A Factsheet for Civil Society

Authors:
Leonie Beaucamp
Eugene Nforngwa

DECEMBER 2022

Green Hydrogen in Africa: Risks and benefits

What is green hydrogen?[1, 2]

Green hydrogen is more than just a fuel: As it saves the renewable energy used in its production process, green hydrogen also serves as a renewable energy storage that can bridge potential production gaps. The saved energy can then be released as heat through the combustion of green hydrogen, or be turned into electricity by using the hydrogen in fuel cells.

How is green hydrogen extracted?[3]

There are three main processes for extracting hydrogen. Based on the energy source and raw materials used during the production, the extracted hydrogen is classified in three different colour codes: green, blue, or grey (cf. figure 1). Current hydrogen production is mainly based on natural gas and methane without storing and capturing the released CO_2 emissions (grey hydrogen), and thereby significantly contributes to climate change.

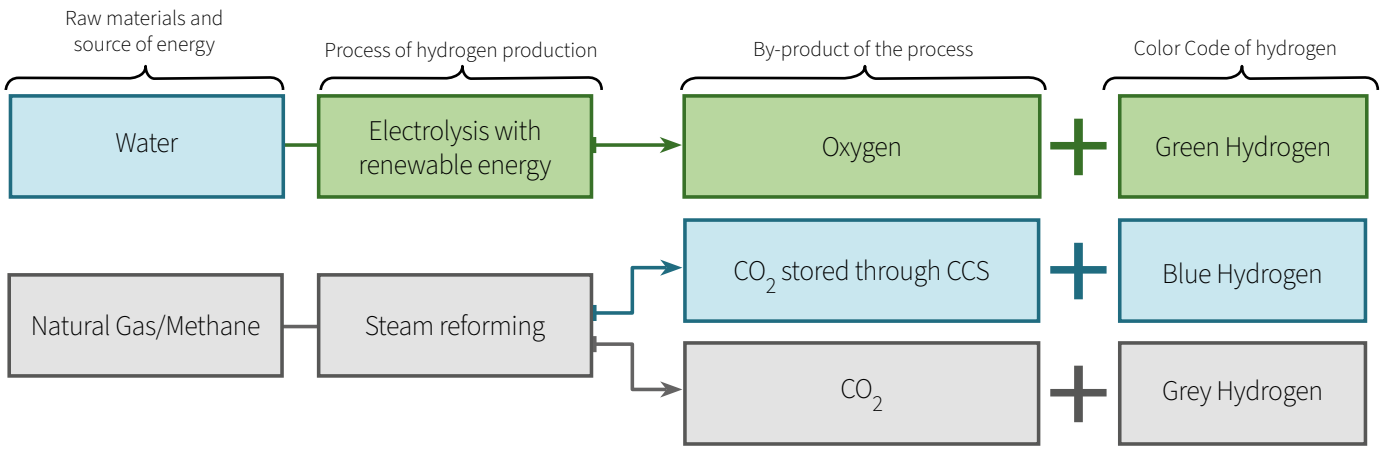


Figure 1: Hydrogen production pathways[4]

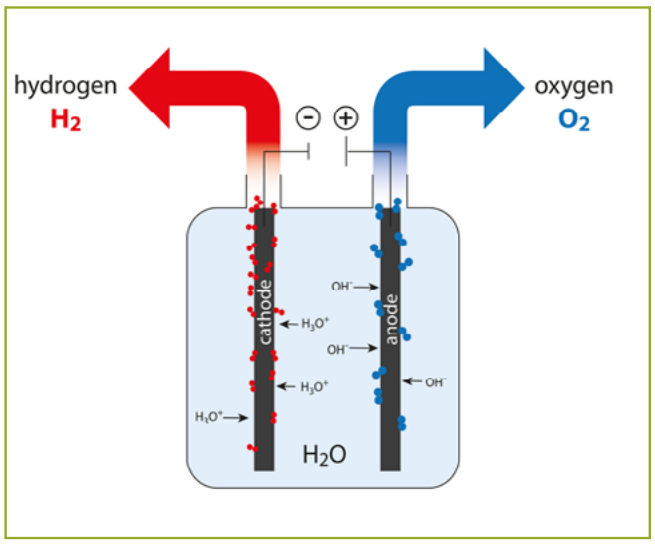


Figure 2: Extraction of hydrogen from water using electrolysis[5]

Green hydrogen, on the other hand, is widely perceived as an alternative with extremely low emissions. It is produced by splitting water into its two components, oxygen and hydrogen, using electrolysis (cf. figure 2). This process is driven by renewable energy, in most cases solar PV or wind energy.

Why is green hydrogen so important?

Limiting global warming to 1.5° requires a shift from fossil fuels to renewable energy. In some countries, however, the renewable energy production capacity is limited, and industrial processes, such as the production of steel,[6] impede or complicate the use of traditional renewable energy. As a renewable energy storage and transport medium, green hydrogen could fill these gaps and serve as a tool on the path to putting net zero commitments into practice[7], as has been expressed by the governments of for example Colombia[8, 9], India[10] or Germany[11, 12].

What are the benefits of producing green hydrogen for African countries?[13]

Not only do many African countries have a great potential for renewable energy production, but also for that of green hydrogen. Considerably lower costs than in other parts of the world (cf. figure 3) as well as the potential to drive domestic industrialisation could make green hydrogen a crucial resource for African countries.

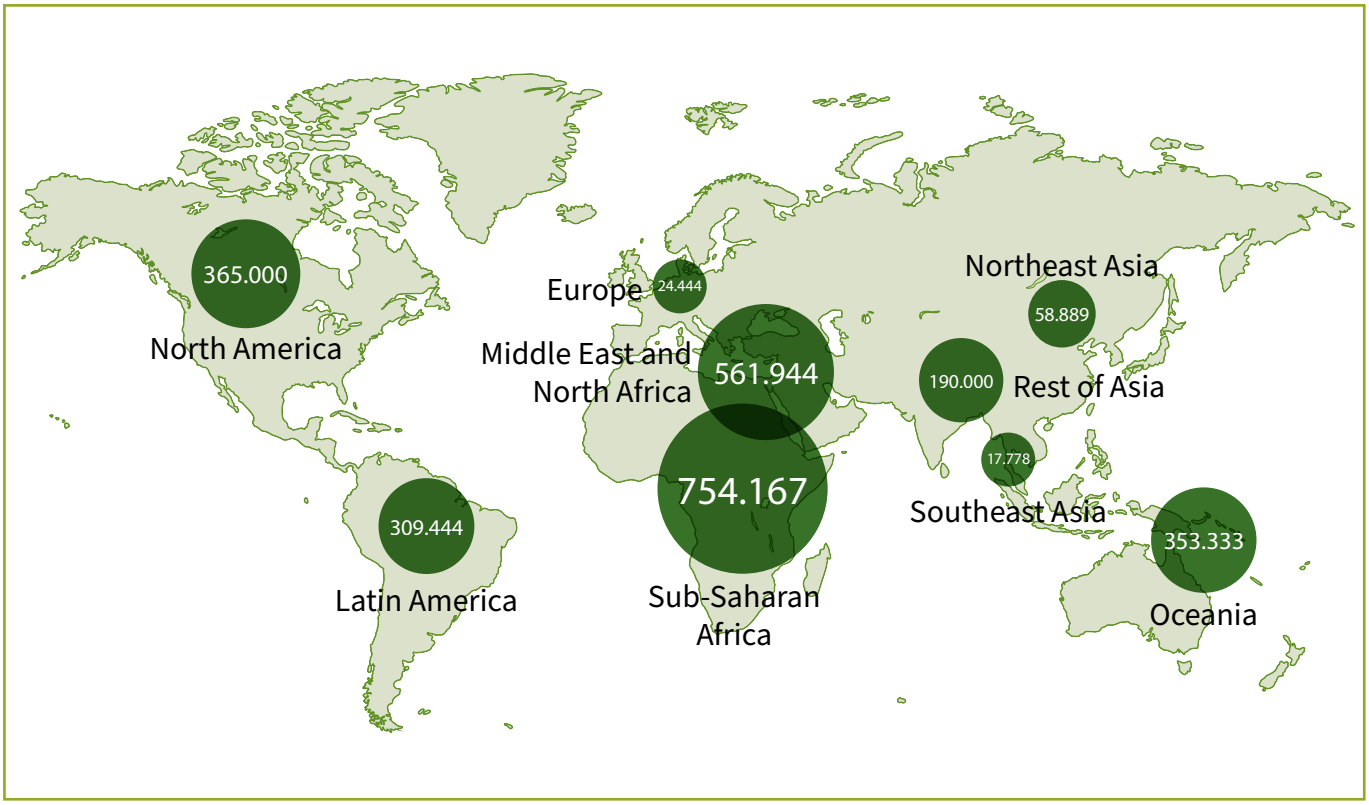


Figure 3: Technical potential for producing green hydrogen under USD 1.5/kg by 2050, in TWh[14]

African Green Hydrogen Alliance (AGHA):

Beyond their own national plans, the following six countries also launched the African Green Hydrogen Alliance in spring 2022, a platform led by governmental bodies of the member states[15, 16]:

- **Egypt:** Ministry of Electricity and Renewable Energy (MOERE)
- **Kenya:** Ministry of Energy
- **Mauritania:** Ministry of Petroleum, Energy & Mines
- **Morocco:** Solar Energy and new Energy Research Institute (IRESEN)
- **Namibia:** Green Hydrogen Commission
- **South Africa:** Industrial Development Corporation

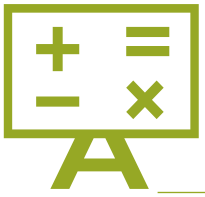
AGHA aims to strengthen the collaboration on capacity building, financing, policy design, and certification. It thereby strives to bring the private sector, development finance institutions, and civil society together.[17]

The benefits for African countries producing green hydrogen

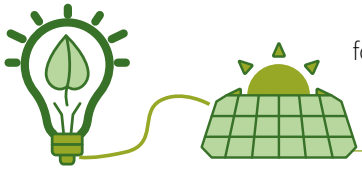
Local economic upstream and downstream opportunities

New branch of industry with a geographical advantage for Africa, contributing to a diversification of the economy

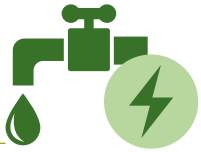
Job creation



Expanded educational opportunities



Provision of energy for the local populations through the expansion of renewable energy production



Local water supply made possible through the installation of desalination plants

What are the risks of expanding the green hydrogen sector in Africa?

- Focus on export, leaving the local populations without any benefits
- Deficient expansion of energy access for the local populations
- Depletion of local resources such as land, water, or energy
- Widening of the gap between rich and poor
- Failure to establish upstream/downstream industry
- Lack of adapted educational provision and local knowledge accumulation
- Lack of integration of the local expertise and workforce to build up, run, monitor, and maintain the production facilities

How can the benefits be secured?

- Prioritisation of the benefits for the broader population as opposed to only a few people
- Inclusion of both civil society and private and public sectors in decision-making processes
- Control and ownership of the projects lies with African actors
- Investments in local economies
- → Creation of upstream (for example, the manufacturing of renewable energy technologies) and downstream industry (for example, the production of ammonia, fertilizer, or green steel)
- Investments in training opportunities
- Establishment of a grievance mechanism as a tool for the participation of the local populations
- Establishment of certification and standards for the production and export of green hydrogen to secure local benefits

Examples of currently planned green hydrogen initiatives[18]:

Moroccan national strategy (2021) Three-stage action plan for green hydrogen[19]:

Phase I (2020 – 2030):

- Hydrogen is only used at a local level
- Further research of green hydrogen products is conducted

Phase II (2030 – 2040):

- Hydrogen serves as a storage medium
- First profitable projects are conceptualised
- Derivatives are exported

Phase III (2040 – 2050):

- Capacities to produce ammonia, hydrogen, and derivatives are improved
- Green hydrogen is used as a local energy source

Hyphen project in Namibia (2021)[20, 21]

- Part of the big Southern Corridor Development Initiative (SCDI)
- Launched at COP26
- Area: 4.000 km^2 in Tsau//Khaeb National Park
- Planned investment: USD 9.4 billion
- Renewable energy capacity: 5 GW
- Electrolyser capacity: 3 GW
- Planned output: 300.000 t green hydrogen per year before 2030
- Start of construction: 2025
- Shareholders: ENERTRAG, Nicholas Holdings; the Namibian government aims for 24% equity shareholding

References

1: IRENA. (2022). Geopolitics of the Energy Transformation – The Hydrogen Factor. https://irena.org/-/media/Files/IRENA/Agency/Publication/2022/Jan/IRENA_Geopolitics_Hydrogen_2022.pdf?rev=1cfe49eee979409686f101ce24ffd71a

2: Weichenhain, U. (2021). Hydrogen transportation - The key to unlocking the clean hydrogen economy. https://www.rolandberger.com/publications/publication_pdf/roland_berger_hydrogen_transport.pdf

3: IRENA. (2022). Geopolitics of the Energy Transformation – The Hydrogen Factor. https://irena.org/-/media/Files/IRENA/Agency/Publication/2022/Jan/IRENA_Geopolitics_Hydrogen_2022.pdf?rev=1cfe49eee979409686f101ce24ffd71a

4: adopted from: Sachverständigenrat für Umweltfragen. (2021). Wasserstoff im Klimaschutz: Klasse statt Masse. https://www.umweltrat.de/SharedDocs/Downloads/DE/04_Stellungnahmen/2020_2024/2021_06_stellungnahme_wasserstoff_im_klimaschutz.pdf?__blob=publicationFile&v=4

5: EPO, & IRENA. (2022). Patent insight report. Innovation trends in electrolysers for hydrogen production. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2022/May/IRENA_EPO_Electrolysers_H2_production_2022.pdf?rev=647d930910884e51b60137bcf5a955a6

6: IRENA. (2022). Green Hydrogen for Industry - A Guide to Policy Making. https://irena.org/-/media/Files/IRENA/Agency/Publication/2022/Mar/IRENA_Green_Hydrogen_Industry_2022_.pdf?rev=720f138dbfc44e30a2224b476b6dfb77

7: Fan, Z., Ochu, E., Braverman, S., Lou, Y., Smith, G., Bhardwaj, A., Brouwer, J., Mccormick, C., & Friedmann, J. (2021). Green Hydrogen in a Circular Carbon Economy: Opportunities and Limits. https://www.energypolicy.columbia.edu/sites/default/files/file-uploads/GreenHydrogen_CGEP_Report_111122.pdf.

8: Green Hydrogen Organisation. (n.d.). Colombia. https://gh2.org/countries/colombia

9: Climate Action Tracker. (n.d.). Colombia. https://climateactiontracker.org/countries/colombia/targets/

10: Climate Action Tracker. (n.d.). India. https://climateactiontracker.org/countries/india/

11: Green Hydrogen Organisation. (n.d.). Germany. https://gh2.org/countries/germany

12: Climate Action Tracker. (n.d.). Germany. https://climateactiontracker.org/countries/germany/

13: Adow, M., Wemanya, A., Opfer, K., Nweke-Eze, C., Njamnshi, A. B., Fernandez, J., & Singer, S. (2022). Green Hydrogen production and Power-to-X products in Africa. https://www.germanwatch.org/en/84785

14: Adopted from: IRENA. (2022). Geopolitics of the Energy Transformation – The Hydrogen Factor. https://irena.org/-/media/Files/IRENA/Agency/Publication/2022/Jan/IRENA_Geopolitics_Hydrogen_2022.pdf?rev=1cfe49eee979409686f101ce24ffd71a

15: Race to Resilience – Race to Zero. (2022). African Green Hydrogen Alliance launches with eyes on becoming a clean energy leader. https://climatechampions.unfccc.int/african-green-hydrogen-alliance-launches-with-eyes-on-becoming-a-clean-energy-leader/

16: Race to Resilience - Race to Zero. (n.d.). Africa Green Hydrogen Alliance. https://climatechampions.unfccc.int/africa-green-hydrogen-alliance/

17: Green Hydrogen Organisation. (2022). Africa Green Hydrogen Alliance holds regional forum to agree ambition ahead of COP27. https://gh2.org/article/africa-green-hydrogen-alliance-holds-regional-forum-agree-ambition-ahead-cop27

18: Keletso Moilwe. (2022). Upcoming Green Hydrogen Projects in Africa. https://energy-capitalpower.com/upcoming-green-hydrogen-projects-in-africa/

19: Stratégie National de l'Hydrogène Vert. (n.d.) https://www.mem.gov.ma/Lists/Lst_rapports/Attachments/28/Stategie%20nationale%20de%20l%20Hydrogene%20vert.pdf

20: HYPHEN Hydrogen Energy. (n.d.). Projects. https://hyphenafrica.com/projects/

21: HYPHEN Hydrogen Energy. (n.d.). Shareholders. https://hyphenafrica.com/shareholders/

The project **"Ensuring a People-Centered Energy Transition in Africa through Civil Society Engagement"** aims at strengthening the engagement of civil society in energy system transformation processes in five African countries – Morocco, Nigeria, Cameroon, Botswana, and Kenya. The project promotes an approach to implementing energy initiatives focused on transformational change in the energy sector through more appropriate policy frameworks and enabling environments on the national, regional, and continental level. Thereby, the project contributes to an effective acceleration of the renewable energy transition, which not only results in significant short- and long-term emissions reductions but also in well-designed renewable energy systems that meet the energy needs of the population and are more resilient to extreme weather events, droughts and supply shortages.

The project is implemented by PACJA with the support of Germanwatch and is financed by the International Climate Initiative (IKI) of the German Ministry for Economic Affairs and Climate Action, the Ministry for the Envrionment, Nature Conservation, Nuclear Safety and Consumer Protection and the Federal Foreign Office.

Supported by:

Federal Foreign Office

IKI INTERNATIONAL CLIMATE INITIATIVE

on the basis of a decision by the German Bundestag

December 2022

Germanwatch – Office Bonn
Kaiserstraße 201, D-53113 Bonn, Germany, Phone +49 (0)228 / 60492-0, Fax -19
www.germanwatch.org

Contact:
Leonie Beaucamp beaucamp@germanwatch.org

Layout:
Monika Schmitt schmitt_monika@web.de