



# Opportunities *for* *Digital Startups and* *Local Innovators* **in Green Hydrogen** *in Kenya*





## Summary

**K**enya has been a green pioneer in electricity generation in the East Africa region for quite some time and the new administration under President William Ruto is further pushing towards 100% of grid electricity being generated by renewable sources. Green hydrogen (GH<sub>2</sub>) will play a major role in this strategy. The public and the private sector have been very active in articulating the best possible way for Kenya to not only position itself as a green hydrogen innovator but also to ensure that local communities and small businesses benefit from the potential in the sector.

During Endeava's inclusive innovation 2030 (ii2030) journey, a group of diverse stakeholders from across the industry identified several challenges, opportunities, and subsequent levers for systemic change, as well as the key stakeholders and activities necessary to implement this change.

Although there are already diverse actors in the hydrogen space, e.g. companies, public stakeholders and academia, there is a lack of startups and small enterprises dedicated to the commercial opportunities in GH<sub>2</sub> and its products and services.



The challenges identified through the ii2030 process range from lack of access to finance, fear of risk in communities and limited skills to very few and unclear business models. Stakeholders articulated a number of innovative recommendations to tackle these obstacles. The largest consensus settled on the need for a Green Hydrogen Centre of Excellence (CoE) that would serve as “one-stop shop” to bring together ecosystem actors in technical training, commercial ideas and investment opportunities to co-create successful startups and subsequent jobs.

This brief outlines the climate for innovators in green hydrogen in Kenya, introduces some of the major players in the ecosystem and shares recommendations to improve system dynamics for startups to enable them to grasp opportunities in the sector. The recommendations were gathered through Endeava’s multi-stakeholder process ii2030 from January to July 2023.





## Background

**K**enya's green hydrogen strategy and roadmap is one of Africa's most progressive and has been launched in September 2023, when Nairobi hosted Africa's first Climate Summit.

The country already produces more than 90% of its electricity from hydropower, geothermal energy, solar and wind energy as well as biomass. Its ambition is to fully transition to renewable energy sources by 2030 while doubling the grid's capacity and reach. Current off-peak renewable electricity capacity will be used for GH<sub>2</sub> production (esp. geothermal at night), thereby using existing infrastructure and expertise, including the public energy provider KenGen's generators and technicians.

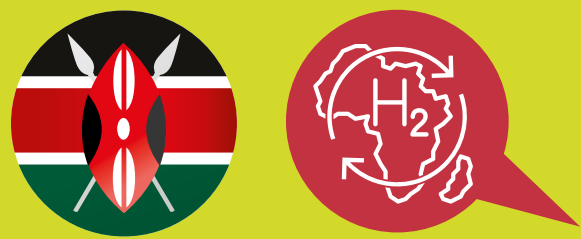
However, despite the excitement of key stakeholders and the practicality of some solutions, **there is also limited awareness, understanding and skills among some parts of society.**

Whereas multistakeholder working groups and task forces have been busy putting Kenya on the GH<sub>2</sub> map, including dedicated hydrogen workshops during the inaugural Africa Climate Summit in Nairobi, much of the **discourse is still focusing on large-scale infrastructure, investments and large players.** More can be done to support the local innovators, business ideas and bolster small-scale industries.

Furthermore, communities are wary of hydrogen and the perceived risks, incl. environmental impact of new infrastructure (wind, solar, pipelines, storage and access to water etc.).

With interest and commitments of several companies, the national government and foreign partners, Kenya is identifying industrial pathways to further pursue uses of **GH<sub>2</sub> as energy carrier** for selected transport (mobility) options and **regional export of green ammonia/fertiliser** into the East Africa Community (EAC) and under the Africa Continental Free Trade Area (AfCFTA).



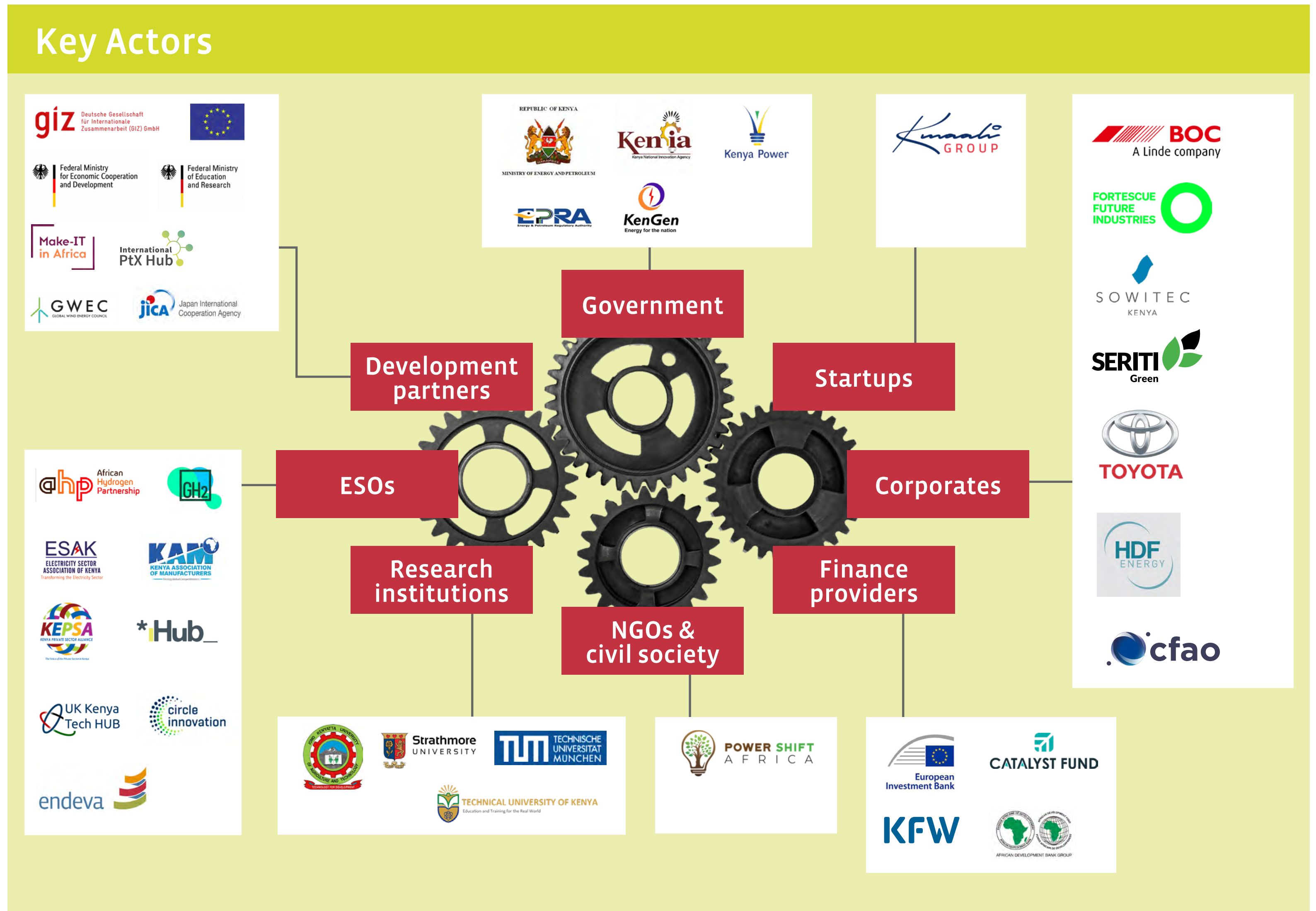


# Actors

The stakeholder landscape in green hydrogen is diverse but limited, as there are a number of development partners and public stakeholders involved in the debate in Kenya, but very few startups or small- and medium-sized businesses have emerged in the GH2 space. Thus, this section is a non-exhaustive sample of organisations focusing on supporting innovation and the startups themselves.

The following overview demonstrates some of the main actors in Kenya's green hydrogen sector.

**Large players** dominating the hydrogen landscape in Kenya include the energy company HDF, the mining giant Fortescue Future Industries (FFI) and potential users of green hydrogen like Toyota and BOC (industrial gases). The public sector is well represented by the Ministry of Energy and Petroleum and parastatals such as KenGen (electricity generation) and KPLC (distribution). Several international development finance institutions (e.g. African Development Bank, European Investment





Bank, the German development Bank KfW) and development partners (e.g. the German development cooperation GIZ, European Union delegation, the Japanese development cooperation JICA) have expressed their interest to support the milestone activities in Kenya's new GH<sub>2</sub> strategy and roadmap.

**Startups** will play a growing role in the sector as the understanding increases that big industry investments will need a functioning local service provider network, both on the technical and training aspect as well as in awareness, distribution and after-sales functions of derivative products' value chains, e.g. in green fertilizer or synthetic aviation fuels.

Startups and innovators are **supported by organisations** such as the Kenya Private Sector Alliance (KEPSA) as they have formed a dedicated green hydrogen working group under their renewable energy sector board. The overall innovation ecosystem for business plan support, incubation of startups and acceleration for the different growth phases is quite well established in Kenya, but so far no specific GH<sub>2</sub> support mechanism has emerged. Innovation hubs such as NaiLab, GrowthAfrica, Circle Innovation and iHub, as well as initiatives of bilateral development partners like GIZ's green Digital Innovation Hub (gDIH) and the PtX Hub are noteworthy examples of early adaptation to support the growing GH<sub>2</sub> sector.

Organisations such as Strathmore University and the Technical University of Kenya (TUK) have a mandate in skills development and contribute to skill building and capacity development in green hydrogen which aids startups in the sector.

The Green Hydrogen Organisation (GH<sub>2</sub>), which is hosting the Africa Green Hydrogen Alliance (AGHA) in Kenya, are among the entities providing support and networking for startups in green hydrogen.





# Green Hydrogen System Dynamics

Overall, we see that the excitement for green hydrogen in Kenya is driven by a committed government to complete the green transition to 100% renewable electricity generation as well as an equally supportive collaboration with development partners such as Germany and (international) financial institutions like the European Investment Bank.

There is a large perceived market potential, both in Kenya and regionally, for derivatives like green ammonia/fertilizer and synthetic fuels.

However, there is a lack of inclusivity as communities and entrepreneurs experience limited awareness, visibility, information, finance options and opportunities to participate. A more holistic approach might be needed for full understanding, support and enthusiasm from all sectors.

Another key bottleneck is the cost of electricity. Therefore, the price to produce green hydrogen is still a challenge.

The following four causal loops representing the key challenges have been developed through interactive consultations with a wide range of stakeholders in Kenya.





# Limited Access to Finance

One of the typical challenges or inhibitors in a startup ecosystem is limited access to finance.

Limited financing options for startups (1) lead to a lack of pilots and innovations in GH2 in Kenya (2), which in turn leads to ideas being stalled and no proofs of concept being developed (3).

Therefore, the demand for loan and investment products/services is limited, and investors and commercial lenders have little incentives to offer them (4). High-risk aversion prevails for such a new sector.

This closes the loop by resulting in limited financing options for startups, leading the vicious cycle to continue.

The development and availability of **targeted finance products** (concessional loans, (matching) grants, impact investments, carbon-credit schemes, and results-based-financing) for startups and small, growing innovators could be a starting point for change. This could be complemented by government subsidies, tax breaks and other non-fiscal incentives (e.g. procurement quotas).







## Recommendations to facilitate access to finance

### ► **Better collaboration between partners**

This recommendation would see a catalytic role of the development partners and development finance institutions to work more closely for the needs of the entrepreneurial ecosystem by helping with grants or soft/convertible loans to get the most promising startup ideas “off the ground”. Innovation Challenge Funds could be designed to focus on certain, market-driven aspects of the GH<sub>2</sub> value chain and help certain groups (e.g. women in GH<sub>2</sub>) or geographies with financial support or technical assistance.

### ► **Increase the GH<sub>2</sub> knowledge for local financiers**

Local commercial lenders are often risk-averse due to their lack of understanding of the specific dynamics, risks, and opportunities in a new sector like green hydrogen. More know-how, understanding and de-risking from partnerships with foundations or development partners could help them to tailor loan products for startups and small and medium companies.

### ► **Develop government subsidies and incentives**

The local and national government should offer direct support and incentives (e.g. tax breaks, concessional loans, innovation grants) to stimulate the development and growth of home-grown enterprises that solve market problems and create jobs and entrepreneurs.



## Fear of risks in communities

This causal loop recognizes the (1) limited knowledge and understanding in communities of green hydrogen as a new technology. This leads to (2) fear and uncertainty on how dangerous GH<sub>2</sub> derivatives like ammonia might be and how safety measures will be deployed.

These doubts and mistrusts around GH<sub>2</sub> are amplified (3) by past negative experiences with renewable energy projects.

The limited participation of community leaders and voices in project development and planning (4) closes the loop as it leads to limited knowledge and understanding.





## Recommendations to reduce fear of risks

### ► **Stronger community engagement**

In order to educate communities that could be affected by extraction, production, storage and transport of green hydrogen, the local government and involved companies should organize village-level round-table information and question & answer sessions, engaging the community and tribal hierarchies. It is important to listen to and understand the fears of the general population and to correct potential misinformation.

### ► **Awareness campaigns by civil society**

Often perceived as a neutral and more trusted source, the involvement of non-governmental organisations (NGO), churches and faith-based organisation (FBO) is important to raise awareness about challenges, opportunities and risks of GH<sub>2</sub> as a new technology and how communities could benefit. These civil society representatives should be involved in risk mitigation and in explaining safety measures through communication campaigns in appropriate languages.



## Low collaboration for skills development

The focus of this loop centers around limited collaboration to develop Kenya-specific GH2 skills programs (1).

Because of this deficiency, we see that there are few locally adapted curricula and training programs (2).

This gap in local training and skills programs leads to the fact that the topic is perceived as abstract (3). This again leads to a lack of clarity as to which GH2 skills should be developed in the Kenyan context (4), which in turn means developing these ambiguous skills isn't a high priority for stakeholders (5).

This closes the loop by explaining the limited stakeholder collaboration we see for skills development locally.

Prioritizing a **local skills needs assessment** and subsequent development of a contextualized curriculum for technical and commercial skills in green hydrogen would change the system. This would help de-mystify the sector and show clear opportunities in **technical jobs and entrepreneurship**, e.g. for maintenance and digital solutions.





## Recommendations to support skills development

► **Partnerships between large companies and colleges/universities**

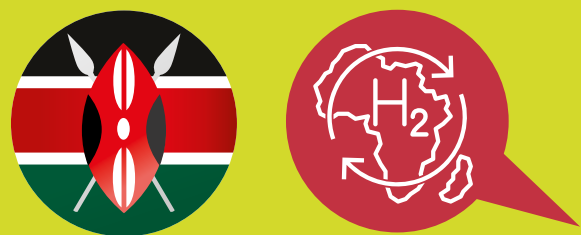
A close relationship between companies and colleges/universities could help to identify and teach skills in demand so that job prospects are improved for graduates and course participants. If companies and other large employers are part of an inclusive curriculum development and review process, there would be more incentives to build a local workforce and support system rather than importing talent and knowledge from abroad. A first step towards such a collaboration could be the co-creation of a needs assessment and capacity review between the public, private and academic sectors.

► **Organize hackathons on a regional level**

This recommendation of organizing hackathons for renewable energy solutions could unearth the creative talent and appetite for startup commercialisation of the most promising ideas. In a multistakeholder setting, such hackathons could bring together the education sector, development partners and the private sector to ensure the right skills are being further developed.

► **In-country demonstration and training site for possible applications.**

This idea of demonstration and training sites would focus on the practical technical training and vocational education by analysing the entire value chain. It would identify and address technical skills that are needed to build a robust local support system for maintenance, servicing and repairs of e.g. solar systems, wind turbines, electrolysers and transport/storage infrastructure.



## Lack of business models

There is a lack of business models in the green hydrogen sector for startups and innovators; so far, only large companies are active in the sector, and there seems to be no room for smaller companies to participate and claim their space.

This notion is cemented by the following loop:

As there is no specific innovation and startup ecosystem for GH2 (1)- and as there is no obvious need for it - it does not develop.

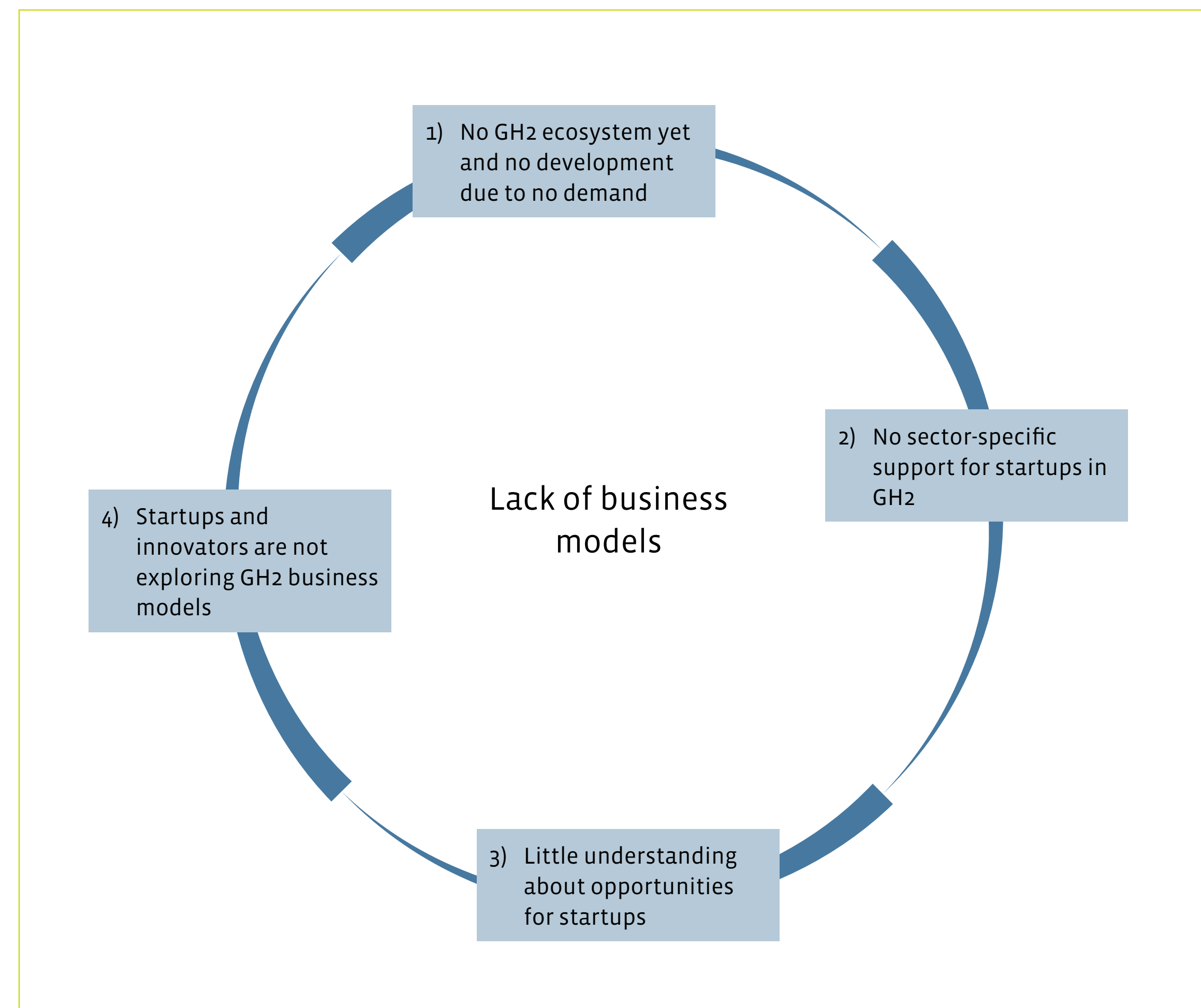
Therefore, the lack of a GH2 innovation ecosystem leads to the fact that there is no sector-specific support for startups and innovators (2).

This lack of support contributes to the fact that there is little understanding of the opportunities in the sector for

existing (digital) startups or innovators at universities, etc. (3)

This finally leads to startups and innovators not working on business models in the GH2 space (4), as it seems to be an unattractive sector for them.

Overcoming the lack of business models includes the notion that the **full value chain** needs to be understood and analyzed for opportunities for local innovators to build successful and relevant business models. Stakeholders should combine resources and knowledge for a **holistic GH2 Hub** (incl. digital innovations) that integrates technical knowledge and commercial skills and helps to create and grow startups.





## Recommendations to support the creation of GH<sub>2</sub> business models

▶ **Create cooperation with universities to turn applied research into commercial opportunities.**

In a young, tech-driven field like green hydrogen, with many ambiguities, new knowledge accumulation and emerging demand patterns, it is recommended to have a close relationship between universities and research institutions and commercialization platforms to turn technical findings into business opportunities.

▶ **Develop a sector-specific platform**

A lively exchange of ideas, needs and opportunities between academia, industry players and government could foster the collaborative spirit in the sector and ensure demand-driven business solutions are created and nurtured. A multi-stakeholder platform that is co-chaired by public sector and private-sector representatives could be anchored in the Office of the President to turn high-level political support into tangible commercial projects.

▶ **Incentivize large international investors to collaborate with local companies**

Big companies who invest in infrastructure and product development should be nudged to partner with local companies and sector associations to identify, train and strengthen local startups and existing small and

medium sized companies to acquire the necessary skills, expertise and certifications to serve, maintain and upgrade the structures in a sustainable manner that drives local job creation and entrepreneurship.

▶ **Showcase profitable business models from other countries and sectors**

As a founding member of the Africa Green Hydrogen Alliance (AGHA) and hosting its secretariat, Kenya can showcase and leverage successful business models from other member states and organisations. The country is well connected to benefit from profitable examples and lessons learned for startups and innovators from other countries and (renewable energy) sub-sectors.

▶ **Create a conducive export market**

Kenya is the commercial and economic powerhouse in the East Africa region and a frontrunner in the development of innovative products from green hydrogen (e.g. green ammonia/fertilizer). As member of the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA) and having ratified the Africa Continental Free Trade Area (AfCFTA), the country is well positioned to help create successful export business models by upgrading infrastructure, border posts and tax regimes.



## Green Hydrogen Centre of Excellence (CoE)

**D**uring a co-creation workshop in Nairobi in June 2023, 14 organisations collaborated to co-design a systemic solution enabling startups to grasp opportunities in the green hydrogen sector. They developed a concept for the Green Hydrogen (GH<sub>2</sub>) Centre of Excellence, a virtual and physical space for bringing stakeholders, ideas and resources together for technical understanding and trainings, exploring commercial opportunities and match-making.

→ The objectives for the **Virtual** Centre of Excellence (Digital Platform) are to become a repository of H<sub>2</sub> information, policies, strategies and applied research. It will organize Ideathons and innovation challenges, function as an incubation and acceleration centre and offer business plan support to help create bankable startups. It will serve as the first point of contact to access funding and support schemes and will act as match-maker with (impact) investors.

The digital platform will also strive to be the key reference point for webinars/online trainings, short courses, certifications and networking on market access, regulations and export.

- The objectives for the **Physical** Centre of Excellence are to offer theoretical and practical trainings on renewable energy, electrolysers and desalination and to collaborate with universities, research centres and TVET institutions. It will offer certification of engineers, GH<sub>2</sub> projects and train maintenance/repair MSMEs and new startups.
- The CoE will serve as a **one-stop shop** that attracts interested parties for commercialization of innovative ideas and collaboration on multi-stakeholder partnerships in green hydrogen. There will be a training centre and a maker space for technologies and maintenance of H<sub>2</sub> infrastructure and experimentation with new

ideas. It will allow for sharing of equipment and resources.

- In short, the CoE will be a **vibrant hub for innovators and startups to find a supportive entrepreneurial ecosystem of incubation, acceleration, market/finance access and knowledge.**
- The CoE will be a regionally replicable model to showcase creative business plans and technical knowledge across the full value chain of green hydrogen.

If you are interested in contributing to the Green Hydrogen Centre of Excellence and would like to be involved in the project's planning and implementation, don't hesitate to contact Endeava at [info@endeva.org](mailto:info@endeva.org) for more information.





# About ii2030

ii2030 is a catalytic process that begins with a problem and an opportunity and ends with the implementation of the prototype of a systemic solution. It catalyses collaboration amongst innovators from corporates, startups, the public sector, NGOs and science. Solutions are developed in tracks around tech-based opportunities. ii2030 is an impactful, action-oriented collaborative process.

The ii2030 Green Hydrogen in Africa edition was organised by Endeava, and fully funded by Make-IT in Africa on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ).

More information at [www.ii2030.com](http://www.ii2030.com)

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