GEF-8 Program Framework Document (PFD)

TABLE OF CONTENTS

General Program Information

Program Title	
Global Clean Hydrogen Programme - Addendum, December 2024	
Country(ies) Global Pakistan	GEF Program ID 11723
Lead GEF Agency: UNIDO	GEF Agency Program ID
Other GEF Agenc(ies):	Submission Date 9/18/2024
Type of Trust Fund GET	
Anticipated Program Executing Entity(s): TBD	Anticipated Program Executing Partner Type(s): Government
Sector (Only for Programs on CC): Technology Transfer/Innovative Low-Carbon Technologies	Project Duration (Months): 60
GEF Focal Area (s) Climate Change	Program Commitment Deadline: 6/30/2026

Taxonomy

Climate Change, Focal Areas, Influencing models, Transform policy and regulatory environments, Strengthen institutional capacity and decision-making, Convene multi-stakeholder alliances, Demonstrate innovative approache, Stakeholders, Private Sector, Large corporations, Individuals/Entrepreneurs, Civil Society, Non-Governmental Organization, Academia, Type of Engagement, Information Dissemination, Consultation, Participation, Partnership, Communications, Awareness Raising, Capacity, Knowledge and Research, Knowledge Generation, Capacity Development, Learning, Theory of change, Indicators to measure change, Innovation, Knowledge Exchange, Gender Equality, Gender Mainstreaming, Climate Change Mitigation

GEF Program Financing (a)	PPG Amount: (c)
1,326,147.00	50,000.00
Agency Fee(s): (b) 119,353.00	PPG Agency Fee(s): (d) 4,500.00
Total GEF Project Financing: (a+b+c+d) 1,500,000.00	Total Co-financing 26,826,484.00
Project Tags	

CBIT: No SGP: No

Program:

Other Program

Program Summary

Please update those parts that are new in the Addendum (i. e. list of countries, GEBs, etc.)

Climate change poses a real and urgent threat to the world. To keep global warming under an agreed 1.5°C threshold, as called for within the context of the 2015 Paris Agreement, emissions need to be reduced by 45% by 2030 and to reach net zero by 2050. The energy sector is key to reaching carbon neutrality and to helping countries to meet their NDCs and net zero strategies. Clean, or green, hydrogen has emerged as a viable solution to decarbonizing hard-to-abate industrial sectors and transport sectors and to achieving climate mitigation goals. According to the Hydrogen Council, using green hydrogen in current hard to-abate industries alone could support the reduction of 80 GT of cumulative CO2 emissions up to 2050, which constitutes about 11% of the emissions reductions required to stay within the 1.5°C goal. The uptake of green hydrogen industries and transport in developing countries and transition economies can provide an opportunity to promote industrial growth and net-zero economic development while creating new jobs and skills.

The Global Clean Hydrogen Programme aims to enhance national institutional capacities, enable policy frameworks, improve technological readiness and financial mechanisms for the successful uptake of clean hydrogen in developing countries, to ensure their net zero development with social considerations and benefits. The programme targets the production and application of hydrogen, with a focus on the industrial and transport sectors. The programme's work will focus on green hydrogen and clean will be used as a synonym. The programme consists of a global component (through a global child project) and National Child Projects:

- The global component provides a foundation to promote innovation and will enhance the national projects by providing technical assistance, bringing all the knowledge together and sharing good practices regarding clean hydrogen production and application.
- National child projects will be implemented in Algeria, Egypt, Malaysia, Namibia, Nigeria, Pakistan, Philippines and South Africa. Each National Child Project will have activities tailored to the country context and in line with the programme's thematic areas of (i) policy, (ii) technical readiness, (iii) pilot projects, and (iv) financing.

This programmatic approach will enable long-term system transformation from robust public-private stakeholder engagement, by providing recommendations on standards, skills development, policy and environmental and social governance to transition industrial processes and transportation with clean hydrogen. The programmatic approach will also support the development of green hydrogen pilots in developing countries and will develop global lessons targeted at developing countries and economies in transition.

The Global Clean Hydrogen Programme (GCHP) will support developing countries in achieving their NDCs and meeting their country-specific climate commitments in line with the Paris Agreement goals. The Programme will deliver impactful outcomes by recognizing country ownership as a core principle and ensuring activities are country-driven through maximizing the capacity of recipient countries. With GEF funds approaching $ 15 million and close to $ 168 million in co-financing, the Programme is

expected to result in approximately 15 million tCO2 reductions. GEF funding is sought for green hydrogen only.

Indicative Program Overview

Program Objective

To enhance national institutional capacities, enable policy frameworks, improve technological readiness and financial mechanisms for the successful uptake of clean hydrogen in developing countries to ensure their net zero development with social considerations and benefits.

Program Components

Component 1 - Policy

Component Type	Trust Fund
Technical Assistance	GET
GEF Program Financing ($)	**Co-financing ($)**
200,000.00	2,000,000.00

Program Outcome:

Outcome 1.1.
Enhanced clean hydrogen enabling environment of the participating countries for hydrogen production and local application

National child projects may include a selection of the following outputs:

Output 1.1.1 Institutional stakeholders mapped and convened

Output 1.1.2. Recommendations on policies and regulations for hydrogen production and application developed/adopted, including environmental and water related policies and taking into account gender responsiveness and market scale up

Output 1.1.3. Recommendations on clean hydrogen standards provided/adopted

Output 1.1.4. Government stakeholders' capacity and awareness increased

Output 1.1.5 Green hydrogen roadmap/strategy developed/adopted

Component 2 – Technical readiness

Component Type	Trust Fund
Technical Assistance	GET
GEF Program Financing ($)	**Co-financing ($)**
300,000.00	2,826,484.00

Program Outcome:

Outcome 2.1. Technical readiness for the production and application (industrial or transport) of clean hydrogen improved

Output 2.1.1 Sectors with greater potential for the application of hydrogen identified (industrial and transport sectors)

Output 2.1.2. New industries that can be developed based on clean hydrogen and renewable energy identified and market opportunities assessed.

Output 2.1.3 The potential impact of clean hydrogen on water and energy access determined

Output 2.1.4. Industry and transport stakeholders' capacity and awareness increased

Component 3 – GHIC and Pilot project(s)

Component Type	Trust Fund
Technical Assistance	GET
GEF Program Financing ($)	Co-financing ($)
500,000.00	19,000,000.00

Program Outcome:

Outcome 3.1
Industrial clusters and companies with great potential to transition to green hydrogen identified, assessed and support provided .

National child projects may include a selection of the following outputs

Output 3.1.1 Industrial cluster with greater potential to become a green hydrogen industrial cluster or industry or transport companies with great potential to apply green hydrogen identified and selected

Output 3.1.2 Selected cluster's or companies' readiness improved to become a green/renewable hydrogen industrial cluster/company

Component 3

Component Type	Trust Fund
Investment	GET
GEF Program Financing ($)	Co-financing ($)

Program Outcome:

Outcome 3.2 Pilot project on green hydrogen developed.

Output 3.2.1 Green hydrogen pilot projects supported

Component 4 - Financing

Component Type	Trust Fund
Technical Assistance	GET
GEF Program Financing ($)	Co-financing ($)

Program Outcome:

Outcome 4.1. Bankable project preparation initiated

National child projects may include a selection of the following outputs:

Output 4.1.1 Project pipelines reviewed

Output 4.1.2 Economic pre-feasibility of projects conducted

Outcome 4.2 Financial mechanisms for clean hydrogen designed

National child projects may include a selection of the following outputs

Output 4.2.1. Capacity on clean hydrogen financing of the government and financial sector increased

Output 4.2.2 Mitigations strategies for clean hydrogen projects' risks developed

Output 4.2.3 Innovative financing options for clean hydrogen identified

Output 4.2.4 Country assistance for improvement of financial mechanisms provided

Component 5 – Knowledge Management and Sharing

Component Type	Trust Fund
Technical Assistance	GET
GEF Program Financing ($)	Co-financing ($)
150,000.00	1,600,000.00

Program Outcome:

Outcome 5.1 - Global stakeholders have improved understanding of the green hydrogen sector and south-south cooperation in developing the sector established

Output 5.1.1 Knowledge products and tools developed, shared and implemented

Output 5.1.2 Convening and dissemination conducted

M&E

Component Type	Trust Fund
Technical Assistance	GET
GEF Program Financing ($)	Co-financing ($)
110,559.00	900,000.00

Program Outcome:

Outcome 6.1. Project monitored and evaluated

Output 6.1.1. Project monitoring and evaluation plan designed and implemented

Output 6.1.2 Mid-term evaluation completed

Output 6.1.3. Terminal project evaluation completer

Component Balances

Project Components	GEF Project Financing ($)	Co-financing ($)
Component 1 - Policy	200,000.00	2,000,000.00
Component 2 – Technical readiness	300,000.00	2,826,484.00
Component 3 – GHIC and Pilot project(s)	500,000.00	19,000,000.00
Component 3		
Component 4 - Financing		
Component 5 – Knowledge Management and Sharing	150,000.00	1,600,000.00
M&E	110,559.00	900,000.00
Subtotal	**1,260,559.00**	**26,326,484.00**

Project Management Cost	65,588.00	500,000.00
Total Program Cost ($)	**1,326,147.00**	**26,826,484.00**

Please provide Justification

PROGRAM OUTLINE

Please use this space to provide a description of all aspects of the Program design that are appropriate for the additional countries being brought into the Program. That includes information from the Program Rationale and Policy Requirements that are not displayed in this Addendum template. Please use subheadings as necessary

PROGRAM OUTLINE

A. PROGRAM RATIONALE

Clean hydrogen and climate change

Since the 2015 Paris Agreement on climate change, there has been an increased focus on reducing emissions to near zero by 2050. The hard-to-abate industrial sectors are responsible for approximately 20% of the world's annual CO2 emissions, including chemicals (2%), iron and steel (10%) and heavy transport (8%). To keep global warming under the 1.5°C threshold, as called for within the context of the Paris Agreement, emissions need to be reduced by 45% by 2030. With growing energy demands, most clean technologies in hard-to-abate industries need to be at scale by 2030. Clean hydrogen has emerged as a viable solution for countries to fulfil their climate commitments with the potential to decarbonize the hard-to-abate industrial sectors. **The International Renewable Energy Agency (IRENA) states that to achieve the 1.5°C scenario, it is necessary to reach an annual clean hydrogen and its derivative fuels production of 614Mt by 2050.** This scale of production represents a substantial increase from current levels and necessitates rapid advancement in hydrogen technology and infrastructure. Notably, 94% of hydrogen consumption is expected to come from renewables, indicating an increased reliance on clean energy sources. (IRENA, World Energy Transition Outlook 2023)

Continuing with business-as-usual keeps the goal of reaching net-zero emissions by 2050 out of reach. Especially in emerging markets and developing economies, CO2 emissions are projected to grow by almost 20% by mid-2040, primarily due to growing energy demands. As a consequence, the global average surface temperature rise would be around 2.7°C in 2100 (with a 50% probability). If countries fulfill their announced pledges, global CO2 emissions could decrease to around 30 Gt by 2030 and 22 Gt by 2050, which is 15% less than business-as-usual, while still leading to a 2.1°C rise in global average surface temperature by 2100.

Hydrogen has a long history of being utilised in a wide variety of industries. However, the majority of hydrogen is currently produced from fossil-fuel based sources such as natural gas and coal, also defined as “grey hydrogen', accounting for more than 95% of the global hydrogen production (IRENA, Green hydrogen supply, a guide for policy making 2021). (IRENA_Green_Hydrogen_Supply_2021.pdf) The demand for industrial hydrogen has grown more than threefold since 1975, reaching 94 Mt in 2021, and hydrogen production is responsible for 830 million tonnes of CO2 emissions annually. (The Future of Hydrogen – Analysis - IEA)The production of grey hydrogen further leads to other environmental and social issues, such as water consumption and local air pollution.

Transitioning industrial processes and some transport sectors to clean hydrogen is essential to decarbonizing the hard-to-abate industries and transport. Clean hydrogen consists of both green hydrogen and low carbon hydrogen. This GEF funded project focuses on green hydrogen only but the terminology green and clean is used interchangeably.

Clean Hydrogen can contribute 20% of global CO2 emissions abatement needed in 2050 across hard-to-abate sectors. Up to 2050, clean hydrogen can avoid 80 GT of cumulative CO2 emissions, which constitutes about 11% of the emissions reductions required to stay within the 1.5-1.8°C goal.1 The annual abatement potential of 7 GT in 2050 is equivalent to about 20% of emissions if the world remains of its current business-as-usual trajectory. By transitioning to clean hydrogen, hard-to-abate industries and transport can reduce their CO2 emissions and remain competitive in the long-run. While the transition requires larger initial investments, the use of hydrogen represents a downward trend and the cost of financing is expected to decline as technology matures and GHG emissions are price appropriately.

The uptake of clean hydrogen industries in developing countries and transition economies can promote industrial growth and inclusive sustainable development. Cooperation amongst government, industry stakeholders, and international organizations is needed to stimulate the adoption of clean hydrogen technologies and to enable a just transition for developing countries. Some transport sectors and hard-to-abate industries can develop and flourish in emerging economies, promoting the region’s competitive advantage, innovation and overall welfare. Growing industries create new jobs and new skills, increasing the population’s prosperity. As a result, the countries grow more independent and accelerate the transition into a developed country.

The pipeline of projects for clean hydrogen production is rapidly increasing as the annual production of clean hydrogen demonstrates a potential of 37 Mt in 2030. If all projects currently in the pipeline are recognized, by 2030 the production of clean hydrogen could reach 27 Mt based on electrolysis and 10Mt on fossil fuels with carbon capture, utilization and storage (Global Hydrogen Review 2023 – IEA). Around a quarter to half of the clean hydrogen will come from

emerging markets and developing countries. Meeting governments' climate pledges would require 34 Mt of clean hydrogen production per year by 2030, a net-zero pathway by 2050 globally would require around 100 Mt per year by 2030 (Global Hydrogen Review 2022 – IEA).

However, today's clean hydrogen projects face a bankability gap as only 10% of projects under development have reached a final investment decision. Producing 1 Mt clean hydrogen per year requires 10 GW of electrolyzers, 20 GW of renewable power and $30 billion in investment. Expanding electrolyser manufacturing capacity, establishing off-take and importing arrangements to address uncertainties about clean hydrogen demand, establishing regulatory frameworks and infrastructure are critical in the scale up of clean hydrogen. Further, addressing systemic barriers on policy and standards, technical assistance, knowledge and capacity building, innovation and global coordination is of particular significance to developing countries and transition economies to foster clean hydrogen developments.

Barriers for clean hydrogen in developing countries

Green hydrogen is key to decarbonizing hard-to-abate industries and transport and providing unique opportunities for net-zero industrial development in developing countries. However, the use of hydrogen, particularly in some industries, is in nascent stages and developing countries face various barriers to further integrating green hydrogen in their domestic industries. To overcome such barriers, developing countries require adequate policy and regulatory frameworks, training, and skills development to increase capacity to support their hydrogen industry. The various barriers in fostering green hydrogen development within developing countries are summarized in Table 1.

Table 1. Barriers in fostering green hydrogen development in developing countries.

Barriers	Description
	There is a lack of appropriate regulatory mechanisms and national enabling policies, including domestic and international standards to facilitate trade. There is a need to create an enabling environment for the expansion of local production and usage of clean hydrogen in developing countries through providing recommendations on policies, regulations, and involving national and international key stakeholders in extensive consultations.
Policy and standards	Countries such as Nigeria and the Philippines are in early stages of development for clean hydrogen policies, requiring support for establishing a roadmap or national strategy to outline strategic pathways and a clear vision in clean hydrogen. This applies to Pakistan as well where activities on hydrogen are only starting. Participating countries such as Egypt and South Africa have developed a hydrogen strategy and roadmap respectively but need further support in implementing policies and regulatory frameworks for the production and application of clean hydrogen. The development of regulatory mechanisms in various country contexts, will enable countries to integrate clean hydrogen in alignment to national energy and climate plans and the Paris Agreement climate mitigation ls.
Technical assistance	Providing technical assistance will address barriers related to a lack of local readiness for the production and industrial application of clean hydrogen. There is a need to enhance the

	technical knowledge and capacity of private sector stakeholders and promote innovation in developing countries for the production, transport, and industrial usage of hydrogen. To develop new industries in developing countries, comprehensive studies, market assessments and assessments on the water and energy usages need to be conducted to identify the potential of green hydrogen application and enable an inclusive clean hydrogen transition. The technical assessments will consider geographic and environmentally dependent factors such as access to renewables, country grid parameters, presence of hard-to-abate industries, and availability of gas and water infrastructure for the production and application of green hydrogen.
Knowledge	Knowledge development and dissemination of policies and regulation, standards on clean hydrogen production and application are lacking. On a global scale, there is a need to address technical knowledge on the use of hydrogen which can be applicable in a variety of regulatory environments and promote innovation of hydrogen technologies to be utilized in multiple markets of developing countries.
Capacity building	There is a lack of capacity in developing countries for the production and industrial application of clean hydrogen. There is a need to identify areas that require knowledge and skills enhancement such as policies, standards, and financial mechanisms, and further promote innovation. Improving the understanding and competencies of industrial stakeholders in developing countries is essential to support the transitioning of industrial processes to clean hydrogen.
Innovation	Clean hydrogen technologies are not yet commercial and are currently at demonstration stage. To deliver the scale and pace to meet global net-zero climate targets, there is a need to accelerate the cost reduction of clean hydrogen production with technology innovation. There is an identified need to improve the understanding of clean hydrogen technologies along the value chain by optimising production, compression, storage and application. Technological capacities and skills need to be strengthened particularly for domestic industries through scaling up clean hydrogen technologies and expanding their applications.
Global coordination	There is a critical need to strengthen global coordination by convening relevant public and private stakeholders for the production and use of clean hydrogen. Strategic coordination amongst various hydrogen stakeholders is required to ensure resources and programmes demonstrate the greatest impact and to reduce duplicated efforts. There is a need to share good practices and develop replicable plans for scaling up hydrogen investments in developing countries and transition economies.

In line with the recognized barriers hindering the development and uptake of clean hydrogen applications, such challenges necessitate global coordination and action. The Global Clean Hydrogen Programme (GCHP) acknowledges the need for collaboration and innovation in addressing entangled barriers, particularly in developing countries. Therefore, national child projects will address barriers locally, while contributing to solving the barriers on a global scale. One major obstacle in the uptake of clean hydrogen applications is the lack of consistency. Without aligned standards, it will be difficult for local clean hydrogen producers to operate and engage in international trade. The programme will foster collective learning and facilitate knowledge management, ensuring that child projects as well as the global hydrogen community remain interconnected and mutually supportive. By addressing the barriers collectively, bundling and leveraging diverse resources, innovation, expertise and best practices, the global programme can effect meaningful change in the adoption of clean hydrogen applications.

Programme's complementary to existing investments

There are a number of existing GEF and non-GEF-funded initiatives either promoting clean hydrogen or complementing the programme on a global level. Organizations such as UNIDO, UNEP, GIZ, Global Climate Fund and international financing institutions, including World Bank, KfW Banking Group and the European Investment Bank, maintain clean hydrogen initiatives which assist in capacity building, project financing and knowledge sharing in support of developing countries. The Global Clean Hydrogen Programme (GCHP) can build on and demonstrate strong linkages to ongoing initiatives and investment opportunities for clean hydrogen. The GCF and DFIs such as AfDB, ADB, EBRD, IDB, and World Bank can provide co-financing for implementing the pilot projects while the various initiatives also bring complementary strengths and competencies to GCHP. The PtX Platform and PtX Growth Fund supported by KfW may further accelerate the pilot projects. Alongside financial aid, technical assistance agencies such as GIZ, IEA, IRENA and UNECE can offer technical and operational assistance in support of scaling-up the pilot projects. The following provides an overview of the key initiatives and stakeholders and how GCHP is complementary. Further details of the envisaged working relationships will be defined during the PPG.

UNIDO: UNIDO aims to stimulate the accelerated uptake of green hydrogen and its application in hard-to-abate industries of developing countries and transition economies. UNIDO considers a wide array of key enablers to support developing countries in achieving a just hydrogen transition that puts social and environmental aspects in focus and has a number of on-going initiatives. As a result, UNIDO is in a good position to ensure the complementarity of all the initiatives it is involved with and to find synergies for a greater overall impact. The initiatives include:

- UNIDO's **Global Programme for Hydrogen in Industry (GPHI)** was launched in 2021 to support developing countries in the promotion of market policies, standards, skills and know-how, financial instruments, innovation and coordination amongst key stakeholders that play an essential role in the development of a hydrogen economy. Promoting tangible projects to accelerate the local uptake of green hydrogen in industries of developing countries and transition economies is a key element of the Programme. GPHI consists of two pillars of work:

i. The **Global Partnership for Hydrogen in Industry** coordinates with international partners to raise awareness and increase capacity of policy makers and industry representatives of developing countries for green hydrogen application in industry. The Partnership addresses countries' needs by developing knowledge products, innovative tools and conducts needs assessments to provide tailored guidance at policy, institutional and industrial level. GPHI and GCHP will work together and share resources developed, building on each other's work. UNIDO will ensure that there is no replication between the programmes.

ii. Through the **Technical Cooperation Programme**, UNIDO cooperates with governments in developing countries and transition economies to implement country-specific green hydrogen projects in industry. The TC Programme entails technical assistance in adapting and applying knowledge and tools, assessing local market needs and devising tailored strategies, tools and instruments. A key component of the TC Programme is the green hydrogen industrial cluster model, which aims to accelerate the application of locally produced green hydrogen in industrial zones, clusters and parks. Where appropriate GCHP will complement the TCP by using the cluster model in identifying pilots.

- The GPHI is supported by the '**International Hydrogen Energy Centre'** (IHEC) in Beijing which UNIDO launched together with the Chinese government. The centre operates as a knowledge partner, supporting technology research, development and application as well as by building-up green hydrogen economies and promoting international cooperation. The Centre functions as a global technology innovation hub for hydrogen energy, supporting the creation of hydrogen value chains and focusing on the R&D, application, and demonstration of key hydrogen technologies. The IHEC aims to enhance the global scale-up of hydrogen application in industry particularly in developing countries by attracting international R&D funding and promoting South-South and regional cooperation. IHEC will act as a knowledge partner in this programme ensuring complementarity, providing expertise and sharing experience and knowledge products.

- UNIDO is coordinating the **International Hydrogen Trade Forum**, which is an inter-governmental platform aiming to stimulate the nascent hydrogen market. The Forum is co-led by the Government of the Netherlands and the United Arab Emirates and member parties including Australia, Brazil, Canada, Chile, Germany, Japan, Saudi Arabia, South Korea, United Kingdom, United States, Uruguay and the European Commission on behalf of the European Union. In this capacity, UNIDO will facilitate the cooperation among the government members, industrial leaders and, in line with GCHP, will bring in the perspective and considerations of developing countries and transition economies.

- The Government of the UK through its Department for Energy Security and Net Zero, has launched the '**Accelerate-to-Demonstrate (A2D) Facility**' with an announced funding of 65.6 million GBP, which will be implemented in partnership with UNIDO. The A2D Facility will accelerate the commercialization of innovative clean energy technologies in low-and middle-income countries, with a focus on clean hydrogen, critical minerals and cross-cutting thematic areas (e.g., clean transport, smart energy, energy efficiency, energy storage, industrial decarbonization and sustainable cooling). The A2D Facility will provide grant funding to small and medium-sized enterprises and research institutions to undertake pilot demonstrations of innovative clean energy technologies, develop business models, trainings, skills development and knowledge products for its dissemination. A2D and GCHP

complement each other with A2D able to provide co-finance for pilot projects and in sharing knowledge products and training materials. GCHP will ensure that it does not duplicate A2D efforts.

- UNIDO's **Industrial Deep Decarbonisation Initiative (IDDI)**, led by the UK and India, is a global coalition which aims to ecarboniza heavy, hard-to-abate industries (e.g., steel, concrete, aluminium and refining) within participating countries. The initiative supports participating countries in the adoption of green public procurement policies, in reducing the carbon emissions associated with public construction projects, and in the development of standards and reporting mechanisms to encourage public sector carbon reductions. Like UNIDO's Global Partnership for Hydrogen in Industry, a central aim of the IDDI is the promotion of innovative technological solutions which will contribute to the decarbonization of industries, especially those which are hard-to-abate. IDDI is complementary to GCHP in that it is focusing on creating the demand for products rather than directly on the application and production of green hydrogen.

World Bank: The World Bank brings financial expertise and a broad programmatic support to the sector. Specifically for hydrogen, the World Bank launched the Hydrogen for Development Partnership (H4D). H4D is a global initiative to boost the deployment of low-carbon hydrogen in developing countries. H4D fosters capacity building and regulatory solutions, business models, and technologies towards the roll out of low-carbon hydrogen. It has published a report on green hydrogen in developing countries and on the development of guarantees of origin. It is developing strategies and roadmaps for India, Morocco, Oman, Qatar, Saudi and UAE and supporting policies and standards in Brazil, Mauritania, Morocco, Tunisia and Uzbekistan and capacity building in Chile, Colombia, Costa Rica, India, Namibia. It is providing concessional financing in Barbados, South Africa, Mexico, Namibia, Chile and India. As such it complements this programme with a focus on different countries. Work in Namibia will look to target gaps not targeted by H4D and there is a role for co-finance of pilot projects in both South Africa and Namibia. Further, H4D has a roster of hydrogen experts and conducts periodic study tours to successful green hydrogen projects. To ensure complementarity, the proposed GCHP programme shall coordinate with H4D to be able to offer services which are not already provided by H4D and be able to access H4D roster of experts and join studies tours as need be. H4D will also be represented on the Global Advisory Board.

IRENA: A source of information and support for governments seeking to transition their energy infrastructures to greener alternatives, such as hydrogen. IRENA contributes to research on green hydrogen topics and provides a platform for dialogue and information sharing between stakeholders working within green hydrogen's political economy. Its Green Hydrogen Collaborative Framework serves as a platform for governments and private sector actors to work together to implement successful green hydrogen projects worldwide. The framework focuses on the development of a global knowledge database, the development of standards and regulations, transportation of hydrogen and financing for green hydrogen projects, among other

topics. Meetings are open to all member states and to others by invitation only. IRENA also serves as a source of information and guidance for governments and policy makers on hydrogen policy. The agency has published a series of guides, reports and frameworks on polices for hydrogen (Creating a global h2 market – certification to enable trade (2023), Decarbonising end-use sectors: green h2 certification (2022), Green H2 for industry: a guide to policy making (2022), and Geopolitics of the energy transformation – the h2 factor (2022)). These sources of information address policy approaches to the sector at every stage of the hydrogen life cycle e.g., generalized hydrogen production, end uses, policies to support electrolyser production, and industrial uses of hydrogen specifically. Although the scope is similar, GCHP's working groups will include governments, academia and the private sector and will make all their reports publicly available. Areas of focus and knowledge projects will be determined based on continued gaps in the market having consulted with IRENA and IRENA will be invited onto the Global Advisory Board.

International Energy Agency (IEA): The IEA partners with governments to serve as a source of information and support in their transition to clean energy. The agency also conducts research to track the progress of the green energy transition, including hydrogen. The IEA developed the 2022 breakthrough agenda, which tracks global progress towards decarbonization in green energy sectors. This includes progress in the green hydrogen sector. The IEA also maintains a global hydrogen project database which tracks all hydrogen projects which have been developed since 2000 globally. The global hydrogen review is an annual publication by the IEA which tracks global hydrogen demand and production, as well as developments related to hydrogen infrastructure, trade, policy, regulation and investment.

The IEA established the Hydrogen Technology Collaboration Program (TCP) in 1977, which serves as a platform for government and private stakeholders to convene and share information and research on the development of hydrogen technologies and policies. GCHP will ensure complementarity to the work of the TCP tasks by involving the TCP within the programme, particularly in the working groups and to advise on the development of policy and knowledge products. The hydrogen TCP will be represented on the Global Advisory Board.

Clean Energy Ministerial (CEM) Hydrogen Initiative: The CEM Hydrogen Initiative aims to advance policies, programmes and projects that accelerate the commercialization and deployment of hydrogen fuels and technologies across all aspects of the economy. The initiative focuses on three key areas:

- Helping to ensure successful deployment of hydrogen within current industrial applications.
- Enabling deployment of hydrogen technologies in transport (e.g. freight, mass transit, and light-rail, marine).
- Exploring the role of hydrogen in meeting the energy needs of communities.

The Initiative includes activities such as the 'Global Ports Hydrogen Coalition', which is led by the European Commission and aims to enhance policy dialogue and project-oriented collaboration to scale up the production and use of low-carbon hydrogen and hydrogen-based fuels in industrial coastal areas; and the 'H2 Twin cities initiative' which is led by the U.S. with the objective to bring together cities and regions to increase awareness, best practices and information on the use of hydrogen and fuel cell technologies at scale. The CEM's focus is primarily (but not exclusively) developed nations where the barriers are not the same as in economies in transition and developing nations. The work is therefore complementary and GCHP will ensure that all relevant work and case studies that come from CEM will be incorporated into its work.

UNECE: The United Nations Economic Commission for Europe recognizes the role of hydrogen in decarbonization the industrial sector and integrating a higher share of renewable energy sources in line with the ambitious policy initiatives outlined in the European Green Deal. The Executive Committee of ECE approved a project in 2021 for "sustainable hydrogen production in the UNECE region and its role in the development of a hydrogen ecosystem and export potential" with the objective to enhance capacities of Azerbaijan, Armenia, Belarus, Kazakhstan, Kyrgyzstan, Republic of Moldova, Tajikistan, Turkmenistan, and Uzbekistan. The project will develop sustainable hydrogen production strategies with the aim to overcome economic, technical, policy and investment barriers. The GCHP is focusing on a different set of countries but will look to build on any relevant capacity building material developed as part of the UNECE project.

In 2022, the ECE Committee on Sustainable Energy discussed on a "comprehensive and science-based terminology, classification and taxonomy for hydrogen" to establish a working group to prepare the specifications for the application of hydrogen and coordinate with other relevant entities. GCHP will establish working groups but they will focus on different technical areas.

GIZ: GIZ combines global experience with local knowledge and brings first-hand experience promoting the uptake of green hydrogen. GIZ is actively supporting green hydrogen via H2-Uppp and Global Hydrogen Diplomacy.

- H2-Uppp's main objective is to further develop markets for green hydrogen technologies, especially in developing countries and emerging economies, through partnerships with business and public-private pilot projects.

- The Global Hydrogen Diplomacy Initiative promotes a political dialogue with fossil fuel exporting countries about switching to become a green hydrogen exporting country.

- H2 Global is a global initiative supported by GIZ and German companies and trade associations. Part of Germany's national hydrogen strategy, this initiative seeks to support the establishment of a global hydrogen market by ramping up global trade in hydrogen and power-to-X (PtX) technologies and products.

- Promoting the energy transition in development cooperation is a GIZ project in cooperation with the German Federal Ministry. It aims to strengthen capacities for international development organizations and their international partners for projects related to the clean energy transition, including green hydrogen projects.

- The Global Energy Transformation Programme (GET.pro) is a GIZ platform that connects funding from multiple European countries to developing economies and economies in transition, with the aim to support the clean energy transition on a global level. GET.pro has identified green hydrogen development as an essential goal within the larger global clean energy transition. For example, the Africa-EU Energy Partnership, which is hosted by the GET.pro platform, is working to develop unified policies and strategies for green hydrogen development in the African region.

GCHP will work with GIZ, particularly in the countries where GIZ is active to ensure there is no duplication of effort and GCHP builds on work already done or underway.

KfW Banking Group: The KfW Banking Group brings financial expertise and experience with concessional finance for hydrogen projects. It offers financing via their PtX Platform. The PtX platform provides funding for projects along the entire PtX value chain: from the generation of green electricity through renewable energies to the production and transport of green hydrogen and derivatives. The platform has two different funding schemes, the PtX Development Fund and the PtX Growth Fund, to support PtX projects in developing countries and emerging economies. GCHP is complementary since it will provide technical assistance in the development of projects and co-financing could be offered to pilot projects via the PtX platform.

Mission Innovation: The goal of the mission is to reduce the costs of clean hydrogen to the end user to 2 USD/kg by 2030. The work includes three areas: Stimulating RDI - Tackle the top research and development priorities with the greatest potential to drive cost reductions across the areas of production, distribution, storage, and end-use applications; the integration of production, storage, distribution and end-use applications in hydrogen valleys with the delivery of 100 clean hydrogen valleys worldwide by 2030; and preparing the ground for the scale-up of the hydrogen economy by building a coalition of partners to provide a clear and coherent enabling environment. They want to create a global collaboration and go-to-platform for all information on large-scale hydrogen flagship projects (Hydrogen Valleys –H2V). GCHP is complementary with its work on industrial

clusters (similar in scope to H2V) with its focus on developing nations and all scale projects. Of the H2V identified so far, none are in Africa. GCHP can work with MI in assessing if any clusters identified could be classified as H2V and in sharing best practice and coordinating with the platform. It is anticipated that the target countries of the two initiatives are complementary to each other.

Green Climate Fund: The GCF aims to ensure access to climate finance for developing countries and that investments drive a paradigm shift towards low emissions and climate resilience. GCF works directly with countries that are affected by climate change, through a country's National Designated Authority (NDA) or Focal Point (FP), government agencies tasked to liaise with GCF in delivering climate solutions. The IDB and GCF created the first regional fund to promote electric mobility and green hydrogen in Latin America and the Caribbean. The fund is expected to provide 450 million USD in concessional loans and grants to nine countries (Barbados, Chile, Colombia, Costa Rica, the Dominican Republic, Jamaica, Panama, Paraguay and Uruguay). GCF support to date is targeted at Latin America and the Caribbean, so complementary to GCHP.

African Development Bank: The AfDB Group has an overarching objective to spur sustainable economy development and social progress in its regional member countries, particularly the least developed African countries by providing concessional funding for project and programs, as well as technical assistance for studies and capacity-building activities. The AfDB developed a report on 'Africa's Extraordinary Green Hydrogen Potential' with an analysis of investment opportunities focusing on three hubs; Mauritania-Morocco, southern Africa and Egypt. The study addresses Africa's solar energy and the potential of transforming solar power into green hydrogen to strengthen energy security, cut emissions and decarbonize industry and transport.

The AfDB supports the Africa Green Hydrogen Alliance which consists of member countries such as Egypt, Kenya, Mauritania, Morocco, Namibia and South Africa to identify energy transition pathways and green hydrogen targets to decarbonize heavy industry and transport sectors through collaboration and development of green hydrogen projects. GCHP will liaise with the Alliance in its work in Egypt, Namibia and South Africa to ensure there is no duplication and that they work together to identify projects.

Asian Development Bank: The ADB is currently focusing on enabling works in the hydrogen economy including knowledge sharing, government policy development, enhancing hydrogen trading platforms, engaging with industry and associations and supporting pilot projects. Through the 'Energy Storage and Green Hydrogen Sector Development Programme', the ADB aims to create the conditions for green hydrogen to be generated from abundant renewable energy resources and allow sustainable battery energy storage systems to be installed. A number of studies are undertaken to identify the viability of hydrogen supply chains in Pakistan, Nepal, the Maldives, Indonesia and Palau. Work carried out on supply chains will be reviewed for relevance and applicability for Malaysia and the Philippines and close liaison with the ADB will be maintained to avoid any duplication.

European Bank for Reconstruction and Development: The EBRD focuses on projects across the

hydrogen value chain in support of regulatory and policy angles for hydrogen certification, access to infrastructure, and providing concessional financing that will support early movers into the hydrogen economy. The EBRD is running a hydrogen acceleration programme for the Southern and Eastern Mediterranean region (SEMED), Turkey, Caucasus, Moldova, Western Balkans, Uzbekistan, Kazakhstan, Ukraine, and Moldova. The programme addresses three work streams on country market assessment, investment case studies and development of a national hydrogen strategy for selected countries.

The EBRD is also supporting the European Clean Hydrogen Alliance, which aims to accelerate investment towards the deep decarbonization of economies and operations. Within the Alliance, the EBRD supports the early uptake of investment across the entire clean hydrogen value chain. EBRD's work is complementary to GCHP with its focus on SEMED and Europe, rather than Africa and Asia, and there are potential lessons to be learned from the work and Europe is a potential market for global green hydrogen.

European Investment Bank: The EIB brings financial expertise and experience with concessional finance for hydrogen projects. Finance is provided through the Green Hydrogen Fund. The Fund provides strategic advice and capacity building to developing countries to help them prepare for decarbonizing the industry sector through green hydrogen.

Inter-American Development Bank: The IDB has been supporting 14 countries within the Latin America and Caribbean region in building capacity and setting favourable conditions for successful green hydrogen investments since 2018. Specifically, the IDB supported several government agencies in Chile, Colombia, Uruguay and Costa Rica, amongst other countries, to build their national hydrogen promotion roadmaps and create favourable market conditions. The IDB approved a 400 million USD loan to develop Chile's green hydrogen industry to finance projects, develop domestic demand and training and research and IDB with IFC supported the Renewable Barbados project developed by Hydrogène de France (HDF) and Rubis, consisting of an installation of a 50MW photovoltaic farm with green hydrogen and lithium-ion battery storage that will provide reliable and clean electricity to the Barbados grid. IDB's focus is complementary focusing on LAC but there is real scope to use the experiences in the hydrogen roadmaps developed in the work of GCHP.

Breakthrough Agenda: The UK Breakthrough Agenda's goal is to accelerate clean technology transitions in each sector through strengthened international cooperation and coordination. Within the Breakthrough Agenda initiatives, the Hydrogen Glasgow Breakthrough Goal maintains an objective to make affordable renewable and low carbon hydrogen globally available by 2030. Five key enablers are identified as priorities for strengthened collaboration within the Breakthrough consisting of:

- Demand creation and management: to create targeted demand for low carbon and renewable hydrogen starting with existing industrial applications;

- Standards and certification: agreeing common standards for hydrogen emissions, safety and operations;

- Research and innovation: accelerating the research, development and demonstration of hydrogen technologies;

- Finance and Investment: Rapidly scale up investments in renewable and low-carbon hydrogen production, and support the development of the sector in emerging economies; and

- Landscape coordination: Establishing a clear architecture for international collaboration within each sector.

GCHP is aligned with the Breakthrough Agenda and by working alongside the same coordinating organisations (The work is coordinated by a number of stakeholders including IRENA, the IEA's TCP and the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE), Mission Innovation and CEM and UNIDO) GCHP's outputs can add to the agenda at the same time as learn from its outputs, for example a proposed standard on emissions accounting.

EU Global Gateway: The European Commission and the EU High representative have set out the Global Gateway, which is a European strategy to boost smart, clean and secure links in digital, energy and transport sectors and strengthen health, education and research systems across the world. Between 2021 and 2027, the EU institutions and EU Member States will jointly mobilise up to 300 billion EUR of investments for sustainable and high-quality projects, considering the needs of partner countries and ensuring benefits for local communities. Specifically, the Global Gateway will invest in green hydrogen production and open up competitive markets to enable hydrogen to be traded internationally and within the EU without export restrictions. To date much of the support has been to LAC with a 2 billion EUR investment pledged to support Brazil's production of green hydrogen and to promote energy efficiency. The EU-LAC Global Getaway Investment Agenda, presented in July 2023, highlights potential investment projects to address the region's infrastructure needs, whilst creating local added value and promoting growth, jobs and social cohesion by strengthening the LAC's unique potential on green hydrogen, renewable energy and strategic critical raw materials. Further, the EU, EIB and KfW, in partnership with Corporación de Fomento de la Producción (CORFO) and the Chilean Ministry of Finance, signed a statement of intent to finance green hydrogen projects with up to 216.5 million EUR to support Chile's renewable hydrogen industry and help meet the country's target of 100% clean energy by 2050. GCIP is complementary in that it could identify green hydrogen production projects that could secure co-finance from the EU.

Although there are numerous initiatives, there are limited lessons learned so far since most are relatively recent. However, within the framework of the GPHI, UNIDO, in cooperation with the World Bank, UK

Breakthrough Agenda and IRENA, developed two questionnaires for mapping financial and technical assistance on clean hydrogen for developing countries and emerging economies. The questionnaire identified the strong need to coordinate both financial and technical assistance along the clean hydrogen value chain and further mitigate associated risks to create bankable projects in developing countries. The questionnaire was distributed to 38 stakeholders representing development finance institutions, government, international development assistance agencies and international organizations.

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                - Responses have shown a strong focus is being placed on assessing policies and providing regulatory support for clean hydrogen in developing countries. However, further alignment is needed in financial and technical assistance towards creating enabling hydrogen infrastructure and providing R&I and skills development in developing countries. Further technical assistance is also required to enhance capacity and skills for clean hydrogen application at the domestic level.

The proposed Global Clean Hydrogen Programme is designed to directly address these identified gaps, reflecting the valuable feedback received. The following additional dimensions and advantages further underscore the value of this initiative in the form of a global program (rather than several stand-alone national projects).

- Economies of scale and shared resources: By operating as a global program, GCHP can leverage economies of scale, ensuring more efficient use of resources. This approach allows for pooling of expertise, technology, and financial resources, which is particularly beneficial for developing countries that may have limited individual capacities.

- Standardization and Best Practices: A global program can facilitate the development and dissemination of standardized best practices and protocols for clean hydrogen projects. This standardization is crucial for ensuring safety, efficiency, and compatibility across different regions and projects.

- Enhancing Policy Coherence and Cooperation: A global program can play a pivotal role in ensuring policy coherence among different countries, which is vital for creating a supportive international regulatory environment for clean hydrogen.

- Facilitating International Collaboration: The global nature of GCHP enables and encourages international collaboration, fostering partnerships between developed and developing countries. This can lead to technology transfer, shared research and innovation (R&I) efforts, and a broader understanding of diverse energy contexts.

- Building a Global Knowledge Base: GCHP can act as a central repository for data, research findings, and lessons learned, making this information widely accessible to all participating countries, thereby accelerating the pace of innovation and implementation in the clean hydrogen sector.

B. PROGRAM DESCRIPTION

Program description

The Global Clean Hydrogen Programme

The GEF-8 Global Clean Hydrogen Programme (the 'programme' or GCHP) – led by UNIDO– aims to enhance national institutional capacities, enable policy frameworks, improve technological readiness and financial mechanisms for the successful uptake of clean hydrogen in developing countries to ensure their net zero development with associated social considerations and benefits.

The programmatic approach aims to achieve greater impact by creating synergies with the participating countries, which, in aggregate, will create scale and momentum, attracting private sector interest and investment. The programmatic approach will also allow for a broader sharing of good practice and create economies of scale through the provision of programme services.

The programme has been designed to specifically address the barriers identified in developing countries and economies in transition and be complementary to existing baseline activities supporting clean

hydrogen development. The programme will focus its work on green hydrogen and clean is used as a synonym.

Programme Design: The programme has two main elements:

- A cohort of National Child projects (Algeria, Egypt, Malaysia, Namibia, Nigeria, Philippines, Pakistan and South Africa), each with a set of activities tailored to the country context and in line with the programme's thematic areas of (i) policy, (ii) technical readiness, (iii) pilot projects, and (iv) financing;

- A knowledge management and dissemination component, led by a Global Child Project, and which supports the programme's national child projects, and developing countries and economies in transition in general, offering two core sets of activities: (i) knowledge products and tools and (ii) convening and dissemination.

The programme is structured around the implementation of five project components across the National Child Projects, all supported and coordinated by one Global Child Project, as set out in the figure below. This structure allows for a clear results framework for measuring impact across national child projects, with a commonality in outcomes, outputs and indicators in each component. The child projects and the overall programme also have monitoring and evaluation components. The programme is flexible and participating countries can decide the components that will be included in their respective National Child Projects based on their current work on clean hydrogen.

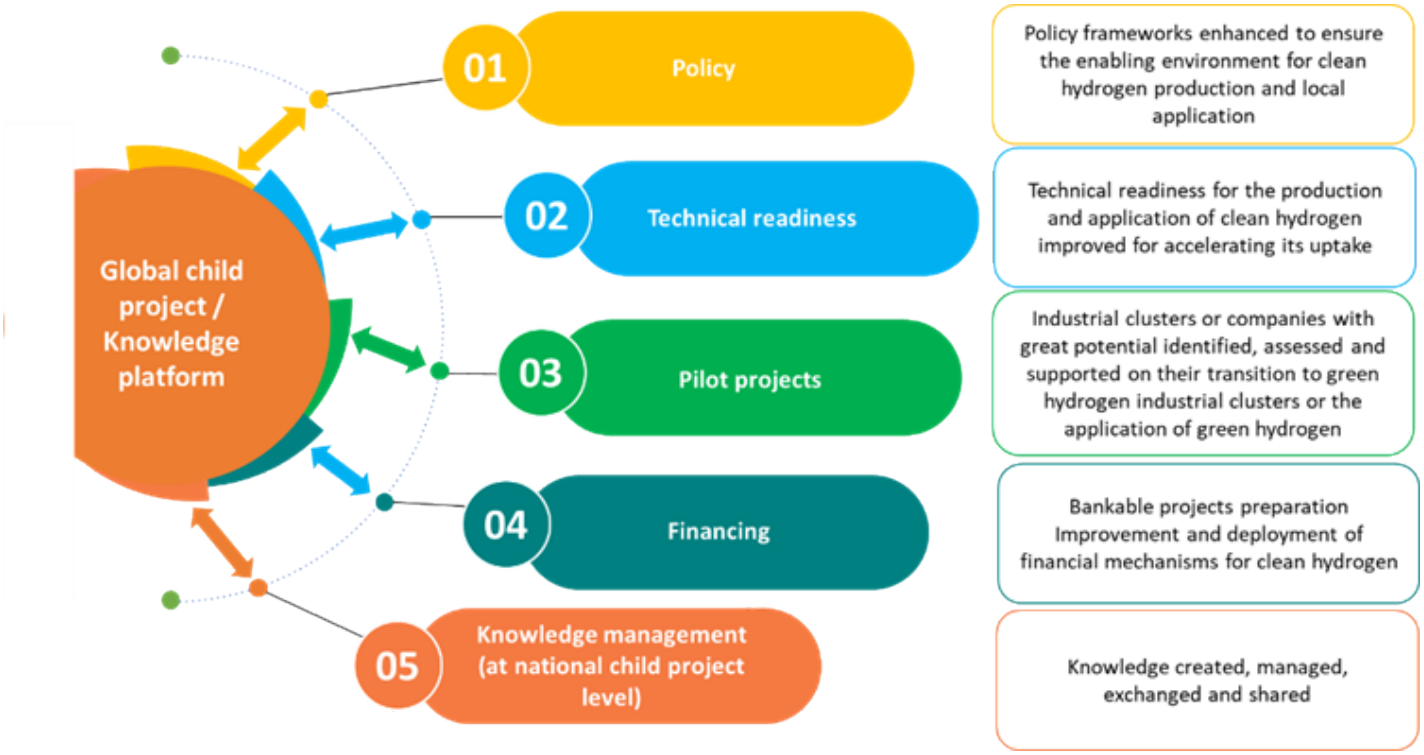


Figure 1: Global Clean Hydrogen Programme components

Theory of Change of the Global Clean Hydrogen Programme

The programme will contribute to enhance national institutional capacities, enable policy frameworks, and improve technological readiness and financial mechanisms for the successful uptake of clean hydrogen in developing countries to ensure their net zero development with social considerations and benefits. This will contribute to supporting participating countries to meet their decarbonisation targets and also provide valuable knowledge and expertise for the production and local uptake of clean hydrogen on their path towards equitable net zero development.

The enabling environment for the development and uptake of clean hydrogen application in developing countries and economies in transition faces several barriers, including lack of appropriate regulations, policies, and standards; limited local readiness, knowledge and capacity for hydrogen production and application; insufficient bankable projects and financing mechanisms for clean hydrogen; and limited global coordination and sharing of best practices. The programme will address these barriers through stakeholder identification and engagement activities; assessments and recommendations on policies, standards and financial mechanisms; technical assessments and studies for hydrogen production and application and for pilot projects in industrial clusters and in transport; awareness raising and capacity building for policy makers, financial institutions and private sector (industry and transport); elaboration

of pre-feasibility studies; development of knowledge products and tools; and the organization of dissemination and convening events.

For the successful execution of the activities, the programme assumes that regulatory bodies, private sector and other stakeholders are willing and able to participate in the transition to clean hydrogen. The global and local markets for hydrogen will continue to grow and will be receptive to new hydrogen-based solutions. There is sufficient infrastructure and technological capabilities to facilitate clean hydrogen production and application. Financial resources and investments will be available to fund clean hydrogen initiatives. Access to water and energy, essential for green hydrogen production, is sustainable and does not negatively impact local communities. Climate change and sustainability continue to be global priorities, incentivizing the transition to cleaner energy solutions like hydrogen.

As a result, participating countries will have enhanced policy frameworks that ensure there exists an enabling environment as well as improved technical readiness for the production and application (in industry and transport) of clean hydrogen; industrial clusters/companies are assessed and assisted on their transition to clean hydrogen industrial clusters or for the application of clean hydrogen in local companies as well as pilot projects developed. The programme outcomes will also include the initiation of bankable project preparation and the design of financial mechanisms for clean hydrogen projects in the participating countries. Finally, the programme will have knowledge products and tools developed and disseminated (at a national and global level).

The figure below presents the Theory of Change of the Global Clean Hydrogen Programme.

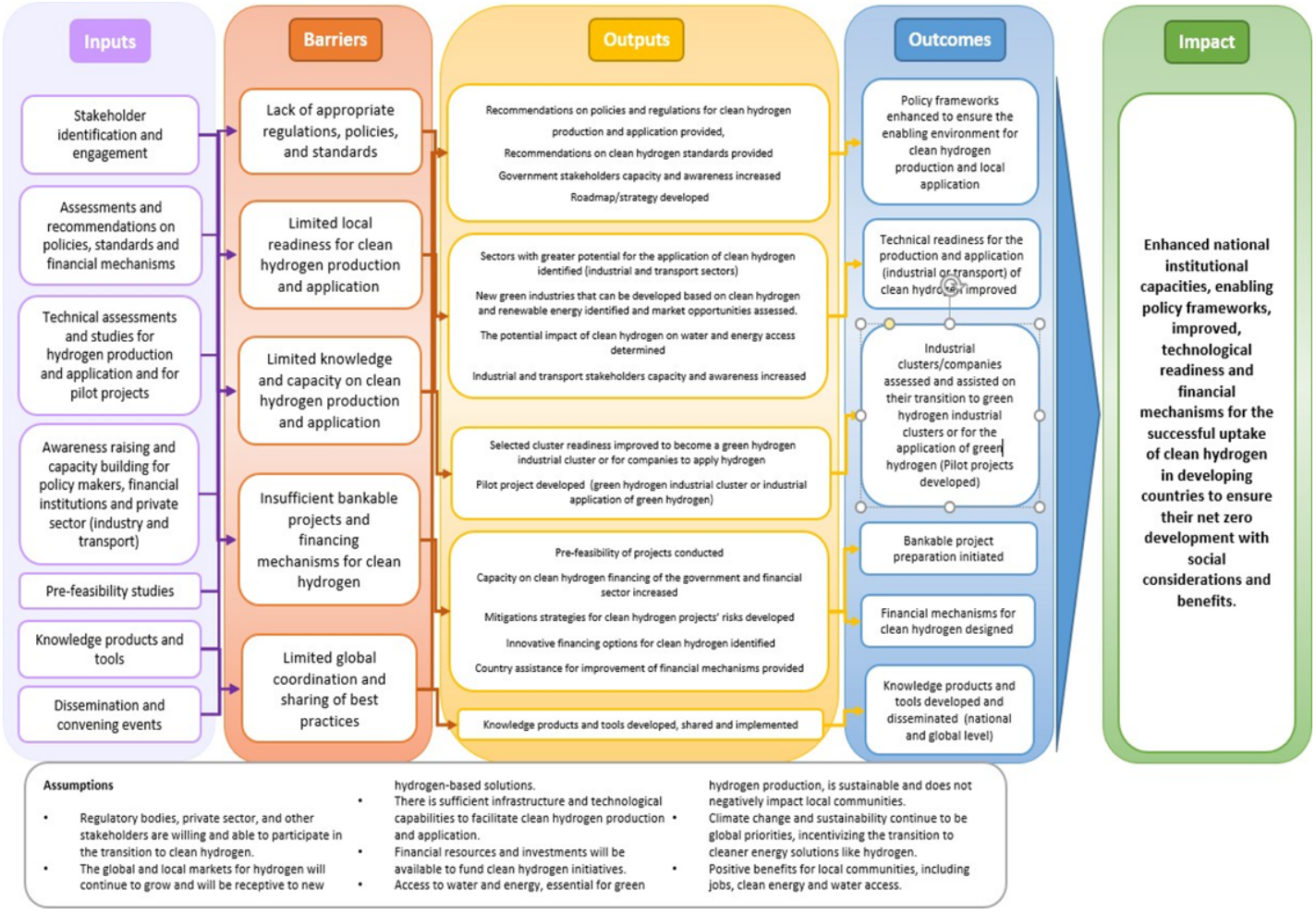


Figure 2: Theory of Change of GCHP

Programme Design and Components

Global Child Project: Knowledge management and dissemination / Knowledge platform

The global component of the programme will be delivered through a Global Child project, developing, sharing and disseminating knowledge products and tools to actively support and enhance all national child projects, as well as carrying out a coherence and M&E role for the overall programme.

Knowledge products and tools developed, shared and implemented

Global level knowledge products that provide guidance, promote innovation and share good practice regarding clean hydrogen production and application will be developed. Innovation is needed to reduce production costs, expand end-use applications and facilitate the sustainable transport and trade of clean hydrogen. A systemic approach to innovation will be integrated into the global component to ensure effective clean hydrogen technological development, and to provide knowledge of socio-environmental impacts and implications towards a growing clean hydrogen economy. The aim is to address the identified barriers and to support the National Child Projects through various knowledge products and tools.

Incorporating existing best practices:

- The Global Child Project will incorporate a thorough analysis of existing lessons and best practices in the clean hydrogen sector. This will involve reviewing successful models, policies, and innovations from relevant global initiatives, ensuring that the program's approach is informed by proven strategies. Special attention will be paid to such strategies that have effectively addressed gender gaps in the sector.
- A dedicated section in the knowledge platform will showcase these existing best practices, providing a reference point for all national child projects.

Learning from relevant projects and engaging to prevent overlaps:

- The GCHP's approach will include a systematic review of ongoing and completed projects, programs, and initiatives in the clean hydrogen space. UNIDO will actively engage with entities like GHIC, H4D, IRENA, and IEA TCPs to learn from their experiences and evaluations.
- Regular stakeholder meetings will be organized to discuss ongoing projects and identify potential overlaps. This will ensure that the proposed program complements, rather than duplicates, existing efforts.

Knowledge products and tools development:

- In the course of the proposed program, a range of knowledge products will be developed, including policy guidelines, technical manuals, and innovation case studies, tailored to the needs of developing countries in the clean hydrogen sector. Dedicated case studies that highlight the role of women in clean hydrogen will be prepared.
- Tools for stakeholder engagement, policy, standards, environmental and social governance (ESG), skills development and innovation for clean hydrogen will be created. The development of such tools will be demand-driven, based on surveys of stakeholder needs from the participating countries and other relevant actors. These tools will be designed to be user-friendly, with a focus on promoting gender equality and women's empowerment in the clean hydrogen sector, and adaptable to various contexts.
- A particular focus will be on creating materials that support capacity building in policy making, financial structuring, and technical implementation of clean hydrogen projects.

Convening and dissemination

The programme will support and facilitate knowledge management and serve as a platform for information sharing amongst the National Child Projects within the programme's community of practice as well as allowing

for broader information sharing amongst the larger global hydrogen community. Several working groups organized around the programme's thematic areas (policies, standards, innovation and skills development) will be established and will convene regularly online and three times in person throughout the duration of the programme. The working groups will place emphasis on south-south cooperation and local application of clean hydrogen and will be complementary to existing working groups. Experts working on other initiatives will be invited into the programme's working groups to bring expertise and to ensure synergies. Particular attention will be given to private sector engagement, encouraging their active participation in working groups, in order to collect inputs for project implementation and to inform government action. Outputs from the working groups will directly support the work of the National Child Projects by providing advice on policy, standards, skills, finance and project development. The programme will also support National Child Projects in disseminating lessons learned and studies that will be used to develop replication plans for scaling up clean hydrogen investments in each participating country. Finally, two global conferences will be organized with the aim to discuss the development of clean hydrogen economies in developing countries and to serve as a platform for the participating countries to position themselves as global front runners and connect with investors to support their clean hydrogen development plans.

National Child Projects

The National Child Projects will have the following five components and will collectively seek to achieve the objective of the programme. Components 1 to 4 will apply at the National Child Project level and Component 5 will be implemented at both the Global and National Child Project level. All projects will have an M&E component.

Participating countries can define and decide which components, outcomes and outputs will be implemented in each country based on their readiness for policies, standards, technical capacities, financing programmes and knowledge requirements. An overview of which outputs each National Child Project is participating in is shown in Figure 3 at the end of the project description.

Component 1 – Policy

Outcome 1.1 Enhanced clean hydrogen enabling environment of the participating countries for hydrogen production and local application

Several countries have developed their policies, strategies or roadmaps for hydrogen. Others are just starting their work on hydrogen policies and guidance is required. This component is designed to enhance the clean hydrogen policy frameworks within participating countries. This enhancement aims to establish a more accommodating environment for local hydrogen production and utilization, providing a basis for

the large-scale adoption of clean hydrogen. Through the activities developed under this component, the programme will facilitate meaningful stakeholder dialogue, policy and regulation improvements, standardization, and increased capacity and awareness among government stakeholders. The Global Child Project will support the outputs of the National Child Projects with guidelines, methodologies, case studies and capacity building material as well as through convening working groups, conferences and hosting the knowledge platform. Component 1 has the following five outputs, with individual countries selecting the outputs most relevant for them.

Output 1.1.1: Institutional stakeholders mapped and convened

The policy frameworks for a hydrogen economy are complex and several government institutions are involved in their development and implementation. Whether the policies for hydrogen are at national level or are for application in a specific sector, it is essential to understand who the institutional stakeholders are and ensure their interactions and engagement. This output aims to provide a strategic process for stakeholder identification and engagement. This critical initial stage will involve the mapping of country or sector-specific stakeholders integral to the successful implementation of clean hydrogen policies and practices (at national or at sector level). A thorough identification of the relevant stakeholders in each country will provide a comprehensive overview of the existing hydrogen landscape and identify the key players and potential barriers. Particular attention will be paid to ensuring organisations representing or led by women are included. Subsequent stakeholder engagement activities will focus on promoting cooperation and alignment amongst these identified entities, primarily through dialogue sessions and workshops. These interactions will ensure a more streamlined process for policy application and will help build consensus on strategic directions.

Output 1.1.2: Recommendations on policies and regulations for clean hydrogen production and application developed/adopted, including environmental and water related policies and taking into account gender responsiveness and market scale up

As previously stated, several countries are at different stages of their hydrogen policy work. Some countries have developed their overall national policies for hydrogen, others are more advanced and developing policies for the local application and others are at very early stages and starting to draft their strategies or roadmaps. The activities within this output seek to address existing gaps in policies and regulations and identify market barriers preventing the large-scale implementation of clean hydrogen. This output will include a rigorous assessment of current policies and regulations related to hydrogen production and application, including environmental, social and energy policies and regulations. The goal is to discern areas requiring improvement or development and provide relevant recommendations for a more conducive policy environment. Moreover, a thorough examination of potential market barriers will be conducted to understand obstacles to clean hydrogen market scale-up. These findings and corresponding recommendations will be presented to government stakeholders during consultation workshops, fostering a collaborative effort toward enhancing the regulatory

framework. Recommendations will include a focus on the inclusion of gender responsive policy elements and attention will be given towards a gender balance among the participants in the consultation workshops. The objective of the stakeholder participation is to bring together a diversity of expertise and experiences to ensure a holistic approach to the discussions. Where possible, support will be provided to ensure adoption of the recommendations.

Output 1.1.3: Recommendations on clean hydrogen standards provided/adopted

Work will be carried out on the standardization aspect of clean hydrogen and its derivative products. Activities here will involve a comprehensive examination of international hydrogen standards, with a focus on the technologies along the value chain, accurate measures and accounting (e.g., H2 purity, pressure, volume, temperature, weight, DC/AC current, CO2 content; gas mixing, leakages, etc.); and the applications of clean hydrogen. This output will strive to establish a strong foundation for clean hydrogen quality infrastructure, taking cues from international practices and tailoring them to the specific context of each country. Subsequently, the most relevant standards will be prioritized, and customized recommendations will be developed, aiming to guide the respective countries' clean hydrogen sector toward globally accepted best practices.

Output 1.1.4: Government stakeholders' capacity and awareness increased

Capacity building and increased awareness among government stakeholders is extremely important for ensuring successful and sustainable policy frameworks. For this, capacity needs assessments will be conducted to identify areas that require knowledge and skills enhancement. Based on this assessment, capacity-building activities, such as training workshops, will be developed and implemented. These activities will cover essential topics related to clean hydrogen, such as policies, standards, financial mechanisms, and permitting procedures. These will also cover the different results of the studies conducted in the previous outputs. By empowering government stakeholders, particularly the ones identified in output 1.1.1 with the necessary knowledge and skills, this output aims to ensure the successful integration of clean hydrogen policies and practices into national systems.

All capacity-building activities and training workshops will be thoughtfully crafted to address and incorporate gender-specific considerations and challenges, fostering an environment where both men and women are equally equipped and encouraged to contribute to the integration of clean hydrogen policies and practices into national systems. This approach not only aligns with global sustainability and equality objectives but also enriches the project outcomes by leveraging diverse perspectives and expertise in policy formulation and execution.

All knowledge products as well as the results of the different assessments and studies will be included in the global component's platform. These will also be shared among the participating countries and also feed the global knowledge products.

Output 1.1.5: Clean hydrogen roadmap/strategy developed/adopted

Finally, for countries that are in the early stages, for example Pakistan, the Philippines and Nigeria, the programme will support the development of a clean hydrogen roadmap or strategy. The drafting of this document will involve extensive consultations with key stakeholders at national level, ensuring a comprehensive and inclusive strategy which will include attention given towards a gender balance among the participants in the consultation workshops. This strategy/roadmap will outline specific goals, strategic pathways, and expected timelines, providing a clear vision for the integration of clean hydrogen into their energy and climate development plans. At the centre of the strategies/roadmaps will be a focus on inclusiveness and ensuring the benefits are felt equally be women and men. The development of such a strategy/roadmap not only reinforces the commitment to clean hydrogen adoption but also serves as a guide for the countries' just hydrogen transition journey. Support will be provided, as appropriate, to adopt the hydrogen roadmaps/strategies.

Table 1: Summary of Component 1 expected outcome and outputs indicators*

Output	**Output and Outcome indicators**
Outcome 1	# of clean hydrogen policies/regulations/roadmaps, including environmental and water related policies and taking into account gender responsiveness and market scale up developed/adopted # of government stakeholders with capacity and awareness increased (40% women)
Output 1.1.1	# of stakeholder mapping exercises
Output 1.1.2	# of clean hydrogen production and application related polices and regulations reviewed # of clean hydrogen production and application related policies and regulations developed/adopted, including environmental and water related policies and taking into account gender responsiveness and market scale up
Output 1.1.3	# of standards for clean hydrogen production/application provided/adopted # of standards for clean hydrogen technologies provided/adopted
Output 1.1.4	# of government capacity needs assessment # of government stakeholders trained (40% women)
Output 1.1.5	# of national clean hydrogen roadmap/strategies developed/adopted

*Targets for the indicators will be elaborated during the PPG phase

Component 2 – Technical Readiness

Outcome 2.1 Technical readiness for the production and application of clean hydrogen improved

Enhancing local technical readiness for the production and industrial application of clean hydrogen of the private sector is crucial for the development of clean hydrogen in the participating countries. Through fostering innovation, supporting the technical readiness in participating countries will help build local skills and capacities to develop local clean hydrogen industries. The objective of this component is to quicken the adoption of clean hydrogen by increasing the technical capacity through studies and capacity building while ensuring it is optimally utilized within local industries and other potential off-takers. In addition, it aims to estimate the reductions or prevention of CO2 emissions due to the local application of clean hydrogen. The Global Child Project will support this component with, inter alia, the development of methodologies for CO2 emission calculations, guidelines for identifying, prioritizing applications and carrying out value chain analyses plus capacity building material. This component will have the following outputs:

Output 2.1.1 Sectors with greater potential for the application of clean hydrogen identified (industrial and transport sectors)

The first output entails identifying and prioritizing sectors with the highest potential for the application of clean hydrogen. In the preliminary phase, a comprehensive study of the country's industry and transport sector will be conducted. This process includes assessments of the existing local demand for hydrogen. Further analysis and prioritization of sectors will be undertaken based on the initial evaluation. In-depth research on industrial infrastructures, process conversion, and application of hydrogen within the chosen sectors will follow. Concurrently, a methodology for CO2 emission estimation will be developed and an estimation for the prioritized sectors provided. This systematic approach offers a strategic direction for the application of clean hydrogen in sectors where it can have the most substantial environmental and economic impact.

Output 2.1.2. New industries that can be developed based on clean hydrogen and renewable energy identified and market opportunities assessed.

The second output focuses on identifying potential new industries that could be established based on clean hydrogen and renewable energy, coupled with an assessment of market opportunities. Initial activities will revolve around evaluating local and international market opportunities for clean hydrogen, considering both imports and exports. This research will be followed by a study aimed at identifying new industrial sectors that could benefit from the application of clean hydrogen and renewable energy as well as analyses of the hydrogen value chain. The most relevant new industrial sectors will be prioritized through a consultative process involving local stakeholders. The consultative process will ensure there

is representation from women and disadvantaged groups. Lastly, business models and investment proposals for the prioritized sectors will be developed, setting the stage for potential economic growth and supporting the just clean hydrogen transition.

Output 2.1.3 The potential impact of clean hydrogen industrial application on water and energy access determined

Clean hydrogen production involves considerable renewable energy, land and water resources. Understanding its potential effects on local water supplies, land use and energy access ensures a balanced and sustainable approach to building-up a clean hydrogen economy. The third output will seek to determine the potential impact of the production and application of clean hydrogen on water and energy access as well as land use. This critical phase will involve an assessment of the water, land and energy uses and how these activities could affect access for local communities, particularly women in these communities.

Output 2.1.4. Industry and transport stakeholders' capacity and awareness increased

The fourth output is aimed at increasing capacity and awareness on clean hydrogen production and application among stakeholders in the industry and transport sectors. Recognizing that stakeholders' understanding and buy-in are critical for the success of any initiative, this output will start by conducting stakeholder identification, prioritization and capacity needs assessments in the selected sectors. These assessments will help determine focus areas for development, including hydrogen production, standards, infrastructure, innovation, and application. Based on the needs identified, training materials will be developed, and workshops will be conducted to improve understanding and competencies among these stakeholders. In acknowledging the imperative role of gender balance in driving sustainability and innovation in clean hydrogen initiatives, the work will explicitly incorporate gender considerations into every stage of stakeholder engagement and capacity-building. The approach ensures that women in the industry and transport sectors are not only identified and included as key stakeholders but also that the training materials and workshops are crafted to be gender- sensitive, acknowledging and addressing the unique challenges and perspectives they bring to the table. The training will also cover the results of the studies conducted in the previous outputs. This systematic approach will help ensure that industry and transport sector stakeholders are well-prepared to support the transition to clean hydrogen.

Table 2: Summary of Component 2 expected outcome and outputs indicators

Output	**Outcome and Output indicators***
Outcome 2	# of industry and transport stakeholders with capacity and awareness increased (40% women)

Output 2.1.1	# of Reports on the priority industry and transport sectors for green hydrogen application # of Methodologies for CO2 emission estimations # of national estimates for avoided CO2 emissions due to local application of green hydrogen
Output 2.1.2	# of hydrogen value chain analyses # of studies identifying new industrial sectors that could benefit from green hydrogen and RE and market opportunities assessed
Output 2.1.3	# of assessments of impact of clean hydrogen application on water and energy access, including any differentiated access between women and men
Output 2.1.4	# of industry and transport stakeholders trained (40% women)

*Targets for the indicators will be elaborated during the PPG phase

All knowledge products as well as the results of the different assessments and studies will be included in the global component's platform. These will also be shared among the participating countries and feed the global knowledge products.

Component 3 –Green Hydrogen industrial clusters and pilot project (s)

The programme will focus on identifying, assessing, and transitioning industrial clusters or (industrial or transport) companies to leverage clean hydrogen. The overarching outcomes of this component are two-fold. Outcome 3.1 aims to identify and support industrial clusters or companies with high potential for transitioning to clean hydrogen utilization while Outcome 3.2 will support the development of some of these into pilot projects. The Global Child Project will be supporting the National Child Projects with knowledge products and tools to assist in providing support and training to the companies and industrial clusters. This will build on the work developed under UNIDO's Green Hydrogen Industrial Cluster programme.

UNIDO's Green Hydrogen Industrial Clusters

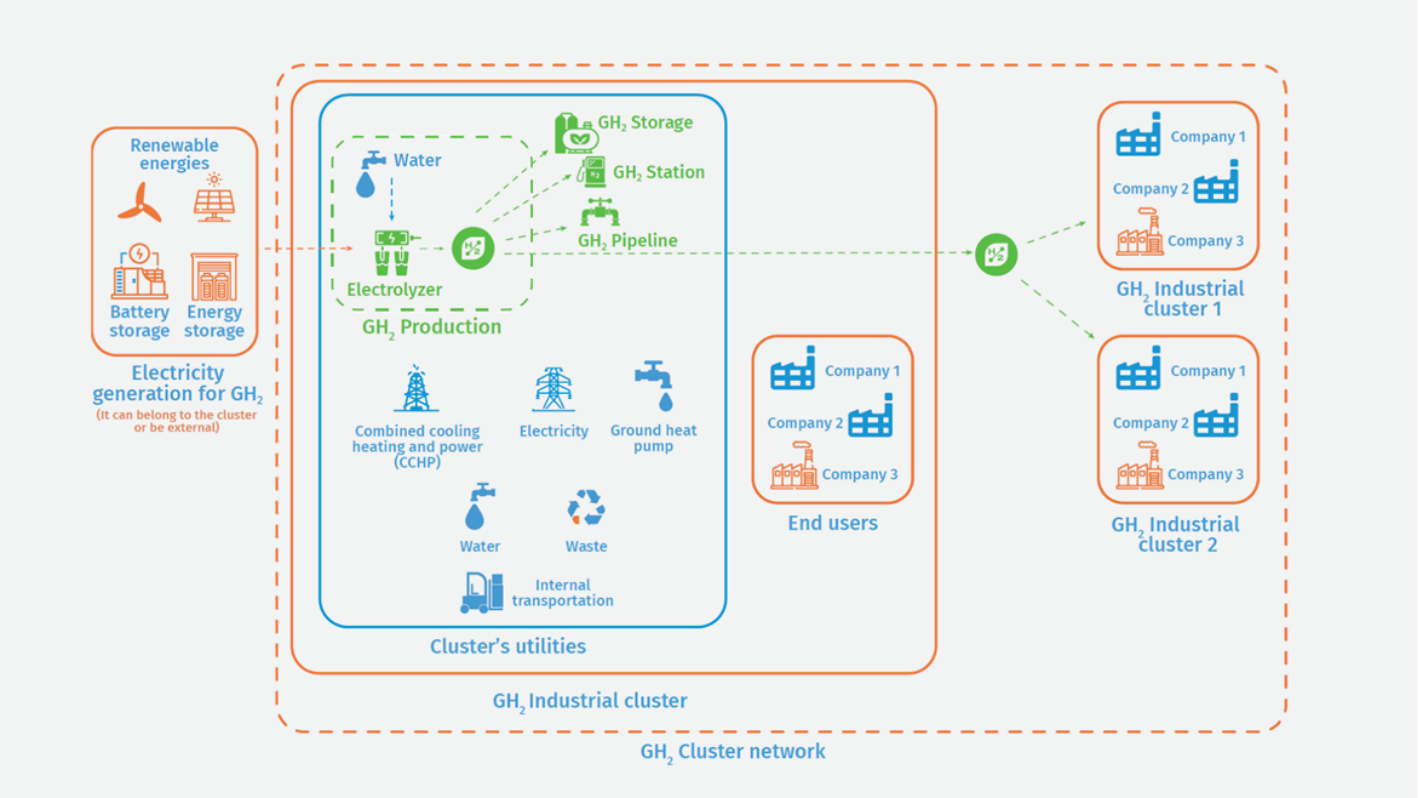


Figure 2: Green hydrogen industrial clusters

UNIDO defines green hydrogen industrial clusters (GHIC) as industrial regions or clusters that share green hydrogen (production, transport and use) and renewable energy electricity, in addition to other resources, for different purposes including material production, heating and cooling, local mobility and industrial feedstock. Such clusters are characterized by internal linkages enabling cooperation, specialized expertise, services, resources, suppliers and skills, and further generate various advantages among the participants, including the distribution of the investment and mitigation of risks. Green hydrogen industrial clusters can reduce greenhouse gas emissions, promote investment, create employment and foster economic growth that is environmentally sustainable and socially responsible.

As a key element of its GPHI, UNIDO developed a model for “green hydrogen industrial clusters”. This model aims to accelerate the application of locally produced green hydrogen in industrial zones, clusters and parks. Its aim is to serve as a replicable model through which countries can deploy green hydrogen technologies to achieve their emissions reductions and industrial production goals as well as to generate economic and social opportunities. This requires significant amounts of green hydrogen and coordination among the stakeholders within the clusters. The model provides guidance for governments and industries in the preparation, implementation and upscaling of green hydrogen industrial clusters.

The model has three stages that are summarized and explained below. Throughout the phases, monitoring and evaluation exercises are carried out to track progress and update the model based on technological, cost and environmental developments.

Phase	Activities in the Phases
Phase 1	Preparation of green hydrogen clusters Awareness-raising Stakeholder engagement Preparation of the objective, strategy and work plan of a green hydrogen cluster Feasibility studies Financial mobilization
Phase 2	Deployment of technologies for green hydrogen, Commissioning of pilot projects Production, process adaptation and use of green hydrogen in industrial processes Testing of pilot projects Commercial operation
Phase 3	Upscaling the use of green hydrogen in industry Programmes for uptake and challenges Development of green hydrogen networks

During Phase 1, industrial clusters are brought to a level of readiness wherein pilot green hydrogen projects can be developed during Phase 2. At this stage, initial pilot projects are supported as well as the adaptation of the cluster to ensure sector coupling and future upscaling. Phase 3 will lead to a successful implementation of green hydrogen strategies and a 100% provision of green hydrogen to meet the hydrogen demand of the production cluster. This will create success studies and examples of good practices for replicability.

Outcome 3.1 Industrial clusters and companies with great potential to transition to green hydrogen identified, assessed and support provided.

Output 3.1.1: Industrial clusters with greater potential to become a green hydrogen industrial cluster or industry or transport companies with greatest potential identified and selected

The activities within this outcome comprise the identification of potential industrial clusters or companies (industry or transport) suitable for the application of green hydrogen. The prioritized sectors from the studies conducted in output 2.1.1 will be used. The activities under this output involve systematic identification and analysis of potential clusters or companies that could benefit from green hydrogen. This process involves assessing current industry/transport practices, potential for hydrogen application, and demand for hydrogen. In particular, the analysis would provide a comprehensive understanding of the quantity of hydrogen required, potential areas of application, necessary energy and water resources, and projected CO2 reduction or prevention estimates. The result is a selection of clusters or companies, with potential for the transition to green hydrogen utilization, based on their potential impact and readiness for change.

The Global Clean Hydrogen Programme will use Phase 1 of the UNIDO's Green Hydrogen Industrial Cluster approach to identify industrial clusters, in addition to identifying individual companies (eg a mining or haulage company, or a cement factory) with the potential to transition to green hydrogen.

Output 3.1.2: Selected clusters' or companies' readiness improved to become a green hydrogen industrial cluster/company

Once potential industrial clusters or companies have been identified, the second output of this component aims to enhance their readiness to become a green hydrogen industrial cluster. The preparatory phase involves conducting technical assessments focused on clean hydrogen production and application, energy efficiency, renewable energy potential and sector coupling within the cluster or near the company. Additionally, environmental and social impact assessments will also be carried out, specifically considering implications for water and energy access for local communities. Subsequently, pre-feasibility studies for the production and application of clean hydrogen within the cluster will be conducted, ensuring a seamless transition. Lastly, stakeholders in the cluster will be engaged in training workshops, during which the results of the studies will be shared, and the next steps outlined. Stakeholder engagement and capacity-building will explicitly ensure women's participation and incorporate gender considerations into every stage. This holistic approach to readiness ensures that the cluster is not only prepared to transition, but that all stakeholders are actively engaged in the process.

Outcome 3.2 Pilot project on clean hydrogen developed

Outcome 3.2 focuses on the development of a pilot project within an industrial cluster and its transition to a clean Hydrogen Industrial Cluster or the application of green hydrogen within a company.

Output 3.2.1 Clean hydrogen pilot project supported

Building on the selected cluster or company, the programme will support the further development of the identified pilot project. This involves selecting an industrial cluster or company, prioritizing it based on a range of factors including potential for success and impact. Thereafter, a comprehensive project document will be developed, ensuring compliance with environmental, social, and gender policies. This document will serve as the roadmap for the pilot project. Additionally, support will be provided in the preparation of an investment proposal, along with identification of potential investors, both domestic and international. In terms of financial backing, the project will be connected with financial mechanisms developed under Component 4 and identified co-financiers. Once the framework is in place, the programme will facilitate the transfer of knowledge and provide technical assistance for the implementation of clean hydrogen technologies, ensuring that the cluster or company has the necessary resources and expertise. The final stage involves the physical transfer of technologies, ranging from electrolyzers to solar panels to hydrogen lift trucks, amongst others. This comprehensive support system lays the groundwork for a successful pilot project and serves as a model for subsequent projects in the clean hydrogen sector.

Table 3: Summary of Component 3 expected outcomes and outputs indicators

Output	**Outcome and Output indicators***
Outcome 3.1	# of industrial clusters identified and supported in their transition to clean hydrogen # of companies identified and supported in their transition to clean hydrogen (% with women in senior management roles)
Output 3.1.1	# of industrial clusters and companies assessed and identified to transition to clean hydrogen (%with women in senior management roles)

Output 3.1.2	# of pre-feasibility studies conducted for industrial clusters and companies # of stakeholders trained in the clean hydrogen potential application (40 % women)
Outcome 3.2	# of clean hydrogen pilot projects started
Output 3.2.1	# of clean hydrogen pilot projects supported

*Targets for the indicators will be elaborated during the PPG phase

Component 4 – Financing

Outcome 4.1 Bankable project preparation initiated

Output 4.1.1 Project pipelines reviewed

Activities within this output will serve to improve clean hydrogen project proposals with respect to their eligibility for financing. The clean hydrogen projects will be identified and included in a country list. A list of best practice project criteria will be developed by the Global Child Project and adapted to each country, and project proposals will be evaluated against this list and prioritized. A maximum of two of the prioritized proposals will be further revised and recommendations will be provided on how to enhance the viability and bankability as well as the quality of the proposals. The list of projects and the results of the revision will be shared with government stakeholders and other potential investors to promote projects and potential financing.

Output 4.1.2: Economic pre-feasibility of projects conducted

The economic feasibility of the prioritized projects will be evaluated. For this, an economic pre-feasibility study will be conducted focusing on key financial figures (CAPEX, OPEX), revenue streams and business cases. This will include economic attractiveness for the investor (NPV, IRR), robustness of the case (sensitivity analyses) and rough financial analysis. This output can be complementary to output 3.1.2 in case the prioritized project is the same as the pilot project of component 3. The Global Child Project will assist in the feasibility by providing guidelines and sharing expertise between countries.

Outcome 4.2 Financial mechanisms for clean hydrogen designed

Financial mechanisms for clean hydrogen will be designed or improved upon with support from the Global Child Project and a specific working group focusing on finance for clean hydrogen. Support will include advice, mitigation strategies and capacity building material.

Output 4.2.1 Capacity on clean hydrogen financing of the government and financial sector increased

This output is aimed at increasing capacity and awareness on financing and financial mechanisms for clean hydrogen projects among stakeholders in the public and financial sectors of the country. The activities within this output will start by conducting the identification, prioritization and capacity needs assessments of the stakeholders from the public and financial sectors. These assessments will help determine the level of knowledge and capacity the stakeholders have on the financing of clean hydrogen projects and the development of financial mechanisms. Based on the needs identified, training materials will be developed, and workshops will be conducted to improve understanding and competencies among these stakeholders.

The activities within this output will actively engage women in the public and financial sectors, ensuring that they are not only participants but also influencers in the development and implementation of financial mechanisms for clean hydrogen projects. The interventions and training materials will be tailored to be gender-sensitive, addressing the unique barriers women might face in this sector, thereby ensuring an equitable enhancement of capacities and crafting a pathway that supports and elevates diverse leadership and expertise in the financing of clean hydrogen endeavours.

All knowledge products as well as the results of the different activities for financing clean hydrogen will be included in the global component's platform. These will also be shared among the participating countries and also feed the global knowledge products.

Output 4.2.2: Mitigations strategies for clean hydrogen projects' risks developed

This output will provide insights regarding the types of risks, their importance for capital cost, and strategies on how to mitigate these risks in a specific country context. The impact of risk mitigation on the clean hydrogen production and supply cost will be elaborated on as well as the cost and actions needed to implement these risk mitigation solutions. This will be done through a country report, that will be shared with relevant stakeholders for its validation and later promotion.

Output 4.2.3 Innovative financing options for clean hydrogen identified

Through this output, a document on innovative financing options for clean hydrogen will be prepared. The document will aim to deepen understandings regarding concessional financing, blended financing, carbon financing and other innovative financing solutions in the hydrogen production, infrastructure and end-use context. The document will be developed according to the context of the country.

Output 4.2.4 Country assistance for improvement of financial mechanisms provided

Countries interested in developing, or that already have, a financial mechanism for clean hydrogen projects will receive technical assistance for the revision and improvement of the mechanisms. The assistance will be provided on concessional financing, blended financing, carbon financing and other solutions in concrete terms in a specific country and project context, drawing on best practice in the clean

hydrogen sector and other sectors. The results of the assessment will be included in the training materials of output 4.2.1. and it will be presented in the capacity building and awareness raising workshops of that output.

Table 4: Summary of Component 4 expected outcomes and outputs indicators

Output	**Outcome and output indicators***
Outcome 4.1	# of bankable project preparation initiated
Output 4.1.1	# of project pipeline reviews # of prioritized projects receive support on enhancing viability and bankability of projects
Output 4.1.2	# of economic pre-feasibility studies of clean hydrogen projects conducted
Outcome 4.2	# of clean hydrogen financial mechanism designed or improved
Output 4.2.1	# of capacity needs assessment of stakeholders from the public and financial sectors # of stakeholders trained in financing of clean hydrogen projects and the development of financial mechanisms (40% women)
Output 4.2.2	# of country reports on clean hydrogen risk mitigation strategies
Output 4.2.3	# of reports on innovative financing options for clean hydrogen
Output 4.2.4	# of sets of recommendation to design, revise and improve financial mechanisms for clean hydrogen projects

*Targets for the indicators will be elaborated during the PPG phase

Component 5 – Knowledge management and dissemination

Outcome 5.1 - Global stakeholders have improved understanding of the clean hydrogen sector and south-south cooperation in developing the sector is established

Output 5.1.1 Knowledge products and tools developed, shared and implemented

At National Child Project level, country activities will contribute to the development of global knowledge products and tools, by providing data, case studies, etc. At the country level, these products will be shared and disseminated through workshops or awareness raising events. Country stakeholders will participate in the surveys to define the topics and themes. However, focus on policy, standards, Environmental and Social Governance (ESG), innovation and skills development for clean hydrogen will be encouraged. Other activities may include collecting and analyzing good practices around clean hydrogen production and application in a variety of regulatory environments, and the research and development of tools (e.g., policy packages,

recommendations on standards for green hydrogen, and technical guidelines). All knowledge products and tools will be developed to be gender sensitive and to ensure equitable access and use. Similarly, all workshops or awareness raising events will ensure women's participation and a role of influence.

From the start of the programme, an interoperable knowledge and collaboration platform will be developed by the Global Child Project and made accessible to all programme beneficiaries and stakeholders, containing knowledge tools and products developed from the programme. It will serve throughout the programme's lifetime to provide partners with access to centralized, accumulated programme knowledge on best practices and to facilitate knowledge-empowered partner collaboration.

Output 5.1.2 Convening and dissemination conducted

Through participation in the programme, counterparts will be part of its global knowledge and collaboration platform, which provides partners with access to knowledge products, tools and an open a space to collaborate and exchange experience and knowledge. In parallel with the programme's knowledge and collaboration platform, countries will participate in the working groups within their selected thematic area (policies, standards, innovation and skills development). Countries will convene regularly online and meet three times in person throughout the duration of the programme. Countries will conduct lessons learned studies that will be used to develop replication plans for scaling up hydrogen investments in each participating country. Finally, programme countries will attend and participate in the two global conferences that will be organized with the aim to discuss the development of clean hydrogen economies in developing countries and to serve as a platform for the participating countries to position themselves as global front runners and to connect themselves with investors to support their hydrogen plans.

The knowledge products will be tracked and adapted into the knowledge and collaboration platform. This component will take a systems integration approach to knowledge management and learning. That is, through the platform, the component will facilitate the sharing, reuse and adaptation of all knowledge products among partners, thereby promoting knowledge durability throughout the programme. To facilitate a fair, collaborative environment for programme participants, the component will also ensure that those responsible for gathering knowledge and developing knowledge products are appropriately recognized and cited for their contributions. From a macro-perspective, the programmes' knowledge component aims to provide a space for vibrant south-south knowledge exchange and collaboration towards the project objective. Activities and all results from the component will be gender responsive and will ensure the active participation of women.

Table 5: Summary of Component 5 expected outcome and outputs indicators

Output	**Outcome and output indicators***
Outcome 5.1	# of countries piloting/applying best practice guidelines/policy packages # of users of the knowledge and collaboration platform (40% women) % of stakeholders with improved understanding of the clean hydrogen sector
Output 5.1.1	# of knowledge and collaboration platforms / websites # of gender-sensitive global knowledge products (eg. case studies, best practice, policy packages, recommendations, technical/ESG guidelines, skills development material)
Output 5.1.2	# of global working groups established

	# of working group meetings (% women participating/facilitating) # of global conferences (% women participating/facilitating)

*Targets for the indicators will be elaborated during the PPG phase

Programme Coherence

The following figures indicate the target project outputs for each of the child projects and how the National Child Projects interact with the Global Child Project. In particular, this shows how the Global Child Project will be supporting each of the other component outputs and outcomes with knowledge products and tools and the facilitation of working groups and south-south cooperation. Likewise, each of the National Child Projects contributes to the overall outcomes of the project by enhancing their respective enabling environments for clean hydrogen production and application, by improving technical readiness for clean hydrogen, supporting companies or industrial clusters to transition, supporting financing of clean hydrogen and developing and sharing knowledge.

Under Component 1, the Global Child Project will provide the National Child Projects with guidelines for institutional stakeholder mapping, for development of policies and regulations and training and awareness raising material for capacity building. Further policy/standards working groups will feed into the National Child Projects and the website and conferences will provide information and the opportunity to exchange/learn from other countries. Experiences, lessons learned and case studies from the National Child Projects will be shared through the Global Child Project. Under Component 2, guidelines will be developed to support the National Child Projects as well as training and awareness raising material to be adapted to the national context for capacity building. Similarly in Component 3, the Global Knowledge Platform will support the National Child Projects in their identification, selection and support for pilot projects. Knowledge products and tools will be developed to support financing of clean hydrogen projects which will assist National Child Projects in creating pipelines of bankable projects and designing financing mechanisms. Even nations that do not participate in Component 4 can access this knowledge and participate in the working groups. Component 5 is common across all child projects with National Child Projects providing information to and using knowledge from the Global Child Project.

Outcomes/ Outputs	Global	Egypt	Algeria	Malaysia	Namibia	Nigeria	Philippines	South Africa	Pakistan
Outcome 1.1 Enhanced clean hydrogen enabling environment of the participating countries for hydrogen production and local application									
Output 1.1.1: Institutional stakeholders mapped and convened									
Output 1.1.2: Recommendations on policies and regulations for clean hydrogen production and application developed/adopted, including environmental and water related policies and taking into account gender responsiveness and market scale up									
Output 1.1.3: Recommendations on clean hydrogen standards provided/adopted									
Output 1.1.4: Government stakeholders' capacity and awareness increased									
Output 1.1.5: Clean hydrogen roadmap/strategy developed/adopted									
Outcome 2.1 Technical readiness for the production and application of clean hydrogen improved									
Output 2.1.1 Sectors with greater potential for the application of clean hydrogen identified (industrial and transport sectors)									
Output 2.1.2. New industries that can be developed based on clean hydrogen and renewable energy identified and market opportunities assessed									
Output 2.1.3 The potential impact of clean hydrogen industrial application on water and energy access determined									
Output 2.1.4. Industry and transport stakeholders' capacity and awareness increased									
Outcome 3.1 Industrial clusters and companies with great potential to transition to green hydrogen identified, assessed and support provided									
Output 3.1.1: Industrial clusters with greater potential to become a green hydrogen industrial cluster or industry or transport companies with greatest potential identified and selected									
Output 3.1.2: Selected clusters' or companies' readiness improved to become a green hydrogen industrial cluster/company									
Outcome 3.2 Pilot project on clean hydrogen developed									
Output 3.2.1 Clean hydrogen pilot project supported									
Outcome 4.1 Bankable project preparation initiated									
Output 4.1.1 Project pipelines reviewed									
Output 4.1.2: Economic pre-feasibility of projects conducted									
Outcome 4.2 Financial mechanisms for clean hydrogen designed									
Output 4.2.1 Capacity on clean hydrogen financing of the government and financial sector increased									
Output 4.2.2: Mitigations strategies for clean hydrogen projects' risks developed									
Output 4.2.3 Innovative financing options for clean hydrogen identified									
Output 4.2.4 Country assistance for improvement of financial mechanisms provided									
Outcome 5.1 - Global stakeholders have improved understanding of the clean hydrogen sector and south-south cooperation in developing the sector is established									
Output 5.1.1 Knowledge products and tools developed, shared and implemented									
Output 5.1.2 Convening and dissemination conducted									
Monitoring & Evaluation									

Figure 3: Child project focus

The GCHP programme will also work with other organizations and initiatives working in the clean hydrogen space, at both the global level and at country level. These stakeholders will be involved as any of the following: knowledge partners, experts on working groups, on the Global Advisory Board, as co-financiers or/and as co-developers and partners. Further details of these initiatives and stakeholders and how the programme is working with them is included in the Baseline section and the Stakeholder section of the document. Figure 4 shows how the different components link to the global component and the interaction with other complementary initiatives.

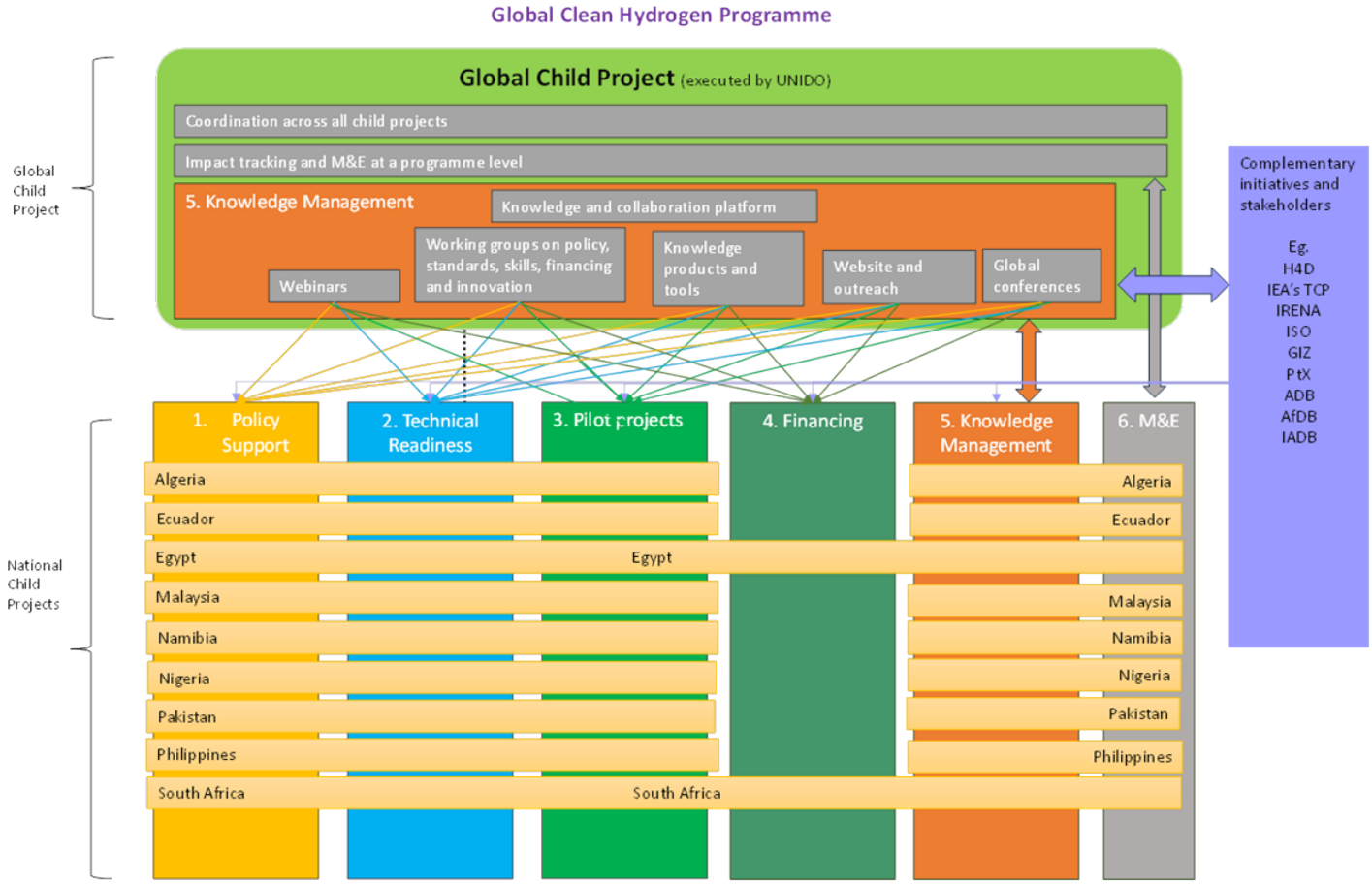


Figure 4: GCHP interaction between the Global Child Project and National Child Projects

UNIDO GEF Project linked to the programme

The GEF project on "Green hydrogen energy integrated demonstration application project in China", will be aligned with the Global Clean Hydrogen Programme. This project is led by UNIDO and executed by the International Hydrogen and Fuel Cell Association (IHFCA), and Ministry of Industry and Information Technology (MIIT) of China, with a total of 17,767,000 USD GEF Resources. The project aims to catalyze green hydrogen production and application in hard-to-abate industries, with the direct reduction of 17 million tCO2 eq. through the commercialization of green hydrogen fuel cell vehicles and enhanced energy security. The project components will be linked to the Global Programme components forming a strong alignment demonstrated by the following:

- **Component 1:** Suggestions on policies, standards, and regulations will be provided and an information platform will be developed to scale applications in hard-to-abate industrial sectors and transportation. The programme's knowledge platform will be linked to the China project's platform

providing information on scaling applications and relevant policies, standards and regulations can be used as a basis for recommendations where conditions are similar. (Component 1 and 2)

- **Component 2:** Multiple demonstrations will be conducted for integrating green hydrogen into the supply chain through identifying and assessing current industry practices, potential for hydrogen applications and demand for hydrogen in an industrial cluster. The Chinese project will feed into the global programme's technical readiness assessments (Component 2) and pilot assessments (Component 3) with its experience, case studies and best practice.

- **Component 3:** Capacity building, training workshops and awareness raising of national and local policy makers, industry and relevant stakeholders on green hydrogen will be conducted. Material from the China project can be used, where considered relevant, for capacity building and awareness raising under Components 1, 2, 3 and 4.

- **Component 4:** Knowledge dissemination, information exchange and international cooperation will be promoted with the aim to enhance industrial stakeholders' manufacturing quality and maintenance capabilities. Knowledge will be shared between the China project and this programme and international cooperation promoted between the national child projects and China. Experts from the China project may be invited to participate in the programme's Working Groups (Component 5) to share their expertise.

Beneficiaries

Government institutions: Will receive support and capacity building on policies for clean hydrogen provided in component 1 of the programme. This strategic support will be addressed to different institutions, one relevant ministry would be the Ministries of Energy or similar which are often the primary responsibility for energy and hydrogen policies and regulations. They can lead or support convening institutional stakeholders, allowing the formulation and adoption of policy recommendations, develop clean hydrogen standards and participate in capacity building. These stakeholders include the Ministries of Industry, Ministries of Environment, Ministries of Finance, Ministries of Science and Innovation, Ministries of Transport, Ministries of Education and local governments. Additionally, they, in particular the Ministries of Finance, can utilize supportive financing mechanisms by providing fiscal incentives, subsidies, or seed funding for clean hydrogen projects.

Private Sector – potential producers and off-takers: These stakeholders, including producers and potential off-takers such as industrial clusters or hard to abate sectors, will benefit from the different assessments and capacity building activities from component 2. The policies and standards from component 1 will also benefit their activities and facilitate an environment for the hydrogen market to take off. One key element will be the identification of potential new industries that can be developed based on clean hydrogen and renewables.

Finally, these stakeholders will understand the potential impact the production can have on the local environment and communities. These inputs will give tools and key information for the best decision-making process. Further, any pilot projects developed (under Component 3) will also provide valuable experience/case studies for others interested in becoming involved in the green hydrogen sector.

Technology Providers and Researchers: These stakeholders can provide support in the development of the different assessments and knowledge products. Through the programme, the technologies can be promoted, and they can also learn what countries decide on their policies and standards.

Financial Institutions: Financial institutions will benefit from defined clean hydrogen projects that they can potentially support and promote their different financial products. They will also receive capacity building on the development of financial instruments for clean hydrogen projects and could benefit from future financial instruments designed for the growing hydrogen market.

Local Comunities: They will better understand the impact that clean hydrogen production and application can have within their communities, particularly regarding energy and water access. Additionally, they can also learn what kind of potential benefits clean hydrogen projects can bring including new jobs.

Gender Equality and Women's Empowerment

UNIDO recognizes that gender equality and the empowerment of women have a significant positive impact on sustained economic growth and inclusive industrial development, which are key drivers for poverty alleviation and social progress. Commitment of UNIDO towards gender equality and women's empowerment is demonstrated in its policy on Gender Equality and the Empowerment of Women (2015), which provides overall guidelines for establishing a gender mainstreaming strategy. UNIDO has also developed an operational energy-gender guide to support gender mainstreaming within its sustainable energy initiatives.

Women are under-represented in the clean hydrogen sector. Clean hydrogen has a key role in the transition of economies to net zero and since it is also a relatively new industry, it has a huge potential role in balancing the workforce. Hydrogen will replace historically male dominated industries and this provides an opportunity to change, to follow a different pathway; one that includes more women and other minorities. According to Women in Green Hydrogen, women constitute just 20 % of speakers at clean hydrogen conferences. It is clear that much still needs to be done to boost women's participation at all levels of the sector, with actions needed to ease their entry into the industry and improve their career prospects and progression. Initiatives to build awareness of the complexity of the barriers that women face are essential. This programme can not only support a clean hydrogen transition but also a transition to a balanced workforce.

Gender experts will be involved in the PPG phase to ensure that the final design of each child project takes into account gender aspects and that the design fully captures gender dimensions, and that gender is integrated well in the project components, outcomes, outputs and indicators.

A guiding principle of the programme will be to ensure that both women and men are provided equal opportunities to access, participate in and benefit from the project, particularly in the capacity building and participation in the global component activities. UNIDO's Guide on Gender Mainstreaming Energy and Climate Change Projects will be used as a framework and guide for the gender studies of the programme in order to ensure that the project is in line with both UNIDO and GEF requirements. Based on the guidelines, attention will be paid to:

- Gender-sensitive recruitment at all levels, where possible, will be conducted especially in selection of project staff. Gender responsive TORs will be used to mainstream gender in the activities of consultants and experts. In cases where the project does not have direct influence, gender-sensitive recruitment will be encouraged. Furthermore, whenever possible existing staff will be trained, and their awareness raised regarding gender issues.
- Considering gender dimensions in all decision-making processes (this will consider but will not be limited to efforts to achieve gender balance/ representation in such processes), including Project Steering Committee meetings.
- Collection of sex-disaggregated data.
- Consultations with and involvement of stakeholders focusing on gender equality and women's empowerment issues, such as gender experts and organizations, CSOs and NGOs promoting GEEW (providing them with equal voice), e.g. for outreach purposes.
- Gender Action Plans will be developed as part of each child project. The gender analysis during the child project design will identify the specific circumstances of women and youth, and will provide a basis on how the priorities and needs of these groups will be integrated in the implementation of the project. Child project log-frames will be developed to reflect key gender dimensions of the respective outputs, activities, indicators and targets.

Enviromental and Social Safeguards

UNIDO is promoting sustainable energy solutions to make industries more productive and climate resilient, which in turn includes creating shared prosperity and environmental safeguards. Environmental and social sustainability is integral to climate action and in the achievement of development outcomes. Therefore, the Programme will systematically integrate UNIDO's Environmental and Social Safeguards Policy and Procedures (ESSPP) and have minimal or no adverse social and/or environmental impacts. The Programme fully supports a human rights-based approach and will not have any negative impact on environmental, social, or civil, political, economic, cultural key potential stakeholders, targeted communities or the population as a whole. A gender-transformative approach will be streamlined throughout the Programme (as described in the Section in Gender Mainstreaming). The Programme will take into account environmental and social risks related to the production and application of clean hydrogen such as water desalination, land use and its impact on flora, fauna, and heritage sites, and inclusion of local communities, indigenous peoples and other marginalized groups of people and individuals. Environmental and social issues will be integrated into institutional decision-making and in assessments, public consultations to effectively enhance an inclusive approach for climate mitigation and industrial decarbonization contextually within the national Child Projects.

Knowledge Management

Knowledge management is an essential objective of the programme, and as such is identified as the focus of the global child project and the programme's fifth component, "Knowledge and Management Sharing". The component identifies two outputs, associated with knowledge sharing and knowledge dissemination. A guiding principle of GCHP's knowledge management will be to learn from other related projects and initiatives and programmes and to share knowledge, experience and best practice. This will be done through a number of different ways. Relevant stakeholders will be knowledge partners for the programme, relevant to their areas of work. UNIDO, the implementing agency, is actively involved in a number of initiatives and therefore the GCU will be responsible for liaising with the other initiatives and building on the results of the other initiatives. Experts working with H4D, IRENA, IEA's TCP and ISO will be invited to participate in the themed working groups and H4D and IRENA will be on the Global Advisory Board. Experts on H4D's roster will be used on this programme to ensure knowledge sharing and where relevant study tours and case studies will be shared. The global knowledge platform will house knowledge products and tools developed by the programme as well as those produced and published by others. The global conferences will also aim to bring all stakeholders together. At a country level, the project will work with stakeholders working in the countries, for example GIZ, to build on their work and create synergies for greater impact.

Under the global child project and project component 5 and associated outputs, knowledge management will be addressed in the following ways:

- Several stakeholder working groups will be organized throughout the programme. They will convene regularly online and three times in person during the programme, and will place emphasis on south-south cooperation and local application of clean hydrogen. Particular attention will be paid to private sector engagement: private sector actors will be encouraged to actively participate in working groups, to collect inputs for project implementation and inform government action.
- A web platform – the Global Knowledge Platform – will be developed to enhance the knowledge management capabilities of the programme. The platform will be used as a place to store relevant information on the project i.e., reports, updates and regulatory innovations related to the project. This platform will serve as a valuable source of information on the project for relevant stakeholders and other interested parties, as it provides a centralized place to find project knowledge and best practices.
- There will be an index of regular publications related to the project's developments and findings. Knowledge outputs will include project updates and reports, as well as information on policy best practices or recommendations for the successful implementation of green hydrogen projects, guidelines for support for green hydrogen projects, finance risk mitigation strategies, standards recommendations, methodologies and case studies. These will be elaborated further during the PPG. This information can be referenced by other clean hydrogen development projects so that the process may be streamlined, thereby increasing the efficiency and effectiveness of similar projects in the future.
- Impact tracking will be administered to ensure knowledge related to child project outcomes is visible and placed in context. Indicators and a methodology will be developed to measure project outcomes and will then be used to carry out impact tracking during project implementation.
- Two conferences involving the participating countries will be organized to facilitate a global discussion about the development of clean hydrogen economies in developing countries. The goal is to provide a platform for the participating countries to showcase their insights and experiences with clean hydrogen development and to also provide an opportunity for investors and participating countries to connect and further develop on their green hydrogen goals.
- Standards will be developed, implemented and disseminated in the form of guidebooks and methodologies to ensure that knowledge management practices are transparent and uniform throughout the programme.

Monitoring and evaluation

UNIDO will develop a measurement, reporting and verification (MRV) framework based on the SMART indicators used to assess project implementation and progress for the GEF. The MRV indicators will be developed by the Global PCU with guidance from the Global Advisory Board, and in consultation with the National PMUs. The National PMUs will be responsible for reporting annually and at the end of the project against these indicators, and the Global PCU will consolidate these reports, in conjunction with the executing agencies.

Monitoring and evaluation (M&E) will be conducted in accordance with established UNIDO and GEF procedures. The overall objective of the monitoring and evaluation process is to ensure successful and quality implementation of the project by:

i) Tracking and reviewing project activities execution and actual accomplishments;

ii) Providing visibility into progress as the project proceeds so that the implementation team can take early corrective action if performance deviates significantly from original plans; and

iii) Adjusting and updating project strategy and implementation plan to reflect possible changes on the ground, results achieved, and corrective actions taken.

A detailed Result Framework (LogFrame) will be prepared for each child project, including the global child project, which will provide performance and impact indicators for project implementation along with their corresponding means of verification. These will form the basis on which the project's M&E Plan will be built. The evaluation team reports and verifies the actual progress against the work plan approved by the National PSCs.

The M&E procedures will consist of project inception, progress reporting and a project final report. A detailed monitoring plan for tracking and reporting on project time-bound milestones and accomplishments will be prepared by the implementing agency of each child project in collaboration with the National PMUs and respective project partners at the beginning of project implementation and then periodically updated. This includes monitoring and reporting on each child project Gender Action Plans and risks.

Investing significantly in the Monitoring and Evaluation (M&E) is key to ensuring robust and transparent project management, optimized to deliver high- quality, verifiable outcomes. The development of a comprehensive MRV framework, demands not only expertise but also thoroughness in its creation and subsequent implementation at both global and national levels. The coordinated efforts between the Global PCU, Global Advisory Board, and National PMUs in consolidating and scrutinizing reports pave the way for detailed, actionable insights that drive adaptive management throughout the project's lifespan. The allocated budget is crucial in enabling comprehensive tracking, review, and timely adjustment of project activities, strategies and Gender Action Plans, ensuring alignment with dynamic on-ground realities and fulfilment of project objectives. The M&E component, therefore, is not an expenditure but a strategic investment, ensuring the efficient use of resources, minimizing risks, and enhancing the project's impact, credibility, and sustainability, thereby justifying the allocated budget to safeguard the extensive and impactful results of the project.

Implementation and Execution Modality

The implementation and execution modalities remain the same and new countries will adhere to the modality.

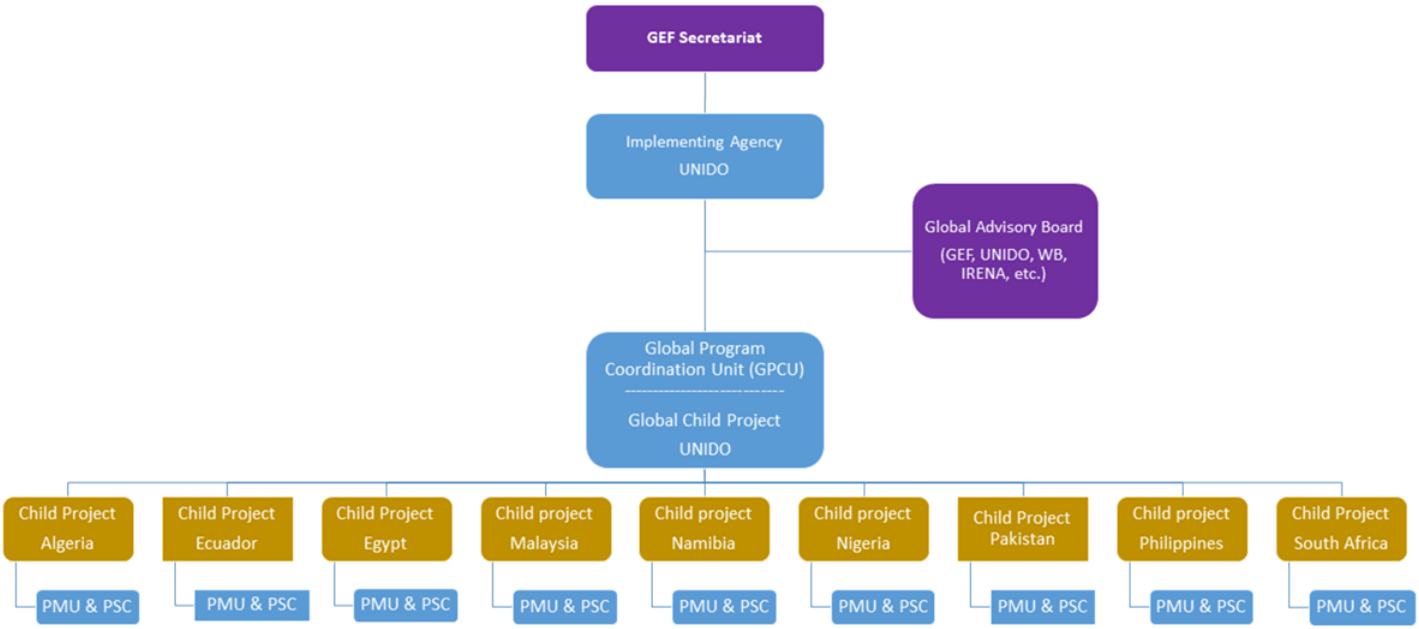


Figure 5: Organisational structure of the programme

UNIDO, as the lead GEF Implementing Agency for the programme, holds the ultimate responsibility for the implementation of the programme, the delivery of the planned outputs and the achievement of the expected outcomes. UNIDO will be responsible for monitoring and evaluation of the programme, and reporting on the programme performance to the GEF. UNIDO will also be responsible for coordinating monitoring and evaluation of child projects. GEF agencies will not execute the national child projects. National projects will be executed by the country executing entities defined by the implementing agency and the governments. UNIDO will execute the global child project of the programme and its global level activities as described in the global child project concept note. The Islamic Republic of Pakistan agrees to apply to the present project, mutatis mutandis, the provisions of the Revised Standard Technical Assistance Agreement concluded between the United Nations and the Specialized Agencies and the Government on 2 July 1956.

Global Programme Coordination Unit

The day-to-day execution of the whole programme and the global child project will be conducted by the Global Programme Coordination Unit (GPCU). The GPCU will be located in UNIDO. The PCU will be composed of a Global Coordinator, two technical experts on hydrogen that will also be responsible for communications and partnerships as well as impact monitoring and reporting, and one administration assistant. The main added value of the Global PCU will be to maintain the programmatic approach, to

ensure the efficient use of funds across all child projects that benefit from the constant development and updating of the materials provided from the Global PCU to the national child projects. This will require robust communication channels between the Global PCU and the National Project Management Units as well as the national counterparts and executing entities.

Global Advisory Board

The Advisory Board will comprise of the GEF, UNIDO, World Bank, IRENA plus government representatives of each participating country. Other key partners and stakeholders active in the clean hydrogen space may be invited to join the Advisory Board if deemed adequate by the Board. The Advisory Board will provide strategic guidance to the programme and will be the decision-making body for items of major impact on the programme. It will meet once a year to monitor progress against the objectives of the overall programme, address potential problems and address strategic and policy issues affecting the programme. It will review impact tracking and will be responsible for defining strategy and advocacy messages. While each county child project will have its own project steering committee, the Global Advisory Board will also actively discuss emerging issues across child projects and suggest solutions that contribute to the overall objectives of the Global Clean Hydrogen programme.

Child Projects

The child projects will be implemented by UNIDO. In line with the GEF's emphasis on national ownership of projects, it will be the decision of the GEF Focal Point to designate a leading executing agency for the respective country child project, as well as a National Project Management Unit (PMU). Each national child project will also establish a National Project Steering Committee (PSC) that will provide strategic guidance to the respective child project. For the global component, the Global Advisory Board will also serve as the PSC.

During the PPG Phase, a meticulous evaluation and selection process will be undertaken to identify apt national executing entities, which will then assume a pivotal role in steering the child projects toward their defined objectives while adhering to the guidelines and standards set forth by GEF and UNIDO. This not only outlines the principle of ownership at national level and ensures alignment with local policies and socio-economic contexts, but also further fosters a conducive environment for tailored interventions and strategic adaptations.

At the PFD stage, the following executing entities have been identified:

Algeria: The Renewable Energies and Energy Efficiency Commission (CEREFE), created in 2019,

contributes to the national development of renewables and energy efficiency as an adviser and evaluates the national policy.

Egypt: The Department of Petroleum and Energy Engineering at the American University of Cairo and Nexus Analytica is an SME specialized in providing consultancy services with a strong focus on energy and industrial sectors. Nexus Analytica has contributed to the development of a roadmap for green hydrogen ecosystem in the Suez Canal Economic Zone (SCZONE) in Sokhna.

Malaysia: NanoMalaysia, established under the Malaysia's Ministry of Science, Technology and Innovation (MOSTI), acts as business and investment arm. The organization is designed to work with a range of stakeholders including government agencies, industries, and academia to promote and coordinate novel technologies development activities in Malaysia, including hydrogen.

Namibia: The Environmental Investment Fund of Namibia plays a crucial role in managing the financial and administrative aspects of the Namibia Green Hydrogen Programme, which is headed by the Green Hydrogen Commissioner. The EIF established the SDG Namibia One Fund, which is a blended finance platform dedicated towards green hydrogen and derivatives investments as well as value chains. The EIF have also accessed two readiness grants from the Green Climate Fund worth USD 1 million, mainly to support the Green Hydrogen Programme to undertake feasibility studies for green hydrogen developments.

Nigeria: Energy Commission of Nigeria (ECN) is the government body responsible for the strategic planning and coordination of national policies in the field of energy. The ECN is involved in various activities and initiatives related to the development of sustainable energy in Nigeria. This includes developing policies for exploring alternative energy resources and technologies. ECN is also involved in the execution of GEF projects in the country.

Philippines: The Department of Science and Technology is the executive department of the Philippine government responsible for the coordination of science and technology-related projects. Within the DOST, the Industrial Technology Development Institute (ITDI) acts as a national R&D agency which undertakes multidisciplinary industrial R&D, technical services for the commercialization of technologies. The Climate Change Commission serves as the GEF focal agency for climate change and endorses all climate change projects for GEF funding to the DENR who serves as the GEF National Operational focal point. Both the DOST-ITDI, in cooperation with the Climate Change Commission will support the national child project in identifying barriers in scaling up the domestic market and provide necessary corresponding enabling policy measures for their removal.

South Africa: The Department of Science and Innovation is the custodian of national research, development and innovation focusing on developing new energy technologies such as hydrogen. The DSI

has implemented the Hydrogen South Africa (HySA) strategy since 2008. Together with other government departments, the DSI has initiated the development of the Hydrogen Society Roadmap in March 2020. The Council for Scientific and Industrial Research (CSIR) is a scientific and technology research organization that researches, develops, localizes and diffuses technologies to accelerate the socioeconomic prosperity in South Africa. The CSIR is involved in the research and development of hydrogen storage technologies as part of the DSI HySA infrastructure project.

Pakistan: The Ministry of Climate Change and Environmental Coordination (MoCC&EC) is in charge of mainstreaming climate change throughout the different layers of the Pakistan society. As part of the Climate Change Policy, the Ministry seeks to promote country's transition to cleaner, lower emission and less carbon intensive development. The Focal Point for the GEF is within the MOCC&EC. UNIDO aims to cooperate with the MoCC &EC along with other stakeholders on green hydrogen policy support for the production and application of green hydrogen in the energy and industrial sectors.

The capacity and institutional preparedness of these entities to act as project executing entities will be assessed and subsequently confirmed during the PPG phase.

UNIDO GEF Project linked to the Programme

The GEF project on 'Green hydrogen energy integrated demonstration application project in China', will allocate funds and actively partake in component 5 - Knowledge management and dissemination of the Programme. Relevant stakeholders of the GEF project will be enabled access to the global platform of the Programme and participate in the working groups and global conferences, which are purposed to replicate plans for scaling up hydrogen investments through sharing knowledge amongst the participating countries. Activities contributing to the development of global knowledge products and tools, providing data, case studies and best practices will be jointly proceeded.

C. ALIGNMENT WITH GEF-8 PROGRAMMING STRATEGIES AND COUNTRY/REGIONAL PRIORITIES

Pakistan

The project objectives in in line NDC, aiming for a 50% reduction in projected emissions by 2030, with 15% of the reductions achieved through domestic resources and the rest contingent on international support. The project will also support the National Climate Change Policy (NCCP) 2021 plays a pivotal role in this effort, focusing on both adaptation and mitigation strategies, emphasizing energy efficiency, renewable energy adoption, and resilience-building across sectors. Pakistan is also working to diversify its energy mix, with a target of 30% of its energy coming from renewable sources by 2030, excluding hydropower.

Consultation national stakeholders

Consultations with the new countries:

Country	Participants (Name, position)	Institution/organization	Date	Type of meeting (online or in person)	Summary of the consultation
Pakistan	Col. Imtiaz , Co-ordinator Energy SIFC Ms. Aneeta Turab, Joint Secretary, Economic Affairs Division (EAD) Ms. Sameera Sheikh, Joint Secretary, Ministry of Climate Change & Environmental Coordination (MoCC&EC) Dr. Nawaz Ahmed Virk, Director Minerals, Ministry of Energy (Petroleum Divison) Dr. Sardar Mohazzam, Managing Director, National Energy Efficiency and Conservation Authority (NEECA)	Special Investment Facilitation Council (SIFC), Prime Minister's Secretariat	April 5, 2024	In Person	The UNIDO Global Hydrogen Programme was presented, along with a GEF child concept note, to solicit feedback and build a national consensus on the development of Green Hydrogen in the country. A strategy was outlined to engage key stakeholders, including relevant ministries, to provide further details and incorporate all comments in the formulation of the GEF child project.

Pakistan	Ms. Sameera Sheikh, Joint Secretary	Ministry of Climate Change & Environmental Coordination (MoCC&EC)	9-Apr-24	In Person	The child concept note for the UNIDO Global Hydrogen Programme was shared and relevant comments were incorporated and request GEF Focal Point's endorsement for the concept note under GEF-8 CCM star allocation
Pakistan	Officials of Ministry of Climate Change, headed by Mr. Aizaz Dar, Secreatary of Ministry.	Ministry of Climate Change & Environmental Coordination (MoCC&EC)	8-May-24	In person	Presentation of GH2 Proposal to National Steering Committee, which approved the concept and Grant request under GEF Star Allocation.
Pakistan	Ms. Bushra Gul, Coordinator Climate Finance Unit	Ministry of Climate Change & Environmental Coordination (MoCC&EC)	15 May , 2024 (frequent correspondence onwards)	In person and virtual	The child concept note for the UNIDO Global Hydrogen Programme was shared and relevant comments were incorporated and request GEF Focal Point's endorsement for the concept note under GEF-8 CCM star allocation

Pakistan	Dr. Sardar Mohazzam, Managing Director	National Energy Efficiency and Conservation Authority (NEECA), Ministry of Energy (Power Divison)	13-Feb-24	online	The concept note for the GEF child project under UNIDO's Global Hydrogen for Industry Programme was presented, and Relevant feedback was incorporated, and co-financing requests were made to support the project's development. They principally agreed to be a partner on this project and provide some in kind co-financing in this respect.
	Mr. Sabieh Haider, Director Policy, NEECA	National Energy Efficiency and Conservation Authority (NEECA), Ministry of Energy (Power Divison)	30-Jul-24	In person	
		National Energy Efficiency and Conservation Authority (NEECA), Ministry of Energy (Power Divison)	26-Aug-24	online	
Pakistan	Mr. Zeeshan Ashfaq, CEO Mr. Muhammad Mustafa Amjad, Program Director	Renewables First	20-Feb-24	In Person	The concept note for the GEF child project under UNIDO's Global Hydrogen for Industry Programme was presented, Relevant feedback was incorporated, and co-financing requests were made to support the project's development.
			13-Aug-24	online	

Pakistan	Dr. Nawaz Ahmed Virk, Director Minerals, Special Initiatives	Ministry of Energy (Petroleum Divison)	31-Jul-24	In Person	The concept note for the GEF child project under UNIDO's Global Hydrogen for Industry Programme was presented. Dr. Virk appreciated and informed his plan to develop a working committee on GH2 and to include UNIDO into it.
Pakistan	Mr. Mehfooz Kazi, Project Director, Dr. Shahnawaz Farhan, Deputy Director (Alternative Energy)	Sindh Solar Energy Project, PMU, Energy Department, Government of Sindh.	23-Aug-24	In Person	The concept note for the GEF child project under UNIDO's Global Hydrogen for Industry Programme was presented. He appreciated the concept and showed his readiness to be included as partner. Co-financing requests were made to support the project's development. In the later communication, it was agreed to utilised 25 million USD as tentative co-financing.
	Mr. Mehfooz Kazi, Project Director, Dr. Shahnawaz Farhan, Deputy Director (Alternative Energy)		3-Sep-24	online	

Pakistan	Mr. Khurram Shahzad Khan, General Manager Mr. Muhammad Waleed Khan, Manager Strategy and Merger & Acquisition Mr. Muhammad Ahsan, Senior Manager Strategy and Mergers & Acquisitions	Fauji Foundation/ FFC Energy Limited	13-Aug-24	online	The concept note for the GEF child project under UNIDO's Global Hydrogen for Industry Programme was presented. Mr. Khurram appreciated the invite to become project partner, and showed his interest. He promised to get back after consulting with his top management on this.
			23-Aug-24	online	
			27-Aug-24	In Person	
Pakistan	Mr. Aqeel Jaffery, Director Policy, Mr. Suleman Malik, Director New alternate Energy	Pakistan Power Infrastructure Board (PPIB)	29-Aug-24	online	The concept note for the GEF child project under UNIDO's Global Hydrogen for Industry Programme was presented. Mr. Aqeel and Mr. Malik appreciated the invite to become project partner, and has offered to arrange a meeting with CEO to finalise the matter.
	Mr. Suleman Malik		03 Sept,2024	online	

Table On Core Indicators

Indicator 6 Greenhouse Gas Emissions Mitigated

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)	27506	0	0	0
Expected metric tons of CO_2e (indirect)	15346529	0	0	0

Indicator 6.1 Carbon Sequestered or Emissions Avoided in the AFOLU (Agriculture, Forestry and Other Land Use) sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)				
Expected metric tons of CO_2e (indirect)				
Anticipated start year of accounting				
Duration of accounting				

Indicator 6.2 Emissions Avoided Outside AFOLU (Agriculture, Forestry and Other Land Use) Sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)	27,506			
Expected metric tons of CO_2e (indirect)	15,346,529			
Anticipated start year of accounting	2030			
Duration of accounting	10			

Indicator 6.3 Energy Saved (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Total Target Benefit	Energy (MJ) (At PIF)	Energy (MJ) (At CEO Endorsement)	Energy (MJ) (Achieved at MTR)	Energy (MJ) (Achieved at TE)
Target Energy Saved (MJ)				

Indicator 6.4 Increase in Installed Renewable Energy Capacity per Technology (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Technology	Capacity (MW) (Expected at PIF)	Capacity (MW) (Expected at CEO Endorsement)	Capacity (MW) (Achieved at MTR)	Capacity (MW) (Achieved at TE)

Indicator 11 People benefiting from GEF-financed investments

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Female	5,920			
Male	8,190			
Total	**14,110**	**0**	0	**0**

Explain the methodological approach and underlying logic to justify target levels for Core and Sub-Indicators (max. 250 words, approximately 1/2 page)

The reduction in GHG was determined with the use of GEF methodology and through a comparison of different scenarios. This comparison covers two time periods: the active project phase from 2025 to 2030 and the subsequent decade until 2040, with the presented number representing the 2040 result.

In accordance with their governmental hydrogen roadmap, they are expected to adhere to IRENA's target for hydrogen to supply 12% of the country's total energy demand by 2050. The total energy demand for the country is based on the current demand, and then projected using the annual energy growth rate for the world. In the baseline scenario, the assumption is that without a hydrogen strategy with set production goals, the 12% will come from grey hydrogen. The baseline is then compared to a scenario with 72% green hydrogen by 2050. The accumulated amount of emitted GHG from the baseline is therefore counted as the potential avoidances over the 10 years of the project.

With this, the CO2e associated with this hydrogen production using their respective emission factors is calculated. The emission reduction potential is calculated by comparing these scenarios with the baseline.

The calculations follow GEFs top-down approach and applying a 40% causality factor to the final amount in accordance with level 2 ( ). Included in the final number is the direct GHG emissions avoidances, obtained using the GEF methodology for calculating direct emission impact (1) using the set monetary target for the pilot project and the data specs for a state-of-the-art alkaline electrolyser, running over the 10 years.

Key Risks

	Rating	Explanation of risk and mitigation measures
CONTEXT		
Climate	Moderate	Climate change risks are not foreseen to affect the programme activities and financial, environmental and social underperformance or failure is unlikely. The potential impact of extreme weather events in respective child project countries may occur but will be limited and the project will take into consideration of the country’s resilience to energy and water security, and other public infrastructure which may be prone to damage from extreme weather events. Particularly within water-stressed countries such as Algeria, Namibia and South Africa, the projected climate change impacts on the water sector will be highlighted. Each national child project will have to conduct a climate screening (following STAP guidelines for GEF projects) and adopt adequate risk management measures, including through adjustment in project design. Project activities will effectively integrate stakeholders from government, industries, civil societies and local communities in the decision-making process to ensure limited water resources for local consumption are not hindered through leveraging desalination from seawater, industrial or urban wastewater and other non-potable water resources.
Environmental and Social	Low	The programme activities will mitigate potential environmental and social risks and ensure a balanced, sustainable approach to the green energy transition within the local communities of the countries. Local communities will be involved in land use decisions, permitting processes and environmental impact

		assessments and understand the impact hydrogen could have particularly in regard to water and energy access. Institutional stakeholders will be provided with recommendations on establishing policies and regulations for environmental and water related policies for clean hydrogen production and application.
Political and Governance	Low	Clean hydrogen is placed as a high priority area in international climate action dialogue and within governmental agendas of countries partaking in the Global Clean Hydrogen Programme. To maintain the momentum and political support, awareness raising activities, capacity building and training of institutional stakeholders will be a key part of the global programme.
INNOVATION		
Institutional and Policy		
Technological		
Financial and Business Model		
EXECUTION		
Capacity	Low	Capacity building amongst government stakeholders is critical for ensuring successful and sustainable policy frameworks. The programme activities will consist of conducting capacity needs assessment to specifically identify areas that require knowledge and skills enhancement. Relevant training workshops will be developed and implemented covering topics on green hydrogen policies, standards, financial mechanisms and permitting procedures to sufficiently develop institutional capacity and mitigate relevant risks.
Fiduciary	Low	UNIDO as the executing agency will ensure effective financial management and monitoring and take into consideration of anti-money laundering and counter-financing terrorism, opportunities for money laundering, terrorist financing or other prohibited practices
Stakeholder	Low	The Global Programme identifies a broad range of public and private actors, who are instrumental in creating an enabling environment for clean hydrogen. To ensure active stakeholder engagement, the programme will develop a stakeholder engagement plan and conduct stakeholder identification and mapping assessments in the initial stage of project implementation. Subsequent stakeholder engagement activities will be developed to promote cooperation and alignment amongst identified entities, primarily through dialogue sessions.
Other	Low	The global programme will pursue gender responsive integration and ensure stakeholder involvement at all levels, involving equal engagement of women and men streamlined throughout all activities. UNIDO's gender policy requirements will be implemented to mitigate potential lack of interest to actively promote gender equality in project activities.

Overall Risk Rating	Low	The overall rating is low

ANNEX A: FINANCING TABLES

GEF Financing Table

Indicative Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	GEF Program Financing ($)	Agency Fee($)	Total GEF Financing ($)
UNIDO	GET	Pakistan	Climate Change	CC STAR Allocation: CCM-1-2	1,326,147.00	119,353.00	1,445,500.00
Total GEF Resources ($)					**1,326,147.00**	**119,353.00**	**1,445,500.00**

Project Preparation Grant (PPG)

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	PPG($)	Agency Fee($)	Total PPG Funding($)
UNIDO	GET	Pakistan	Climate Change	CC STAR Allocation: CCM-1-2	50,000.00	4,500.00	54,500.00
Total PPG Amount ($)					**50,000.00**	**4,500.00**	**54,500.00**

Sources of Funds for Country Star Allocation

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Sources of Funds	Total($)
UNIDO	GET	Pakistan	Climate Change	CC STAR Allocation	1,500,000.00
Total GEF Resources					**1,500,000.00**

Indicative Focal Area Elements

Programming Directions	Trust Fund	GEF Project Financing($)	Co-financing($)
CCM-1-2	GET	1,326,147.00	26,826,484.00
Total Project Cost		**1,326,147.00**	**26,826,484.00**

Indicative Co-financing

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Recipient Country Government	Sindh Energy Department	In-kind	Recurrent expenditures	25,000,000.00
GEF Agency	UNIDO	In-kind	Recurrent expenditures	1,826,484.00
Total Co-financing				**26,826,484.00**

ANNEX B: ENDORSEMENTS

Record of Endorsement of GEF Operational Focal Point (s) on Behalf of the Government(s):

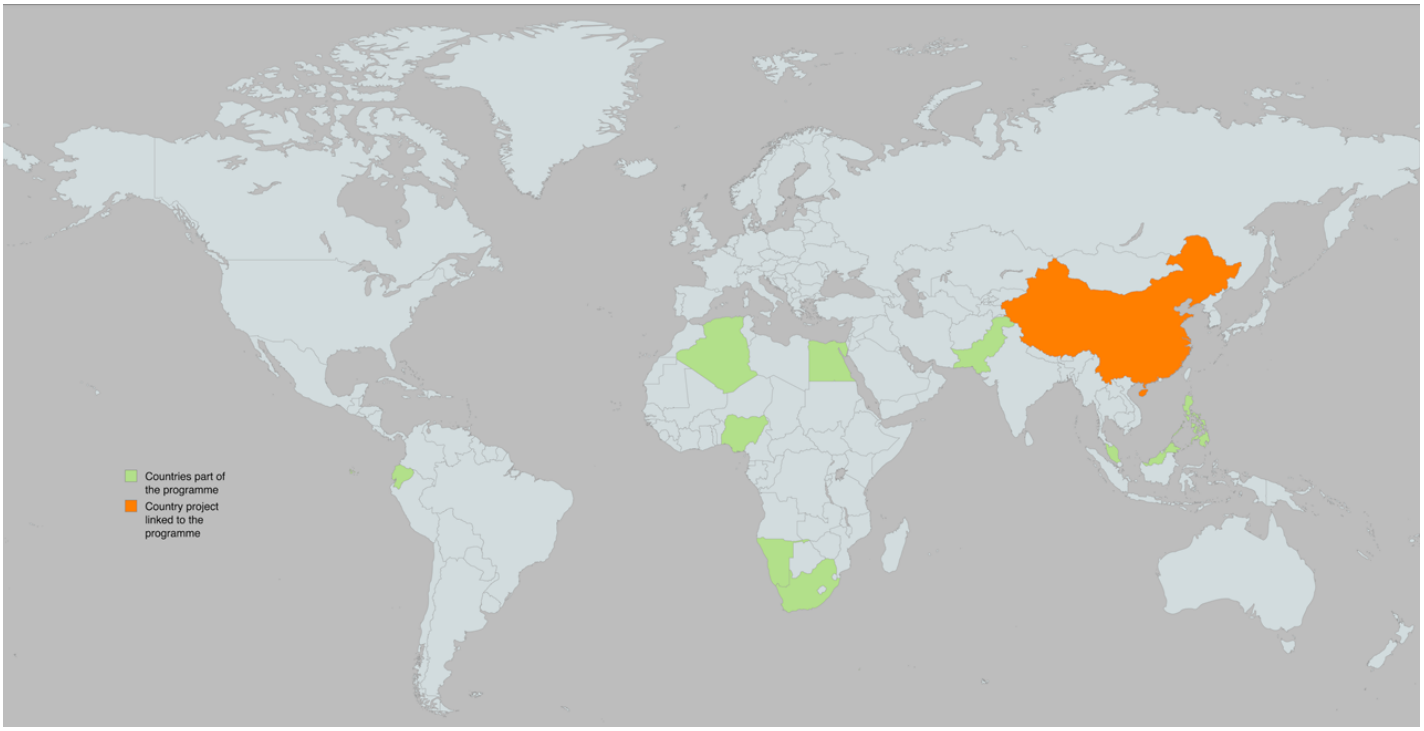
Name	Position	Ministry	Date
Zulfiqar Younas	Additional Secretary	Ministry of Climate Change & Environmental Coordination	

ANNEX C: PROGRAM LOCATION

Please provide geo-referenced information and map where the project interventions will take place

Additional country:

Pakistan	Southern Asia	N 30°00′00″ E 70°00′00″	1168579



ANNEX E: RIO MARKERS

Climate Change Mitigation	Climate Change Adaptation	Biodiversity	Desertification
Principal Objective 2	No Contribution 0	No Contribution 0	No Contribution 0

ANNEX H : CHILD PROJECT INFORMATION

Title
ESS PFD
Child Project Concept Note Pakistan
GCHP Addendum Dec 2024
New Concept Notes of the GCHP
Complete concept notes_old and new countries
PFD Adendum

Child Projects under the Program

Country	Project Title	GEF Agency	GEF Amount ($) PROJECT FINANCING	Agency Fees($)	Total($)
	FSPs				
	Subtotal ($)		0.00	0.00	0.00
	MSPs				
Pakistan	Decarbonization through innovative clean hydrogen technology in Pakistan (Child Project of the Global Clean Hydrogen Programme for Pakistan)	UNIDO	1,326,147.00	119,353.00	1,445,500.00
	Subtotal ($)		1,326,147.00	119,353.00	1,445,500.00
	Grant Total ($)		1,326,147.00	119,353.00	1,445,500.00