hydrogen becomes more than one fuel, but several of them when properly converted. This versatility enables its products to fuel both fixed premises and vehicles.

The second driver of policy support for the development of green hydrogen is that South Africa is the world's largest producer of platinum-group metals such as platinum, palladium, ruthenium, iridium, and osmium, all of which provide the necessary electrolyzers for green hydrogen production and fuel cell catalysts.<sup>38</sup> Leveraging this endowment of natural resources means that South Africa can accelerate the

<sup>29</sup> Department of Mineral Resources and Energy, "Integrated Resource Plan," 2023, <https://www.dmre.gov.za/mining-minerals-energy-policy-development/integrated-resource-plan/irp-2023>.

<sup>30</sup> NECSA, "South Africa Doubles down on Nuclear Power," South African Nuclear Corporation, 2024, <https://www.necsa.co.za/2024/08/06/south-africa-doubles-down-on-nuclear-power/#:~:text=Koeberg is the only nuclear,offline until later this year.>

<sup>31</sup> Eskom, "Koeberg Nuclear Power Station," Eskom, 2023, <https://www.eskom.co.za/eskom-divisions/gx/koeberg-nuclear-power-station/#:~:text=Koeberg%2C the only nuclear power,power station in the world.>

<sup>32</sup> Eskom., "Koeberg Operating Licence Extended for Further 20 Years," Eskom, 2024, <https://www.eskom.co.za/koeberg-operating-licence-extended-for-further-20-years/>.

<sup>33</sup> N. Cowling, "Total Wind Energy Capacity in South Africa 2013-2023," Statista, 2024, <https://www.statista.com/statistics/1218114/south-africa-total-wind-energy-capacity/#:~:text=As of 2023%2C the total,followed an overall growing trend.>

<sup>34</sup> Department of Mineral Resources & Energy, "Wind-Power. Republic of South Africa," 2022, <https://www.dmre.gov.za/energy-resources/energy-sources/renewable-alternative-fuels/wind-power.>

<sup>35</sup> Department of Mineral Resources & Energy, "Renewable Energy Independent Power Producer Procurement (REIPPP) Programme," 2024, <https://www.dmre.gov.za/energy-resources/reipp-programme.>

<sup>36</sup> Department of Science and Innovation, "Hydrogen Society Roadmap for South Africa. Government of the Republic of South Africa."

<sup>37</sup> Department of Science and Innovation, "Hydrogen Society Roadmap for South Africa. Government of the Republic of South Africa."

<sup>38</sup> Department of Science and Innovation, "Hydrogen Society Roadmap for South Africa. Government of the Republic of South Africa."

local beneficiation of these minerals, thereby increasing its revenue. Given that South Africa already has partnerships with countries such as Japan, members of the European Union, and South Korea, and in view of the fact that these countries are pivoting towards importing green hydrogen, South Africa will be well placed to commercialise its green hydrogen.

The third policy consideration in the development of green hydrogen in South Africa is robust port infrastructure, which, although facing challenges at the time of writing, provides the necessary facilities for supplying green hydrogen to domestic and international markets. This is because the infrastructure for transporting hydrogen is the same as that for natural gas, although minor modifications are necessary to ensure safe transportation.<sup>39</sup> Given that the gas fields for which this infrastructure was developed are depleted, South Africa may benefit from repurposing terminals and storage facilities for hydrogen. In view of this infrastructure, South Africa can realise its objective of being a world leader in the commercialisation of green hydrogen, as set in the National Hydrogen and Fuel Cell strategy and the Hydrogen South Africa programme, as discussed above.

The policies discussed above have outlined the commercial reasons for the research and development of green hydrogen in South Africa. It is noted that the pursuit of green hydrogen provides several opportunities for industrialisation, given that green hydrogen adds value across several industries, such as “renewable energy, steel, petrochemicals, transport, manufacturing, mining, construction, and agriculture.”<sup>40</sup> In a country whose manufacturing sector has been declining for more than a decade and unemployment is on the rise, the addition of new jobs and economic opportunities through green hydrogen research and development will be a welcome relief, particularly given that such hydrogen will be mostly exported, thereby earning the country’s vital foreign currency.

The potential for commercialisation is particularly large, given that Europe, Japan, South Korea, and the United Kingdom are interested in deploying green hydrogen into their energy mixes.<sup>41</sup> In view of the huge commercialisation opportunities, the research and development of green hydrogen justifies large infrastructure investments in green hydrogen, thereby adding more jobs to the economy and reskilling workers who could be redundant as a result of the shift from coal. Some infrastructure projects for green hydrogen have already demonstrated this. The development of the Boegoebaai port and the expansion of the Northern Cape grid are examples of this.<sup>42</sup> According to the Presidential Climate Commission, South Africa expects green hydrogen to increase its GDP by 1-3%, which represents approximately R100-R250 billion. This will create between 650,000 and 1 million jobs.

### **Risks to Green Hydrogen Policy Development**

Although the foregoing analysis demonstrates South Africa’s strong commitment to progressive green hydrogen policies, the development of these policies faces several risks and barriers which may ultimately affect the country’s ambition to become a global leader in green hydrogen. Some risks and barriers arise from the regulatory framework that exists at the time of writing. For instance, legislation such as the Gas Act 48 of 2001 incorporates hydrogen into the meaning of gas, but the regulations promulgated under it do not specifically regulate the “deployment or injection of hydrogen into the pipe-gas network, particularly with regard to the minimum and maximum pressures that are commercially viable and safe.”<sup>43</sup>

The fact that legislation for regulating the transportation of hydrogen gas already existed years before the adoption of the first Hydrogen Energy Policy (2007) illustrates the need to revisit such legislation, update it, and amend the regulations to ensure that the transportation of green hydrogen meets the safety and security standards for it to be commercially viable. There is also a need to review matters pertaining to green hydrogen from the perspective of environmental legislation so that regulations under the National Environmental Management Act and associated legislation are suitable for the production of green hydrogen, motor-vehicle emission standards, storage, transportation, and usage are sustainable.

However, amendments to legislation and regulations often take time, which adds a delay factor to the development of green hydrogen. In light of the post-2006 hydrogen policies, there is a need for South

<sup>39</sup> Department of Science and Innovation, “Hydrogen Society Roadmap for South Africa. Government of the Republic of South Africa.”

<sup>40</sup> Presidential Climate Commission., “Green Hydrogen (GH2) Commercialisation in South Africa.”

<sup>41</sup> Presidential Climate Commission., “Green Hydrogen (GH2) Commercialisation in South Africa.”

<sup>42</sup> Presidential Climate Commission., “Green Hydrogen (GH2) Commercialisation in South Africa.”

<sup>43</sup> Department of Science and Innovation, “Hydrogen Society Roadmap for South Africa. Government of the Republic of South Africa .”

Africa to re-examine the entire value chain to ensure safety and security in the infrastructure and conditions for the production, storage, and transportation of green hydrogen to protect human life and the environment. The risks to people and the environment have made it necessary for South Africa to undertake studies on the regulation of green hydrogen in other countries. In addition, South Africa participates in the Regulations, Safety, Codes and Standards Working Group and the Task Force on Hydrogen Production and Analysis of the IPHE to ensure that its laws and regulations on the production, handling, storage, and distribution of green hydrogen meet standards.

Regarding the readiness of the regulatory framework, there are also concerns about its adequacy for the transportation of green hydrogen, which is deemed to be costly. However, the Presidential Climate Commission states that there is a real issue in this regard, as green hydrogen is exported by first converting it into ammonia, thereby reducing the costs of long-distance transportation via ships. Notwithstanding this, there is a need for a feasibility study on whether pipelines can be used to transport hydrogen inland, as is currently the case with diesel and petrol.<sup>44</sup> Although these studies are necessary, evidence from other parts of Africa suggests that such infrastructure can be easily repurposed for green hydrogen, as argued by Cardinale.<sup>45</sup>

In addition to the regulatory challenges outlined above, South Africa must address other challenges in creating a viable green hydrogen industry through sound policy development. These include negative perceptions of its impact on water, transportation costs, developmental risks, and the high costs of green hydrogen products compared to conventional fuels. Additionally, there is a lack of awareness regarding the benefits of green hydrogen. These are briefly analysed. Concerning water, there are conceptions that the production of green hydrogen is exceedingly intensive to the extent that it is not justifiable. This view stems from the fact that South Africa is a water-scarce nation which even imports water from its neighbour, Lesotho.<sup>46</sup> However, the Presidential Climate Commission argues that the impact of green hydrogen development on water is minimal and that, instead of abandoning the production of green hydrogen on water scarcity grounds, South Africa should invest in desalination to increase water availability to communities.

Another concern with green hydrogen is that its implementation at a time when South Africa is experiencing energy insecurity will exacerbate energy poverty, further affect the economy and result in a situation in which the adoption of green projects erodes the country's energy sovereignty. The government understands these concerns and argues that it anticipates green hydrogen projects to "come online after the energy crisis is resolved, projects will feed into the grid, and community mini-grid opportunities."<sup>47</sup> Depending on the meaning that one ascribes to this articulation, it can be concluded that the implementation of green hydrogen projects for the benefit of local consumers should be carefully balanced with the energy needs of the country so that South Africa does not find itself in a situation in which the pursuit of green hydrogen increases its energy insecurity and erodes its energy sovereignty. In order to reduce the risks of pursuing green hydrogen, South Africa needs to 'de-risk' by taking measures that mitigate and remove the financial, energy and other risks that arise.<sup>48</sup>

## RECOMMENDATIONS

The foregoing discussion has revealed that while South Africa justifies its green hydrogen policy on the Just Energy Transition and related climate change commitments, the main driver is competitiveness. This demonstrates a misalignment which can be addressed through policy interventions that address both the immediate needs of the energy transition and the broader socio-economic landscape. South Africa must strengthen policy coherence by integrating green hydrogen objectives into broader national strategies, such as the Just Energy Transition and Low-Emission Development Strategy. At the moment, these strategies do not adequately address the role of green hydrogen. As such, a more integrated approach

<sup>44</sup> Presidential Climate Commission., "Green Hydrogen (GH2) Commercialisation in South Africa."

<sup>45</sup> Roberto Cardinale, "From Natural Gas to Green Hydrogen: Developing and Repurposing Transnational Energy Infrastructure Connecting North Africa to Europe," *Energy Policy* 181 (October 2023): 113623, <https://doi.org/10.1016/j.enpol.2023.113623>.

<sup>46</sup> Parliamentary Monitoring Group, "Lesotho Highlands Water Project," 2012, [https://static.pmg.org.za/docs/121023lesotho\\_1.pdf](https://static.pmg.org.za/docs/121023lesotho_1.pdf).

<sup>47</sup> Presidential Climate Commission., "Green Hydrogen (GH2) Commercialisation in South Africa."

<sup>48</sup> Sören Scholvin, Anthony Black, and Glen Robbins, "De-Risking Green Hydrogen? Insights from Chile and South Africa," *Energy Policy* 198 (March 2025): 114485, <https://doi.org/10.1016/j.enpol.2024.114485>.

across energy, economic, and industrial policies would ensure a unified direction for green hydrogen development and ensure that its growth aligns with South Africa's climate commitments and developmental goals. This alignment will create synergies between the energy transition and its economic competitiveness objectives and position green hydrogen as both an energy solution and an engine for economic growth.

In addition to policy alignment, regulatory amendments are needed to ensure that the green hydrogen sector grows. For instance, the Gas Act needs to be amended to address the unique challenges posed by hydrogen production and distribution. This revision should ensure that safety standards and operational guidelines accommodate hydrogen-specific infrastructure, including storage and transportation technologies. A dedicated legislative enactment for hydrogen should be considered alongside updates to existing policies in order to support the rapid development of the green hydrogen economy.

Given the scale of investment required by the green hydrogen sector, South Africa needs to prioritise infrastructure development regarding critical components such as electrolyser technology, port facilities, and hydrogen transportation pipelines. The existing infrastructure (particularly port facilities) could be repurposed to store and export green hydrogen. Such infrastructure investments are necessary for South Africa as a global leader in the hydrogen market. The government should also seek to build public-private partnerships that can help provide funding for these large-scale investments. Financial support mechanisms such as grants, tax incentives, and international financing are necessary for the growth of the green hydrogen sector. These can incentivise private sector investment in green hydrogen when coupled with tax relief and the removal of statutory hindrances on the storage and transportation of green hydrogen.

South Africa also needs to address the socio-economic impacts of green hydrogen development. While green hydrogen holds the potential for job creation and economic diversification, the government must ensure that these benefits are equally distributed across the country. Job creation initiatives must be coupled with skills development programs to ensure that the workforce is prepared for the transition. It is thus necessary to design green hydrogen projects to reduce energy poverty and empower communities that are disproportionately affected by the energy transition. Programs that involve local communities in the development of green hydrogen projects in regions that are heavily dependent on coal will encourage inclusive growth and ensure that no one is left behind in the energy transition.

Although the potential of green hydrogen has been discussed above on a positive note, it must be noted that it is necessary for the government to create a regulatory framework that addresses the environmental implications of green hydrogen, particularly where it concerns water use. This is because South Africa faces ongoing challenges with water scarcity. These problems can be worsened by green hydrogen production, which requires substantial amounts of water. As such, the legal framework must require investment in water-efficient technologies for hydrogen production, including exploring desalination technologies and water recycling systems. A comprehensive impact assessment of water usage in green hydrogen projects should be conducted to ensure sustainability in regions with high water stress, such as Gauteng, Limpopo, Mpumalanga and some parts of the Eastern Cape province.

Finally, this study recommends that South Africa should design mechanisms for monitoring the progress and effectiveness of green hydrogen policies. This can be achieved through clear monitoring and evaluation mechanisms. A framework with well-defined performance indicators and regular assessments will help track the success of green hydrogen initiatives to ensure timely policy adjustments when necessary. Continuously evaluating the environmental, economic, and social outcomes of green hydrogen projects will ensure that the hydrogen strategy is on track to meet its long-term goals and climate targets.

## **CONCLUSION**

The development of a green hydrogen policy in South Africa is partly justified by the Just Energy Transition and related climate change mitigation commitments. However, this study demonstrates that while the government presents green hydrogen as a component of its climate strategy, the true driver behind this initiative lies in economic competitiveness. Rather than being positioned purely as a climate mitigation tool, the green hydrogen policy is a strategic asset aimed at boosting South Africa's industrial base, creating export opportunities and enhancing global market integration.

The findings indicate that South Africa's engagement with green hydrogen is not a recent development. This is demonstrated by the initial research and strategy formulation in the early 2000s and the establishment of dedicated hydrogen initiatives like the Hydrogen South Africa Programme and the Hydrogen Society Roadmap in 2022. This shows that South Africa's interest in hydrogen has evolved from a commercial opportunity to a technological and environmental necessity. The historical developments outlined in this research indicate that when paired with South Africa's vast renewable resources and mineral wealth, the green hydrogen policy can position South Africa as a potential leader in the global green hydrogen economy. However, this study finds that South Africa's green hydrogen strategy faces many challenges, such as an outdated legislative environment, a lack of regulatory clarity, and an infrastructure that is not optimised for green hydrogen production, storage and export. While green hydrogen represents a promising avenue for South Africa to diversify its energy mix and advance its industrial strategy, the policy must remain closely aligned with the country's long-term climate goals. It must be integrated into a comprehensive policy and legislative framework that supports both economic growth and environmental concerns while addressing the risks and uncertainties that accompany the Just Energy Transition.

## BIBLIOGRAPHY

- Beidari, Mohamed, Sue-Jane Lin, and Charles Lewis. "Decomposition Analysis of CO<sub>2</sub> Emissions from Coal-Sourced Electricity Production in South Africa." *Aerosol and Air Quality Research* 17, no. 4 (2017): 1043–51. <https://doi.org/10.4209/aaqr.2016.11.0477>.
- Cardinale, Roberto. "From Natural Gas to Green Hydrogen: Developing and Repurposing Transnational Energy Infrastructure Connecting North Africa to Europe." *Energy Policy* 181 (October 2023): 113623. <https://doi.org/10.1016/j.enpol.2023.113623>.
- Cowling, N. "Total Wind Energy Capacity in South Africa 2013-2023." Statistica, 2024. <https://www.statista.com/statistics/1218114/south-africa-total-wind-energy-capacity/#:~:text=As of 2023%2C>.
- Department of Mineral Resources & Energy. "Renewable Energy Independent Power Producer Procurement (REIPPP) Programme," 2024. <https://www.dmre.gov.za/energy-resources/reipp-programme>.
- . "Wind-Power. Republic of South Africa," 2022. <https://www.dmre.gov.za/energy-resources/energy-sources/renewable-alternative-fuels/wind-power>.
- Department of Mineral Resources and Energy. "Integrated Resource Plan," 2023. <https://www.dmre.gov.za/mining-minerals-energy-policy-development/integrated-resource-plan/irp-2023>.
- Department of Minerals and Energy. "White Paper on Energy Policy of the Republic of South Africa." Government of the Republic of South Africa, 1998. [https://www.gov.za/sites/default/files/gcis\\_document/201409/whitepaperenergypolicy19980.pdf](https://www.gov.za/sites/default/files/gcis_document/201409/whitepaperenergypolicy19980.pdf).
- Department of Science and Innovation. "Hydrogen Society Roadmap for South Africa. Government of the Republic of South Africa," 2021. [https://www.dsti.gov.za/images/South\\_African\\_Hydrogen\\_Society\\_RoadmapV1.pdf](https://www.dsti.gov.za/images/South_African_Hydrogen_Society_RoadmapV1.pdf).
- Department of Science and Technology. "National Hydrogen and Fuel Cell Technologies Research, Development and Innovation Strategy." Government of the Republic of South Africa, 2007. [https://www.hysa-padep.co.za/wp-content/uploads/2022/02/Document-2\\_National-Hydrogen-and-Fuel-Cell-Technologies-Research-Development-and-Innovation-Strategy.pdf](https://www.hysa-padep.co.za/wp-content/uploads/2022/02/Document-2_National-Hydrogen-and-Fuel-Cell-Technologies-Research-Development-and-Innovation-Strategy.pdf).
- Eskom. "Koeberg Operating Licence Extended for Further 20 Years." Eskom, 2024. <https://www.eskom.co.za/koeberg-operating-licence-extended-for-further-20-years/>.
- Eskom. "Coal-Fired Power Stations." Eskom, 2024. <https://www.eskom.co.za/eskom-divisions/gx/coal-fired-power-stations/>.
- . "Decommissioning/End of Life Dates and MES Applications Per Coal-Fired Power Station," 2019. <https://cer.org.za/>.
- . "Koeberg Nuclear Power Station." Eskom, 2023. <https://www.eskom.co.za/eskom-divisions/gx/koeberg-nuclear-power-station/#:~:text=Koeberg%2C>.
- Groenewald, Y. "Komati Shutdown: Future Bleak for Communities as People Lose Jobs, Money." The

- Citizen, March 30, 2023. <https://www.citizen.co.za/news/komati-shutdown-future-bleak-for-communities/>.
- Hartnady, Chris J.H. "South Africa's Diminishing Coal Reserves." *South African Journal of Science* 106, no. 9/10 (September 17, 2010). <https://doi.org/10.4102/sajs.v106i9/10.369>.
- Hydrogen South Africa, & University of the Western Cape. "Hydrogen South Africa." HySA, 2007. <https://www.hysasystems.com/index.php/about-hysa#:~:text=The principal strategy of HySA,the world's known PGM reserves>.
- Lekunze, Angwe Rachel. "Rethinking the (Un) Just Transition: A Review of the Impact of Neoliberal Approaches to Energy Governance in South Africa." *Journal of Law, Society and Development* 11, no. 1 (2024): 1–18.
- Li, Chengzhe, Libo Zhang, Qunwei Wang, and Dequn Zhou. "Towards Low-Carbon Steel: System Dynamics Simulation of Policies' Impact on Green Hydrogen Steelmaking in China and the European Union." *Energy Policy* 188 (May 2024): 114073. <https://doi.org/10.1016/j.enpol.2024.114073>.
- Makgetla, N., and M. Patel. "The Coal Value Chain in South Africa. Trade & Industrial Policy Strategies: Pretoria, South Africa," 2021. <https://tips.org.za/research-archive/trade-and-industry/item/4161-the-coal-value-chain-in-south-africa>.
- Mathe, M. "South African Hydrogen Economy Activities - National Hydrogen Energy & Fuel Cell R&D Strategy Development." *The Hydrogen Economy for Sustainable Development, Reykjavik, Iceland*, September 2006.
- NECSA. "South Africa Doubles Down on Nuclear Power." South African Nuclear Corporation, 2024. <https://www.necsa.co.za/2024/08/06/south-africa-doubles-down-on-nuclear-power/#:~:text=>.
- Nel, Johan, and Willemien du Plessis. "An Evaluation of NEMA Based on a Generic Framework for Environmental Framework Legislation." *South African Journal of Environmental Law and Policy* 8, no. 1 (2001): 1–36.
- Parliamentary Monitoring Group. "Lesotho Highlands Water Project," 2012. [https://static.pmg.org.za/docs/121023lesotho-\\_1.pdf](https://static.pmg.org.za/docs/121023lesotho-_1.pdf).
- Presidential Climate Commission. "Green Hydrogen (GH2) Commercialisation in South Africa," 2023.
- Scholvin, Sören, Anthony Black, and Glen Robbins. "De-Risking Green Hydrogen? Insights from Chile and South Africa." *Energy Policy* 198 (March 2025): 114485. <https://doi.org/10.1016/j.enpol.2024.114485>.
- South Africa. "South Africa's Low Emission Development Strategy 2050," 2020.
- Swilling, Mark, Ivan Nygaard, Wikus Kruger, Holle Wlokas, Tasneem Jhetam, Megan Davies, Merin Jacob, et al. "Linking the Energy Transition and Economic Development: A Framework for Analysis of Energy Transitions in the Global South." *Energy Research & Social Science* 90 (August 2022): 102567. <https://doi.org/10.1016/j.erss.2022.102567>.
- The Presidency. *South Africa's Just Energy Transition Investment Plan (JET Plan)*. Pretoria: Government of the Republic of South Africa, 2022.
- Winkler, Harald, Emily Tyler, Samantha Keen, and Andrew Marquard. "Just Transition Transaction in South Africa: An Innovative Way to Finance Accelerated Phase out of Coal and Fund Social Justice." *Journal of Sustainable Finance & Investment* 13, no. 3 (July 3, 2023): 1228–51. <https://doi.org/10.1080/20430795.2021.1972678>.

## ABOUT AUTHOR

Dr. Angwe Rachel Lekunze is a legal scholar specialising in environmental, energy, and public law in South Africa, the African Union, and the SADC region. She holds a PhD in Law from North-West University and serves as a Postdoctoral Research Fellow at UNISA. Her work focuses on legal and regulatory framework analysis, comparative law, and governance research, with contributions to multi-country projects such as the FAO SADC Drought Study. Dr Lekunze has lectured at various institutions and previously led academic accreditation processes as Principal at Jeppe College. She has published widely on energy governance, environmental law, and just transitions in Africa.