UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Progress by innovation

A2D
Accelerate to Demonstrate Facility

Smart Energy

Clean Hydrogen

Industrial Decarbonization

Critical Minerals

Accelerate-to-Demonstrate (A2D) Facility

YEAR 2 ANNUAL REPORT

APRIL 2024 - MARCH 2025

Partners

UK Government

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UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

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FOREWORD BY THE DIRECTOR GENERAL

The Accelerate-to-Demonstrate (A2D) Facility offers innovative climate action solutions in developing countries. Implemented by UNIDO with the generous support of the United Kingdom, is now entering its second year and has begun to pilot and help commercialize these solutions for the energy transition, clean hydrogen, smart energy, industrial decarbonization and critical minerals.

Following the first call-for-proposals in 2024, the A2D Facility has launched the first five high-impact demonstration projects, developed in partnership with the private sector, in Kenya, Namibia, Nepal, Nigeria, and Tanzania.

Climate action must be a global priority and shared responsibility. The impacts of climate change hit the poorest of the poor the hardest, but is also affecting all of humanity regardless of national borders. UNIDO is committed to climate action through the power and innovative potential of industry – which is central to the solution.

I am very grateful to the Government of the United Kingdom through its Department of Energy Security and Net-Zero (DESNZ) for sponsoring the A2D Facility to help deliver these solutions. Through it, we have established new partnerships with many climate innovation ecosystem players, including the private sector, project developers, international organizations, and financial institutions. Now a new level of cooperation amongst these stakeholders is necessary to most effectively seize the opportunities created through this Facility to realize change on the ground which will ultimately benefit all.

Gerd Müller

UNIDO Director General

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ACKNOWLEDGEMENTS

This annual report was written by the United Nations Industrial Development Organization (UNIDO). This effort was made possible through the support of the United Kingdom's Department for Energy Security and Net Zero (DESNZ).

UK Government

UNIDO is a specialized agency of the United Nations with a unique mandate to promote, dynamize and accelerate industrial development. Our mandate is reflected in Sustainable Development Goal (SDG) 9: "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation", but UNIDO's activities contribute to all the SDGs. UNIDO's vision is a world without poverty and hunger, where industry drives low-emission economies, improves living standards, and preserves the livable environment for present and future generations, leaving no one behind.

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1

Introduction

UNIDO's vision is a world without poverty and hunger, where industry drives low-emission economies, improves living standards, and preserves the livable environment for present and future generations, leaving no one behind.

The United Nations Industrial Development Organization (UNIDO) is a specialized agency of the United Nations with a unique mandate to promote, dynamize and accelerate industrial development. UNIDO's mandate is reflected in Sustainable Development Goal (SDG) 9: "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation", but UNIDO's activities contribute to all of the SDGs.

UNIDO's vision is a world without poverty and hunger, where industry drives low-emission economies, improves living standards, and preserves the livable environment for present and future generations, leaving no one behind.

UNIDO provides support to its 173 Member States through five mandated functions: technical cooperation; action-oriented research and policy-advisory services; normative standards-related activities; fostering partnerships for knowledge and technology transfer; and its convening function.

UNIDO´s work is concentrated on three focus areas: ending hunger by helping businesses from farm to fork; stopping climate breakdown by using renewable energy and energy efficiency to reduce industrial greenhouse gas emissions; and supporting sustainable supply chains so that developing country producers get a fair deal and scarce resources are preserved. In addition, the

Organization also works on several cross-cutting topics, including digitalization and artificial intelligence, and gender equality.

The Accelerate-to-Demonstrate (A2D) Facility contributes to these priorities by focusing on accelerating the commercialization of innovative and transformational climate solutions in developing countries. The A2D Facility, implemented by UNIDO, supports the implementation of catalytic demonstration projects, particularly in critical minerals, clean hydrogen, industrial decarbonization and smart energy.

Almost 35% of the emissions reductions necessary for achieving a global net-zero scenario by 2050 will come from technologies that are still in the demonstration or prototype phase.[1] Alongside the important need for leveraging private sector finance, at least USD90 billion in public funding is needed globally by 2026 for clean energy demonstration projects to be commercially ready by 2030. The A2D Facility contributes to filling this important gap in support to developing countries by targeting the demonstration phase of the innovation chain, bridging earlier-stage and commercial-scale projects.[2]

During the second year of the A2D Facility, the Facility launched three large-scale market assessments presenting new evidence and analysis covering the landscape of stakeholders, markets, technologies, projects, financial delivery mechanisms and initiatives, and Sustainable Development Goal (SDG) impacts in developing countries.

For example, the clean hydrogen analysis revealed that 41% of clean hydrogen innovators in developing countries are working on production technologies, with the majority focusing on technology readiness levels (TRLs) 6 to 9 — signaling a growing push toward near-commercial applications in clean hydrogen.

In the critical minerals market assessment, over 100 global, regional and national initiatives were identified that supported critical minerals innovation, but many suffer from limited scale, fragmented focus, and a lack of shared data on barriers, technologies, and drivers.

The smart energy and industrial decarbonization market assessment found that most smart energy projects in developing countries rely on government grants, with 42% of identified projects financed this way, underscoring the importance of public funding to de-risk innovation.

The Annual Report covers the second year (1 April 2024 to 31 March 2025) of the A2D Facility and has the following objectives, which are primarily focused on moving the Facility into its early implementation phase.

Monitoring: providing progress updates on the A2D Facility's performance against key milestones during its second year.

Dissemination: the Annual Report aims to enhance the visibility and awareness of the A2D Facility amongst stakeholders.

1) Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach, IEA, 2023.

2) Clean Energy Demonstration Projects Database, IEA, 2024.

2

Year 2 Key Milestones

The overall aim of the second year of the A2D Facility was to move into an early implementation phase, including the publication of the first call-for-proposals and the announcement of the first-supported demonstration projects.

A2D Facility's Year 2 Key Milestones

2024

1

PARTICIPATION IN ASIA CLEAN ENERGY FORUM

3-6 JUNE 2024

Organization of three events at the Asia Clean Energy Forum

Public Engagement

2

LOGICAL FRAMEWORK FINALIZED

26 JUNE 2024

Finalization of the A2D Facility LogFrame

Monitoring and Reporting

3

FIRST CALL-FOR-PROPOSALS PUBLISHED

8 JULY 2024

Opening of the A2D Facility's first Call-for-Proposals

Project Development

4

CALL-FOR-PRO ANNOUNCEMEN

18 JULY 2024

Announcement event the first Call-for-Propo by UNIDO Director G Müller

Public Engagement

8

GENDER EQUALITY AND SAFEGUARDS PROJECT INITIATED

12 SEPTEMBER 2024

Kick-off of the gender equality and safeguards project that will develop action plans for demonstration project

Dissemination

9

LAUNCH OF MARKET ASSESSMENT (X3) AT COP29

14-16 NOVEMBER 2024

Launch of three market assessments on Critical Minerals, Clean Hydrogen, and Smart Energy & Industrial Carbonization at COP29

Dissemination

10

GLOBAL WEBINARS ON MARKET ASSESSMENTS (X3) COMPLETED

26-28 NOVEMBER 2024

Delivery of three global webinars covering the key findings of the market assessments

Dissemination

2025

11

ANNUAL EV PROJECT INIT

16 JANUARY 202

Kick-off of the Annual project

Dissemination

5

A2D FACILITY WEBSITE LAUNCH

18 JULY 2024

Launch of the A2D Facility Website

Dissemination

6

A2D FACILITY YEAR 1 ANNUAL REPORT LAUNCHED

18 JULY 2024

Launch of the A2D Facility Year 1 Annual Report

Monitoring and Reporting

7

FIRST ISSUE OF NEWSLETTER LAUNCHED

14 AUGUST 2024

Publication of the first A2D Facility newsletter issue to more than 750 stakeholders

Public Engagement

12

KICK-OFF EVENT FOR FIRST SUPPORTED DEMONSTRATION PROJECTS

24-26 MARCH 2025

Kick-off event, led by UNIDO DG Gerd Müller, to launch first five supported demonstration projects from the first Call-for-Proposals

Project Development

13

COMPLETION OF GESI-ESS PROJECT

31 MARCH 2025

GESI-ESS Action Plans developed

Dissemination

14

ANNUAL REPORT

31 MARCH 2025

Year 2 Annual Report finalized

Monitoring and Reporting

The overall aim of the second year of the A2D Facility was to move into an early implementation phase, including the publication of the first call-for-proposals and the announcement of the first-supported demonstration projects.

The A2D Facility met its milestones for the second year of the Facility, which are summarized below.

The information has been labelled delineating the categories of the milestones, namely: Project Development, Public Engagement, Dissemination, and Monitoring and Reporting. A summary of some of the key milestones is presented in the table below and presented chronologically.

TABLE 1: Summary of year 2 key milestones

Date	Milestone	Description	Category	Status
June 2024	**Participation in Asia Clean Energy Forum**	The A2D Facility successfully organized three events at ACEF 2024 from 3 – 6 June. The activities included organizing a pre-forum event that highlighted the crucial role of demonstration projects in accelerating clean energy transitions in developing countries. During the forum, the A2D Facility co-led the thematic track on Financing Innovative Clean Energy Solutions in Hard-to-Abate Sectors with the Asian Development Bank (ADB) and led two of the four sessions: Green Hydrogen for Industrial De-carbonization and Solutions for Industrial Decarbonization. Addition-ally, the A2D Facility presented in a deep dive workshop focusing on Critical Minerals and Clean Energy Technology Manufacturing Supply Chains.	Public engagement	Completed
June 2024	**Logical Framework finalized**	The LogFrame (monitoring and reporting framework) for the A2D Facility was finalized on 26 June.	Monitoring and reporting	Completed
July 2024	**First Call-for-Proposals published**	The A2D Facility published the first call-for-proposals on 8 July and launched the A2D Facility LinkedIn account.	Project development	Completed
July 2024	**Call-for-Proposals announcement event**	On 18 July, the A2D Facility held a senior-level announcement event to launch the first Call-for-Proposals. The event was led by UNIDO Director General Gerd Müller and Corinne Kitsell, Ambassador of the United Kingdom Mission to the United Nations. It received strong endorsements from the Ambassadors chairing key regional groups: Ambassador Philbert Abaka Johnson, Permanent Representative of Ghana to UNIDO and Chair of the African Group; Ambassador Evangelina Lourdes Bernas, Permanent Representative of the Philippines to UNIDO and Chair of the Asia-Pacific Group; and Natanael Pineda from the Embassy of Panama, Chair of the GRULAC Group.	Public engagement	Completed

Date	Milestone	Description	Category	Status
July 2024	**A2D Facility website launch**	The A2D Facility launched its web-site on 18 July. The website is the main resource to access up-to-date information.	Dissemination	Completed
July 2024	**A2D Facility Year 1 Annual Report launched**	The A2D Facility launched its Year 1 Annual Report on 18 July, which provides an overview of progress in establishing the A2D Facility in its first year.	Monitoring and reporting	Completed
August 2024	**First issue of newsletter launched**	The first issue of the A2D Facility newsletter was sent out to more than 750 stakeholders on 14 August, which summarized key achievements from the first year, and highlighted current activities and opportunities.	Public engagement	Completed
September 2024	**Gender equality and safeguards project begins**	On 12 September, the A2D Facility kicked off its Gender Equality and Social Inclusion (GESI) and Environmental and Social Safeguards (ESS) project. The project develops GESI and ESS strategies, action plans, and capacity building training and knowledge-sharing. The project ensures that the A2D Facility advances a Just Energy Transition by promoting equitable out-comes, enhancing environmental resilience, and improving the well-being of vulnerable communities.	Dissemination	Completed
November 2024	**Launch of Market Assessments (x3) at COP29**	On 14–16 November, the A2D Facility published three market assessments on Critical Minerals, Clean Hydrogen, and Smart Energy & Industrial Decarbonization, which were launched at COP29 during three A2D Facility-organized side events in the UNIDO pavilion.	Dissemination	Completed
November 2024	**Global webinars on Market Assessments (x3) completed**	On 26 – 28 November, the A2D Facility hosted three global webinars on the three market assessments, covering the key findings from the reports. Recordings of the webinars are available on the UNIDO YouTube channel.	Dissemination	Completed
January 2025	**First A2D Facility Annual Event project begins**	The A2D Facility kicked-off the planning and organization of the first A2D Facility Annual Event on 16 January.	Dissemination	Completed
March 2025	**Completion of GESI & ESS project**	The A2D Facility finalized GESI and ESS actions plans and frameworks at the programme-level, and undertook capacity building training for the first supported A2D Facility demonstration projects on 26 March.	Dissemination	Completed

Date	Milestone	Description	Category	Status
March 2025	**Kick-off event for first supported A2D Facility demonstration projects**	The A2D Facility organized and hosted a kick-off event from 24-26 March in Vienna to launch the A2D Facility's first supported demonstration projects and to undertake capacity building training on requirements and on GESI-ESS. This included a senior-level launch event on 25 March led by UNIDO Director-General Gerd Müller with speeches from the Ambassadors of the five countries where projects will be implemented, and from the UK Ambassador.	Project Development	Completed
March 2025	**A2D Facility Year 2 Annual report finalized**	The A2D Facility finalized its monitoring and reporting for the second year of operation, including finalizing the Year 2 Annual Report, covering the progress of the Facility during its early implementation phase.	Monitoring and Reporting	Completed

In summary, the A2D Facility achieved key milestones in its second year. It actively engaged in public forums, notably co-leading thematic discussions and organizing events at the Asia Clean Energy Forum and presenting its market assessments at COP29. The Facility successfully published its first Call-for-Proposals, accompanied by a senior-level announcement event and the launch of a dedicated LinkedIn account. The A2D Facility further strengthened its communications with the launch of its website, the Year 1 Annual Report and a stakeholder newsletter. Additionally, it initiated critical projects on gender equality and social inclusion (GESI) and environmental and social safeguards (ESS), ensuring the integration of inclusive strategies into supported demonstration projects, and the Annual Event project, which will offer a unique platform for key stakeholders in climate innovation (to be reported on in the Year 3 Annual Report). The A2D Facility announced the first five-supported demonstration projects and hosted a kick-off event for them.

3

Supported Demonstration Projects

The A2D Facility selected five demonstration projects, covering the following thematic areas: Industrial decarbonization, Clean hydrogen, Critical minerals and Smart energy.

3.1 COMPACT SYNGAS SOLUTIONS

Thematic area	Industrial decarbonization
Country of implementation	Kenya
Project Title	“Green” Tea: Clean Heat and Power with Biomass Residues in Kenya
Beneficiary Name(s)	Compact Syngas Solutions (CSS)
Project Duration	February 2025 – March 2028
Brief Description	The project will deploy and operate an innovative gasification plant at a Kenyan tea factory, using local agri-wastes and biomass to enhance sustainability and reduce carbon emissions. Carbon capture in biochar (and gaseous form) will contribute to industrial decarbonization of the Kenyan tea sector.
Expected results	The project will demonstrate the environmental and economic benefits of innovative gasification technology in Kenya’s tea industry, achieving a reduction of 5,532 tons of CO_2 emissions through renewable energy, fertilizer savings and biochar application. It aims to lower energy costs, reduce fertilizer usage and improve productivity for surrounding farms while showcasing a scalable solution for industrial decarbonization. The primary beneficiary of the project is a Browns-operated tea factory in Kenya, where the gasifier plant will be installed. Expected benefits are to lower energy costs, reduce fertilizer usage and improve productivity for surrounding farms. The project aims to engage key stakeholders, including government agencies, tea buyers and energy producers, ensuring the broad dissemination of results to encourage the adoption of gasification technology across the region.

FIGURE 1: Tea farm in Kericho

FIGURE 2: Tea pickers at the tea farm in Kericho

3.2 MONDJILA PROJECT ADVISORY AND MANAGEMENT (MPAM)

Thematic area	Clean hydrogen
Country of implementation	Namibia
Project Title	Ammonium Sulfate Fertilizers from Renewable Hydrogen in Namibia
Beneficiary Name(s)	Mondjila Project Advisory and Management
Project Duration	February 2025 – December 2027
Brief Description	The primary objective of the ammonium sulfate fertilizer demonstration project is to demonstrate the feasibility and effectiveness of producing ammonium sulfate fertilizer using renewable solar energy and clean hydrogen. By utilizing solar energy to produce clean hydrogen, which is then converted into clean ammonia and ammonium sulfate fertilizer, the project aims to reduce carbon dioxide emissions from the industrial sector (SDG 13).
Expected results	By integrating innovative clean energy technologies and sustainable agricultural practices, the project seeks to achieve multiple objectives: enhancing food production, creating employment opportunities in the clean hydrogen and derivative industries, and significantly reducing carbon emissions in the industrial sector. The Daures Green Hydrogen Village aims to drive inclusive, sustainable economic growth and position the region as a model for green energy innovation. The Daures Green Hydrogen Village benefits local communities through a 10% shareholding by the Daures Daman Traditional Authority and Tsiseb Conservancy, ensuring financial returns and active involvement. Local agricultural businesses also gain from off-take agreements for ammonium sulfate fertilizer, boosting productivity and driving regional economic growth.

FIGURE 3: Daures Green Hydrogen Village site

FIGURE 4: Produce made with ammonium sulfate fertilizer

3.3 OASIS FINANCIAL SERVICES LTD

Thematic area	Critical minerals
Country of implementation	United Republic of Tanzania
Project Title	Lithium-Ion Transport Solutions in Tanzania
Beneficiary Name(s)	Oasis Financial Services LTD
Project Duration	February 2025 – February 2028
Brief Description	The project will accelerate the implementation of clean, affordable and user-friendly solutions using electric charging batteries in the transportation sector. The project will locally manufacture high-performance lithium-ion batteries and chassis for electric two- and three-wheeler motorcycles and assemble and install innovative clean electricity charging infrastructure in both urban and rural areas.
Expected results	The project will reduce air pollution and greenhouse gas emissions through the adoption of zero-emission electric motorcycles, improving air quality and supporting climate goals. The project will create jobs in manufacturing, maintenance and charging infrastructure whilst reducing riders' operating costs, which will boost savings. The project also promotes technological advancement with lithium-ion batteries, modernizing transportation and encouraging green investments. Furthermore, the development of charging infrastructure will expand renewable energy access, benefiting wider communities and positioning Tanzania as a leader in sustainable mobility. The beneficiaries of the project include youth groups, who make up a significant portion of the population (11.5 million aged 15–24 and 20.6 million aged 15–35) and who heavily rely on motorcycles for employment as "boda boda" (motorcycle taxi) operators or delivery service providers. In doing so, the project addresses critical employment challenges and will similarly benefit women groups. Additionally, government ministries and agencies (e.g. telecom, water and electric authorities) and the private sector (e.g. food vendors such as KFC, parcel services such as DHL and telecommunication companies) depend on motorcycles for efficient delivery services, making the project a driver of economic opportunity across diverse sectors.

FIGURE 5: Lithium battery factory

FIGURE 6: Battery monitoring process

3.4 PRACTICAL ACTION

Thematic area	Smart energy
Country of implementation	Nepal
Project Title	Grid Resilience through Intelligent PV and Storage in Nepal
Beneficiary Name(s)	Practical Action
Project Duration	February 2025 – March 2028
Brief Description	The project is a continuation and scale-up of a project that developed and installed a small (100kW) smart micro-grid in a residential block in Kathmandu, Nepal. The second phase of this project aims to implement a larger, industrial-scale smart solar storage micro-grid at the Laxmi Steel factory in Sunwal, Nepal.
Expected results	Through its partnership with the Nepali Chamber of Commerce, the project will showcase its innovative solution to a wide array of local industries, creating a ripple effect that encourages widespread adoption of smart micro-grid technologies across the country. The primary beneficiary of the project will be the Laxmi Steel Factory located in Sunwal. The factory is expected to save over USD1.3 million in electricity and diesel costs while offsetting 2,800 tons of CO_2 over a period of 25 years. The factory employs over 500 workers, whose quality of work and workplace safety will also be improved. Being situated in an industrial district, the factory's involvement will allow the project's impact to be demonstrated to over 100 similar companies in the area. 50% of technical training will include trainers representing women and individuals from marginalized communities. Additionally, the financial benefits of the project will be highlighted to banks and private equity funds in Nepal.

FIGURE 7: 100kw smart grid technology in an apartment in Kathmandu

FIGURE 8: Implementation of industrial-scale smart solar storage micro-grid at the Laxmi Steel factory in Sunwal

3.5 GREENAGE TECHNOLOGIES POWER SYSTEMS LTD

Thematic area	Smart energy
Country of implementation	Nigeria
Project Title	Smart Grid Scale-Up in Nigeria
Beneficiary Name(s)	Greenage Technologies Power Systems LTD
Project Duration	February 2025 – March 2028
Brief Description	The project will transform wasted renewable energy into community power through an innovative peer-to-peer energy-sharing system. It will use existing assets by improving their utilization.
Expected results	The project aims to reduce 800 tons of CO2 emissions annually by enabling the widespread adoption of clean energy and substituting carbon-intensive fuels such as diesel and kerosene. It plans to connect 2,000 solar PV sites to 20,000 consumers, improving energy access whilst optimizing existing solar PV systems. The project will generate operational data to validate the scalability and financial viability of its innovative energy-sharing model. The primary beneficiaries are unserved and underserved communities, women-led businesses and low-income individuals across Nigeria. These groups will gain access to clean, reliable and affordable electricity through the project's innovative peer-to-peer energy-sharing system. Other beneficiaries include solar PV owners, who will generate additional income from unused capacity, and local technicians, who will receive training to support system operations.

FIGURE 9: Pitch of the smart solution

FIGURE 10: Energy-sharing system installation at a local site

4

Knowledge-sharing and Analytical Products

Three market assessments were published at COP29 in November 2024 and further disseminated through three international webinars in November 2024. In the third year of the A2D Facility, the key findings from the three market assessments will be further disseminated.

The three market assessments were published at COP29 in November 2024 and further disseminated through three international webinars in November 2024. In the third year of the A2D Facility, the key findings from the three market assessments will be further disseminated. Snapshots of some of the key findings from the three market assessments are provided in sub-sections 4.1, 4.2 and 4.3.

The A2D Facility also undertook two further knowledge-sharing and analytical projects in its second year: a project on Gender Equality and Social Inclusion, and Environmental and Social Safeguards (GESI-ESS), and a project on communications for the A2D Facility. A summary of the projects is provided in sub-sections 4.4 and 4.5.

4.1 MARKET ASSESSMENT ON CRITICAL MINERALS INNOVATION IN DEVELOPING COUNTRIES

4.1.1 Introduction

Critical minerals are essential for renewable energy technologies, electric vehicles and industrial decarbonization. Many developing countries possess significant reserves of these minerals, yet they face challenges in fully leveraging them for economic growth due to limited midstream and downstream activities such as processing, refining, manufacturing and recycling. The market assessment examined the innovation ecosystem for critical minerals (midstream and downstream) and identified the need for greater international support, improved financing mechanisms and strengthened policy coordination.

4.1.2 Market and Innovation Landscape

A total of 100 global, regional and national initiatives related to critical minerals were analyzed, with a focus on financing mechanisms (53%) and enabling policies (47%). Gaps in these initiatives include the need for greater scale, improved coordination amongst them for informing policy interventions, minerals and segments to be prioritized in different markets, and increased sharing of knowledge and data on technologies and their drivers and barriers.

Out of 131 ODA-eligible countries, 30 were identified as key markets for critical minerals based on their midstream and downstream critical mineral imports, policy readiness, governance and innovation indicators. From these, nine countries were selected for an in-depth analysis, representing Africa (South Africa, Namibia and Zambia), Asia (India, Indonesia and Türkiye), and Latin America (Mexico, Argentina and Brazil).

4.1.3 Innovation and Project Trends

The market assessment found that innovation is primarily focused on midstream and downstream activities, including refining, battery manufacturing and recycling. In Latin America, efforts are primarily concentrated on lithium extraction and the production of battery-grade lithium carbonate. Africa is advancing safer, modular lithium-ion battery recycling technologies. The Asia-Pacific region has made significant progress in processing nickel laterites and developing high-purity silicon for solar panel manufacturing.

Despite these advancements, midstream and downstream innovations remain underfunded compared to exploration and extraction activities (upstream), limiting local value addition and economic diversification.

4.1.4 Challenges and Barriers

Several barriers hinder the development of critical minerals innovation in developing countries. Infrastructure constraints, including unreliable power supply and inadequate transport networks, create bottlenecks for processing and refining activities. Regulatory frameworks are often fragmented across multiple ministries, leading to inefficiencies in policy implementation. Additionally, most financing mechanisms prioritize raw material extraction rather than supporting downstream industrialization.

4.1.5 Investment and Policy Support

Several international financial mechanisms support critical minerals development. For example, the World Bank's Climate-Smart Mining Initiative has allocated USD50 million for sustainable mining practices. The European Union's Horizon Europe Programme, with a total budget of EUR95.5 billion, includes funding for critical mineral processing and recycling. Regional initiatives such as Africa's Green Minerals Strategy and Latin America's Mining Hub also contribute to advancing the sector.

4.1.6 Conclusion and Recommendations

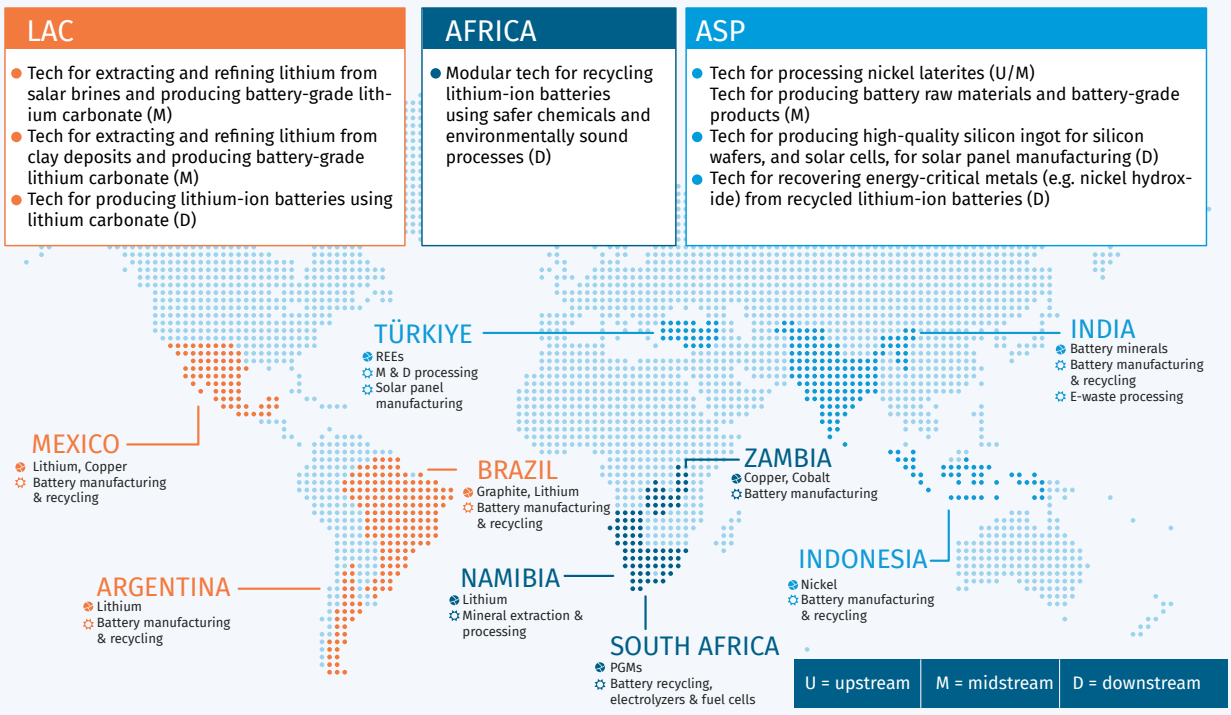
Homegrown technological innovation in the midstream and downstream segments of the critical minerals sector is emerging in developing countries, albeit gradually. The market assessment highlights that such innovation, whilst still in early stages, is increasingly supported by national policy frameworks and international incentive schemes introduced largely over the past five years.

The analysis suggests that increased attention to midstream and downstream activities, such as processing, refining and recycling, could enhance the value addition and competitiveness of developing countries in the clean energy supply chain.

The market assessment also points to the potential benefits of stronger international collaboration, including knowledge exchange and technology transfer, which could support the scaling of innovation ecosystems.

The findings further indicate that a global multi-stakeholder platform may help to coordinate efforts, align initiatives and facilitate partnerships across sectors in the midstream and downstream parts of the critical minerals value chain in developing countries. The market assessment underscores the role of circular economy policies and innovation incentives in enabling sustainable growth.

FIGURE 11: Distribution of innovative technologies across nine deep-dive countries



4.2 MARKET ASSESSMENT ON CLEAN HYDROGEN INNOVATION IN DEVELOPING COUNTRIES

4.2.1 Introduction

The market assessment on clean hydrogen innovation identified over 200 innovators across developing countries, with the highest concentrations in China (27.6%) and India (17.4%). These innovators operate across various sectors, including universities (33.9%), research institutions (13.4%), dedicated clean hydrogen developers (8.9%), and energy companies (8.0%). Despite this, innovators are currently and primarily located in 42 of the 141 developing countries eligible for Official Development Assistance (ODA), representing 29.7% of the total.

4.2.2 Market and Innovation Landscape

The market assessment analyzed five key aspects: projects and innovation, financing mechanisms, hydrogen associations, hydrogen roadmaps, and international partnerships. It found that currently, only 16 of the 141 ODA-eligible countries have emerged as pioneers in clean hydrogen innovation, meaning that they have active policies, funding support and on-going projects that position them as leaders in the field.

Currently, over 110 hydrogen projects are in late-stage planning across 35 developing countries. Of these, most innovators (47%) are focused on clean hydrogen production technologies, particularly electrolysis-based methods. Whilst innovation exists at various stages, projects at lower Technology Readiness Levels (TRLs 3-5) are primarily led by universities and research institutes (99%), whereas more advanced projects (TRLs 6-7) are increasingly driven by industrial stakeholders (81%).

4.2.3 Challenges and Barriers

Despite growing momentum, innovators in developing countries still face barriers. Key challenges include limited access to key materials, technologies and equipment; insufficient infrastructure for clean hydrogen storage and distribution; a lack of technical expertise and training; difficulty in securing funding; and the absence of local off-takers to create demand for clean hydrogen. The market assessment identifies the need for targeted interventions to accelerate the development and deployment of clean hydrogen technologies.

4.2.4 Investment and Policy Support

Clean hydrogen initiatives in developing countries have benefited from international funding and policy support. Examples of government-led initiatives include India's USD2.4 billion National Green Hydrogen Mission and concessional financing from KfW, which allocated USD1 billion for clean hydrogen projects in Africa. The World Bank and the Inter-American Development Bank (IDB) provide funding and technical assistance for clean hydrogen innovation in Latin America and the Caribbean. Private sector engagement is increasing, with notable investments, such as Singapore Capital Ventures funding for Semarak Renewable Energy in Malaysia and SBI Ventures USD25 million equity investment in Hygenco in India.

Whilst existing funding mechanisms prioritize clean hydrogen production, the market assessment highlights that there is a growing need to support demand-side initiatives, such as clean hydrogen storage, transportation and market development, as well as establishing enabling regulatory frameworks, clean hydrogen sandboxes for testing innovative technologies, and structured incentive schemes that could further stimulate investment and adoption.

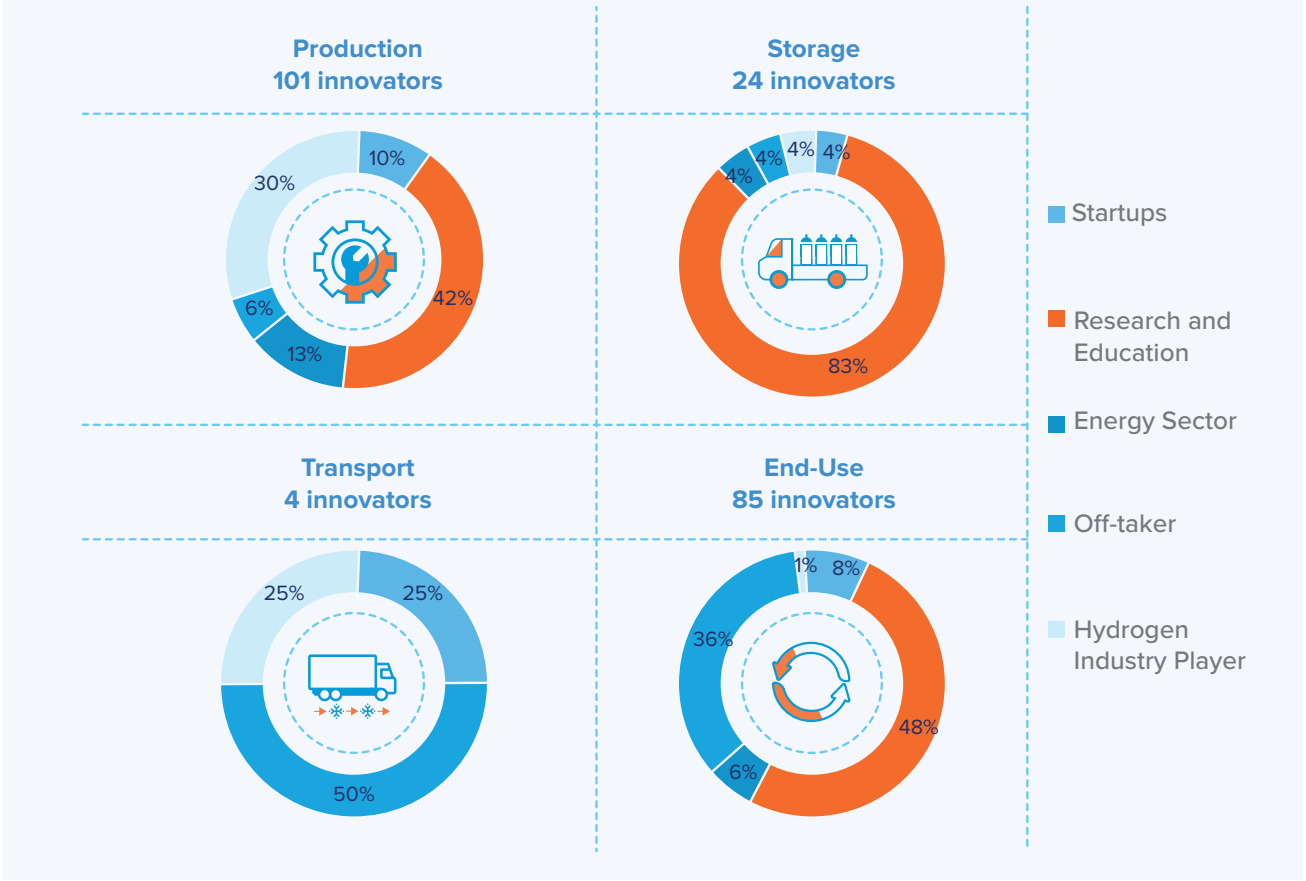
4.2.5 Conclusion and Recommendations

The market assessment highlights that scaling-up clean hydrogen innovation in developing countries can benefit from enhanced public-private collaborations, and that research, development and demonstration (RD&D) efforts have the potential to accelerate progress when directed toward key areas such as clean hydrogen storage, transport, electrolysis efficiency, catalyst development and system optimization.

The findings also suggest that expanding financing mechanisms could help to bridge existing investment gaps and accelerate the transition of promising projects toward commercial deployment.

The market assessment conveys that by responding to these challenges and leveraging international partnerships, developing countries are well-positioned to contribute meaningfully to the global clean hydrogen economy, whilst simultaneously advancing their own sustainable energy transitions.

FIGURE 12: Number of innovators by segment of the clean hydrogen value chain



4.3 MARKET ASSESSMENT ON SMART ENERGY AND INDUSTRIAL DECARBONIZATION INNOVATION IN DEVELOPING COUNTRIES

4.3.1 Introduction

A third market assessment covered two thematic areas: industrial decarbonization and smart energy solutions in developing countries. Industrial sectors in the A2D Facility are defined as hard-to-abate sectors (such as cement, steel and chemicals), processing and manufacturing, buildings, and energy-from-waste. The market assessment reiterates that hard-to-abate sectors, as well as other energy-intensive sectors across agrobusiness and manufacturing, are amongst the largest contributors to global greenhouse gas emissions, while smart energy solutions, including through smart grids and other advanced solutions in energy management systems, support clean energy integration and enhance grid stability and security.

4.3.2 Market and Innovation Landscape

The market assessment identified 28 developing countries with favorable conditions for industrial decarbonization and smart energy innovation. In the industrial decarbonization sector, 32 demonstration projects were identified, with 44% focused on carbon capture, utilization, and storage (CCUS) technologies. Other key areas of innovation include alternative fuels, process optimization, and electrification (for renewables integration). For smart energy, 24 projects were identified, with 84% focused on smart grid technologies, particularly those led by utilities and private sector stakeholders.

4.3.3 Challenges and Barriers

The market assessment conveys that, despite promising developments, industrial decarbonization and smart energy solutions face several challenges. High capital costs and limited financing options restrict the scalability of innovative solutions. The analysis highlights that regulatory frameworks often lack targeted incentives for industrial decarbonization, whilst infrastructure limitations, particularly in grid stability and energy storage, slow the deployment of smart energy solutions.

4.3.4 Investment and Policy Support

Several international financial mechanisms support industrial decarbonization and smart energy demonstration projects, including national R&D incentives and development finance programmes. However, the market assessment identified that most funding is concentrated through grants, underscoring the need for greater private sector engagement.

4.3.5 Conclusion and Recommendations

The market assessment suggests that accelerating the adoption of industrial decarbonization and smart energy solutions may benefit from the introduction of targeted incentives, increased investment in technologies such as CCUS and alternative fuels, as well as the integration of smart grid systems.

The analysis also highlights the potential for enhanced public-private collaborations to unlock innovative financing opportunities and facilitate broader uptake of these solutions across developing countries.

FIGURE 13: Distribution of identified industrial decarbonization projects across key parameters

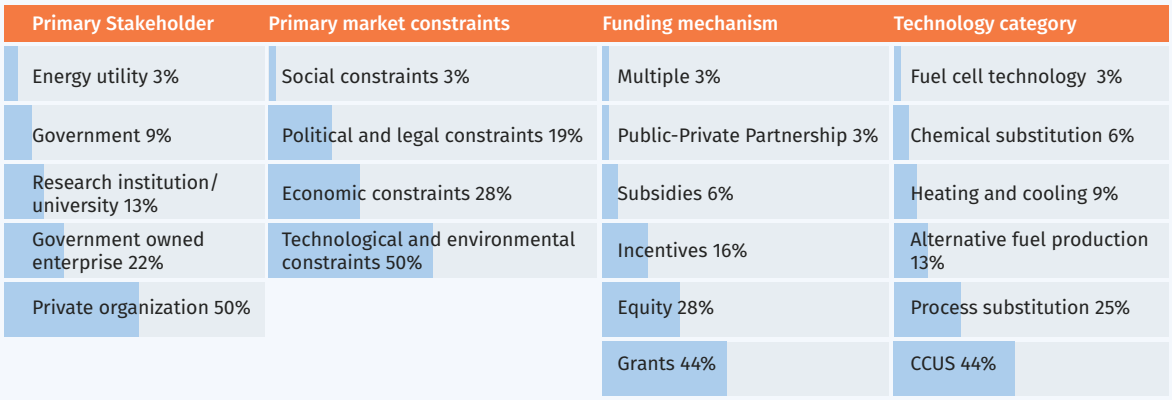
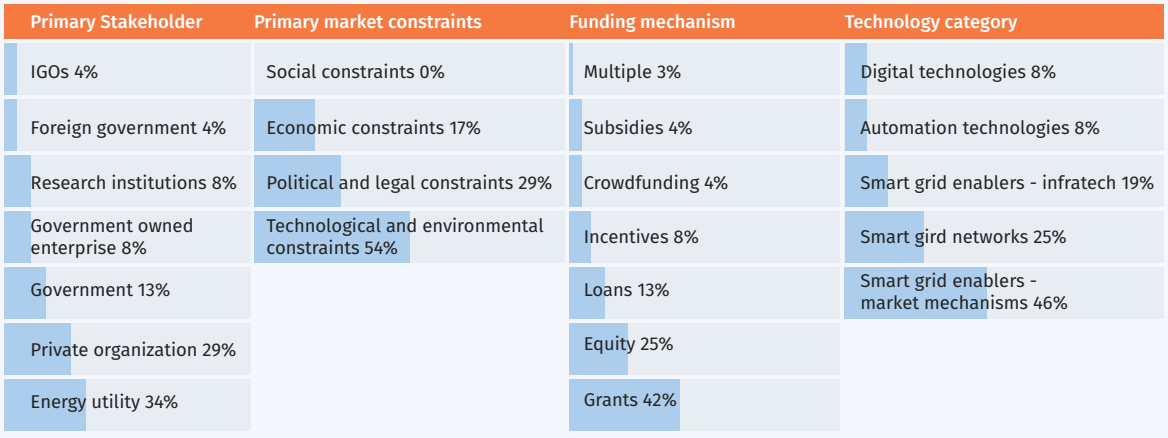


FIGURE 14: Distribution of identified smart energy projects across key parameters



4.4 GENDER EQUALITY AND SOCIAL INCLUSION & ENVIRONMENTAL AND SOCIAL SAFEGUARDS (GESI-ESS)

A third market assessment covered two thematic areas: industrial decarbonization and smart energy solutions in developing countries. Industrial sectors in the A2D Facility are defined as hard-to-abate sectors (such as cement, steel and chemicals), processing and manufacturing, buildings, and energy-from-waste. The market assessment reiterates that hard-to-abate sectors, as well as other energy-intensive sectors across agrobusiness and manufacturing, are amongst the largest contributors to global greenhouse gas emissions, while smart energy solutions, including through smart grids and other advanced solutions in energy management systems, support clean energy integration and enhance grid stability and security.

Developed a robust GESI action plan for the A2D Facility: to reduce disparities and enhance opportunities for marginalized communities and disadvantaged groups most impacted by climate change, including women, low-income groups and marginalized communities. The action plan ensures that women and men can equally access, and benefit from, the demonstration projects supported by the A2D Facility, as well as achieving co-benefits in relation to SDG 5 on gender equality. It promotes equal opportunities, participation and access to resources for all individuals. The action plan also provides a framework for GESI-related monitoring, reporting and evaluation, including indicators and gender-disaggregated data.

Developed a robust ESS action plan for the A2D Facility: to identify and mitigate potential environmental and social risks, ensuring that demonstration projects supported under the A2D Facility create positive outcomes for ecosystems and local communities, and follow a “do no harm approach” by enhancing the protection and well-being of both the environment and the communities that rely on it, contributing to the creation of more equitable and resilient outcomes. The action plan also provides a framework for ESS-related monitoring, reporting and evaluation, including indicators and risk management.

In the third year of the A2D Facility, the programme-level frameworks for GESI and ESS will be translated into project-level action plans and frameworks for each supported project under the A2D Facility, including monitoring and reporting techniques, indicators and requirements, and will deliver further capacity building training and knowledge-sharing activities on GESI and ESS.

4.5 COMMUNICATIONS PROJECT

The aim of the project is to amplify the visibility and dissemination of the A2D Facility's funding opportunities, knowledge products, projects and results. As part of the project, the following was developed in the second year of the A2D Facility.

Development of a user-friendly, public-facing website aligned with UNIDO's goals, featuring outputs, funding calls, events, project data and news, a login section for donors, a monitoring mechanism for effectiveness, and a robust post-launch support plan.

Development of comprehensive branding for the A2D Facility, including logo design, brand applications (roll-ups and posters), a style guide, digital assets for web and social media, event promotion templates, and thematic infographics.

The project will move into the maintenance phase in the third year of the A2D Facility.

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Finance

The A2D Facility's initial donor funding comes from the UK Government, which committed an initial GBP65 million.

The A2D Facility's initial donor funding comes from the UK Government, which committed an initial GBP65 million (~USD 80 million). The UK Government's funding is part of its international climate finance (Official Development Assistance (ODA)) commitment through the Department for Energy Security and Net Zero (DESNZ)

Description	Value (in million USD)
Payments/Encashment to UNIDO	USD 25.83
Allocations	USD 25.83

The indicative encashment schedule for 2024 was followed and has been updated below for 2025.

Encashment	Year	Encashment Date	Encashment Amount (£)
1	**2023**	13 April	2,000,000
2	**2023**	22 November	144,814
3	**2024**	20 May	1,174,446
4	**2024**	6 November	17,056,090
5	**2024**	12 December	96,984
6	**2025**	June	878,010
8	**2025**	October	40,536,853
9	**2026**	February	235,052
10	**2026**	April	803,442
11	**2027**	February	235,052
12	**2027**	April	776,425
13	**2028**	February	1,062,832

Table: Indicative encashment schedule

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Forward Look for Year 3

The third year of the A2D Facility will shift from the early implementation phase to the implementation phase.

During the A2D Facility's third year (1 April 2025 to 31 March 2026), the Facility will focus on the following key areas:

Second call-for-proposals at A2D Facility Annual Event: UNIDO will launch the second call-for-proposals to support demonstration projects in critical minerals, clean hydrogen, smart energy and industrial decarbonization in developing countries. The call-for-proposals will be published at the A2D Facility's first annual event (taking place in Nairobi, Kenya, in May 2025). Calls-for-proposals are published on UNIDO's procurement portal and further information about the requirements are found there. The supported demonstration projects from the second call-for-proposals will be announced in the third year of the A2D Facility.

Engagements at international events: the A2D Facility will continue to participate in international events, such as ACEF and COP30, to highlight the first five supported demonstration projects, disseminate evidence, such as the market assessments and GESI-ESS frameworks, and increase the visibility of the A2D Facility's activities and impacts. Additionally, the A2D Facility will host a global workshop on "scaling innovation through demonstration projects" across four different time zones in Brazil, Indonesia, Mexico and South Africa ahead of the first annual event, focused on enhancing the development of transformational demonstration projects in ODA-eligible countries across the A2D Facility's initial four thematic areas-of-focus.

The third year of the A2D Facility will shift from the early implementation phase to the implementation phase. A summary of some of the key activities for the third year of the Facility is provided below.

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