
Sector Analysis Kenya

# Green Ammonia for Fertiliser Applications

Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

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# Abbreviations/acronyms

| | |
|---|---|
| **A2D** | Accelerate-to-Demonstrate |
| **CAN** | Calcium ammonium nitrate |
| **CAPEX** | Capital expenditure |
| **$CO_2$** | Carbon dioxide |
| **DAP** | Diammonium phosphate |
| **EASF** | East Africa Sea Foods |
| **EPRA** | Energy and Petroleum Regulatory Authority |
| **EPZ** | Export Processing Zone |
| **EPZA** | Export Processing Zones Authority |
| **EU** | European Union |
| **FOSS** | Flowers and Ornamentals Sustainability Standard |
| **GDP** | Gross domestic product |
| **GIPA** | Green Investment Program for Africa |
| **GIZ** | Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH |
| **$H_2$** | Hydrogen |
| **$H_2$Uppp** | International Hydrogen Ramp-up Programme |
| **IRR** | Internal rate of return |
| **KeGIB** | Kenya Green Investment Bank |
| **KeNHA** | Kenya National Highways Authority |
| **KETRACO** | Kenya Electricity Transmission Company |
| **KFC** | Kenya Flower Council |
| **KPA** | Kenya Ports Authority |
| **LAPSSET** | Lamu Port-South Sudan-Ethiopia Transport |
| **LCOA** | Levelised cost of ammonia |
| **LCOH** | Levelised cost of hydrogen |
| **LCPDP** | Least Cost Power Development Plan |
| **MGR** | Metre gauge railway |
| **NCPB** | National Cereals and Produce Board |
| **NLC** | National Land Commission |
| **NPK** | Nitrogen, phosphorus and potassium |
| **NPV** | Net present value |
| **PPP** | Public-private partnership |
| **PtX** | Power-to-X |
| **PV** | Photovoltaic |
| **RE** | Renewable energy |
| **SEZ** | Special Economic Zone |
| **SEZA** | Special Economic Zones Authority |
| **SGR** | Standard gauge railway |
| **UNIDO** | United Nations Industrial Development Organization |
| **VAT** | Value added tax |
| **WACC** | Weighted average cost of capital |

# Currency units

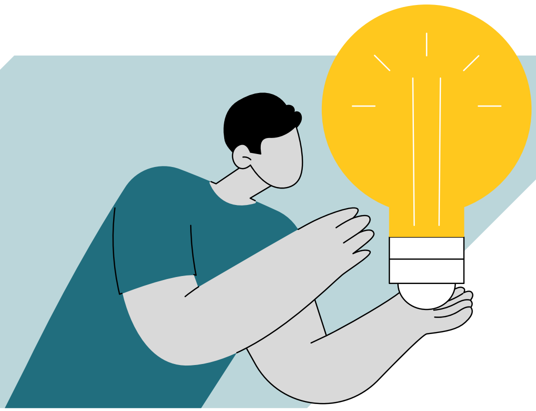
| | |
|---|---|
| **KES** | Kenya shilling |
| **USD** | United States dollar |

Conversion rate as of 24.07.2025
USD 1 = KES 129.50

Source: exchange-rates.org, 2025

# Technical units

| | |
|---|---|
| **GW** | Gigawatt |
| **GWh** | Gigawatt hour |
| **ha** | Hectare |
| **kg** | Kilogram |
| **km** | Kilometre |
| **kV** | Kilovolt |
| **kWh** | Kilowatt hour |
| **kWp** | Kilowatt peak |
| **m** | Metre |
| **mtph** | Metric tonnes per hour |
| **mtpy** | Metric tonnes per year |
| **MW** | Megawatt |
| **MWh** | Megawatt hour |
| **MWp** | Megawatt peak |
| **s** | Second |
| **t** | Tonne |
| **TW** | Terawatt |



# ENERGY SOLUTIONS – MADE IN GERMANY

## The German Energy Solutions Initiative

The German Energy Solutions Initiative of the German Federal Ministry for Economic Affairs and Energy (BMWE) aims to globalise German technologies and expertise in climate-friendly energy solutions.

Years of promoting smart and sustainable energy solutions in Germany have led to a thriving industry known for world-class technologies. Thousands of specialised small and medium-sized enterprises (SMEs) focus on developing renewable energy systems, energy efficiency solutions, smart grids, and storage technologies. Cutting-edge energy solutions are also built on emerging technologies such as power-to-gas, fuel cells, and green hydrogen. The initiative's strategy is shaped around ongoing collaboration with the German business community.

The initiative creates benefits for Germany and the partner countries by:

- boosting global interest in sustainable energy solutions
- encouraging the use of renewables, energy efficiency technologies, smart grids, and storage technologies, while facilitating knowledge exchange and capacity building
- enhancing economic, technical and business cooperation between Germany and partner countries

### THE PROJECT DEVELOPMENT PROGRAMME (PDP)

PDP is a key pillar of the German Energy Solutions Initiative and is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. It connects development cooperation with private-sector engagement and supports climate-friendly energy solutions in selected developing and emerging countries, enabling local businesses to adopt solutions in energy efficiency, electricity and heat supply, and hydrogen, while facilitating market access for German solution providers.

Developing and emerging economies offer promising business potential for climate-friendly energy solutions but also pose challenges for international business partners. The PDP team works closely with local industries to develop financially viable projects by providing technical expertise, financial guidance, and networking opportunities.

It identifies project leads, collects and analyses energy consumption data, and assesses projects from both a technical and economic perspective. This includes outlining the business case, calculating payback periods, and evaluating profitability. Companies can then choose to finance projects using their own funds or explore leasing and other financing options. PDP provides cost-free advice to local companies and connects them with German solution providers for project implementation.

Additionally, by offering training, organising reference project visits, and publishing studies on the potential of climate-friendly solutions and on navigating regulatory frameworks, the programme supports market development and fosters private-sector cooperation.

# Executive summary

This sector analysis for Kenya assesses the potential for green ammonia development in the country, providing a foundation for future projects, particularly fertiliser applications. It is part of a series of studies that seek to offer market insights and support pre-development efforts, with a view to generating both local and international interest in the green hydrogen and ammonia economy.

The analysis explores the feasibility of introducing green ammonia into Kenya's agricultural sector, evaluating specific use cases and providing techno-economic estimates for stakeholders – particularly companies based in Germany. The objective is to review local conditions, such as resource availability and the regulatory situation, identify viable opportunities, address key challenges and outline a pathway for initial green ammonia projects that aligns with Kenya's broader energy and industrial development goals.

Kenya fulfils many important prerequisites for the development of a green ammonia industry, such as domestic demand, abundant renewable energy resources, robust infrastructure and positive policy frameworks. The government aims to promote sustainable economic growth for the country, with green hydrogen and ammonia as one of the focus areas.

# Zusammenfassung

In der Ihnen vorliegenden Sektoranalyse wird das Potenzial für die Entwicklung grünen Ammoniaks in Kenia bewertet. Die Analyse bildet damit eine Grundlage für zukünftige Projekte, insbesondere zur Herstellung grünen Ammoniaks zur Anwendung als Düngemittel. Zudem ist sie Teil einer Reihe von Sektoranalysen, die Markteinblicke bieten und Bemühungen um Vorentwicklungen unterstützen, damit sowohl das lokale als auch internationale Interesse an der Wirtschaft rund um den grünen Wasserstoff- und Ammoniaks geweckt wird.

Die vorliegende Analyse untersucht die Machbarkeit der Einführung grünen Ammoniaks in den kenianischen Agrarsektor, bewertet spezifische Anwendungsfälle und liefert techno-ökonomische Schätzungen für Stakeholder, insbesondere für Unternehmen mit Sitz in Deutschland. Sie hat zum Ziel, lokale Bedingungen wie die Verfügbarkeit von Ressourcen und Regularien zur Herstellung und Anwendung grünen Ammoniaks zu überprüfen, tragfähige Möglichkeiten zu identifizieren, die wichtigsten Herausforderungen anzugehen und einen Weg für erste Projekte mit grünem Ammoniak zu skizzieren, das mit den umfassenderen Energie- und Industrieentwicklungszielen Kenias übereinstimmt.

Kenia erfüllt viele wichtige Voraussetzungen für die Entwicklung einer Industrie für grünen Ammoniak, zum Beispiel die verfügbare Inlandsnachfrage, reichlich Ressourcen für erneuerbare Energie, eine robuste Infrastruktur und positive politische Rahmenbedingungen. Die Regierung strebt ein nachhaltiges Wirtschaftswachstum für das Land an, hierbei sind grüner Wasserstoff und Ammoniak einer der Schwerpunkte.

Green ammonia could play a complementary role in Kenya's green economic growth by:

- **Supporting agricultural stability:** Fertiliser production is identified as an early priority area in Kenya's Green Hydrogen Strategy and Roadmap, helping to stabilise the agriculture industry, exposed to price volatility and supply disruptions because it is entirely reliant on fertiliser imports.
- **Leveraging renewable energy potential:** Kenya has abundant renewable energy resources, which can provide a reliable and sustainable energy source for ammonia production via electrolysis. As over 90% of the electricity distributed in Kenya via power grids is already produced from renewable energy sources, additional renewable energy developments would primarily meet new demand, such as further electrification or production of energy-intensive products, such as green ammonia.
- **Boosting economic growth and export opportunities:** With its strategic position and positive policy frameworks, Kenya could develop into a regional hub for green ammonia and fertiliser production, supporting both domestic use and potential exports to neighbouring countries and overseas markets.

Grüner Ammoniak könnte eine Rolle auf dem Pfad des grünen Wirtschaftswachstums Kenias spielen, indem es

- **die landwirtschaftliche Stabilität unterstützt:** Die Düngemittelproduktion wird in Kenias Strategie und Roadmap für grünen Wasserstoff als früher Prioritätsbereich identifiziert. Sie trägt dazu bei, die Agrarindustrie zu stabilisieren, die Preisschwankungen und Versorgungsunterbrechungen ausgesetzt ist, weil Kenia von Düngemittelimporten vollständig abhängig ist.
- **das Potenzial erneuerbarer Energien nutzt:** Kenia verfügt über reichlich viele Ressourcen für erneuerbare Energie, die eine zuverlässige und nachhaltige Energiequelle für die Ammoniakproduktion durch Elektrolyse sein können. Da der Strom, der in Kenia über die Stromnetze verteilt wird, bereits zu mehr als 90 Prozent aus erneuerbarer Energie besteht, würden zusätzliche Entwicklungen im Bereich der erneuerbaren Energien vor allem neue Anforderungen wie die weitere Elektrifizierung oder die Produktion energieintensiver Produkte wie grünen Ammoniaks decken.
- **Wirtschaftswachstum und Exportchancen eröffnet:** Mit seiner strategischen Lage und seinen positiven politischen Rahmenbedingungen könnte sich Kenia zu einem regionalen Zentrum für die Produktion grünen Ammoniaks und grüner Düngemittel entwickeln, das sowohl den Inlandsverbrauch als auch potenzielle Exporte in Nachbarländer oder über die Verschiffung in zusätzliche Märkte unterstützt.

### BUSINESS OPPORTUNITIES FOR GERMAN SOLUTION PROVIDERS

Kenya's evolving energy landscape presents several business opportunities for German solution providers, particularly in renewable energy, electrolysis and ammonia production, and infrastructure development. Key advantages include:

- **Renewable energy potential:** Kenya's renewable energy resources provide a strong foundation for green ammonia production. German firms specialising in electrolysis, hydrogen storage and renewable energy integration can play a crucial role in early-stage projects.
- **Industrial integration:** Kenya has a growing industrial base with strong demand for ammonia, particularly in the agricultural sector, as well as high ambitions for future growth, for example, into export-oriented projects. German companies with expertise in industrial ammonia applications can support pilot projects and large-scale deployment.
- **Export and trade potential:** As Kenya develops its green ammonia industry, German businesses involved in port infrastructure, ammonia transportation and supply chain logistics could benefit from early engagement.

### GESCHÄFTSCHANCEN FÜR DEUTSCHE LÖSUNGSANBIETER

Kenias sich entwickelnde Energielandschaft bietet deutschen Lösungsanbietern zahlreiche Geschäftsmöglichkeiten, insbesondere in den Bereichen erneuerbare Energien, Elektrolyse und Ammoniakproduktion sowie Infrastrukturentwicklung. Zu ihren wichtigsten Vorteilen gehören:

- **das Potenzial erneuerbarer Energien:** Kenias Ressourcen für erneuerbare Energie bilden eine starke Grundlage für die Produktion grünen Ammoniaks. Deutsche Unternehmen, die sich auf Elektrolyse, Wasserstoffspeicherung und die Integration erneuerbarer Energien spezialisiert haben, können in der Frühphase von Projekten eine entscheidende Rolle spielen.
- **die industrielle Integration:** Kenia verfügt über eine wachsende industrielle Basis mit einer starken Nachfrage nach Ammoniak, insbesondere im Agrarsektor, sowie über hohe Ambitionen für zukünftiges Wachstum, zum Beispiel in exportorientierte Projekte. Deutsche Unternehmen mit Expertise in industriellen Ammoniakanwendungen können Pilotprojekte und den großtechnischen Einsatz unterstützen.
- **das Export- und Handelspotenzial:** Beim Ausbau der Industrie für grünen Ammoniak in Kenia könnten deutsche Unternehmen, die in der Hafeninfrastruktur, dem Ammoniaktransport und der Lieferkettenlogistik tätig sind, von einem frühzeitigen Engagement profitieren.

### CHALLENGES ON THE PATH TO A GREEN AMMONIA ECONOMY

Despite its potential, Kenya faces a number of hurdles in developing a green ammonia economy:

- **Financing gap:** One of the main obstacles is the financing gap, as neither small-scale nor large-scale projects are economically viable yet, due to the generally high cost of the technology compared to grey sources and the high interest rates prevalent in Kenya. Incorporating additional revenue streams, such as selling oxygen produced as a by-product and utilising excess electricity credits, can improve the economics where feasible. Nonetheless, it is expected that projects will require additional financial support, for example, through grants or soft loans.
- **Infrastructure and resource gaps:** For large-scale deployment, additional investment is required to develop ammonia production, storage and transportation infrastructure. In addition, despite the generally good availability of critical resources, such as renewable energy sources, land and water, there are significant regional disparities, and strategic planning is necessary to avoid land and resource conflicts.

### HERAUSFORDERUNGEN AUF DEM WEG ZU EINER WIRTSCHAFT FÜR GRÜNEN AMMONIAK

Trotz seines Potenzials steht Kenia bei der Entwicklung einer Wirtschaft für grünen Ammoniak vor mehreren Hürden:

- **Finanzierungslücke:** Eines der Haupthemmnisse ist die Finanzierungslücke, denn sowohl kleine als auch große Projekte sind noch nicht wirtschaftlich tragfähig, weil die Kosten der Technologie und die in Kenia vorherrschenden hohen Zinssätze im Vergleich zu grauen Quellen allgemein hoch sind. Werden zusätzliche Einnahmequellen, zum Beispiel durch den Verkauf von Sauerstoff, der als Nebenprodukt produziert wird, und die Nutzung überschüssigen Stroms, einbezogen, kann dies die Wirtschaftlichkeit verbessern, wo es möglich ist. Es ist jedoch davon auszugehen, dass die Projekte zusätzliche finanzielle Unterstützung benötigen, zum Beispiel durch Zuschüsse oder Darlehen zu Vorzugsbedingungen.
- **Infrastruktur- und Ressourcenlücken:** Für den großflächigen Einsatz der grünen Ammoniakproduktion sind zusätzliche Investitionen erforderlich, mit denen die Infrastruktur für die Produktion, die Lagerung und den Transport von Ammoniak entwickelt werden kann. Trotz der allgemein guten Verfügbarkeit kritischer Ressourcen wie des Potenzials erneuerbarer Energien zu Land und Wasser gibt es erhebliche Unterschiede zwischen den Regionen. Dies erfordert eine strategische Planung, damit Konflikte um Land- oder Ressourcen vermieden werden.

- **Regulatory uncertainty:** Kenya's energy policies and hydrogen guidelines are comparatively well advanced, but they are still being developed and have rarely been tested, as few investment projects have been commissioned to date. German companies will need to navigate policy risks when engaging in long-term investment planning.

### WHY KENYA MATTERS FOR GREEN AMMONIA

Kenya's strong agricultural base, renewable energy resources and strategic location create a promising landscape for green ammonia development. Strong government support for green hydrogen development sets Kenya apart from most other countries in the region. However, challenges such as financing gaps, infrastructure limitations and regulatory uncertainties must be addressed. German companies that position themselves early can contribute to shaping this emerging market while benefiting from Kenya's long-term sustainable growth ambitions and industrial modernisation. Through targeted investments, innovation and policy engagement, German firms can play a crucial role in Kenya's future green ammonia economy.

- **regulatorische Unsicherheit:** Kenias Energie- und Wasserstoffpolitik ist vergleichsweise weit fortgeschritten, aber noch in Arbeit. Sie wurde aufgrund der unzureichenden beauftragten Investitionsprojekte bisher nur selten getestet. Deutsche Unternehmen werden politische Risiken bewältigen, während sie gleichzeitig eine langfristige Investitionsplanung betreiben müssen.

### WARUM KENIA FÜR GRÜNEN AMMONIAK WICHTIG IST

Kenias starke landwirtschaftliche Basis, Quellen für erneuerbare Energie und die strategische Lage sind ein vielversprechendes Umfeld für die Entwicklung grünen Ammoniaks. Die starke staatliche Unterstützung für die Entwicklung grünen Wasserstoffs unterscheidet Kenia von den meisten anderen Ländern in der Region. Herausforderungen wie Finanzierungslücken, Beschränkungen der Infrastruktur und regulatorische Unsicherheiten jedoch müssen angegangen werden. Deutsche Unternehmen, die sich frühzeitig positionieren, können diesen aufstrebenden Markt mitgestalten und gleichzeitig von Kenias langfristigen nachhaltigen Wachstumsambitionen und der industriellen Modernisierung profitieren. Durch gezielte Investitionen, Innovationen und politisches Engagement können deutsche Unternehmen eine entscheidende Rolle in Kenias künftiger grüner Ammoniakwirtschaft spielen.

# 1

# Introduction

## 1.1 Introduction

Kenya is a developing economy offering a unique combination of economic, environmental and strategic advantages for the production of green ammonia. It is the largest economy in East Africa, making a significant contribution to the region's gross domestic product (GDP). Strategically positioned with access to vital shipping routes, Kenya is an important commercial and logistics hub and is strengthening its role in regional trade. The country's economy is relatively diversified, the key sectors being services, agriculture and manufacturing. The food and beverage industry, encompassing everything from dairy and processed cereals to beverages and confectionery, is a significant component of the manufacturing sector. It is complemented by the robust agro-processing sector, which focuses on adding value to agricultural products through activities such as sugar production, tea and coffee processing and floriculture, with cut flowers, tea and coffee being the major exports. The building, mining and construction sector plays a crucial role in infrastructure development, contributing to Kenya's GDP through the production of construction materials and mineral extraction. Other important industries are the chemicals and allied sectors (agrochemicals, cosmetics and paints) and the energy, electrical and electronics sector (energy production and the manufacturing of electrical equipment). The metals and allied industries, plastics and rubber and the automotive sector contribute to manufacturing, particularly steel and aluminium products, plastic packaging and recycling, and vehicle assembly respectively (KAM, 2025).

As a developing economy with sustained growth over the past decade, Kenya has the ambition to transform into a newly industrialising, middle-income country by 2030. To achieve this goal, the country has identified agriculture and manufacturing as economic pillars to drive growth. The surge in discussions on green hydrogen in the country in recent years has emphasised that it will play a vital role in Kenya's agriculture and manufacturing sectors for many years to come. The Kenyan Government has strongly supported the development of the emerging sector, ensuring that there is a conducive environment, and has already established guidelines for developing green hydrogen projects.

Since 2022, several studies have been published giving an insight into green hydrogen development potential in Kenya. One of them is the Baseline Study on the Potential for Power-to-X/Green Hydrogen in Kenya, commissioned by the Ministry of Energy and Petroleum (MoE and GIZ, 2022), which details green hydrogen opportunities in the country, action plans to support the deployment of such projects and investment perspectives. The Project Development Programme (PDP) of the German Energy Solutions Initiative later published a sector analysis exploring the green hydrogen market in Kenya (GIZ, 2023). The study identified two industry segments (fertiliser and food industries) that would be suitable for pilot projects and provided simplified cost estimates for setting up such projects in the country. Kenya's Green Hydrogen Strategy and Roadmap (MoEP, 2023), launched in 2023, provided tangible targets for green hydrogen use in the country, with fertiliser offtake given more focus in the short to medium term.

Building on these previous reports and in alignment with the focus of the country's hydrogen strategy, this study is centred on the production of green ammonia for nitrogen-based fertilisers in Kenya. It gives an overview of the fertiliser landscape and presents business case analyses on the production of major fertilisers from green ammonia in the country, with the aim of providing interested stakeholders with concrete information on how to develop such projects.

# 2

## Market conditions in Kenya

## 2.1 Fertiliser market assessment and demand analysis

Agriculture is crucial to Kenya's economy, accounting for over 20% of GDP, employing 40% of the population and supporting 80% of people living in rural areas. It generates 65% of export earnings, with agro-processing making up more than 50% of manufacturing GDP (MoEP, 2023).

Fertiliser plays a vital role in enhancing agricultural productivity, particularly for key crops such as maize, tea, coffee and horticulture products. Notably, Kenya's fertiliser usage, which was 55 kg/ha of arable land in 2022, is above Africa's target of 50 kg/ha (FAK, 2024) but way below the global average of 134.2 kg/ha for the same year (World Bank Group, 2025). There is therefore an immense demand potential for affordable fertilisers in the country.

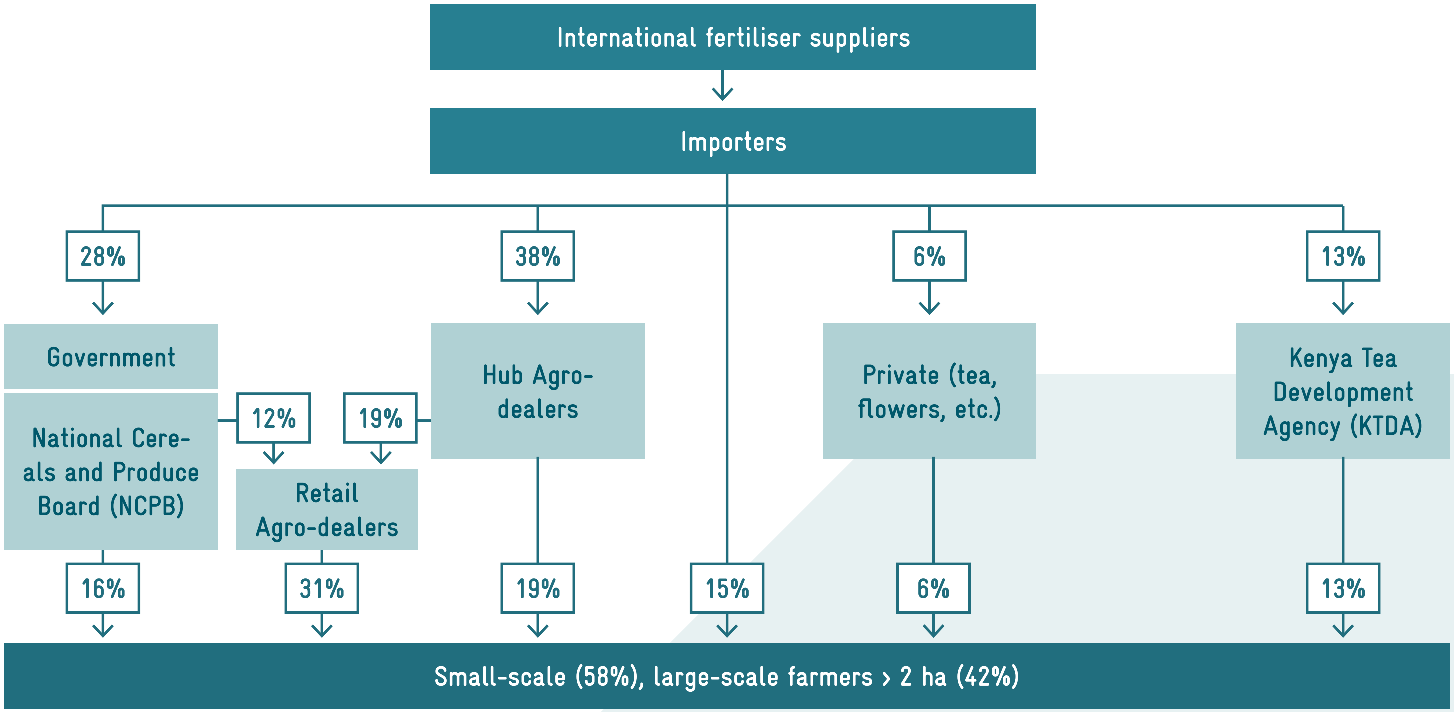
### 2.1.1 Kenya's fertiliser value chain

Kenya imports all the fertilisers it needs to meet local demand through the port of Mombasa, and there has been no fertiliser production in the country since early 2018 when KEL Chemicals Ltd stopped producing single super phosphate. There are multiple fertiliser blenders (see overview in Table 4 in the Annex) in the country that blend fertilisers imported in bulk (e.g. urea) and additional raw materials. About 95% of the imported fertiliser is consumed in Kenya, with the rest exported onwards to other countries in the region.

The fertiliser distribution system in Kenya consists of international and local importers, approximately 150 hub dealers and 8,000 retailers. Typically, importers distribute their products through the hub dealers and agro-dealers instead of marketing them directly, as illustrated in Figure 1.

Kenya relies heavily on fertiliser imports from places such as Europe, Russia, Turkey, Qatar, China and North Africa. Major importers and manufacturers have blending capacity and storage facilities to aid product movement, mainly around Mombasa, serving Kenyan and Ugandan markets (AfricaFertilizer, 2025).

**FIGURE 1. Kenya's fertiliser value chain**




Source: Adapted from IFDC, 2018

The main importers are private sector companies including Yara East Africa, MEA Fertilizers and ETG Kenya Ltd. There are also blending facilities that use imported and locally available raw materials, including MEA Ltd, Mavuno Fertilizer and Timac Agro East Africa Limited (MoE and GIZ, 2022). The government also procures fertilisers for use under the subsidy programme through either the Ministry of Agriculture or the National Cereals and Produce Board (NCPB).

Kenya's distribution landscape is characterised by several different channels:

- The government plays a role in fertiliser distribution through procurement, sales and subsidies for targeted farmers under the fertiliser price stabilisation plan through NCPB and its 180 depots countrywide. The government programmes are responsible for about 28% of national fertiliser demand.
- A network of private, independent importers, wholesalers and retailers operate on a demand and supply basis, including an estimated 8,000 agro-dealers working alongside approximately 3,000 wholesalers and retailers. This channel accounts for 38% of fertiliser demand.
- About 15% of fertilisers are directly distributed by the importing companies to farmers.
- Private entities, including flower farms and private tea estates, account for 6% of fertiliser consumption.

Commodity-based, interlinked input–credit–output marketing systems are responsible for about 13% of fertiliser consumption. This channel is exemplified by the Kenya Tea Development Agency (KTDA) model that provides smallholder farmers with credit in the form of bulk-purchased farm inputs, including fertiliser, distributed by the supporting agency.

### 2.1.2 Fertiliser imports and consumption in Kenya

The main fertilisers imported and consumed in Kenya are nitrogen, phosphorus and potassium (NPK), ammonium phosphates, urea and calcium ammonium nitrate (CAN). They account for 93% of the ~690,000 t of fertiliser imported into Kenya on average each year between 2012 and 2023. The country consumes an average of ~630,000 t annually, with the same nitrogen-based fertilisers accounting for 93% of national consumption and demand increasing at a compound annual growth rate of more than 5% (AfricaFertilizer, 2025). This demonstrates that the country has a sustainable demand for green ammonia to produce green fertilisers.

Kenya has also been exporting an average of 56,000 t of fertiliser annually to its neighbours. Uganda is its largest fertiliser export market.

Figure 2 shows historical import data by fertiliser type. NPK and ammonium phosphates consistently represent a significant portion, with urea imports also maintaining a considerable share.

Projections indicate a further overall increase in fertiliser imports by 2030, with continued growth into 2040 and 2050. Urea and ammonium phosphate imports are projected to show the highest growth, while NPK imports are expected to rise at a modest rate.

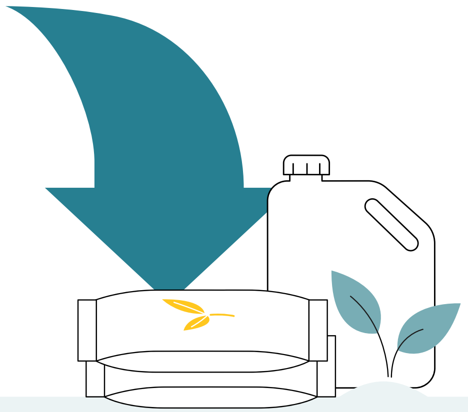
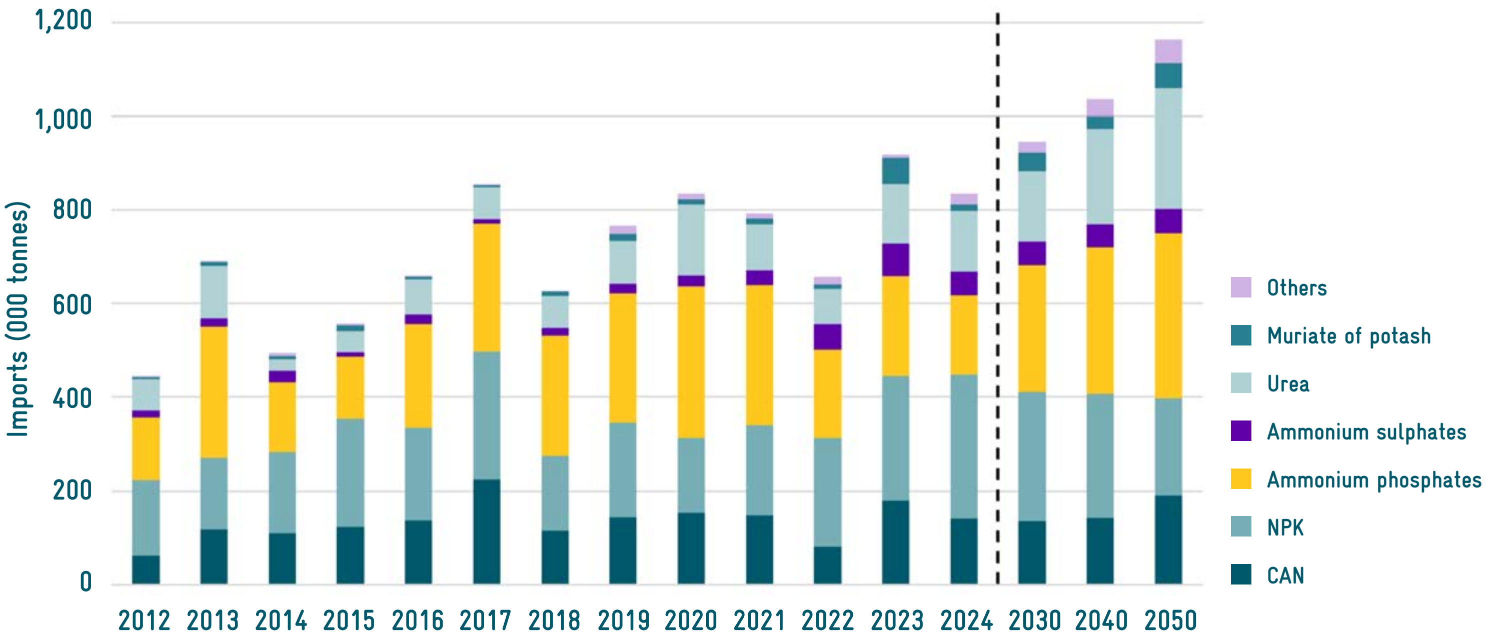


**FIGURE 2.** Trends in fertiliser imports in Kenya

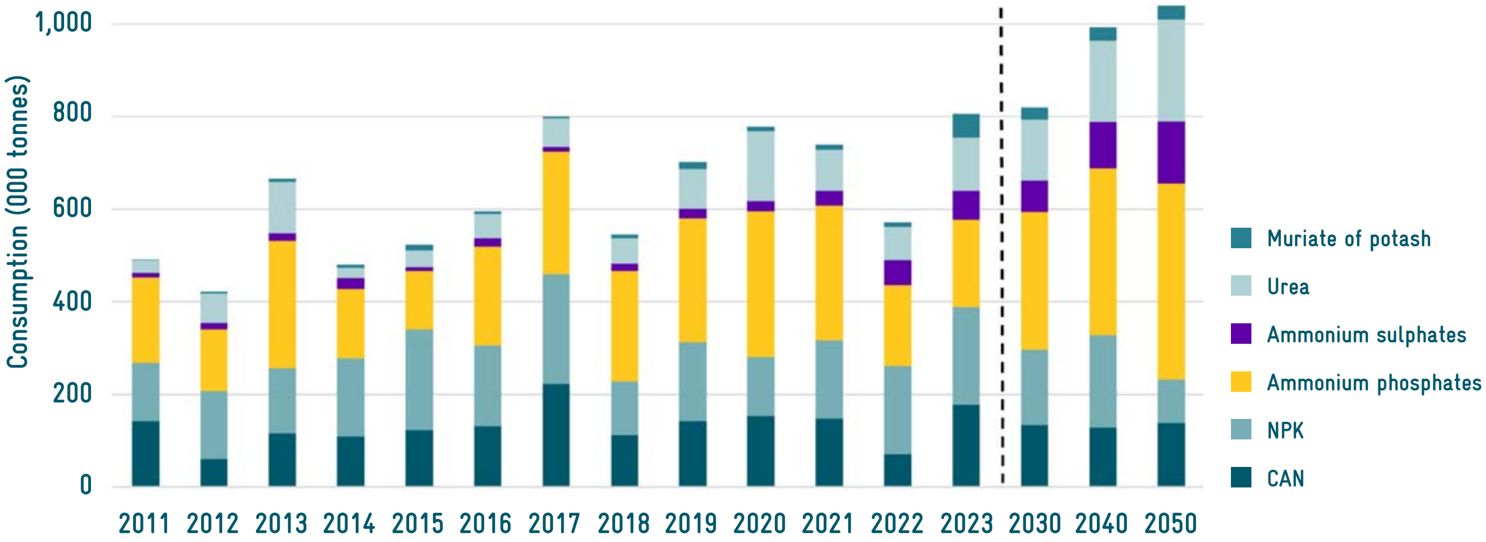



Source: Based on analysis of data from AfricaFertilizer, 2025

This is driven by the projected growing demand for fertiliser in Kenya (see Figure 3). Demand for ammonium phosphates and urea will grow the fastest, while CAN and NPK demand is projected to decrease.

By 2050, demand for ammonium phosphates is projected to increase by more than 100% as compared to 2023, while demand for urea is expected to rise by more than 90%. Growth in fertiliser imports and demand will likely be driven by population growth, expanding agricultural activities and government initiatives to boost food production.

**FIGURE 3.** Trends in fertiliser consumption in Kenya



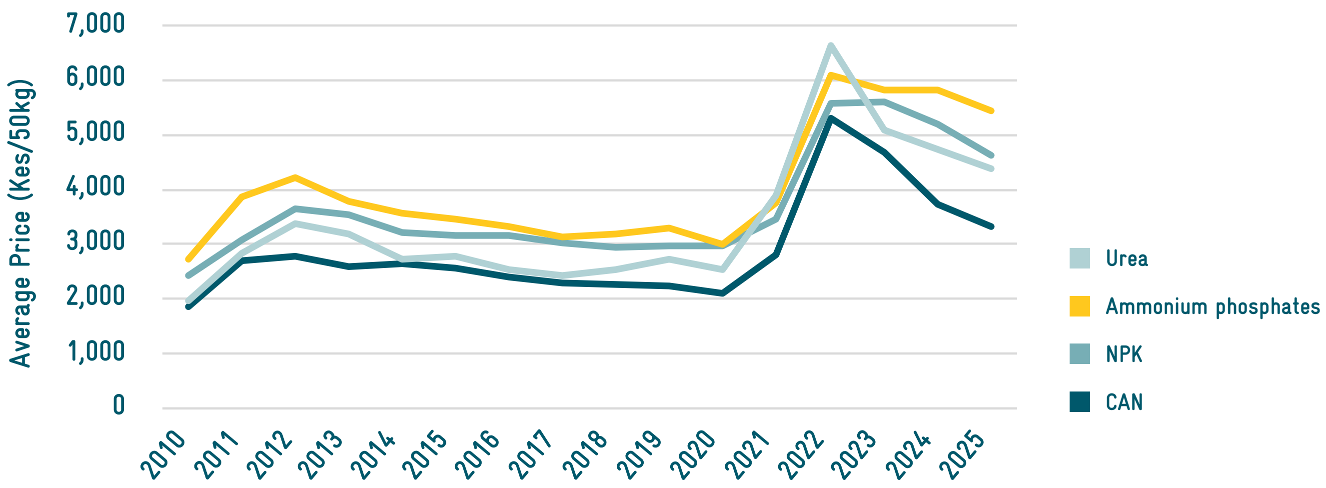

Source: Based on analysis of data from AfricaFertilizer, 2025

There are also some indications that fertiliser production in Kenya might resume and expand. The Nairobi Declaration of the Africa Fertilizer and Soil Health Summit (AU, 2024) outlines a transformative commitment to significantly increase the production and distribution of high-quality organic and inorganic fertilisers across Kenya and the African continent. By setting a target to triple domestic fertiliser production and distribution by 2034, it aims to enhance accessibility and affordability for smallholder farmers, who form the backbone of Africa's agricultural sector. To achieve this, the declaration prioritises efforts to increase local production by leveraging available raw materials and promoting the blending of mineral fertilisers in the region. By tapping into opportunities presented by the African Continental Free Trade Area (AfCFTA), countries could double intra-Africa fertiliser trade by 2034, creating a more integrated and competitive market. In addition to supply, the declaration addresses the sustainable use of fertilisers, with a commitment to provide 70% of smallholder farmers with agronomic recommendations tailored to specific crops, soils and climatic conditions. With these commitments adopted by African countries, Kenya has the opportunity to produce low carbon fertilisers for local and regional consumption.

### 2.1.3 Fertiliser prices

Figure 4 illustrates the historical average cost of fertiliser in Kenya. From 2010 to 2020, fertiliser prices in Kenya remained relatively stable or showed a gradual decline. In this period, the cost of CAN, urea and NPK fertilisers fluctuated within a range between KES 2,000 and KES 3,500 per 50 kg bag, reflecting a relatively predictable market. However, in 2021, the fertiliser market experienced a sharp surge in prices, which peaked in 2022 across all fertiliser types. Prices doubled or even tripled compared to previous years, due to global supply chain disruptions caused by the Russian war against Ukraine. This sudden spike created significant market volatility and uncertainty for businesses and farmers alike. After 2022, fertiliser prices began to decline, although they remained above pre-2020 levels. By 2025, the cost of fertilisers stabilised between KES 2,500 and KES 4,500 per 50 kg bag, indicating improved market conditions and a potential return to greater predictability for investors and stakeholders in the agricultural sector.

**FIGURE 4. Historical average cost of fertiliser in Kenya**




Source: Based on analysis of data from AfricaFertilizer, 2025

Given the observed price volatility in Kenya's fertiliser market, there is a strong incentive to explore alternative solutions that can provide more stability and cost efficiency. One promising opportunity lies in the local production of substitutes, such as green ammonia-based fertilisers.

The production of green ammonia and fertilisers such as CAN, DAP and NPK could be feasible, as costs are expected to be even lower than 2024 market prices (see Figure 5). The cost of producing urea would be slightly higher but still below 2022 prices ($H_2$Global, 2025).

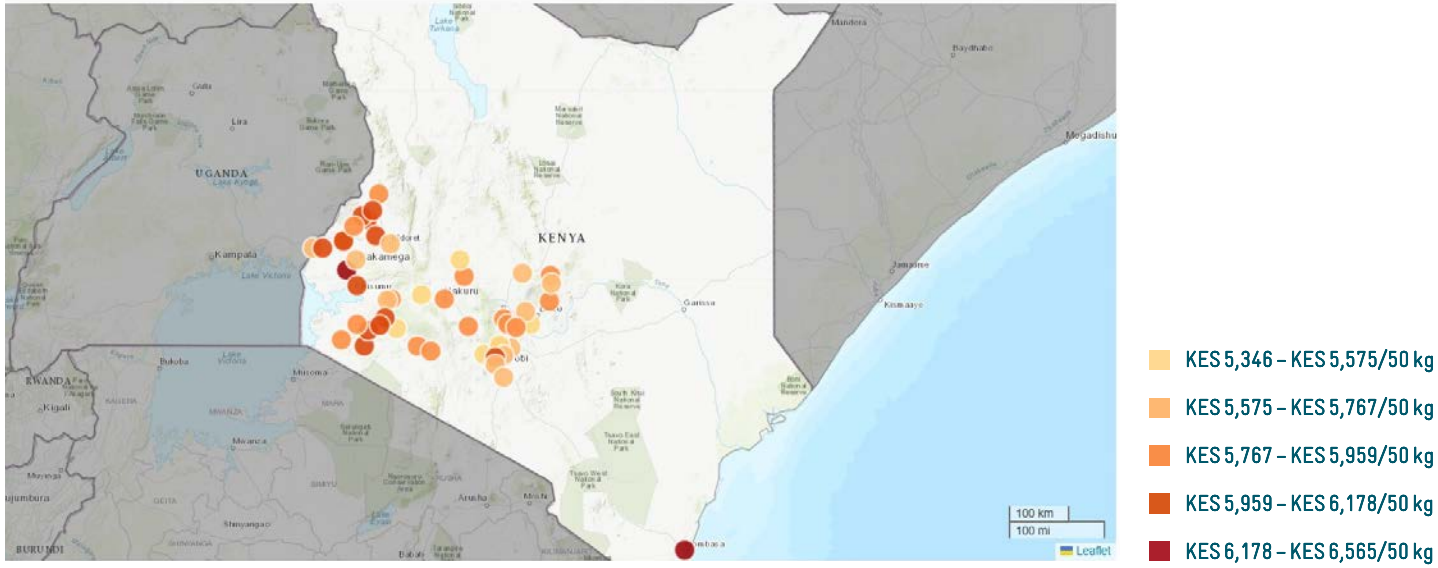
Figure 6 shows variations in fertiliser prices in different parts of Kenya.

The price of a 50 kg bag of DAP fertiliser varied between KES 5,400 and KES 6,500. In general, fertiliser prices were lower around Nairobi and higher towards the western and coastal areas of Kenya.

**FIGURE 5.** Comparison of international, local and low carbon fertiliser prices in Kenya


Source: H2Global, 2025

**FIGURE 6. Fertiliser prices in different parts of Kenya in 2023**




Source: AfricaFertilizer, 2025

### 2.1.4 Availability of feedstock for nitrogen-based fertilisers

The main raw materials needed for grey nitrogen-based fertilisers are natural gas (to provide hydrogen and subsequently ammonia), phosphorus, potash, calcium carbonate and carbon dioxide ($CO_2$). Transitioning to green ammonia requires renewable energy, water and nitrogen (typically obtained directly from the air) to replace grey ammonia. The other feedstocks are the same.

Kenya is not producing phosphorus or potash. There are limited deposits of phosphorus in the country, but their exploitation is not deemed economically viable. Phosphorus is abundant in many African countries, and Morocco is the leader in production. Closer to Kenya, Uganda and Tanzania have considerable deposits estimated at 230 million t and 375 million t respectively. On the other hand, only a few African countries have potash deposits, including the Republic of the Congo, Ethiopia and Eritrea, which have the potential to produce 33.2 million t, 4.2 billion t and 1.1 billion t respectively (AUC, et al., 2019) but have yet to start mining potash commercially. Phosphoric acid is normally produced by reacting phosphate rock with sulphuric acid. Kenya has no phosphate rock and relies on imports costing USD 560/t in 2023. Additionally, there are several companies in the country that produce sulphuric acid, which retails at about USD 1,400/t. Currently, Kenya imports phosphorus mainly from China and South Africa, and potash mainly from Korea, China and France. The value of imported phosphorus and potash in 2024 was USD 272,000 and USD 459,000 at an average cost of USD 6,413/t and USD 1,261/t respectively (ITC, 2025).

Kenya's limestone deposits, primarily located in regions such as Garissa, Tana River, Kajiado and Turkana, provide vital resources for calcium carbonate production (NLC, 2023). Despite these reserves, the country still imports over 40,000 t annually at a cost of USD 233/t. Additionally, natural $CO_2$ sources are found in Kenya's Rift Valley and on the eastern slopes of Mount Kenya. In 2022, Kenya imported approximately 22 t of $CO_2$, with an average cost of USD 864/t (ITC, 2025).

## 2.2 Resource availability

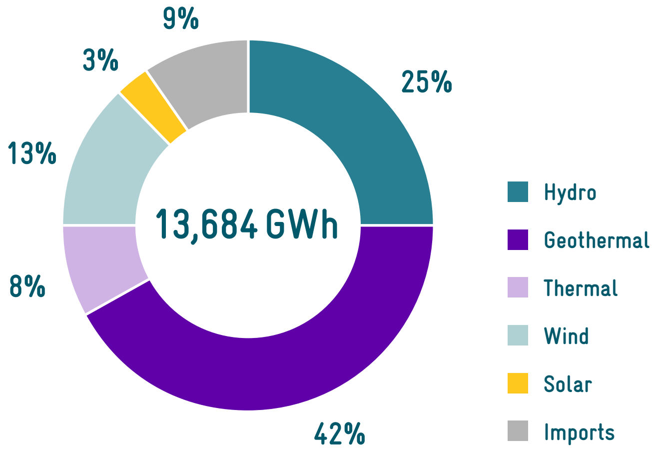
Kenya can build on its existing resources, such as abundant renewable energy, water, land, infrastructure and a skilled workforce, to develop green ammonia plants.

### 2.2.1 Renewable energy potential

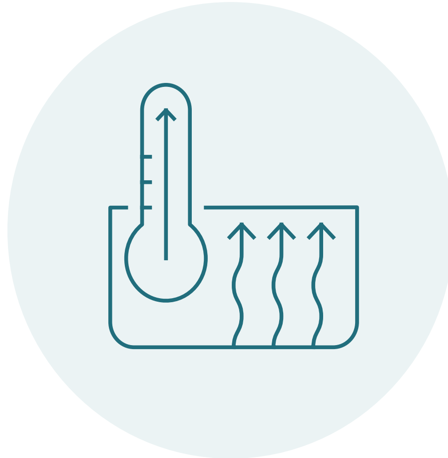
In 2024, 92% of Kenya's electricity was generated from renewable energy sources (grid connected, off-grid and captive), including hydro, geothermal, wind and solar, as illustrated in Figure 7. A good rainy season helped increase the contribution of hydro by 5%, while the proportion of energy from thermal sources declined by 2% (EPRA, 2024a). Kenya has the largest geothermal power plants in Africa and continues to invest in expanding geothermal capacity. Geothermal has consistently accounted for over 40% of Kenya's electricity generation capacity for the last 10 years. The Lake Turkana Wind Power Project is Africa's largest wind farm. The 310 MW wind farm has the potential to provide about 20% of Kenya's electricity needs during peak production. In 2024, it produced about 13% of the country's electricity, a bit less than in previous years, as wind speeds fell because of the prolonged rainy season.

Kenya's energy sector has undergone various reforms aimed at enhancing efficiency and reliability. The 2019 Energy Act introduced provisions to build a competitive and diverse energy market, focusing on renewable energy and efficiency.

**FIGURE 7. Kenya's electrical energy generation mix 2023/2024 fiscal year**

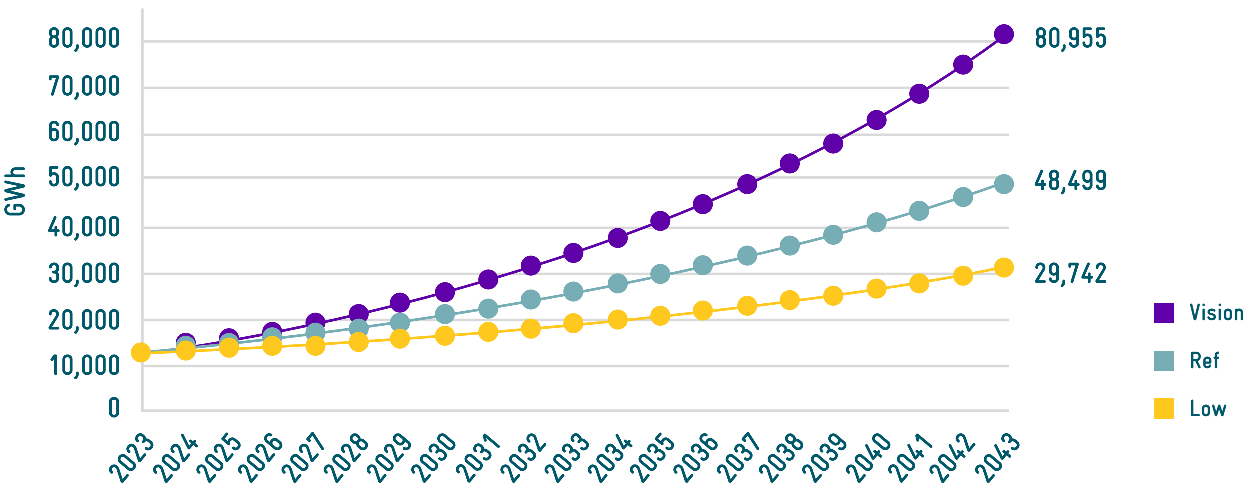



Source: Authors' analysis



The generation of electricity is completely unbundled, with the Kenya Electricity Generating Company (KenGen) producing about 60% of the power, while the rest is produced by the private sector through independent power producers. The energy sector in Kenya is expected to grow in the coming years. The Ministry of Energy and Petroleum regularly develops and updates its Least Cost Power Development Plan (LCPDP), aimed at developing a capacity expansion plan to meet projected electricity demand at minimal cost. The current LCPDP projects energy purchased to grow from 13,627 GWh in 2023 to 48,499 GWh in 2043 in its reference scenario, as indicated in (MoE, 2024).

**FIGURE 8.** Projected increase of energy purchased in Kenya




Source: MoE, 2024

The country has developed a range of strategies and plans aimed at achieving universal energy access and 100% renewable power by 2030. With the growing penetration of variable renewable energy, there is increasing interest in the use of grid-scale energy storage systems and green hydrogen as an energy carrier.

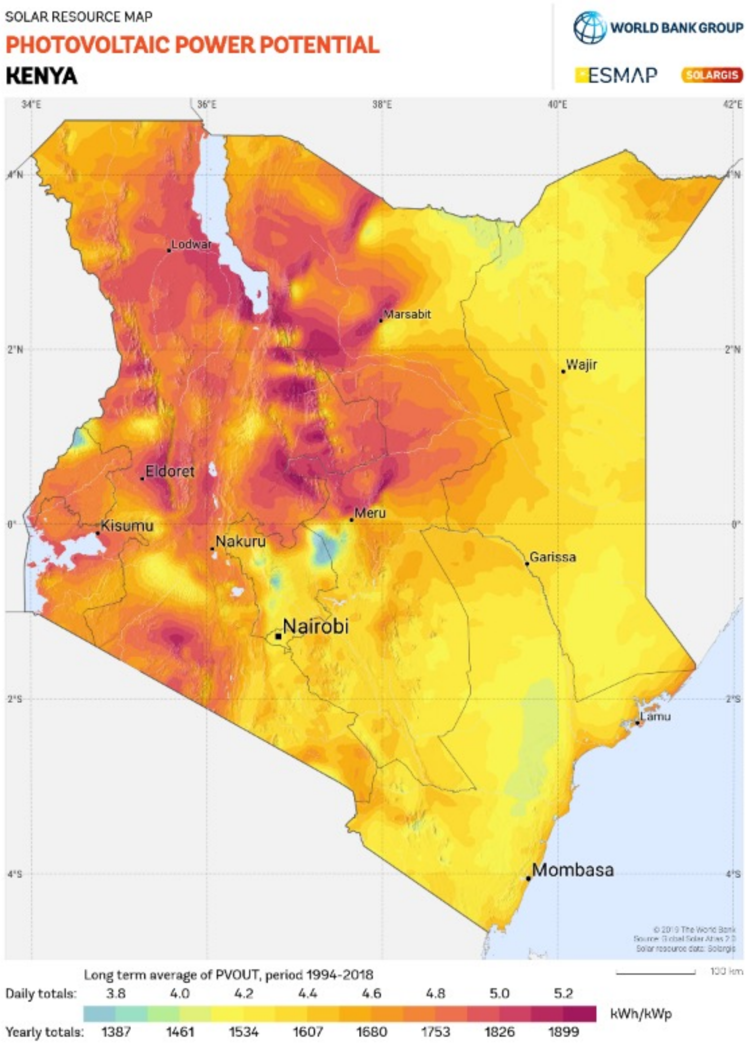
Kenya is endowed with substantial renewable energy resources, including geothermal, wind, solar and hydropower, providing a good starting point for green ammonia production. The country has significantly expanded its geothermal capacity, which now exceeds 900 MW, positioning it as the eighth largest geothermal electricity producer globally and the leading producer in Africa. Geothermal potential along the Great Rift Valley is estimated at 10 GW, with existing plants achieving a capacity factor of over 90% and ensuring a stable and reliable power supply for energy-intensive green ammonia facilities (MoEP, 2023).

Onshore wind energy presents another key opportunity, as Kenya has some of the most favourable wind conditions in sub-Saharan Africa. Approximately 73% of the country experiences wind speeds exceeding 6 m/s at 100 m above ground level, translating to a potential of up to 1 TW and capacity factors surpassing 60%. The northern regions, particularly around Lake Turkana, offer optimal conditions for wind power development. Offshore wind remains untapped, despite the country's strategic location (MoEP, 2025).

Solar energy remains a largely untapped resource with only about 450 MW in operation in 2024, despite Kenya's high irradiation levels. Figure 9 shows there are regions exhibiting solar yields between 1,700 and 1,800 kWh/kWp, corresponding to capacity factors of around 20% (MoEP, 2023).

Kenya's solar potential is estimated at 15 GW (MoEP, 2025), and its hydropower potential at 6,000 MW, half of which could be derived from small-scale hydro projects. To date, over 800 MW of hydropower has been developed, primarily through large-scale installations managed by KenGen, with major hydropower resources concentrated in the country's five principal water basins (MoEP, 2023).

**FIGURE 9. Solar photovoltaic (PV) potential in Kenya**




Source: https://globalsolaratlas.info/map

## 2.2.2 Water resources

Water is a critical input for electrolysis to produce green hydrogen, which is a key feedstock for ammonia synthesis. Kenya possesses diverse but unevenly distributed water resources that present both opportunities and challenges for green ammonia production. The country's water assets include inland saline lakes, freshwater systems, coastal waters and extensive underground sources. With 11,200 km$^2$ of inland waters and wetlands and an annual groundwater abstraction potential of 3,115 million m$^3$, Kenya's hydrological profile appears robust at the national level. The five permanent water basins – Lake Victoria, Rift Valley, Athi, Tana and Ewaso Ng'iro North – collectively generate an annual water flow of over 14,900 million m$^3$. This apparent abundance masks significant regional disparities. The Tana and Lake Victoria basins have a water surplus, while the Rift Valley, Athi and Ewaso Ng'iro North basins face chronic water shortages (Oyan, et al., 2024).

According to international benchmarks, a country is deemed water-stressed when per capita freshwater availability falls below 1,700 m$^3$ a year, and water-scarce when it falls below 1,000 m$^3$. Kenya's current per capita water availability stands at approximately 600 m$^3$ a year, placing it among the world's water-constrained nations (Mulwa, et al., 2021). In fact, approximately 80% of Kenya is classified as arid or semi-arid (MoEWNR, 2013). Given the constraints, sustainable green ammonia production in Kenya will require innovative water sourcing strategies which could include:

- Strategically locating green ammonia plants in regions with high rainfall, such as the Lake Victoria basin
- Considering seawater desalination along Kenya's coast, with an evaluation of potential co-benefits, such as the provision of clean water to communities and the removal of salt and minerals from brine, and an environmental impact assessment of brine
- Considering the desalination of brackish groundwater, especially in northern and eastern regions of Kenya with high renewable energy potential

Green hydrogen and ammonia projects are required to secure official permits from the Water Resources Authority before utilising any water sources. In addition, it is essential to ensure compliance with the 2016 Water Act, which sets out the standards for the responsible use, conservation and management of water resources. County governments also play an important role in overseeing and providing water services within their jurisdictions, so close coordination with these local authorities is necessary to ensure projects are both legally compliant and sustainable in terms of water usage (EPRA, 2024b).

### 2.2.3 Availability of land

Kenya has significant potential in terms of the availability of land for green ammonia plants. The 80% of land categorised as arid or semi-arid has low population density, reducing the likelihood of competition for land uses. The coastal areas also have low population density, making them suitable for green ammonia production. Land use and planning in Kenya is based on a structured legal framework established by the 2019 Physical and Land Use Planning Act, which provides the overarching guidelines for sustainable land management. This legislation is further reinforced by complementary county-level urban and rural regulations, ensuring a multi-tiered approach to land governance. The National Land Commission (NLC) serves as the principal regulatory body, vested with independent oversight authority to enforce compliance, adjudicate disputes and coordinate land-use policies across different jurisdictions (SE4All, 2025).

### 2.2.4 Well-developed infrastructure

#### Electricity transmission

Kenya has relatively well-developed infrastructure that can support green ammonia production, including power transmission and distribution, road and rail networks and ports for imports and exports.

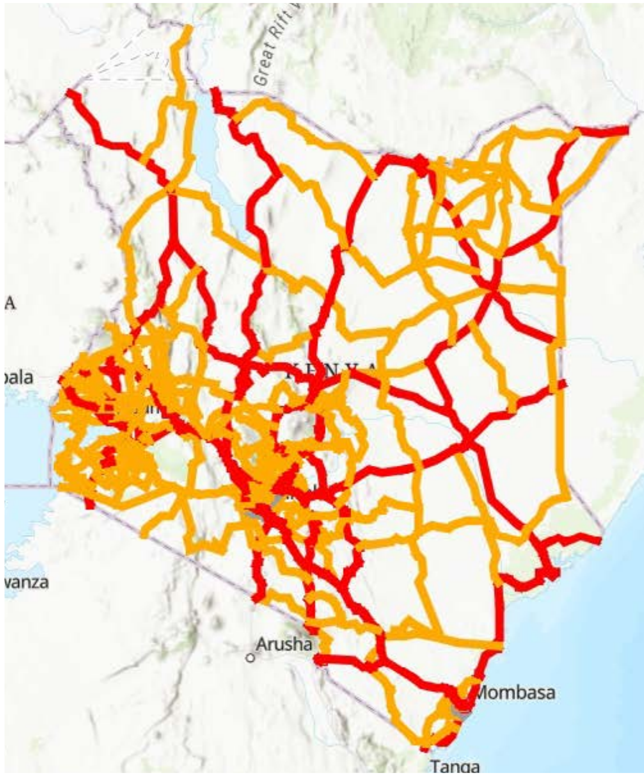
Kenya's electricity transmission and distribution infrastructure has undergone substantial growth in recent years, driven by deliberate government initiatives to strengthen the national grid. The country's transmission network, consisting of 400 kV, 220 kV and 132 kV power lines, spanned approximately 7,220 km as of 2021. This critical infrastructure is jointly managed by two state-owned entities: Kenya Power, which controls 52% of the network, and the Kenya Electricity Transmission Company (KETRACO), which oversees the remaining 48%. KETRACO's strategic Transmission Master Plan aligns infrastructure development with both the national generation capacity roadmap outlined in the LCPDP and projected electricity demand growth. When evaluating transmission capacity availability for new projects, KETRACO conducts comprehensive assessments that factor in geographical location, project scale and any grid limitations. For projects where current transmission capacity proves insufficient – a scenario particularly relevant for large-scale green hydrogen developments with electrolysers located far from generation sources – the project developer is financially responsible for the required grid upgrades and new transmission lines (MoEP, 2023).

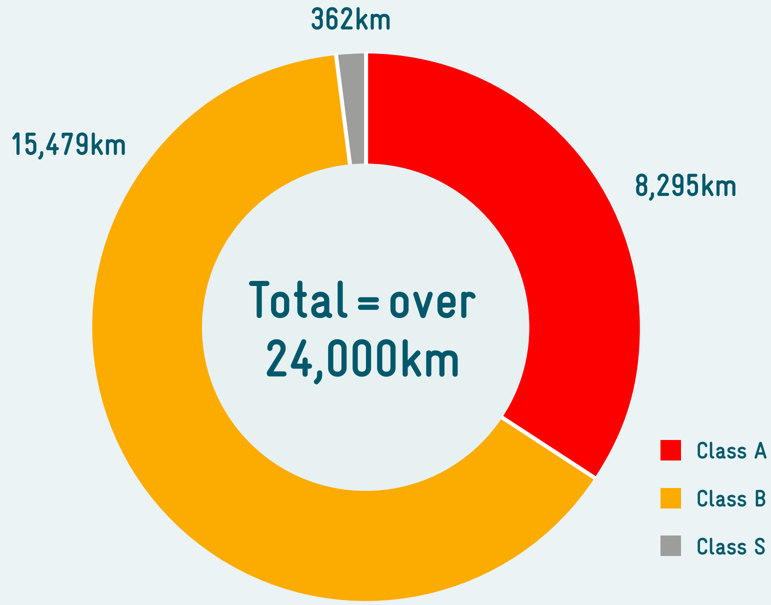
## Road network

Kenya's road infrastructure is among the most developed in East Africa, playing a crucial role in facilitating industrial and logistics operations. As of December 2024, the country had over 24,000 km of major roads across the country, as depicted in Figure 10. According to the Kenya National Highways Authority (KeNHA), the main roads in the country are classified as Class A, B or S, whereby:

- **Class A roads** are highways serving as critical international corridors, linking Kenya's borders at designated immigration checkpoints with major ports of entry, including international airports and seaports. They form the backbone of the country's transnational trade and transport network.
- **Class B** roads are national routes connecting key economic centres, county headquarters and other strategically important locations to the capital Nairobi and to the Class A road network. They serve as vital links between regional commercial hubs and the national transport system.
- **Class S roads** are designed as high-capacity intercity connectors that facilitate rapid movement of substantial volumes of traffic between urban centres. Engineered for optimal safety and speed, they represent the country's premium domestic transport arteries

**FIGURE 10. Road network in Kenya**




Source: KeNHA, 2024

Other roads in Kenya are categorised as Class C, D or E. Overall, the network has over 160,000 km of roads.

## Rail transport

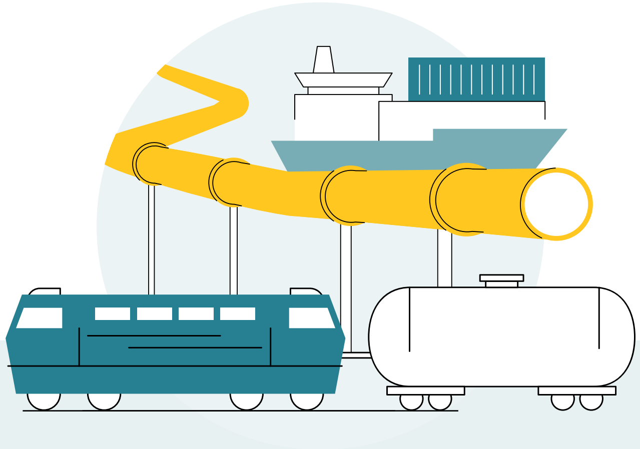
Kenya has about 2,600 km of railway lines: 492 km of modern standard gauge railway (SGR) and more than 2,000 km of old metre gauge railway (MGR). The MGR network is composed of the mainline (1,082 km), running along the northern corridor from Mombasa to Malaba, and seven branch lines. The SGR was constructed in two phases from 2014, the first between Mombasa and Nairobi (472 km), and the second between Nairobi and Naivasha (120 km), which was completed in 2017 (Kenya Railways, 2023).

Kenya's rail transport system continues to demonstrate growing importance in the nation's logistics landscape, with both the SGR and MGR networks showing significant cargo handling improvements in recent years. The SGR recorded a 7.3% increase in freight volumes, which rose from 6.09 million t in 2022 to 6.53 million t in 2023. Meanwhile, the revitalised MGR network experienced even greater growth, with cargo volumes surging 27.2% from 787,000 t to over 1 million t during the same period. This notable expansion in MGR utilisation can be partially attributed to the commissioning of the SGR Longonot connection, which has facilitated efficient cargo transfers between the Naivasha Inland Container Depot and the Malaba border crossing into Uganda, enhancing regional trade connectivity (KNBS, 2025).

## Ports

Kenya's strategic location along the Indian Ocean has positioned it as a key maritime gateway for East and Central Africa. It has some nine commercial ports, the main one being the port of Mombasa, followed by Lamu, which can also handle larger ships, and the smaller ports of Shimoni, Funzi, Vanga, Mtwapa, Kilifi, Malindi and Kiunga. The port of Mombasa's cargo imports and exports, which remained steady at around 32 million t for a number of years, saw moderate growth from 2022 to 35 million t in 2024. In addition, trans-shipments have also increased due to congestion at other regional ports and the diversion of shipping routes away from the Suez Channel (KNBS, 2025).

The Kenya Ports Authority (KPA) plays a crucial role in overseeing and operating the nation's seaports as well as its inland water transport. Committed to sustainable development, KPA has introduced a green port policy focused on lowering carbon emissions, improving waste management, combating water pollution and conserving local ecosystems.



## 2.2.5 LAPSSET

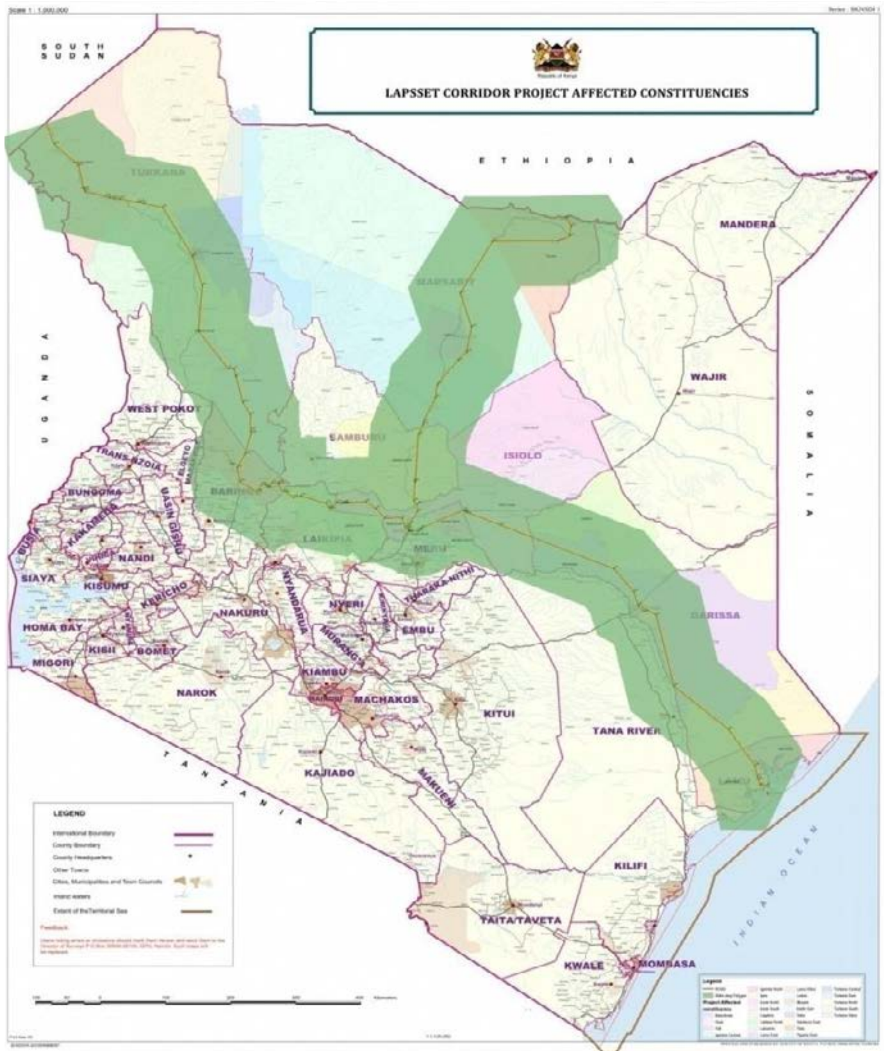
The Lamu Port–South Sudan–Ethiopia Transport (LAPSSET) Corridor Programme is a regional flagship project intended to provide transport and logistics infrastructure aimed at creating seamless connectivity between the Eastern African countries of Kenya, Ethiopia and South Sudan (LAPSSET, 2024).

Key infrastructure projects in the LAPSSET Corridor Programme include the following (LAPSSET, 2024):

- Lamu Port consisting of 32 deep-water berths
- Interregional SGR lines
- Interregional road network
- International airports

This corridor has the potential to open Kenya's northern corridor, which is endowed with a high potential for renewable energy generation, particularly solar and wind. The project can also provide the infrastructure needed for the production and transportation of green ammonia.

**FIGURE 11.** LAPSSET Corridor




Source: LAPSSET, 2024

### 2.2.6 Skilled workforce

Kenya has notable strengths in renewable energy, with well-developed local capacity in geothermal, wind and solar energy. This is complemented by practical experience in large-scale projects, such as the Lake Turkana Wind Power initiative and the Olkaria geothermal plants. Academic institutions provide strong mechanical, chemical and electrical engineering programmes that contribute to the talent pipeline. Additionally, Kenya benefits from an experienced workforce, with local firms proficient in engineering, procurement and construction for energy projects, giving the nation a practical advantage as it develops new sectors such as green hydrogen and ammonia. The country also has a growing practical capacity in environmental assessment, legal expertise and project management relevant to renewable energy deployment.

Despite these strengths, Kenya faces notable skill shortages. There is a need to enhance the foundational skills of the workforce, including environmental impact assessors, legal experts, engineers and technologists, who are key in developing and maintaining green hydrogen and ammonia plants. Developing new skills and expertise is crucial. This includes establishing standards and certifications as well as gaining specialised technological knowledge in fields such as aviation, shipping and carbon assessment. There is limited local expertise in electrolyser operation and hydrogen safety protocols, which are vital for efficient and safe hydrogen processing. There is also a shortage of lawyers skilled in handling green ammonia transactions and certified safety professionals adept in hydrogen and ammonia storage and transportation (GIZ, 2024).

## 2.3 Policy and regulatory framework

Kenya's Vision 2030 aims to transform the nation into a newly industrialising, middle-income country by 2030, with agriculture and manufacturing identified as priority sectors. It seeks to transform agriculture through a three-tier fertiliser cost reduction strategy (bulk procurement, blending and local fertiliser manufacture) (GoK, 2007). Structured according to the steps needed for green fertiliser production and usage, the following sections analyse policies on renewable energy, hydrogen and fertiliser.

### 2.3.1 Renewable energy

The primary policy guiding the sector is the 2018 National Energy Policy, and the specific legislation is the 2019 Energy Act. Currently, the energy policy is being reviewed, and a new draft policy for 2025–2034 is in development. The 2019 Energy Act provides that a person does not require authorisation to generate electrical energy for their own use when capacity does not exceed 1 MW. For installations with a higher capacity, a generation licence is required, which is issued by the Energy and Petroleum Regulatory Authority (EPRA). The 2012 Energy (Electricity Licensing) Regulations regulate the licensing of the generation, exportation, importation, transmission, distribution and supply of electrical energy in Kenya. The licence application process is outlined in the regulations. A non-refundable fee of KES 10,000 is payable upon submission of the application for a licence. If the applicant is granted a licence, a fee of KES 10,000 per MW of installed capacity is payable. The 2024 Energy (Net Metering) Regulations were gazetted to operationalise the net metering arrangements provided for in the 2019 Energy Act. They allow consumers to feed excess power from their renewable energy system into the grid and receive a credit on their electricity bill for the exported power.

The existing general legal framework supports the adoption and utilisation of clean energy in the country. For example, specialised equipment used for the development and generation of solar and wind energy is exempt from value added tax (VAT). Additionally, the supply of solar and lithium-ion batteries is VAT zero-rated, and inputs and raw materials imported and purchased by manufacturers of agricultural machinery and implements are VAT exempt (KenInvest, 2024). Given the nascent nature of green ammonia in Kenya, electrolysers could qualify for exemption as agricultural inputs, although this is not explicitly stated.

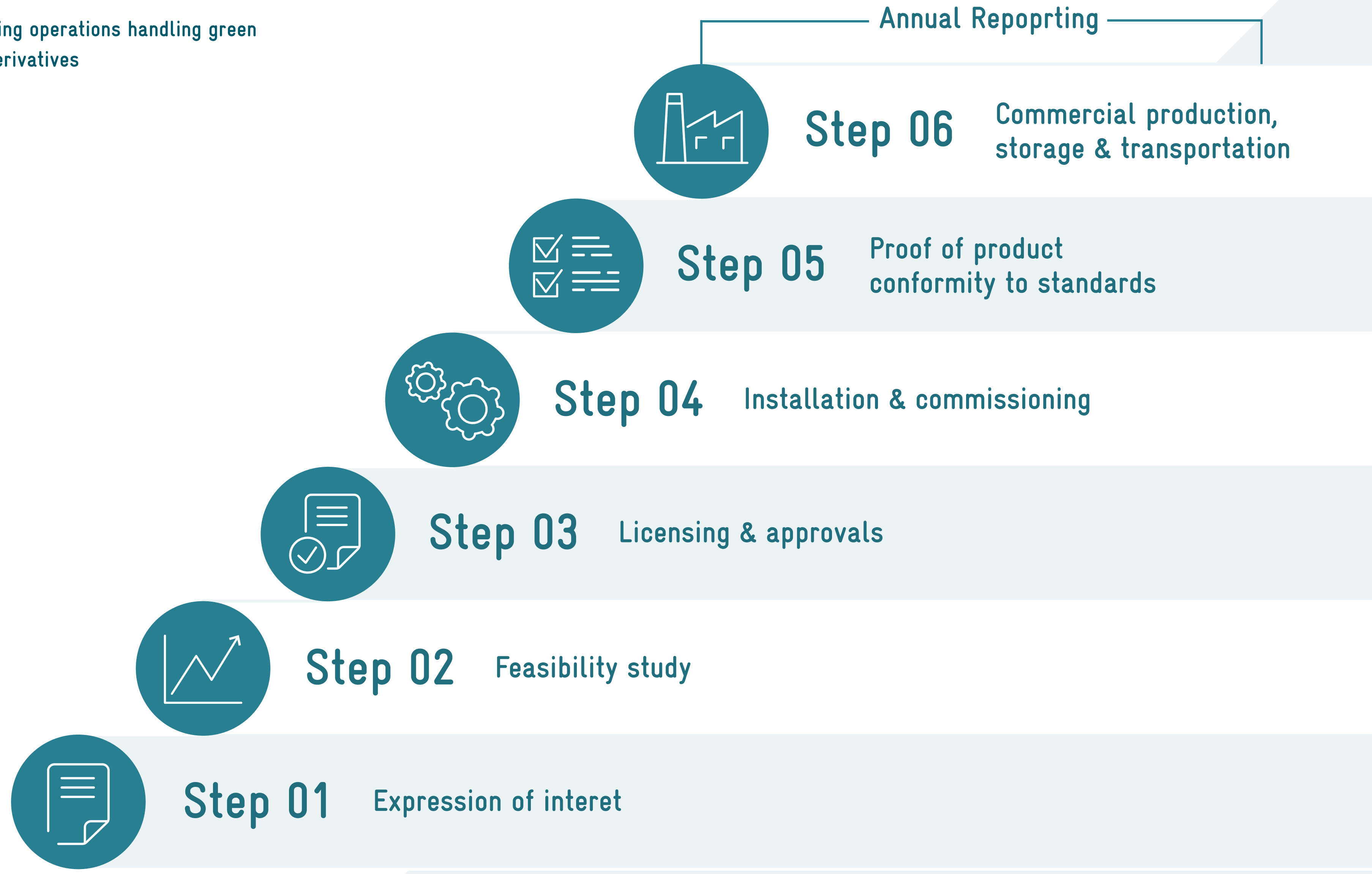
The National Energy Policy 2025–2034 (currently in draft form) aims to advance the nation's goal of bringing about an equitable energy transition, emphasising innovation, resilience and sustainability, to meet the energy needs of all Kenyans. Once adopted, it will seek to leverage Kenya's vast renewable energy potential to produce green hydrogen, which shall help the country to enhance its energy security and contribute to meeting decarbonisation goals.

### 2.3.2 Green hydrogen

Currently, Kenya has no laws or policies regulating the production, storage and distribution of green hydrogen. However, EPRA issued Kenya's Guidelines on Green Hydrogen and its Derivatives (EPRA, 2024b), which came into effect on 1 May 2024 and are applicable to developers and users of green hydrogen (and/or its derivatives). The main objective of the guidelines is to stimulate a green hydrogen economy in Kenya.

The regulatory steps for establishing operations handling green hydrogen and its derivatives are depicted in Figure 12.

**FIGURE 12.** Steps for establishing operations handling green hydrogen and its derivatives




Source: EPRA, 2024b

To produce green hydrogen in Kenya, developers must first submit an expression of interest to the Ministry of Energy and Petroleum, accompanied by a pre-feasibility study providing project details, such as location, land requirements, electricity and water sources, electrolyser capacity, infrastructure needs and potential offtakers. If approved, a detailed feasibility study must be completed within 24 months.

The guidelines stipulate that electricity for green hydrogen production may be sourced from renewable sources, either through a dedicated off-grid or grid-tied captive plant, a grid supply with at least 80% renewable energy or power wheeling via a renewable energy plant not contracted for the grid (EPRA, 2024b).

The guidelines also provide that developers should optimise water use, avoid using freshwater in locations affected by water stress and reduce risks associated with water access. A water resource assessment is mandatory to establish water availability, quantity and quality. The 2016 Water Act establishes a legal framework for water use, management and conservation and is the primary legislation governing water resources. Developers are encouraged to use non-arable land or sites where environmental and ecological impacts will be minimal, and they must seek acceptance of the project by the community.

For green ammonia production, the guidelines set out specific sustainability criteria that green ammonia developers need to consider. Some of these considerations are summarised below:

- **Land use:** Projects must consider the impact on land use and biodiversity
- **Water use:** Sustainable sourcing and management of water for electrolysis is critical
- **Renewable energy source:** At least 80% of electricity used for hydrogen production must be from renewable sources, aligning with European Union (EU) standards for additionality and time matching
- **Carbon intensity for ammonia:** A well-to-gate threshold of 0.3 kg $CO_2$ equivalent per kg of ammonia is set, averaged over a 12-month production period
- **Local content:** Partnerships with Kenyans, the use of local skills and materials and investment in capacity building are encouraged

The guidelines provide that sustainably sourced nitrogen and renewable energy must be used, with well-to-gate emissions not exceeding 0.3 kg $CO_2$ equivalent per kg of ammonia annually. Export-oriented production must comply with the target market's emissions standards. All ammonia-related infrastructure – including production, storage, transport and handling equipment – must be approved by a licensed engineer under the 2011 Engineers Act and adhere to safety regulations for hazardous materials. Storage must be in cryogenic tanks or high-pressure cylinders meeting pressure vessel standards and leak detection and ventilation requirements.

Kenya has already identified its advantaged position in terms of renewable energy resources that can be used to grow the green hydrogen industry and has developed the Green Hydrogen Strategy and Roadmap for Kenya (MoEP, 2023). The strategy is to be implemented in two five-year phases from 2023 to 2032. The first phase (2023–2027) will primarily focus on cultivating domestic demand and implementing the first catalytic commercial projects to kickstart the hydrogen industry. This phase will pursue the promotion of green hydrogen to produce domestic green (nitrogen) fertiliser, with a view to increasing agricultural productivity and thereby enhancing food security and eradicating hunger. The target is to substitute 20% of imported ammonia-based fertiliser (around 100,000 t/year) and 100% of imported methanol (>5,000 t/year) with local production. The second phase (2028–2032) will consider market developments and other external factors to leverage the lessons learned from the initial phase and explore new hydrogen opportunities, such as regional exports. Other sectors, such as green steel and mobility applications, and expansion from the local use of green hydrogen products to regional or international export activities will be explored in this phase. The target is to substitute 50% of imported ammonia-based fertiliser (between 300,000 and 400,000 t/year), decarbonise power generation and the transport sector using green fuels and explore the export market for green hydrogen derivatives.

Kenya recognises the need to establish an effective regulatory and institutional framework that is fit for purpose and includes fiscal incentives to attract investment in the green hydrogen sector, stimulate demand for green hydrogen and create an attractive investment environment. The need for strategic partnerships and collaborations at the national and international level with governments, institutions and industry players to promote knowledge sharing and leverage expertise, resources and market opportunities is also acknowledged.

### 2.3.3 Fertiliser production and consumption

The Agricultural Soil Management Policy (2023) indicates that local fertiliser manufacture and blending is one of the strategic actions required to address the demand for fertiliser in Kenya and make it easily accessible and available to farmers.

The 2015 Fertilizers and Animal Foodstuffs (Amendment) Act establishes the Fertilizer and Animal Foodstuffs Board of Kenya. The Board's functions are to:

- Regulate the fertilisers and animal foodstuffs industry in Kenya, including the production, manufacture, packaging, importation and marketing of fertilisers and animal foodstuffs
- Promote the manufacture of fertilisers and animal foodstuffs
- License manufacturers, distributors and retailers of fertilisers and animal foodstuffs
- Ensure that fertilisers and animal foodstuffs imported, manufactured or distributed in Kenya meet quality and safety standards

The Kenya Plant Health Inspectorate Service Act (2011) establishes the Kenya Plant Health Inspectorate Service (KEPHIS). Its functions include establishing service laboratories to monitor the quality and levels of toxic residues in agro-inputs, irrigation water, plants, soils and produce.

The continued use of acidifying fertilisers, such as DAP, has contributed significantly to increased soil acidity, particularly in maize-growing areas in Kenya. This affects crop yields and overall soil health. To address this issue, Kenya's Agricultural Soil Management Policy prioritises training for farmers to enable them to select appropriate fertiliser types and apply them at the correct rate for specific crops and soil conditions. Moreover, there should be an emphasis on soil analysis to determine fertility levels and guide targeted nutrient replenishment strategies for sustainable agricultural practices (MoALD, 2023).

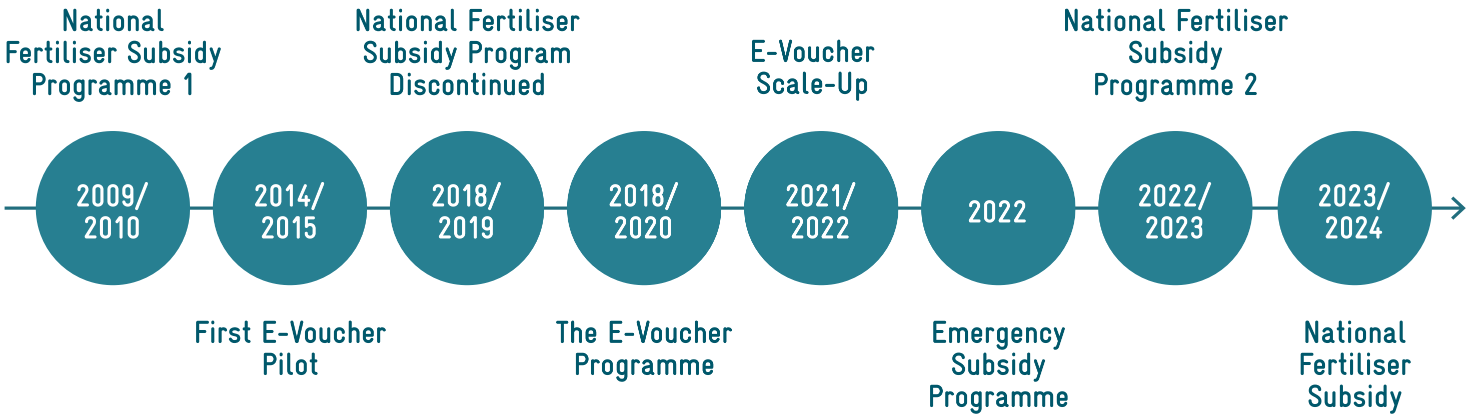
### 2.3.4 Fertiliser subsidy programmes

In Kenya, fertilisers are subject to the Common External Tariff of the Eastern African Community's Customs Union. This tariff system categorises goods into three bands based on their level of processing. Raw materials and inputs are exempt from duty. Processed or manufactured inputs incur a 10% duty, while finished products are taxed at a rate of 25%. This structured approach aims to encourage local production and processing of goods, including fertilisers, by reducing the tax burden on raw materials and inputs necessary for manufacturing.

The history of fertiliser subsidies in Kenya dates to the 1960s when the government provided subsidies for the importation of soluble phosphates and nitrogen-based fertilisers. This initiative was suspended in the 1970s but then reintroduced in 2007 in response to the 2006 Abuja Declaration and the significant increase in global fertiliser prices in 2008. The evolution of these subsidy programmes in Kenya is depicted in Figure 13.

The 2009/2010 National Fertiliser Subsidy Programme provided registered farmers with discounted fertilisers through NCPB depots. However, due to inefficiencies, this programme was replaced by the e-voucher system, first piloted in three counties in 2014/2015. In 2018/2019, the traditional subsidy programme was discontinued, and the e-voucher scheme was rolled out in 12 counties, benefiting farmers in specific value chains. In 2021/2022, the e-voucher programme was expanded to 37 counties, supporting 50,000 farmers.

**FIGURE 13.** Evolution of fertiliser subsidy programmes in Kenya




Source: Analysis based on AfricaFertilizer, 2025

The global fertiliser crisis led to a sharp increase of 76% in the price of DAP fertiliser in 2021, followed by an additional 10% rise by mid-2022. Similarly, CAN fertiliser prices rose dramatically by 102% in 2021, with a subsequent 56% increase recorded in July 2022. In response, the government announced an emergency subsidy programme in 2022 to support local procurement. In September 2022, the National Fertiliser Subsidy Programme was reintroduced as part of the government's Bottom-Up Economic Transformation Agenda, which aimed to supply farmers with 10 million bags of subsidised fertiliser. By early 2023, over 450,000 t had been distributed during the long rainy season, with an estimated financial commitment of KES 54.3 billion (approximately USD 400 million). The subsidised fertiliser cost KES 3,500 per 50 kg bag, representing a substantial discount relative to the prevailing market price for commonly utilised planting fertilisers, such as DAP, which retailed at between KES 5,500 and KES 6,000 per 50 kg bag. As of mid-June 2024, 413,884.5 t had been distributed to registered farmers accessing fertilisers from NCPB depots and affiliated stores. The programme aims to expand these subsidies to all counties and more value chains, ensuring last-mile distribution for easier access by farmers (AfricaFertilizer, 2025).

### 2.3.5 Free trade zones

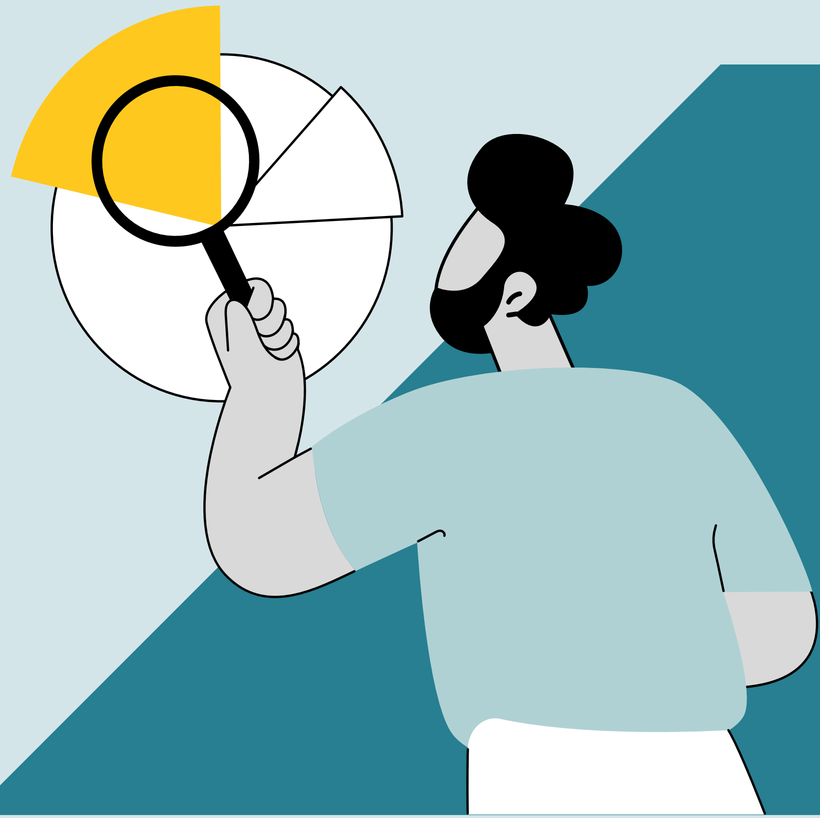
Free trade zones could offer significant advantages to green ammonia producers in Kenya by providing attractive fiscal incentives, simplified regulatory frameworks and a single operating licence. These benefits have the potential to reduce operational costs, streamline processes and enhance the competitiveness of green ammonia. The main free trade zones in Kenya are Special Economic Zones (SEZs) and Export Processing Zones (EPZs). A SEZ is a geographically demarcated area operating under distinct economic regulations designed to stimulate industrial growth, attract foreign investment and enhance export competitiveness. The Special Economic Zones Act No. 16 of 2015 serves as the legal framework governing SEZs, establishing the Kenya Special Economic Zones Authority (SEZA) to oversee both public and private SEZ developments. EPZs are specialised economic areas established to promote and streamline the export of manufactured goods. They are administered by the Export Processing Zones Authority (EPZA), which operates under the oversight of the Ministry of Investments, Trade and Industry. Businesses operating within Kenya's SEZs and EPZs enjoy a range of fiscal and regulatory incentives, including the following (SE4All, 2025):

- **Tax and duty exemptions:** Complete exemption from import duties, taxes and fees on goods brought into the SEZ. Zero-rated VAT on supplies sourced from domestic manufacturers. Reduced corporate tax rates (10% for the first decade, 15% for the following 10 years, and 30% thereafter).
- **Investment and operational benefits:** Full capital expenditure deductions for buildings and machinery. Tax-free dividends, capital gains, royalties and service fees for non-resident investors during the first 10 years. Waiver of local government levies and fees.
- **Streamlined processes:** Expedited licensing and project approvals. On-site customs clearance and inspections for efficient trade facilitation.
- **Foreign investment advantages:** No restrictions on foreign ownership or capital repatriation. Flexible work permit allocations (up to 20% of full-time staff, with potential extensions subject to SEZA approval).

Businesses should consult SEZA or EPZA to confirm which incentives are applicable to which free trade zones.

# 3

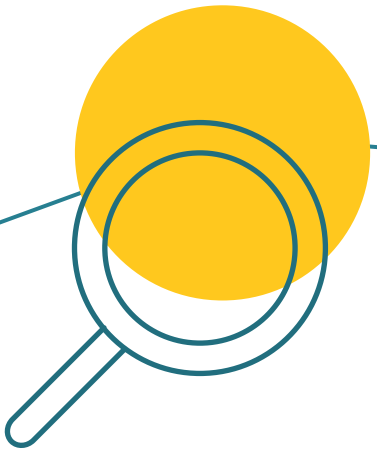
# Techno-economic analysis of green ammonia and fertiliser production in Kenya



Based on the prerequisites described in the previous chapter, Kenya has the potential to produce green ammonia from its substantial green energy resources. This section analyses potential setups for producing green hydrogen, ammonia and, ultimately, fertiliser and economic performance compared to their grey counterparts.

The production route considered for green fertiliser from renewable energy sources is as follows:

- Green hydrogen is produced utilising an electrolyser powered by renewable energy (various sources are possible)
- Green ammonia ($NH_3$) is synthesised by combining hydrogen ($H_2$) and nitrogen ($N_2$) in an 18% to 82% weight ratio using a Haber-Bosch unit
- Green fertiliser is produced by combining green ammonia with a variety of other chemical components, depending on the type of fertiliser to be produced



In comparison, grey ammonia is typically produced from grey hydrogen, the production of which is highly emission-intensive and largely depends on fossil fuels. Approximately 70% of global production uses natural gas, with coal accounting for the remaining 30%. Fossil fuel-based ammonia production emits $CO_2$ at an approximate rate of 2 kg $CO_2$/kg of $NH_3$ produced. The levelised cost of ammonia (LCOA) in 2021 was USD 2/kg and has followed an upward trend (GIZ, 2023).

## 3.1 Small-scale hydrogen and ammonia production

Small-scale green hydrogen projects (typically kW to low MW electrolyser size range) serve industries with moderate hydrogen demand or decentralised production needs. These setups prioritise on-site or near-site generation to minimise logistics costs and seamlessly integrate with existing processes.

In this case, electrolysers are typically powered by local wind or solar PV plants, supported by battery energy storage and hydrogen storage to manage (part of the) fluctuations in electricity supply and hydrogen demand. In most cases, hydrogen is consumed directly on site, ensuring efficiency and reliability.

One of the few examples of the use of hydrogen in Kenya is in the iron and steel sector, whose performance is closely linked to growth in complementary sectors, such as building and construction, energy and chemicals. The metal sector contributes 8% to Kenya's manufacturing production index, indicating its significant role within the country's manufacturing sector (GIZ, 2021) and economy as a whole (KNBS, 2024). Kenya mainly relies on imported iron billets for steel processing. Most of the steel is used in the construction sector, and the common steel processes applied are hot rolling and cold rolling. During the annealing of steel in readiness for coating, hydrogen mixed with nitrogen, which is known as HNX gas (or sometimes pure hydrogen), is required to create a reducing atmosphere and prevent oxidation of the steel. The production of green hydrogen on a small scale will require significant financial incentives over the short, medium and long term to make it cost-competitive with conventional hydrogen sources.

With further processing, green ammonia can be obtained. Examples of current applications of (mostly grey) ammonia in Kenya include fertiliser blending through the production of nitric acid and the natural refrigerant (R717) used in industrial cold rooms due to its favourable thermodynamic properties and performance in higher ambient conditions. There are several facilities in Kenya that use small amounts of ammonia for refrigeration, with cooling capacities above 500 kW. One example is the East Africa Sea Foods (EASF) plant, a fish processing facility located in Kisumu, which replaced its aging R22 refrigeration system with a two-stage ammonia system from the German manufacturer GEA to increase production capacity. The system installed by EASF has a total ammonia charge of approximately 1,400 kg.

An additional option is the direct application of green ammonia to replace nitrogen-based fertilisers. For such decentralised production, large-scale farms could set up green ammonia plants on site and apply the ammonia directly through injectors in anhydrous form or through fertigation (fertiliser and irrigation) systems in aqueous form. Medium-scale farms in the same area could also pool together to set up a common green ammonia production facility.

In Kenya, Talus Renewables installed one such decentralised green ammonia plant at Kenya Nut Company's Morendat farm in Naivasha in 2023. The facility, powered by a 2.1 MWp solar plant, produces 1 t of green ammonia per day and is used by Kenya Nut Company under a 15-year supply agreement. Such decentralised deployment could be interesting to farmers in Kenya seeking to reduce their reliance on external/imported fertilisers.

## 3.2 Large-scale hydrogen and ammonia production

Large-scale green hydrogen projects (multi-MW electrolyser capacity) serve industries with high and continuous hydrogen demand, maximising economies of scale through larger electrolyser installations and the utilisation of optimal wind and solar resources.

These projects typically feature large renewable energy facilities paired with nearby large-scale electrolysers, supported by infrastructure for electricity transmission, water supply, wastewater management, and hydrogen storage and transport to offtakers or ports. Extensive hydrogen storage is essential either to balance production fluctuations without disrupting downstream processes or to accommodate the periodic nature of maritime transport for export-oriented projects.

There is currently no significant direct demand for green hydrogen on this scale in Kenya, but it could be processed further to obtain methanol, the primary hydrogen-based commodity imported into Kenya. Kenya imported over 7,000 t in 2024 for different industrial applications, such as paints, plastics, pharmaceuticals and industrial solvents. The country has an ambition to locally produce green methanol to replace all methanol imported into Kenya by 2027.

Additionally, hydrogen is sometimes considered for electricity storage as well, replacing or complementing battery storage. Renewable energy can power electrolysers, producing green hydrogen that is then stored. This stored hydrogen can be converted back into electricity via fuel cells during periods of low renewable generation or high demand, providing crucial grid stability and baseload power. Several project developers are already working on plants in Kenya that would deliver baseload power by integrating renewable energy sources with energy storage in the form of green hydrogen. One of these companies, HDF Energy, has already commenced development studies for a large-scale green hydrogen power plant in Kenya's coastal region. This project will combine 180 MW of solar PV with 500 MWh of long-term hydrogen-based storage and deliver stable, firm and dispatchable power to the Kenyan grid (HDF, 2025) In addition to storage, green hydrogen can offer essential grid services, such as frequency regulation and black start capabilities, enhancing overall grid reliability.

Large-scale ammonia production would be particularly attractive for the production of green fertiliser in Kenya. As highlighted in Section 2.3.2, Kenya aims to reduce its dependence on imported fertiliser by producing 100,000 t/year of green fertiliser by 2027. For example, fertiliser companies could produce or procure locally produced ammonia that could be processed or blended into standard fertilisers to be distributed through existing channels.

Alternative applications involving larger amounts of green ammonia might include utilisation as a sustainable marine fuel for the shipping industry.

## 3.3 Techno-economic analysis of use cases

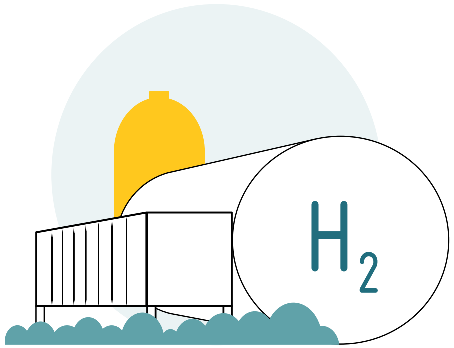
For techno-economic modelling, a fictional case established Naivasha (latitude: −0.713093; longitude: 36.30884) as the selected location, due to the presence of many flower farms and other large commercial farms that are potential green fertiliser offtakers. The flower farms normally export to markets abroad, especially Europe, which could be willing to pay the premium for sustainably produced products. It should be noted that the results could vary significantly for locations in other parts of the country with different conditions, for example, in terms of nearby wind resources.

Three different cases were calculated for hydrogen and subsequent ammonia production. For these selected cases, the analysis examined the levelised cost of hydrogen (LCOH) and the LCOA, based on different renewable energy mixes of PV and wind necessary to meet a given annual hydrogen/ammonia demand. Different electrolyser sizes were used. The main results of these three cases are summarised in Table 1 and Table 2.

Geothermal energy was not included because the different setup required makes comparison to the other technologies less meaningful. In-depth information on utilising geothermal energy for power-to-X (PtX) applications in Kenya can be found in (International PtX Hub, 2023).

The data are given as average values over the project lifetime and include inflation and an assumed increase in grey hydrogen prices of 2% above inflation. The levelised cost of grey hydrogen, for example, is therefore based on a current price of USD 5.6 per kg (assuming purchase from external supply, including transport), which increases substantially during the modelling period.

Further assumptions are detailed in Annex 2.




1 In the optimisation process, least cost project setups are designed, matching demand by ±3%.

2 Excess renewable energy (RE) is calculated for the value chain, including ammonia. If only $H_2$ is to be produced, the amount of excess renewables can be increased by ~5%.

**TABLE 1. Green hydrogen cases**

| Case | Small-scale $H_2$ (PV only) | Small-scale $H_2$ (wind & PV) | Large-scale $H_2$ (wind & PV) |
|---|---|---|---|
| Demand ($H_2$) in t/year[1] | 45 | 45 | 450 |
| Installed RE (capacity) in MW | PV: 3.5 | PV: 2.1<br>Wind: 0.5 | PV: 21.8<br>Wind: 2 |
| Electrolyser size in MW | 0.9 | 0.8 | 8.3 |
| Weighted average cost of capital (WACC) (%) | 13 | 13 | 13 |
| Total investment in million USD | 5.5 | 6.1 | 39.9 |
| Oxygen sales in million kg | 0.4 | 0.4 | 3.4 |
| Excess RE sales/ consumed in GWh[2] | 2.6 | 1.4 | 12.3 |
| Average LCOH grey in USD/kg | 8.74 | 8.74 | 8.74 |
| Average LCOH proposed case/green in USD/kg | 11.66 | 18.60 | 11.89 |
| Project internal rate of return (IRR) in % | 10.6 | 6.7 | 9.8 |
| Net present value (NPV) in million USD | -0.5 | -1.7 | -5.5 |
| Finance gap (USD/kg) | 2.94 | 9.86 | 3.15 |

Source: Based on analysis by GIZ

**TABLE 2. Green ammonia cases**

| Case | Small-scale $NH_3$ (PV only) | Small-scale $NH_3$ (wind & PV) | Large-scale $NH_3$ (wind & PV) |
|---|---|---|---|
| Demand ($NH_3$) in t/year[3] | 270 | 270 | 2,700 |
| Installed RE (capacity) in MW | PV: 3.5 | PV: 2.1<br>Wind: 0.5 | PV: 21.8<br>Wind: 2 |
| Electrolyser size in MW | 0.9 | 0.8 | 8.3 |
| Weighted average cost of capital (WACC) (%) | 13 | 13 | 13 |
| Total investment in million USD | 6.3 | 6.8 | 44.5 |
| Oxygen sales in million kg | 0.4 | 0.4 | 3.4 |
| Excess RE sales/consumed in GWh[4] | 2.6 | 1.4 | 12.3 |
| Average LCOA grey in USD/kg | 2.23 | 2.23 | 2.23 |
| Average LCOA proposed case in USD/kg | 2.92 | 4.30 | 2.83 |
| Project internal rate of return (IRR) in % | 10.5 | 7.0 | 10.4 |
| Net present value (NPV) in million USD | -0.7 | -1.8 | -5.0 |
| Finance gap (USD/kg) | 0.68 | 1.96 | 0.60 |

3 In the optimisation process, least cost project setups are designed, matching demand by ±3%.
4 Excess renewable energy (RE) is calculated for the value chain, including ammonia. If only $H_2$ is to be produced, the amount of excess renewables can be increased by ~5%.

Source: Based on analysis by GIZ

Based on the results presented in Table 1 and Table 2, the following conclusions can be made.

## Resource utilisation and cost analysis

The analysis reveals that wind resources at the selected location are insufficient for effective electricity generation, as indicated by the lower LCOH/LCOA for green hydrogen and ammonia in the 'small-scale (PV only)' cases compared to the 'small-scale (wind and PV)' cases, even though only a small wind power addition was applied. With a low wind capacity factor, the overall capital expenditure (CAPEX) investment needed to produce enough hydrogen is higher in this setup than with 'PV only', owing to the wind turbine cost. The electrolyser achieves somewhat better full load hours and can therefore be sized a little smaller, but this does not compensate for the additional wind turbine cost. Additionally, in this setup, less electricity is produced overall, reducing the amount of excess electricity that can be used elsewhere.

## Financial viability

All hydrogen and ammonia cases show a substantial financing gap compared to the assumed cost of grey hydrogen and ammonia.

The 'PV only' system shows lower LCOH for green hydrogen and therefore a lower financing gap of USD 2.94/kg compared to the case including wind capacity.

This is due to the region's good solar availability and less favourable wind availability. For the large-scale system, substantial economies of scale can be observed, which push down the cost substantially compared to the small-scale mixed system, further aided by a lower wind share. Eliminating wind power altogether would bring a further reduction of costs.

Given the lower production cost of nitrogen compared to hydrogen, grey and green ammonia costs are substantially lower, but the financing gap remains similar in percentage terms. As the costs are primarily driven by the underlying hydrogen costs, the comparative effects of 'PV only' being more favourable than 'wind and PV' and of the economies of scale obtained in the case of the larger system remain.

For all cases, a relatively high IRR between 7% and 11% can be observed, suggesting a generally favourable business case. This is based on relatively high prices for grey hydrogen/ammonia and for oxygen (assumed to be for industrial not medical use) and power in Kenya, which yield solid revenue streams for these projects. However, the WACC is even higher at 13%, owing to the high cost of debt and capital in Kenya. This results in negative NPVs and financing gaps for all cases.

By leveraging a single funding source or a mix of the funding sources described in Chapter 4, it might be possible to close the financing gap and make projects economically feasible.

### Implications for project developers

Overall, and under the current assumptions, the results support the general rationale that larger projects are more cost-efficient than small-scale projects. Nevertheless, they also require higher initial investment, and the LCOH/LCOA is still not low enough to reach a positive NPV. It is therefore clear that these projects are not economically feasible in the short term without intensive funding. From a funding perspective, it might be more feasible to opt for small-scale projects, as the funding required to set them up is lower in absolute terms; however, this is heavily dependent on the funding scheme to be used.

It is important to note that the aforementioned options provide an estimate of potential green hydrogen and ammonia costs; however, cost evaluations should be conducted on a project-by-project basis since factors such as the local renewable profile and the industry's offtake profile (the analysis in this study is based on a constant profile) can significantly influence the levelised cost, in particular, because they affect the sizing of the electrolyser and storage system required. This effect is smaller for ammonia than for hydrogen, as the former has significantly lower storage costs. Additionally, securing an offtaker for the oxygen produced can be challenging, as revenue from the sale of this by-product does not generally justify investment in extensive transport infrastructure. If an offtaker can be found, however, oxygen revenues can play a big part in ensuring financial viability. As significantly more oxygen than hydrogen is produced, it can provide a similar or even higher share of revenues, even though the price per kg is typically much lower. In the calculation, it is further assumed that the full amount of renewable electricity generated can be used by the industrial facility, thereby reducing other electricity costs at an average price of USD 0.16/kWh. It is likely that industries will be interested in utilising the renewable electricity that would otherwise be curtailed, but if this is not the case, other options might include installing a battery or feeding the power into the grid for credits, based on Kenya's Energy (Net-Metering) Regulations, which were gazetted in 2024 (EPRA, 2024c) but have not yet been practically implemented. In certain scenarios, it may also be feasible to derive additional benefits from using the electrolyser's waste heat for applications such as industrial pre-heating processes.

## 3.4 Producing green fertilisers in Kenya

The main nitrogen-based fertilisers used in Kenya are ammonium phosphates, NPK, CAN and urea (see section 2.1.2). With all but NPK blends being imported – some of the NPK varieties are locally blended – there is an opportunity to set up local fertiliser plants to use locally produced green ammonia. This would have several benefits for the country, including security of supply, local job creation and improvement of the country's trade balance.

Production of these fertilisers would require additional feedstocks. Table 3 provides a summary of their availability in Kenya and their cost.

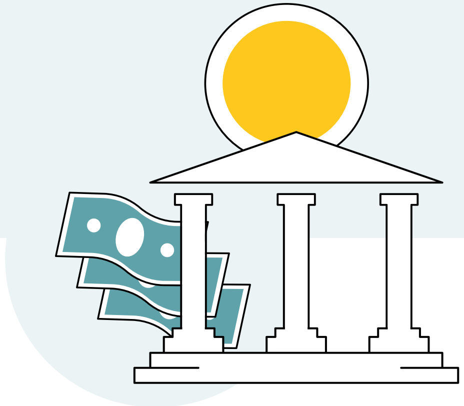
**TABLE 3. Production of fertilisers most commonly consumed in Kenya**

| | CAN | Urea | Ammonium phosphate | NPK |
|---|---|---|---|---|
| **Production process** | Produced with aqueous nitric acid ($HNO_3$), ammonia ($NH_3$) and calcium carbonate ($CaCO_3$). By-product is water.<br>$NH_3 + HNO_3 + CaCO_3 + H_2O$<br>$= \mathbf{NH_4NO_3 + CaCO_3} + H_2O$ | Synthesis from liquid ammonia and gaseous $CO_2$. By-product is water.<br>$NH_3 + CO_2$<br>$= \mathbf{CH_4N_2O} + H_2O$ | Produced by reacting phosphoric acid ($H_3PO_4$) with ammonia ($NH_3$)<br>$2NH_3 + H_3PO_4 \rightarrow$<br>$(NH_4)2HPO_4$ | Blending and granulation of pre-processed NPK source materials |
| **Additional feedstock required** | Calcium carbonate ($CaCO_3$) | $CO_2$ | Phosphoric acid ($H_3PO_4$) | $H_3PO_4$, potash (KCl), sulphuric acid ($H_2SO_4$) |
| **Availability** | $CaCO_3$ – locally available and imported | $CO_2$ – locally available and imported | $H_3PO_4$ – imported | KCl – imported<br>$H_2SO_4$ – locally produced |
| **Quantity of feedstock required (molar ratio as per final product)** | 0.590 kg $HNO_3$/kg CAN<br>0.347 kg $H_2O$/kg CAN<br>0.160 kg $NH_3$/kg CAN<br>0.250 kg $CaCO_3$/kg CAN | 0.567 kg $NH_3$/kg $CH_4N_2O$<br>0.733 kg $CO_2$/kg $CH_4N_2O$ | 0.26 kg $NH_3$ and 0.74 kg $H_3PO_4$ | 0.279 kg $H_3PO_4$<br>0.048 $NH_3$<br>0.283 KCl<br>0.638 $(NH_4)2SO_4$ |
| **Cost of feedstock (USD/kg)** | $CaCO_3$: 0.23 | 0.86 | 1.16 | Phosphoric acid: 1.16<br>Potash: 1.26 |

Source: Author's analysis

# 4

## Overview of financing instruments



Financing instruments are paramount for scaling renewable energy, green hydrogen and green ammonia projects due to their capital-intensive nature and the need to de-risk investments. While access can be challenging owing to perceived risks, complex regulations and limited local financial capacity, successful projects often leverage a blend of financing types, including grants, concessional loans from development finance institutions, private equity and structured project finance (such as power purchase agreements and special purpose vehicles), often through public–private partnerships (PPPs).

## 4.1 National financing instruments

Kenya's Green Economy Strategy and Implementation Plan identifies key financing channels for green economy initiatives, including the government budget, concessional grants and loans, PPPs and the mobilisation of international funding sources. Other innovative financing options include establishing green funds or sovereign wealth funds, developing stronger partnerships with emerging economies and co-financing with other funds and banks.

The country is taking significant steps to finance green projects, although there are no funding mechanisms exclusively for green ammonia projects. The development of the Green Fiscal Incentives Policy Framework aims to guide private financing for climate initiatives, promote green innovation, improve fiscal consolidation and drive private investment towards cleaner production methods. Several key actions are proposed within this framework (GoK, 2022):

- The creation of the Kenya Green Investment Bank (KeGIB), which will offer various funding instruments and associated incentives. KeGIB is expected to provide financial tools such as credit guarantees, risk reduction facilities and both debt and equity financing.
- The establishment of the Green Investment Register, which will list national priority projects within the green sector, including flagship green projects and PPPs. This database, along with an information management system, will facilitate investor access and resource mobilisation, potentially as early initiatives managed by KeGIB.
- The exploration and design of a carbon tax in Kenya, aimed at efficiently reducing greenhouse gas emissions while generating revenue to support broader government objectives.

The country has implemented various mechanisms to mitigate risks associated with renewable energy project planning. One such strategy involves the careful acquisition of land. By securing land that poses minimal potential for conflict with local communities, project developers can manage risks more effectively and reduce overall costs.

## 4.2 International financing instruments

To secure appropriate financing for projects in Kenya's nascent green ammonia sector, a strategic approach to leveraging international financing instruments is essential. These instruments, ranging from start-up grants and technical assistance to sophisticated blended finance mechanisms and catalytic private capital, are designed to de-risk projects, bridge investment gaps and accelerate the market penetration of green hydrogen derivatives such as ammonia.

### Grants and technical assistance

Direct grants and technical assistance are critical for early-stage development, providing non-repayable funds and expert support crucial for proving concepts and building local capabilities in an emerging sector. Typical examples include:

- develoPPP, a programme of the German Federal Ministry for Economic Cooperation and Development (BMZ) that supports private sector companies looking to invest sustainably in developing and emerging countries, providing them with both financial and technical assistance to help expand their local operations.
- The Green Hydrogen Fund, established by the European Investment Bank (EIB), offers transformative opportunities for financing green hydrogen infrastructure projects globally. Its focus on grant support and technical assistance creates a pathway for developing nations to leverage renewable hydrogen technologies.
- The Accelerate-to-Demonstrate (A2D) Facility, implemented by the United Nations Industrial Development Organization (UNIDO), serves as a mechanism for financing clean hydrogen projects in developing countries. By focusing on the demonstration phase of innovative climate solutions, the A2D Facility bridges the gap between research and market deployment through targeted grant funding. It aids in the implementation of catalytic demonstration projects, enabling the technical and commercial validation of clean hydrogen technologies.

### Blended finance and strategic initiatives

These instruments integrate various financial tools, including grants, concessional loans, guarantees and PPPs, into broader strategic frameworks to catalyse significant investment and mitigate risks inherent in larger-scale projects. Some of the financing opportunities include:

- Germany's International Hydrogen Ramp-up Programme ($H_2$Uppp) is funded by the Federal Ministry for Economic Affairs and Energy. It supports entrepreneurial initiatives and project development essential for scaling the hydrogen market globally. $H_2$Uppp facilitates collaboration between private and public partners, including companies based in Germany and other EU countries, potential local partners and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. These partners combine their expertise through formalised PPP projects, aiming to foster the market for green hydrogen technologies across the value chain. All activities are conducted in close cooperation with the respective German Chambers of Commerce Abroad (AHKs).

- The EU Global Gateway initiative (Africa–Europe Investment Package) has allocated approximately EUR 150 billion to enhance cooperation with African partners through various forms of financial support, including grants and concessional financing.
- The Clean Hydrogen Partnership is a public–private collaboration that provides research and innovation grants specifically for hydrogen projects undertaken by European companies.
- The EU Emissions Trading System Innovation Fund reinvests proceeds from the system into fostering innovative low-carbon technologies, including green hydrogen. Among the projects benefiting from this fund is Sweden's HYBRIT initiative, which aims to produce fossil-free steel, exemplifying the fund's commitment to groundbreaking advancements in sustainable technology (GIZ, 2023).
- $H_2$Global (Germany) promotes the creation of clean hydrogen markets through an innovative double-auction mechanism. This involves an intermediary, Hintco, that purchases the typically more expensive products and sells them at auction at a lower price to customers, thereby encouraging demand. The price difference is covered by public funding, although it could potentially also be funded by climate funds, private capital or a combination thereof. This approach implemented by $H_2$Global mimics a functioning market for clean hydrogen, helping to advance market creation.
- The EU's Carbon Border Adjustment Mechanism (CBAM) encourages cleaner production by levying a carbon tax on certain carbon-intensive goods imported into the EU, including fertilisers. This mechanism, while not a direct financing tool, makes green derivatives more competitive in the EU market compared to conventional products and incentivises developers to adopt cleaner production methods.
- The European Hydrogen Bank aims to create a foundational market for renewable hydrogen by facilitating private investments in hydrogen value chains, both within the EU and internationally. This initiative will link renewable energy supply with EU demand and tackle initial investment obstacles.
- The PtX Development Fund (KfW, Germany) combines promotional and financing instruments under the PtX Platform. Its primary goal is to support projects across the entire PtX value chain, from generating renewable energy to producing and transporting green hydrogen and derivatives such as ammonia. This initiative is focused particularly on addressing financing challenges in the Global South by closing the bankability gap for capital-intensive PtX projects that are not yet deemed financially viable.
- The African Development Bank's Green Investment Program for Africa (GIPA) is designed to address critical market barriers in Africa, such as fragmented investment and the predominance of smaller ticket size projects. GIPA seeks to strengthen knowledge, capacity and supply chains in the green technology sector. By offering project preparation support, green lines of credit and a guarantee fund for the Sustainable Development Goals (SDGs), GIPA provides the financial tools necessary to de-risk projects and attract co-financing in target sectors, including green hydrogen.

### Private capital and specialised funds

Projects relying solely on private investment have yet to fully develop due to constraints posed by nascent markets and pricing mechanisms for green hydrogen products (GIZ, 2023). However, the landscape is evolving with the emergence of specialised private funds and platforms that are specifically designed to address these challenges, often by working in conjunction with public de-risking mechanisms. They include the following:

- Hy24 serves as the leading private equity asset manager in the hydrogen sector, focusing on investments across the entire hydrogen value chain to build the infrastructure and technologies essential for a low-carbon, resilient and self-reliant economy. Its Clean Hydrogen Infrastructure Fund has amassed EUR 2 billion and drawn investors from top-tier industrial and financial institutions.
- Copenhagen Infrastructure Partners is a prominent global entity in energy infrastructure investments, focusing on the development and execution of large-scale, cutting-edge projects that drive the energy transition forward. Its Copenhagen Infrastructure Energy Transition Fund stands as the world's largest dedicated clean hydrogen fund, with approximately 6.5 GW of electrolysers included in its core portfolio. The fund is committed to next-generation energy infrastructure, particularly industrial-scale PtX projects. It offers institutional investors the opportunity to support decarbonisation efforts in challenging industries such as shipping, steel production and agriculture, using green fuels, sustainable feedstock and carbon-neutral fertilisers.
- SENCO Capital plays a role in advancing green hydrogen and ammonia technologies by strategically investing in companies and infrastructure along the energy transition value chain. With a focus on sustainable returns compliant with environmental, social and governance (ESG) standards, SENCO provides equity to projects that drive innovation in green fuels and derivatives, such as hydrogen and ammonia, fostering industrial transformation and creating long-term value for society, nature and investors.

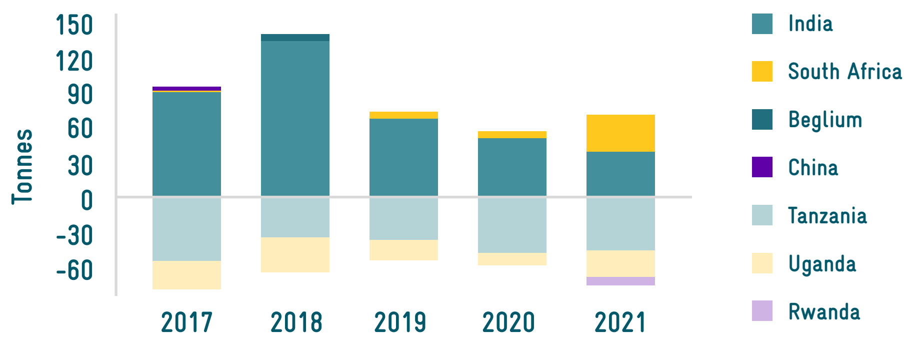
German companies specialising in electrolyser technology, ammonia synthesis plants and renewable energy development could also consider entering Kenya through direct foreign investment or joint ventures with local partners or by providing technology and services to projects financed by other international or local entities. These types of investment could be supported by the mechanisms described above, which support market entry and de-risk technological deployment.

# 5

## Opportunities, risks and benefits of green ammonia projects

The development of green ammonia projects in Kenya presents numerous opportunities that the country could leverage to transform its economy by enhancing the agricultural and industrial sectors. As with any other nascent industry, the opportunities are also accompanied by inherent risks and challenges that must be navigated carefully to ensure maximum benefit for the country and the companies involved in the industry. Some of these considerations are discussed below.

**FIGURE 14. Kenya's ammonia imports and exports**




Source: GIZ, 2023

## 5.1 Handling of ammonia and its derivatives

Kenya currently imports a small amount of ammonia and re-exports it to neighbouring countries, especially Uganda and Tanzania (See Figure 14).

The handling of ammonia at different stages, including production, imports, exports, distribution, storage and transportation, is regulated under Kenya's Environmental Management and Co-ordination (Management of Toxic and Hazardous Chemicals and Materials) Regulations (2024). There is some experience in the country in handling small quantities of ammonia, mainly used for blending with other fertilisers. As green ammonia plants will produce much larger quantities, the country's infrastructure, including renewable energy, rail and roads, and bunkering facilities at ports for exports, will need to be expanded.

Kenya employs a Tier 1 approach to account for greenhouse gas emissions from fertiliser use in the agricultural sector. This method relies on general activity data derived from agricultural statistics combined with global emission factors. However, the absence of a robust framework for the continuous collection of precise and comprehensive activity data has hindered accurate and complete estimates of emissions. The underlying challenge stems from the lack of systematic mechanisms to gather detailed information about fertiliser application rates and associated emissions across different agricultural practices in the country. This results in incomplete greenhouse gas inventories and limits the ability to effectively address emissions from the crop sub-sector. Kenya could establish a national framework for continuous data collection and monitoring involving digital tools and training programmes for farmers and agricultural officers to improve the accuracy of data on fertiliser usage (Ndetu, et al., 2024). Some sectoral organisations, such as the Kenya Flower Council (KFC), have started collecting fertiliser usage data to track environmental impacts. KFC has established the Flowers and Ornamentals Sustainability Standard (FOSS), one of the most robust standards in the Floriculture Sustainability Initiative (FSI). FOSS mandates its members to record and share data on the use of nitrogen- and phosphorus-based fertilisers. This initiative aims to optimise nutrient usage, prevent chemical build-up in the soil and reduce the pollution of water sources (KFC, 2025).

## 5.2 Opportunities and macroeconomic benefits

Kenya currently imports almost all the fertiliser needed to meet demand, spending about USD 400 million annually (KNBS, 2025). It aims to substitute 50% of current nitrogen-based fertiliser imports with local production by 2032 (MoEP, 2023). Local production of green ammonia and fertiliser can reduce reliance on foreign markets, stabilising supply and saving foreign exchange. A stable and reliable supply of essential nutrients for agriculture is expected to increase yields and improve food security in Kenya.

Due to the volatility of the international fertiliser market, the government has decided to provide subsidies. In 2022, the government granted KES 54.3 billion (over USD 400 million) in subsidies. Local fertiliser production could positively impact Kenya's fiscal planning, thanks to price predictability. Local green ammonia and fertiliser production could improve and ease the balance of payments and free up financial resources to address other national priorities.

The development of a green ammonia and fertiliser industry will create jobs across the value chain, including production, transportation, distribution and related services. Kenya anticipates that by 2030, over 25,000 new permanent jobs will be created (MoEP, 2023). The country has a median population age of 19 years and a high youth unemployment rate, peaking at 13% in 2022 (DTDA, 2024). The development of local green ammonia and fertiliser plants could therefore help to create much-needed jobs for people with training.

Investment in the green ammonia sector can stimulate economic growth through direct investment, increased agricultural productivity and the development of new industries and export opportunities. Projected investment, expected to surpass USD 1 billion by 2030, could contribute to expanding sectors such as renewable energy and the nascent green hydrogen and ammonia sectors (MoEP, 2023). Local green ammonia production could create demand for local manufacturing and businesses in areas such as transportation and maintenance.

Kenya already exports fertilisers to its regional neighbours, and it has an opportunity to position itself as a regional commercial hub and exporter of green ammonia and fertilisers to neighbouring countries. Additionally, with the country mainly exporting agricultural products, such as flowers, coffee and tea, to international markets, green products can be expected to achieve better acceptance and fetch higher prices for farmers.

## 5.3 Potential risks affecting green ammonia projects

The development of green hydrogen projects in Kenya faces potential risks, particularly land disputes resulting from the expansion of large-scale renewable energy infrastructure. Historically, land acquisition for power projects has encountered significant challenges, causing delays and increased costs, whether these projects were initiated by the government or private developers. The 2016 Community Land Act and the 2018 National Energy Policy were designed to address some of these issues. However, the process of communities self-identifying and organising to obtain communal land rights remains complex and is often influenced by cultural, geographic and livelihood factors. Although this legislation aims to legalise customary land rights, many communities have struggled to meet the requirements, leaving numerous land areas unregistered and susceptible to government acquisition under the National Energy Policy. To mitigate these challenges, green hydrogen projects must consider these potential obstacles and develop strategies for co-benefit sharing with local communities early in the planning phase. Balancing the incentives for both foreign and domestic investors who require land for their projects and the needs and demands of local communities is essential. This balancing act is a critical challenge for the Kenyan Government in fostering the development of a green hydrogen market.

Kenya also faces a critical challenge in balancing its national electricity supply priorities with the energy demands of large-scale green hydrogen production. While the country has made significant progress in electrification, about 23% of Kenyans still lack reliable and affordable electricity. This gap persists despite constitutional guarantees (Article 42) of the right to a clean and healthy environment and legal mandates under the Energy Act (2019) requiring the government to ensure access to affordable energy for all citizens. The gap can be attributed to affordability issues and the geographical challenges of extending the grid to sparsely populated or hard-to-reach rural areas. Diverting renewable energy capacity towards hydrogen production could strain the grid, exacerbating existing disparities in electricity affordability and availability. This tension risks creating socio-economic conflicts, particularly if communities perceive hydrogen projects as diverting resources away from local energy needs. Kenya could utilise excess renewable energy for green hydrogen projects, co-locating renewable energy generation with green hydrogen production, rather than grid-connected electricity. Additionally, a hybrid setup could be utilised where green hydrogen plants could be co-located with mini-grids and act as anchor loads, with the mini-grids also providing electricity to the local community.

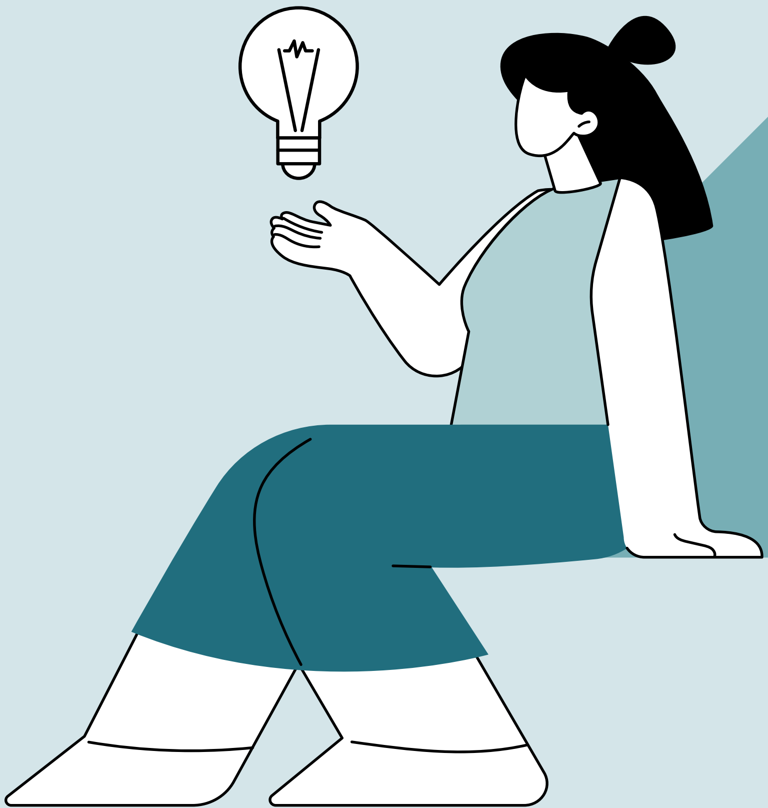
Water may be a less critical issue than demand for renewable electricity supply and the storage and transportation of hydrogen, but its importance as the primary raw material, its availability and cost cannot be overlooked. Typically, water constitutes about 1% to 5% of the overall cost of green hydrogen production. The challenge arises from seasonal variations and the impacts of climate change on water availability, which may pose significant issues in regions already experiencing water scarcity (Oyan, et al., 2024). In Kenya, where fresh water is a limited resource largely dependent on surface runoff, the utilisation of water for hydrogen production must be carefully justified. Acute water shortages during dry seasons in various parts of the country make it essential to weigh the benefits of green hydrogen production against local water needs. Green hydrogen projects should demonstrate significant additional benefits beyond energy supply. One viable solution could be the dual use of water from desalination plants, where water is used both for electrolysis and household consumption.

Green hydrogen and ammonia projects have the potential to attract foreign capital and technologies once the global market scales up. However, while both green hydrogen and ammonia are essential, they often fail to translate into sustained domestic capacity or broad-based economic gains. Green hydrogen projects risk perpetuating the trend whereby Kenyan communities bear land-use or resource costs but reap minimal long-term benefits. While foreign expertise provides an initial knowledge base, failure to institutionalise skills locally could result in dependency on external technical support. A socially equitable green hydrogen strategy in Kenya must prioritise local value chain integration and inclusive benefit sharing. Additionally, the country must prioritise capacity building at all levels to provide the critical mass of experts needed to support the green hydrogen sector.

Public and business stakeholders in Kenya generally view the emergence of a green hydrogen industry favourably, although their support remains conditional on two critical factors: the establishment of robust regulatory frameworks and the formation of strategic international partnerships. These elements are considered fundamental to creating the investment security required to transition from implementing small-scale pilot projects to developing a fully scaled industry, particularly for domestic agricultural applications in the initial phase. Historical lessons from Kenya's renewable energy sector highlight the importance of inclusive planning and benefit sharing. Past infrastructure projects have demonstrated that meaningful engagement with civil society and local communities, not just during implementation but also in the distribution of economic and social benefits, is essential to ensuring long-term viability and public acceptance. Without such participatory approaches, even technically sound initiatives risk facing resistance or failing to deliver equitable value to Kenyan stakeholders.

# 6

## Conclusions



Kenya fulfils many important prerequisites for the development of a green ammonia industry, such as domestic demand, abundant renewable energy resources, robust infrastructure and positive policy frameworks. The government aims to promote sustainable economic growth for the country, prioritising the agricultural and manufacturing sectors in which green ammonia production could play an important role in supporting such growth. The commissioning of a green ammonia plant in Kenya could spur further developments needed to drive market and capacity development at all levels.

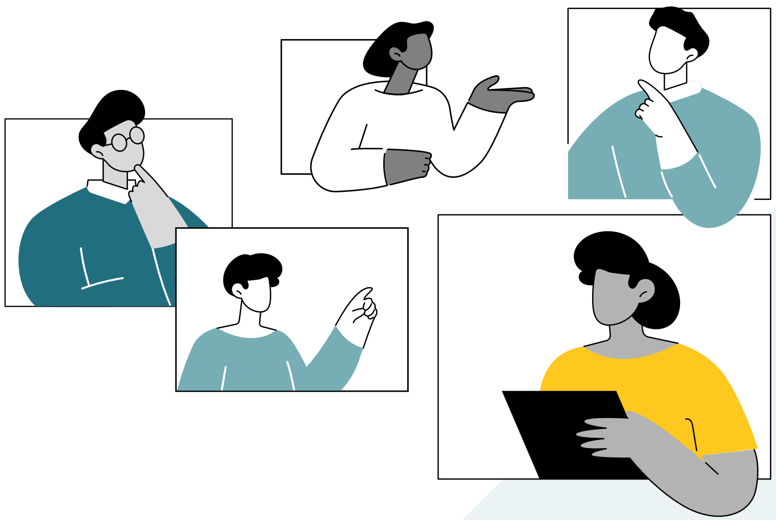
Until the global and regional market for green hydrogen and its derivatives ramps up in the medium to long term, domestic production will be the focus in the short to medium term, as highlighted in Kenya's Green Hydrogen Strategy and Roadmap. Here, the low-hanging fruit is fertiliser production, considering that the agriculture industry has been exposed to instability arising from price volatility and supply disruptions affecting the fertiliser imports that the country relies on. Several stakeholders in the fertiliser industry have already expressed interest in the local production of green ammonia to manufacture nitrogen-based fertiliser. For centralised production, fertiliser companies could procure locally produced ammonia for processing or blending into standard fertilisers, which could then be distributed using the existing channels. For decentralised production, large farms could set up green ammonia plants on site and apply ammonia directly through injectors in anhydrous form or through fertigation (fertiliser and irrigation) systems in aqueous form. Medium-sized farms in the same area could also pool together to set up a common green ammonia production facility.

One of the main obstacles to local green ammonia production is the financing gap, as neither small-scale nor large-scale projects are economically viable yet. Moreover, the ability and willingness of fertiliser offtakers to pay a premium is limited, as evidenced by the perpetual government subsidies on fertilisers. As fertilisers are inputs for agricultural production, the impact of higher prices is passed on through the whole value chain to the end consumer, making their application more likely in for-export crops. Incorporating additional revenue streams (primarily by selling the oxygen produced and utilising excess electricity credits) can improve economics where feasible. Green ammonia producers could take advantage of the incentives offered for operations located in free trade zones. However, based on the modelling carried out for this report, additional financial support, for example, in the form of grants or subsidised loans, will be needed for all project types to achieve financial viability.

Despite this obstacle, multiple companies in Kenya, including both local business and companies cooperating with international players, are at various stages of developing further projects.

German solution providers aiming for early market entry are therefore advised to explore the market and position themselves. Kenyan companies are particularly eager to partner with companies that are not only able to offer solutions in line with green ammonia production but also bring technical know-how, which is limited in the country. Other areas of involvement for German companies looking to participate in Kenya's green ammonia market include:

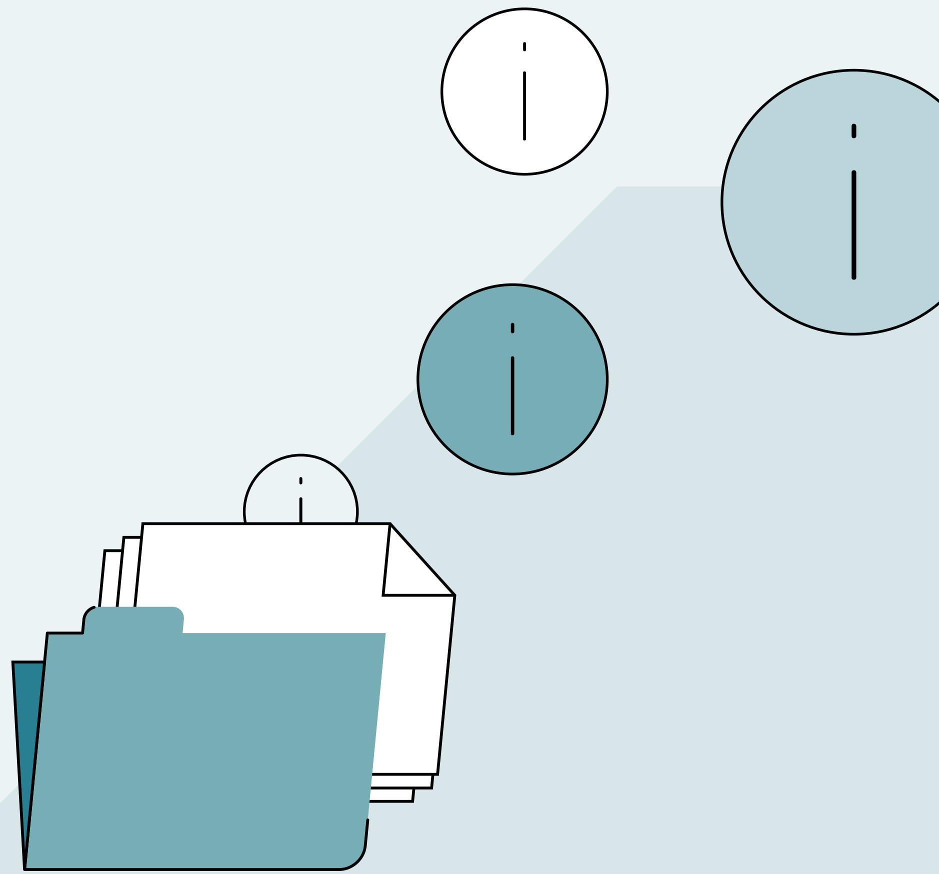
- Participating in pilot and R&D projects by collaborating with local developers, local universities and research institutions actively addressing green hydrogen and ammonia.
- Leveraging funding mechanisms for which green hydrogen projects in Kenya are eligible, such as the PtX Development Fund and UNIDO's A2D Facility.
- Engaging with local stakeholders, such as the Kenya Green Hydrogen Secretariat and the Programme Coordination Committee at the government level, and with private sector bodies, such as the Kenya Green Hydrogen Association (KGHA).
- Participating in national and international green hydrogen conferences held in Kenya for business development. Recent conferences include the Kenyan-German Symposium on Green Hydrogen Development and the Eastern African Regional Green Hydrogen Symposium.



**With these activities, German companies can establish a strong position in Kenya's promising green hydrogen market and benefit from both domestic and regional opportunities.**

**Collaborative efforts between the government, the private sector and local communities are essential to mitigate the risks and build a strong presence in Kenya's nascent green ammonia market.**

# Annexes



## Annex 1 Main fertiliser manufacturing companies in Kenya

Activity type:
I = Import
M = Manufacturing (including chemical reactions)
P = Processing (blending and steam granulation)

**TABLE 4.** Main fertiliser companies in Kenya

| Company | Founded | Location | Activity type | | | Capacity | Key facts |
|---|---|---|---|---|---|---|---|
| | | | I | M | P | | |
| OCP | – | – | √ | – | – | – | • With the war in Ukraine, Moroccan-based OCP became one of the largest importers |
| MEA | 1977 | Nakuru | √ | – | √ | 50 mtph | • Privately owned Kenyan firm<br>• Hit hard by subsidies<br>• Moving into NPK blending to maintain/grow volumes |
| ETG | 2017 | Mombasa | √ | – | √ | 50 mtph | • Regional commodity trader<br>• Owns Falcon brand<br>• Sells to other smaller importers/distributors to maintain volume |
| Yara | 2021 | Nairobi | √ | – | √ | 30 mtph | • Used to own 70% of the market; share declined in last 10 years<br>• Built brand name in the east via demo plots and field days<br>• Well known for quality |
| TIMAC Agro | 2016 | Eldoret | √ | – | √ | 50 mtph | • In 2022, TIMAC Agro acquired 51% of CFAO Agri to further develop CFAO's Baraka Fertiliser brand by adding more advanced solutions for soils and crops |
| Fertiplant East Africa | 2021 | Nakuru | – | – | √ | 15 mtph | • Fertiplant is a subsidiary of MEA and received a USD 10 million loan from the International Finance Corporation (IFC) to set up a plant (2017) and boost local fertiliser production (100,000 t annually) |
| Elgon | 2022 | Nairobi | – | – | √ | 30 mtph | • Thabiti as main fertiliser brand for NPK, CAN, UREA and DAP |
| Maisha Minerals & Fertilizers | 2004 | Athi River | – | – | √ | 35 mtph | • Devki Group of Companies acquired a plant (300,000 t of fertiliser annually) in buyout of ARM Cement<br>• Mavuno Fertilizer as main brand for fertiliser blends |
| KEL Chemicals | 1970 (M)<br>2020 (P) | Thika | – | √ | √ | 12,000 mtpy (M)<br>35,000 mtpy (P) | • Only phosphate manufacturing facilities in Kenya, with production of phosphate rock and phosphate-based fertiliser compounds |

Source: Analysis based on AfricaFertilizer, 2024 and FCDO, 2023

# Annex 2 Assumptions for techno-economic modelling

**TABLE 5. Assumptions used in techno-economic modelling**

| Parameter | Value |
|---|---|
| Equity cost (%) | 17 |
| Debt interest rate (%) | 11.9 |
| Debt tenor (years) | 10 |
| Debt-to-equity ratio (%/%) | 70/30 |
| Inflation (%) | 2.1 |
| $H_2$ price increase above inflation (%) | 2 |
| Project lifetime (years) | 25 |
| CAPEX electrolyser (USD/kW) | Large-scale projects: 2,276<br>Small-scale projects: 2,710 |
| CAPEX PV (USD/kWp) | Large-scale projects: 596<br>Small-scale projects: 813 |
| CAPEX Wind (USD/kWp) | Large-scale projects: 2,710<br>Small-scale projects: 3,793 |

| Parameter | Value |
|---|---|
| Electricity price (USD/kWh) | 0.16 |
| Water cost (USD/t) | 2 |
| Grey hydrogen benchmark price (USD/kg) | 5.6 |
| Oxygen selling price (USD/kg) | 0.15 |
| Grey ammonia benchmark price (USD/kg) | 1.4 |
| Corporate tax rate (%) | 30 |

Source: Analyses conducted by GIZ (2025)

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