HYDROGEN INSIGHTS

Part 5

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The Road to Green Hydrogen in Kenya

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As discussed earlier in the publication, green hydrogen is currently viewed as the next big thing in energy, a game changer for meeting the world's growing energy demands. As a clean alternative to fossil fuels, green hydrogen also offers significant opportunity for the decarbonisation of important sectors for Kenya and the East African region.

Kenya's potential for green hydrogen production

Kenya benefits from having an abundance of the elements required to develop green hydrogen: electricity, water, wind and solar.

According to 2021 data from the Energy and Petroleum Regulatory Authority (EPRA), about 73% of the country's land mass experiences an average wind speed of about 6m/s or higher at a 100m above ground level. The average wind speeds on about 28228km^2 range between 7,5 and 8,5m/s while about 2825km^2 experiences wind speeds ranging between 8,5 and 9,5m/s. As such, Kenya has great potential to produce electricity from wind.

With regards to hydro power, Kenya is endowed with various water resources.

According to EPRA, Kenya's currently installed large hydropower capacity is 826,23MW. This is in addition to small hydro potential with an estimated capacity of 3000MW. Of this, less than 30MW has been exploited and about 15MW supplies the national grid. This further shows that there is great untapped potential that Kenya could exploit to generate hydropower for the purpose of producing green hydrogen.

EPRA also reports that in addition to abundant wind and water resources, Kenya's daily insolation is 4 to 6kWh/m^2. Despite this great potential, only a small portion (1% of the country's energy mix) has been utilised. The estimated solar potential in Kenya is about 15000MW. Of this, the installed capacity is 100MW. The northern part of Kenya experiences the highest solar intensity. Therefore, taking advantage of all these resources would go a long way in supplying sufficient electricity to produce green hydrogen in the country.

Currently, electricity generation sources in Kenya are mainly renewable, with geothermal, which generates over 40% of Kenya's power, being the main source of energy. Hydro, wind and solar also contribute significantly at 34,22%, 14,05% and 0,73% respectively, according to Kenya Power and Lighting Company's 2021 Annual Report.

However, the production of green hydrogen does not solely rely on the availability of renewable sources of energy. In its 2020 Guide to Policymaking on Green Hydrogen, the International Renewable Energy Agency (IRENA) highlights that the production of green hydrogen requires a dedicated transport infrastructure, capital to manage the high production costs, and a reliable market, among other factors.

While developing and middle-income countries like Kenya do not as yet have all the essential ingredients to drive a hydrogen economy, political will and interest in green hydrogen is high.

For example, in his speech at COP26 in Glasgow, President Uhuru Kenyatta affirmed Kenya's commitment to fully transition to clean energy by 2030. To achieve this, the President indicated that the Kenyan Government intends to tap into other sources of clean energy, such as green hydrogen.

To affirm its commitment, at COP26, Kenya was among 42 countries that endorsed the ground-breaking Glasgow Breakthrough Agenda, an international clean technology plan to help achieve the Paris Agreement of 2015 where world leaders at COP21 agreed to take steps to limit the increase in global temperature to 1,5 degrees Celsius. The Glasgow agenda set out common targets known as "*Glasgow Breakthroughs*" for 2030 to accelerate the innovation and deployment of clean technologies in five key sectors of global economies, including hydrogen.

Kenya's steps towards green hydrogen production

Kenya has begun its journey towards a green hydrogen future and in 2021 conducted a yet unpublished baseline study on green hydrogen production and utilisation in the country. There are also plans underway for the piloting of green hydrogen projects to assess the feasibility of large-scale green hydrogen production in Kenya. To drive the process towards a green hydrogen economy, a national green hydrogen working group made up of stakeholders from both the public and private sectors, has been set up and planning has begun for a roadmap on the future of green hydrogen in the country that will be used in formulating policy on the subject.

While there are no laws or policies regulating the production, storage, and distribution of green hydrogen in Kenya, the existing general legal framework supports the adoption and utilisation of clean energy in the country.

One example can be found in Kenya's taxation framework. Under the Value Added Tax, 2013, the importation of windmills is not subject to import duty or value-added tax (VAT) while hydraulic turbines and water wheels do not attract any import duty but 16% VAT. Furthermore, the Finance Act 2021 reinstated VAT exemptions on renewable energy equipment, such as solar and wind generation equipment, by scrapping the imposition of 14% VAT on the equipment which had been introduced by the Finance Act, 2020. These tax reliefs are critical for persons seeking to invest in green hydrogen since its production relies on wind, solar, and water generated electricity.

In order for the country to implement real change in this sector and meet its obligations in this respect, Kenya must address the issues that hinder the production of green hydrogen. These include the high cost of production, the lack of an enabling infrastructure, and the lack of market, among other factors. The first critical steps Kenya should take are outlined below.

The development of a stand-alone green hydrogen policy and strategy

The IRENA guide on developing policy on green hydrogen advises that some of the key pillars of a green hydrogen policy are a national hydrogen strategy that outlines the support required for producing and using green hydrogen; a set of priorities with regards to the production and use of green hydrogen; and a policy which establishes a governance system and a mechanism to integrate green hydrogen into the larger energy framework. In developing its policy, Kenya should consider all these pillars and use the examples set by other countries such as France and Namibia.

France has developed a Green Hydrogen Plan 2020–2030 setting out the country's long-term plan to achieve mass production of green hydrogen by 2030. Some of the target sectors in the plan are transport, heavy metal industries, aviation, and other energy intensive sectors. In addition to identifying target sectors, the plan also sets a target of green hydrogen production capacity at 6,5GW, which would save 6MT CO2 emissions by 2030. Moreover, the plan identifies various market opportunities including large group energy suppliers, start-ups and small and medium enterprises, and the public sector.

In addition, France has a national hydrogen strategy that focuses on three areas: French electrolysis, production of hydrogen-controlled vehicles, and support for research and innovation on green hydrogen, while at the same time recognising the role of the private sector in the production of green hydrogen.

Due to its clear plan and strategy on green hydrogen production, France has attracted private sector players who have shown interest in investing in green hydrogen production. For instance, Total Energies and Engie signed an agreement to design, develop, build, and operate France's largest renewable energy production pilot project at Châteauneuf-les-Martigues in the Provence-Alpes-Côte d'Azur region in the south of the country. The 40MW electrolyser will produce about 5 tonnes of green hydrogen daily.

Closer to home, Namibia broadly has a green hydrogen policy and strategy that identifies private sector players as key in the implementation of its green hydrogen production. Furthermore, the policy identifies both local and international markets for green hydrogen exports. These provisions have attracted international players to partner with Namibia's government in the production of green hydrogen, solidifying the African country's forerunner status in green hydrogen.

The exploration of regional and international collaborations

The process of producing, storing, and using green hydrogen is capital intensive. As such, funding from collaborative efforts between countries and governments can assist in spearheading Kenya's investment in green hydrogen. This approach is being applied in Egypt and Namibia in their pilot green hydrogen production projects with the signing memoranda of understanding.

There is scope for Kenya to collaborate with countries that have demonstrated interest in supporting green hydrogen development projects in developing countries. Besides collaborations with international players, regional collaborations on the African continent would be beneficial. These could be within the East African community to support the development of green hydrogen transportation system to access regional markets. Kenya may also consider partnerships fronted by trading blocks. For instance, the Common Market for Eastern and Southern Africa collaborating with the Southern African Development Community. The AfCFTA would also help Kenya to access a wider market.

The implementation and learning from pilot projects

Pilot projects play a crucial role in promoting the development of green hydrogen. Essentially, pilot projects test the viability of implementing a project on a full scale.

Outcomes from a pilot project inform policymakers about issues such as licencing, electrolyser capacity targets, transportation, and storage of green hydrogen. Further, a pilot project would assist in developing infrastructure and identifying potential market targets to explore. Private sector players would also be motivated to invest in green hydrogen following the outcomes of a pilot project.

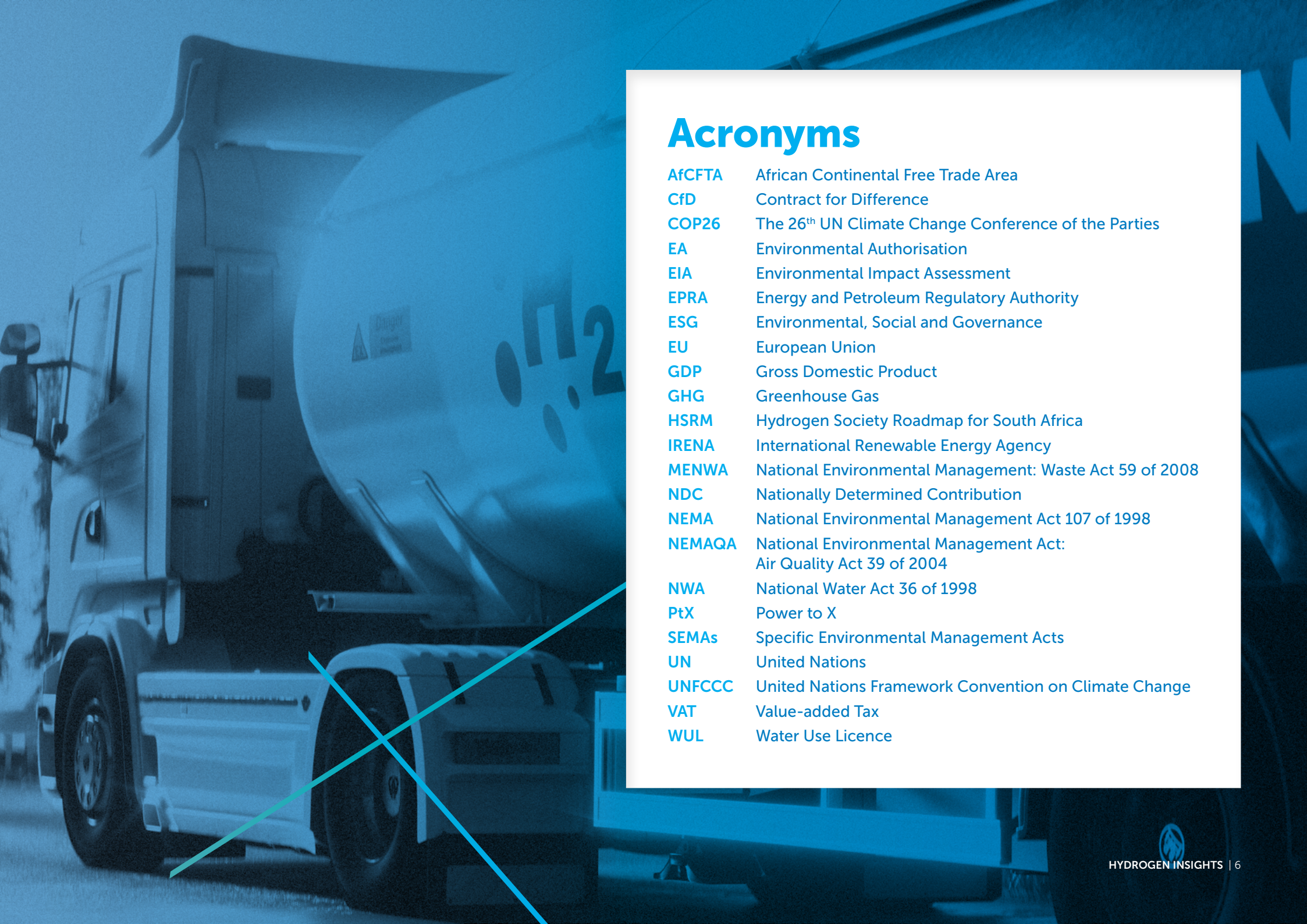
The pilot projects that Kenya is considering are therefore a good opportunity to introduce and promote the production and use of green hydrogen, including developing storage and transportation infrastructure for both local and international markets and creating awareness about the use of green hydrogen locally.

Conclusion

Kenya is well placed to produce green hydrogen, which will contribute to the country's goal to reduce emissions to 32% by 2030, as outlined in Kenya's updated NDC, submitted to the UNFCCC in December 2020. Local high emission sectors such as the industrial processing sector and the transport sector, among others, would benefit greatly from green hydrogen production.

In addition to reducing emissions and providing energy security, the production and use of green hydrogen would provide job opportunities for local populations along the production and distribution value chain.

Should the push for hydrogen gain significant momentum in the country, it also offers an opportunity for Kenya to potentially become a hydrogen exporter by developing export-oriented hydrogen projects. It has been said that nothing is more powerful than an idea whose time has come, and Kenya is embarking on the path towards a green hydrogen future aware of the opportunities that abound and needing more clarity on how to fully embrace these for a more sustainable future.



Acronyms

AfCFTA	African Continental Free Trade Area
CfD	Contract for Difference
COP26	The 26th UN Climate Change Conference of the Parties
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EPRA	Energy and Petroleum Regulatory Authority
ESG	Environmental, Social and Governance
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HSRM	Hydrogen Society Roadmap for South Africa
IRENA	International Renewable Energy Agency
MENWA	National Environmental Management: Waste Act 59 of 2008
NDC	Nationally Determined Contribution
NEMA	National Environmental Management Act 107 of 1998
NEMAQA	National Environmental Management Act: Air Quality Act 39 of 2004
NWA	National Water Act 36 of 1998
PtX	Power to X
SEMAs	Specific Environmental Management Acts
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value-added Tax
WUL	Water Use Licence

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