Feasibility Study on Green Hydrogen Potential in Maldives and Development of a National Roadmap for Sustainable Energy Transition

Inception Report

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Prepared for

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Submitted by

pMANIFOLD Advancing Net Zero Markets

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List of Abbreviations

GDP	Gross Domestic Product
GCF	Green Climate Fund
GHG	Green House Gases
GH2	Green Hydrogen
UNON	United Nation Office of Nairobi
OEM	Original Equipment Manufacturer
NDA	National Designated Entity
GEF	Global Environmental Facility
PPP	Public Private Partnership
PEM	Proton Exchange Membrane
TOC	Theory of Change
CAPEX	Capital Expenditure
OPEX	Operational Expenditure
CO2	Carbon Dioxide

1. PROJECT BRIEF

1.1 PROJECT OVERVIEW

Maldives, an island nation spread across dispersed atolls, relies almost entirely on imported fossil fuels to meet its energy demand. This dependence creates economic strain, vulnerability to global fuel price fluctuations, and environmental challenges. To reduce these risks and align with its net-zero by 2030 commitment, the Maldives is accelerating renewable energy deployment. The country has installed 68.5 MW of solar PV hybrid systems, with an additional 100 MW under installation, and is exploring wind, ocean energy, and floating solar solutions integrated with battery energy storage systems to overcome land constraints.

While national policies prioritize reducing fossil fuel dependency and scaling up renewables, green hydrogen (GH2) offers a new pathway to diversify the energy mix, strengthen energy security, and advance the low-carbon transition. This technical assistance project aims to assess the feasibility of GH2 production using domestic renewable resources and to develop a national GH2 policy framework supporting its sustainable development.

Despite growing interest, the Maldives faces critical barriers notably, the absence of a national hydrogen strategy, limited technical expertise, and lack of regulatory instruments governing hydrogen production and use. Stakeholder engagement remains fragmented, and hydrogen-related research is still at a pilot stage. Addressing these gaps through technical support, policy coordination, and capacity building will be vital to establish the foundation for a future green hydrogen economy in the Maldives.

1.2 OBJECTIVES OF STUDY

The primary objective of this technical assistance is to assess the feasibility and potential of green hydrogen (GH2) development in the Maldives and to formulate a national GH2 Policy framework that supports the country's sustainable energy transition. The project seeks to evaluate renewable energy-based hydrogen production opportunities, identify suitable end-use applications, and propose enabling policy, regulatory, and institutional measures to facilitate future GH2 deployment. This initiative will help the Maldives chart a structured pathway toward energy diversification, reduced fossil fuel dependence, and achievement of its net-zero 2030 target.

The technical assistance will deliver a comprehensive Feasibility Study Report on the potential utilization of green hydrogen within the Maldivian context. The study will cover the technical, economic, and environmental assessment of viable hydrogen production, storage, and transportation options suited to the nation's geographic and resource conditions. Based on these findings, the project will develop a National Green Hydrogen Policy Framework, outlining the existing policy gaps, priority areas, technological options, and enabling actions to integrate GH2 into the national energy mix.

In addition, the project will undertake capacity-building activities aimed at enhancing the understanding and capabilities of policymakers, regulators, and other key stakeholders. These activities will foster institutional readiness and coordination necessary to support future investments and policy implementation in the green hydrogen sector. Collectively, these efforts are expected to strengthen energy security, climate resilience, and sustainable development in the Maldives.

Expected Outcomes:

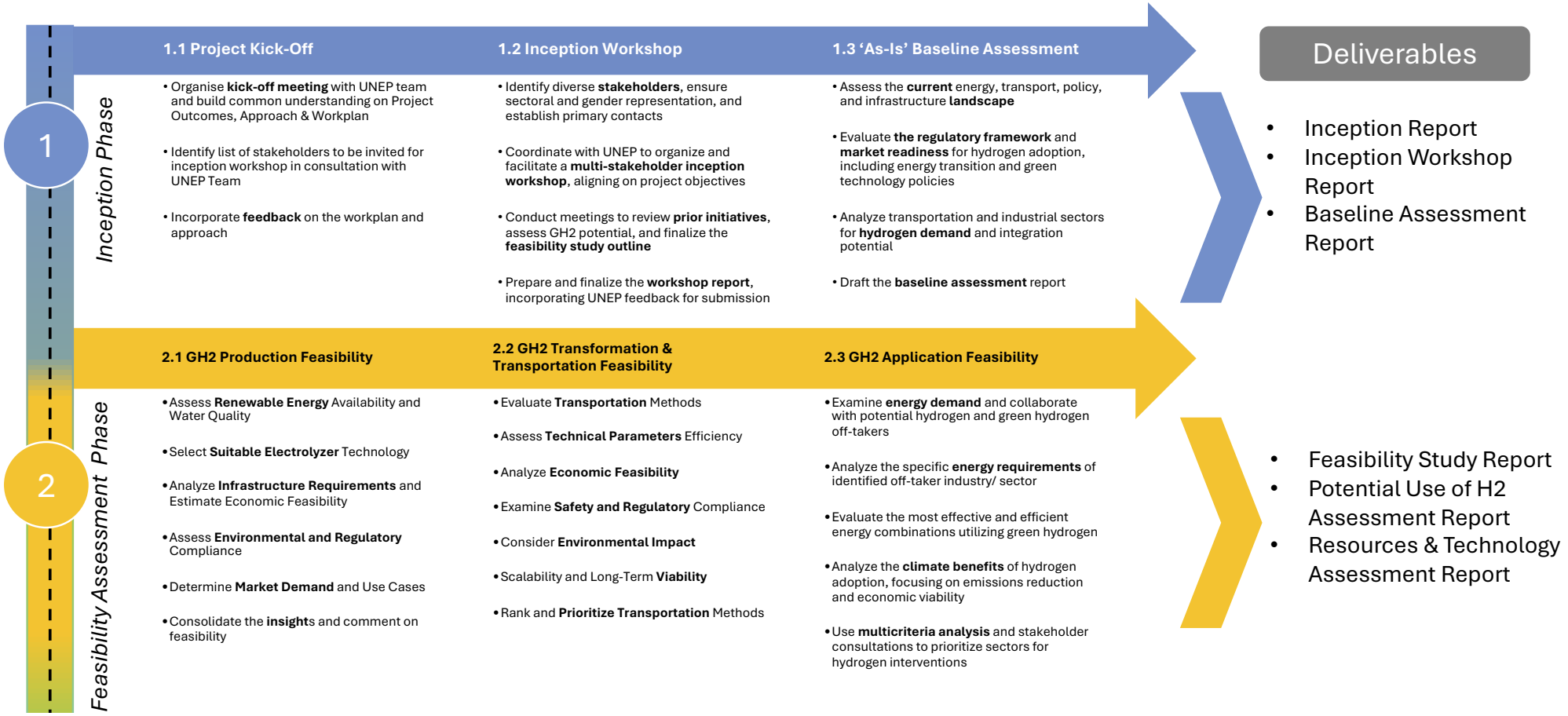
- Comprehensive **Feasibility Study** Report assessing the technical, financial, social (gender) and environmental potential of green hydrogen production, storage, and utilization in the Maldives
- Identification of **suitable technological pathways** for hydrogen production, storage, and transportation, tailored to the Maldivian context and resource availability
- Development of a National Green Hydrogen **Policy Framework** outlining policy gaps, strategic directions, priority actions, and enabling mechanisms for integrating green hydrogen into the national energy mix
- Enhanced institutional and technical **capacity of policymakers** and key stakeholders through targeted capacity-building and knowledge exchange activities

1.3 OBJECTIVE OF INCEPTION REPORT

The objective of the Inception Report is to outline our interpretation of the project and the expected outcomes of the assignment. It details our approach and methodology (revised in alignment with the contract) including our communication strategy with the UNON and Ministry of Tourism and Environment. The report also presents an updated scope for the replacement of GH2 Roadmap package with GH2 Policy Framework for the country with a work plan for the 12 months project as discussed during kick-off.

2. APPROACH AND METHODOLOGY

This section outlines the approach and methodology that will be followed to achieve the objectives of the project. The below figure gives the top-level approach to execute the project in line with the defined deliverable.


1
Inception Phase
1.1 Project Kick-Off
• Organise kick-off meeting with UNEP team and build common understanding on Project Outcomes, Approach & Workplan
• Identify list of stakeholders to be invited for inception workshop in consultation with UNEP Team
• Incorporate feedback on the workplan and approach
1.2 Inception Workshop
• Identify diverse stakeholders, ensure sectoral and gender representation, and establish primary contacts
• Coordinate with UNEP to organize and facilitate a multi-stakeholder inception workshop, aligning on project objectives
• Conduct meetings to review prior initiatives, assess GH2 potential, and finalize the feasibility study outline
• Prepare and finalize the workshop report, incorporating UNEP feedback for submission
1.3 'As-Is' Baseline Assessment
• Assess the current energy, transport, policy, and infrastructure landscape
• Evaluate the regulatory framework and market readiness for hydrogen adoption, including energy transition and green technology policies
• Analyze transportation and industrial sectors for hydrogen demand and integration potential
• Draft the baseline assessment report
2
Feasibility Assessment Phase
2.1 GH2 Production Feasibility
• Assess Renewable Energy Availability and Water Quality
• Select Suitable Electrolyzer Technology
• Analyze Infrastructure Requirements and Estimate Economic Feasibility
• Assess Environmental and Regulatory Compliance
• Determine Market Demand and Use Cases
• Consolidate the insights and comment on feasibility
2.2 GH2 Transformation & Transportation Feasibility
• Evaluate Transportation Methods
• Assess Technical Parameters Efficiency
• Analyze Economic Feasibility
• Examine Safety and Regulatory Compliance
• Consider Environmental Impact
• Scalability and Long-Term Viability
• Rank and Prioritize Transportation Methods
2.3 GH2 Application Feasibility
• Examine energy demand and collaborate with potential hydrogen and green hydrogen off-takers
• Analyze the specific energy requirements of identified off-taker industry/ sector
• Evaluate the most effective and efficient energy combinations utilizing green hydrogen
• Analyze the climate benefits of hydrogen adoption, focusing on emissions reduction and economic viability
• Use multicriteria analysis and stakeholder consultations to prioritize sectors for hydrogen interventions
Deliverables
• Inception Report
• Inception Workshop Report
• Baseline Assessment Report
• Feasibility Study Report
• Potential Use of H2 Assessment Report
• Resources & Technology Assessment Report

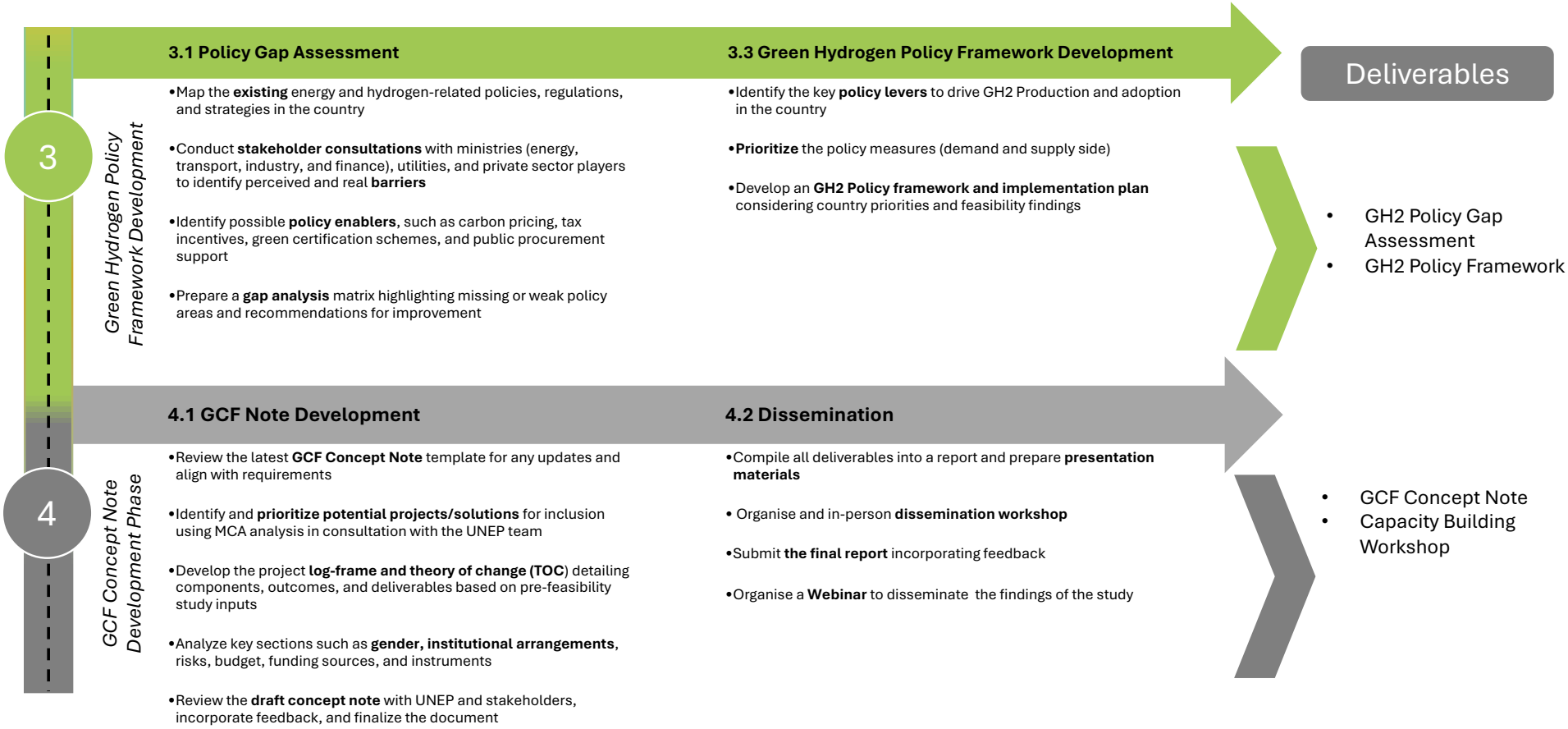


Figure 1 Approach Diagram

- pManifold team will leverage its network of experts Maldives and other island countries to evaluate transition to the Green Hydrogen economy for Maldives maintaining the confidentiality of National data points
- pManifold team will ensure the timely delivery of key milestones by tracking project timelines and addressing any delays or bottlenecks promptly
- pManifold will establish a clear communication channel with all stakeholders, including regular updates and feedback loops, to maintain transparency and ensure alignment with project goals
- pManifold will allocate dedicated resources and experts to focus on specific study areas, ensuring that each element of the study receives the necessary attention and expertise
- pManifold team will conduct internal review sessions before each deliverable is shared with the client, ensuring quality assurance and alignment with the scope of work

2.1 DETAILED METHODOLOGY

The methodology is consistent with that presented in the technical proposal and re-arranged/ revised as per deliverables and agreed upon with UNON and Ministry of Tourism and Environment team during the kick-off meeting.

1. Inception Report

1.1. Project Kick-Off:

- Conduct a project kick-off meeting with the UNON team to establish a shared understanding of the project objectives, work plan, and implementation approach
- Clarify roles, responsibilities, timelines, and communication protocols to facilitate effective coordination
- Ensure alignment on expectations and deliverables for the inception workshop and baseline assessment activities
- In consultation with the UNON team, identify and finalize the list of participants and experts to be engaged in the inception workshop
- Inception report with key changes made after Kick-off and finalized scope along with Gender Action Plan, Monitoring and Evaluation Plan

Deliverable-1A	Inception report covering scope validation, methodology, work plan, gender action plan, monitoring and evaluation plan

1.2. Stakeholder Engagement and Inception Workshop:

- Establish contact with stakeholders and identify primary contact persons from each entity including representation across sectors (e.g., government, private, NGOs, academia) and gender-disaggregated (at least 30% female participants)
- Plan the multi-stakeholder inception workshop, including scheduling and sending invitations to key stakeholders such as government department representatives (transport, industries, sustainability, climate, etc.) local industry representatives – OEMs, importers, traders, etc., GCF NDA, GEF focal persons to explore scaling-up opportunities
- Co-ordinate with UNON team and plan inception workshop logistics along with the local expert for smooth delivery of the workshop
- Plan consultative meetings with the confirmed participants and prepare semi-structured interview questions for discussion with the key stakeholders

- Conduct consultative meetings with each member of the Steering Committee to review prior initiatives, understand views on GH2 potential (off-takers, infrastructure capacity, target industries, etc.) and align on project objectives
- Facilitate discussions during the workshop to inform stakeholders of the project goals, expected outcomes, and planned activities, and ensure active participation
- Confirm the outline of the feasibility study, including project outcomes, outputs, activities, deliverables, and time schedule
- Prepare the Inception workshop report and share with UNON team for review
- Incorporate feedback, update the report and share for final submission of the deliverable

2. 'As-Is' Country Baseline Assessment

- Conduct a mix of primary and secondary research to collect data on 'As-Is' country landscape including current energy use patterns, existing renewable energy sources in the Maldives, etc.
- Assess the '**As-Is'** Energy, Transport, Policy and Infrastructure landscape in Maldives
- Understand the existing **energy** production, consumption, and distribution infrastructure to assess whether it is compatible with hydrogen production and future integration
    - Total Energy Consumption (MWh/year): The overall energy demand in the country, including electricity, heat, and fuel
    - Primary Energy Sources: Breakdown of energy sources (coal, natural gas, renewables, etc.)
    - Energy Imports and Exports (kWh/year): If the country relies on energy imports, particularly from neighboring countries or regional grids
    - Electricity Grid Capacity (MW): Current capacity of the electricity grid and any potential for expansion
    - Renewable Energy Share (%): Proportion of energy derived from renewable sources, such as solar, wind, hydro, etc.
    - Installed Solar Power (MW): Capacity of solar energy production
    - Installed Wind Power (MW): Wind energy potential and installed capacity
    - Grid Stability and Reliability (Frequency/Voltage fluctuations): Evaluate how stable and reliable the existing grid is for future hydrogen production

Sample framework to assess the energy baseline of Maldives

Parameter	Unit	Value
Total Energy Consumption	MWh/year	
Primary Energy Sources	%	
Energy Imports and Exports	kWh/year	
Electricity Grid Capacity	MW	
Renewable Energy Share	%	
Installed Solar Power	MW	
Installed Wind Power	MW	
Grid Stability and Reliability	Frequency/Voltage	
…	…	…

- Evaluate the existing **regulatory** framework and market readiness for hydrogen adoption, including government policies on energy transition and green technologies
  - Hydrogen-Related Policies: Presence of any national or regional hydrogen-focused policies or strategies
  - Incentives and Subsidies: Availability of financial incentives for renewable energy projects and hydrogen infrastructure development
  - Energy Regulatory Environment: Assessment of laws governing energy production, carbon credits, and the potential for carbon pricing
  - Public-Private Partnerships (PPPs): Current or potential partnerships for energy projects, including hydrogen
- Evaluate current **transportation and industrial** sectors to assess potential demand for hydrogen and its integration
  - Transport Energy Consumption (MWh/year): Total energy used by the transportation sector
  - Fossil Fuel Consumption in Transport (L/year): Amount of fuel consumed by the transportation sector, which could potentially be replaced by hydrogen fuel
  - Ports and Shipping Infrastructure: Assessment of existing maritime transport infrastructure (since it's an island country), which could be a potential demand area for hydrogen
  - Heavy Industry Demand: Demand for hydrogen in industrial processes such as steel production, refining, etc.
- Prepare the draft baseline assessment report consolidating the analysis findings and share for review to the UNON team
- Incorporate feedback, update the final report and share for submission to UNON team

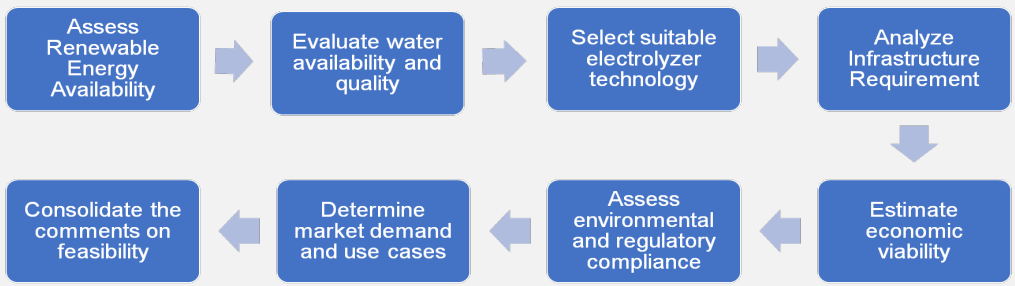
Deliverable-1B	Baseline Assessment report covering country landscape including energy, regulatory and industrial aspects

3. Feasibility Assessment Phase

3.1 Green Hydrogen Production Feasibility Assessment

- Develop GH2 production feasibility framework and corresponding data templates to collect quantified data through mix of primary and secondary consultations.
- Assess renewable energy potential to identify feasible sources like solar, wind, or ocean energy for green hydrogen production
  - Quantify energy generation potential in MW or MWh/year for the identified resources
  - Collaboration with private sector stakeholders to explore opportunities for renewable energy deployment (investments committed)

Sample framework to assess GH2 Production Feasibility



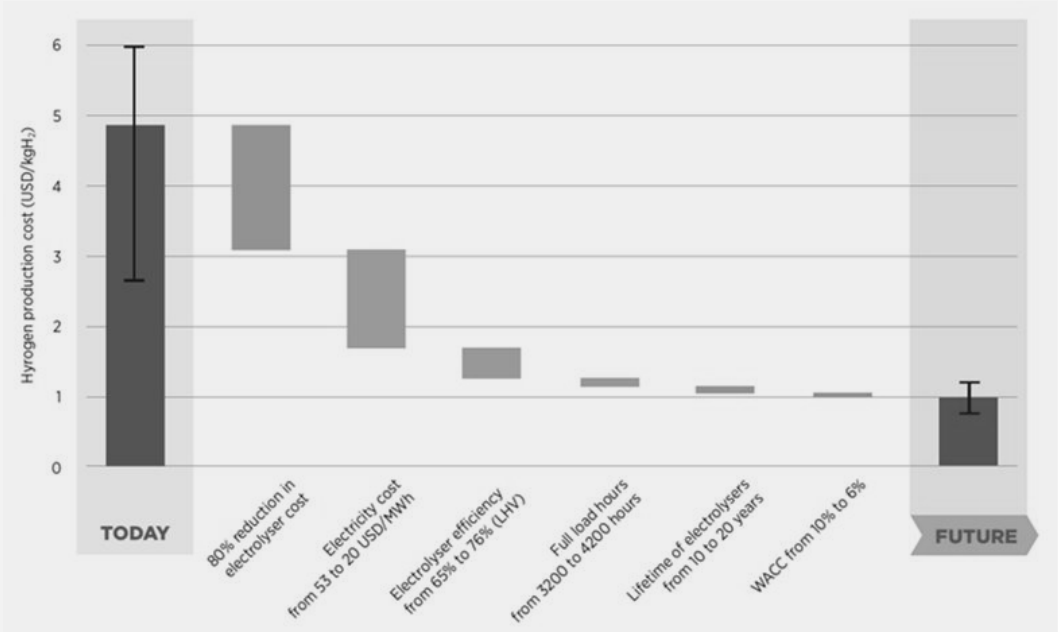
- Assess the feasibility of integrating renewable energy systems into the national hydrogen energy infrastructure
  - Evaluate land availability and suitability for renewable (like solar) installations through GIS mapping
  - Analyze of grid integration capacity and infrastructure readiness for renewable energy supply
- Assess and select suitable electrolyzer technologies (e.g., PEM, alkaline, or solid oxide) based on efficiency, scalability, and cost-effectiveness
  - Estimate energy requirements (kWh/kg H2 and overall system efficiency)

Sample framework to assess the various Electrolyzer Technologies

Electrolyzer Technology	Alkaline Electrolyzer	PEM Electrolyzer	Solid Oxide Electrolyzer
Efficiency	62-82%	67-82%	90-95% (high-temp input)
Operating Temperature (°C)	60-80	50-80	650-1000
Scalability	High	Medium	Low
Durability (hours)	60,000-90,000	50,000-80,000	20,000-30,000
Water Consumption (L/kg H2)	~9	~9	~8
Flexibility	Moderate	High	Low
Environmental Impact	Low	Moderate	High
Key Notes	Mature technology; lower CAPEX; slower response time	Suitable for variable renewable energy; higher cost	High efficiency with heat integration; less mature

- Calculate the Levelized Cost of Hydrogen (LCOH) in USD/kg based on renewable energy input, water costs, and capital/operational expenditures
  - Compare costs with alternative energy sources or imported hydrogen
  - Identify financial risks and opportunities, including private sector involvement and government incentives.

Sample Illustration of Cost Economics of GH2 Production

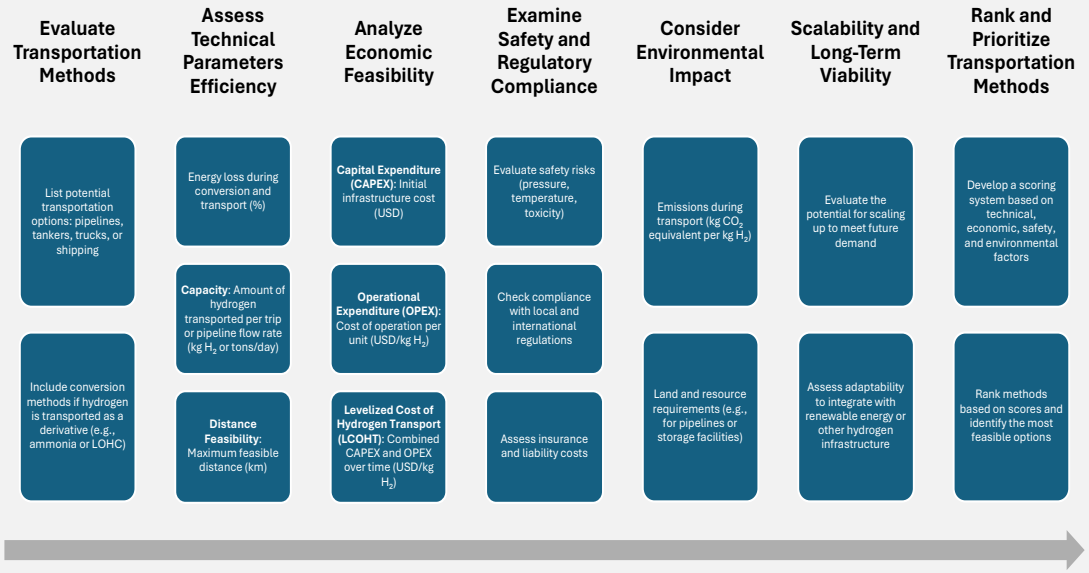


- Estimate greenhouse gas (GHG) emissions reductions (tons of CO2/year) achievable through green hydrogen production
  - Analyze potential environmental impacts, including water use and land occupation
- Evaluate the availability and quality of water resources for electrolysis, including any need for purification or desalination
  - Analyze water consumption requirements (liters/kg of hydrogen produced) and potential water risks
  - Recommend water management strategies to ensure long-term sustainability
- Identify optimal sites for hydrogen production facilities based on proximity to renewable energy sources, water resources, and infrastructure
  - Map land availability and suitability, including geographic or environmental constraints by conducting geospatial analysis of solar irradiance, wind patterns, and ocean energy resources through GIS mapping including
- Identify and recommend suitable technology for Maldives for Hydrogen production based on all the above assessments
- Consolidate the findings and highlight key recommendations for GH2 Production in Maldives
- Review the findings, incorporate if any discrepancies observed and finalise the findings

3.2 Green Hydrogen Transportation Feasibility Assessment

- Prepare a framework to evaluate the feasibility of GH2 Transportation in Maldives

Sample GH2 Transportation Feasibility Assessment Framework



- Analyze transportation methods for potential hydrogen production sites:
  - Evaluate options such as pipelines, tanker trucks, or ships for hydrogen transportation
  - Assess the distance from production sites to demand centers (km) to determine the most efficient (kg/km) and cost-effective transportation option
  - Assess technical feasibility and compliance with safety standards for each method (e.g. adherence to ISO standards)
- Conduct a technical evaluation of transportation vehicles and facilities for storing liquid hydrogen:
  - Assess storage requirements, focusing on cryogenic tanks' capacity (kg of hydrogen per m^3) and insulation systems (W/m^2) to minimize losses
  - Evaluate transportation vehicle specifications, including efficiency (km/kg of hydrogen) and operational reliability under different conditions

Sample assessment framework to evaluate hydrogen transportation

Parameters	Liquid Hydrogen (LH_2)	Hydrogen Carriers (e.g., Ammonia)	Pipeline Transport	Metal Hydrides	Tanker Shipping	....
Efficiency	Low (energy loss: 30-40%)	Moderate (conversion loss: ~25%)	High (minimal energy loss <10%)	Moderate (depends on material properties)	Depends on hydrogen form (LH_2 or ammonia)	
Cost (USD/unit)	High ($3-6/kg H_2 for liquefaction and transport)	High ($2-4/kg H_2 for conversion and transport)	High initial cost (pipeline: $1M+/km); low operational cost	High ($10+/kg H_2 for storage materials)	Very high ($5-10/kg H_2 for tanker operation and infrastructure)	
Scalability	Medium (requires advanced cryogenic infrastructure)	High (existing ammonia infrastructure can be leveraged)	High (effective for large-scale and continuous supply)	Low (limited by material scalability and technology readiness)	High (suitable for intercontinental transport)	
Safety	Cryogenic risks (handling at -253°C); potential boil-off losses	Toxicity risks; relatively safe in liquid form	Leakage risks; high initial cost	Safe storage; moderate transport risks	Risks depend on form (cryogenic or ammonia handling)	

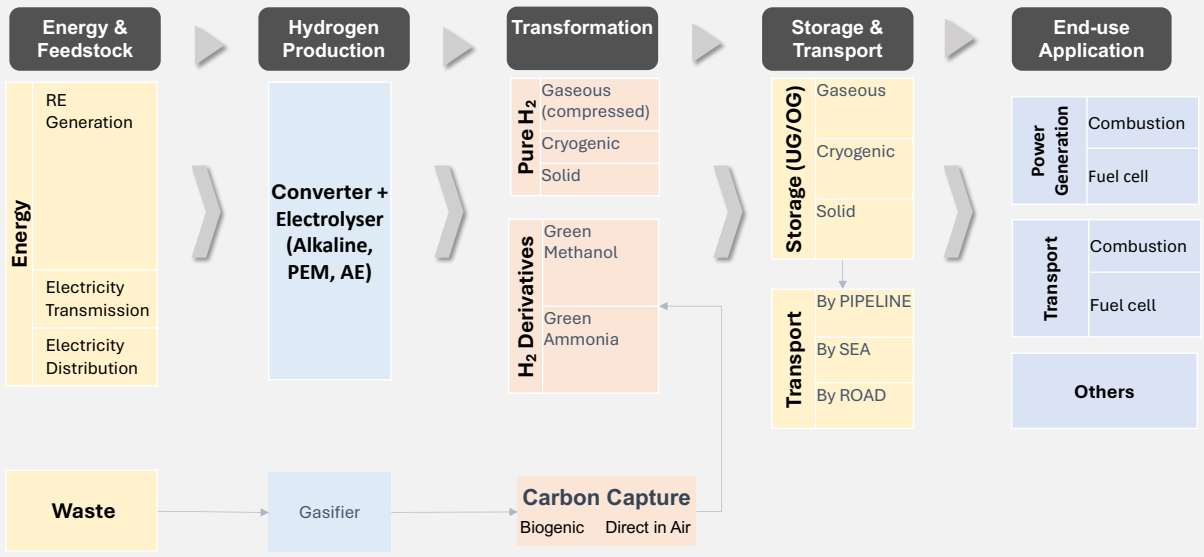
Environmental Impact	High (due to energy use in liquefaction)	Moderate (depends on energy for conversion and cracking)	Low (after installation, minimal emissions)	Low (safe, environmentally friendly materials)	Moderate to High (depends on fuel used for tankers)	
Key Notes	Effective for medium-long distances but requires significant energy input for liquefaction.	Ideal for large-scale global trade; well-established ammonia transport network.	Best for continuous industrial supply over long periods; high CAPEX.	Suitable for small-scale niche applications, like portable storage.	Essential for exporting hydrogen; requires port and tanker investments.	

- Select essential infrastructure for hydrogen transportation and assess associated costs for future implementation:
  - Identify necessary infrastructure, such as loading/unloading stations and storage depots, considering their alignment with transportation methods
  - Calculate capital expenditure (CAPEX) and operational expenditure (OPEX) for the selected infrastructure in USD
- Identify and recommend suitable technology for Maldives for Hydrogen transportation based on the above feasibility assessments

3.3 Green Hydrogen Utilization Feasibility Assessment:

- Examine energy demand and collaborate with potential hydrogen and green hydrogen off takers:
  - Identify key sectors such as industries (cement, shipyard, etc.), transportation (ferries, speedboats, and domestic aviation), and government facilities for hydrogen and green hydrogen adoption
  - Gather data on energy consumption patterns, including peak and average demands, and calculate the total energy demand (MWh/year) across these sectors in collaboration with NDE (National Designated Entity)
  - Determine the potential off-takers based on Sectorial energy usage and hydrogen adoption readiness
  - Review the Government of Maldives' carbon economy vision and related strategies to ensure alignment with national goals
- Analyze the specific energy requirements of identified off-taker industry/ sector:
  - Assess energy intensity (MWh/unit of production), reliability needs, and current energy costs, focusing on sectors heavily reliant on imported diesel and other fossil fuels
  - Match hydrogen supply capabilities with demand profiles, projecting hydrogen demand (kg/day) to meet Sectorial energy needs
- Evaluate the most effective and efficient energy combinations utilizing green hydrogen:
  - Identify optimal hydrogen blends (e.g., % hydrogen in energy mix) or hybrid energy systems integrating green hydrogen with renewable like solar PV and energy storage systems for various applications
  - Evaluate the cost-effectiveness (USD/kWh) and environmental impact, estimating emission reduction potential (tons of CO2/year) for transitioning to green hydrogen solutions
- Use multicriteria analysis and stakeholder consultations to prioritize sectors for hydrogen interventions

Green Hydrogen Value Chain



Deliverable-2	Feasibility Study Report along with the technology assessment and sectoral application

4. GH2 Policy Framework Development

4.1. Policy Gap Assessment

- Map the existing energy and hydrogen-related policies, regulations, and strategies in the country

Existing Energy and Hydrogen-related Policies and Regulations

No.	Policy / Document	Key Points / Objectives	Incentives / Mechanisms
1	**Energy Act, 2021**	• Establishes a unified legal framework for sustainable energy development • Mandates energy diversification and integration of renewable sources	• Provides legal basis for granting generation licenses, grid access rights, and tariff regulations for RE producers
2	**Energy Policy & Strategy 2024–2029**	• National target: 33% electricity generation from RE by 2028 • Focus on solar PV, wind, biomass, ocean energy, and storage • Encourages private sector and IPP participation in RE	• Import duty and tax exemptions for RE equipment • Feed-in tariffs and PPAs under utility agreements • Net-metering policy for rooftop solar producers
3	**Energy Roadmap 2024–2033**	• Strategic roadmap to achieve Net Zero Energy Sector by 2030 • Plans deployment of 500 MW solar PV and 200 MWh battery storage across islands Integrates hybrid diesel-solar systems for islands under ≥5 MW grids • Encourages use of surplus RE for H2 production & retrofitment of Ferries	• Access to concessional finance and green investment frameworks under the Climate Change Trust Fund
4	**National Energy Policy & Strategy 2016**	• Prioritizes energy security through RE diversification • Promotes private sector-led RE development through open tenders and IPP models	• Import duty exemptions on solar panels, batteries, inverters • VAT and customs waivers on RE project imports
5	**Maldives Climate Change Policy Framework (MCCPF), 2015**	• Policy objective: “Low Carbon and Climate Resilient Development.” • Promotes RE for emission reduction and resilience of island energy systems	• RE deployment expected to avoid >250,000 tonnes CO2 emissions/year by 2030

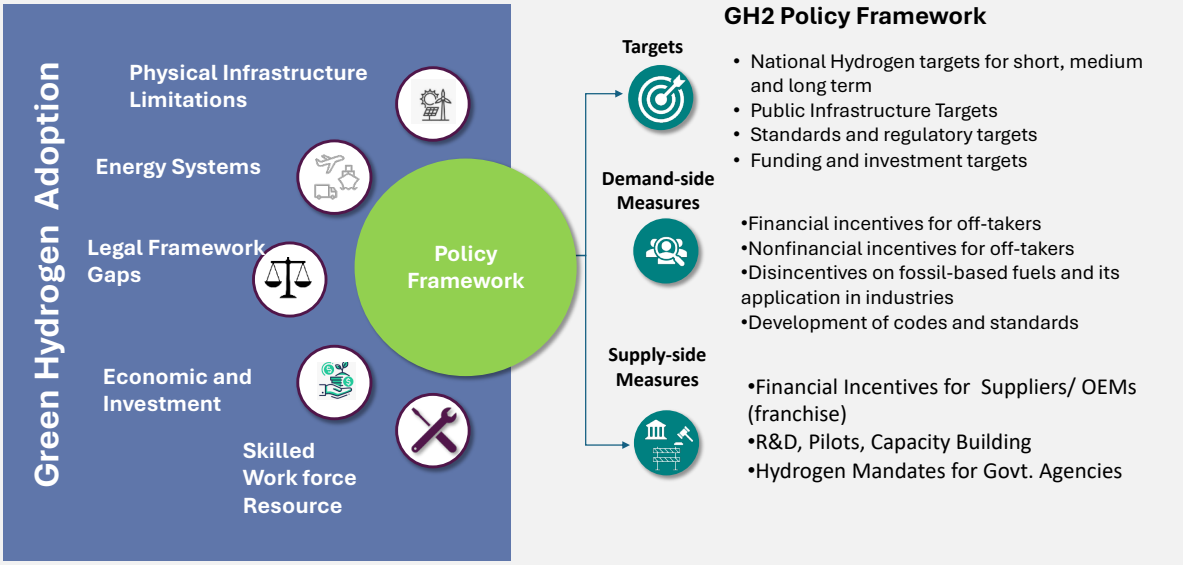
6	**Nationally Determined Contribution 3.0 (2025)**	• Emission reduction targets: 1.52 million tonnes of CO2eq in 2035 • Expands solar PV and energy storage across inhabited islands • Green hydrogen recognized as long-term storage/fuel option for remote islands	–
7	**Fifth Tourism Master Plan (2023–2027)**	• Provides policy priorities for sustainable tourism development, environmental integration in tourism planning, resilience, infrastructure development	-

- Conduct stakeholder consultations with ministries (energy, transport, industry, and finance), utilities, and private sector players to identify perceived and real barriers.
- Identify possible policy enablers, such as carbon pricing, tax incentives, green certification schemes, and public procurement support
- Prepare a gap analysis matrix highlighting missing or weak policy areas and recommendations for improvement

4.2. Green Hydrogen Policy Framework Development

- Identify critical enablers across regulation, finance, infrastructure, technology, and capacity domains for Maldives
- Define actionable interventions and instruments to operationalize each enabler
- Conduct Stakeholder Consultation and Validation with government agencies, private sector, and experts to refine and prioritize measures
- Consolidation and prioritize policy vision, principles, enablers, and measures into a coherent national framework
- Recommend structures and responsibilities for policy coordination, monitoring, and review
- Review global GH2 policies to ensure compatibility, alignment and investment readiness
- Prepare draft GH2 Policy Framework and share for review with UNON and Ministry
- Incorporate the feedback from Ministry, Steering Committee and finalise the framework

Sample GH2 Policy Framework to be suggested



Deliverable-3	GH2 Policy Gap Analysis Report and GH2 Policy Framework

5. GCF Concept Note Development Phase

5.1. Concept Note Development

- Review the latest GCF Concept Note template to understand if any changes to the template
- Identify potential projects/ solutions to be included in the GCF concept note using MCA analysis / prioritization in consultation with UNON team
- Develop project **log-frame** comprising of technical assistance and investments to detail the components like project details, outputs, deliverables, etc. as per the template using the inputs from pre-feasibility study conducted during the previous phases of the project
- Develop theory of change (TOC) explaining how the project will lead to the desired outcomes
- Analyze other key sections–gender, institutional arrangements, risks, etc.
- Estimate project budget, funding source ,instruments and others
- Review draft concept note with UNON and other key stakeholders
- Incorporate feedback and finalise the note

Deliverable-4A	GCF Concept Note

5.2. Dissemination

- Compile all deliverables into a report and prepare presentation materials
- Organize in-person dissemination workshop and invite GCF NDA, GEF focal person, government representatives, and key stakeholders
- Conduct Workshop and present project outcomes, explore scaling opportunities, and gather stakeholder feedback
- Organise the webinar to disseminate the study outcomes
- Submit the final report, summarizing outcomes and recommendation

Deliverable-4B	Capacity Building Workshop

4 STAKEHOLDER ENGAGEMENT

The below stakeholders shall be interviewed/ consulted during the study to capture the required inputs, data and views through a mix of online and in-person interactions.

Value Chain Stage	Key Stakeholders	Roles
Power Generation	• Ministry of Tourism and Environment • Utilities (STELCO, FENAKA) • Independent Power Producers	Planning, operation, regulation
Hydrogen Production	• Ministry of Tourism and Environment • Private Players • Resort operators	Developers; currently no operating hydrogen projects
Storage & Transformation	• Maldives Ports Limited • Airports Company • Logistics firms	Infrastructure, safety codes still absent
Applications & End Use	• Resort chains • Ferry operators & other Transport operators	Anchor demand; sector buy-in not yet mobilised
Export/Trade	• Ports Authority • Ministry of Trade • shipping companies • International Solar Alliance (ISA) • GH2	Future role; export potential still speculative
Enablers	• Development banks (ADB, WB) • Bilateral donors • Academia • Training institutes	Finance, technical support, capacity building

Table 1: Indicative Stakeholder List

5 TEAM STRUCTURE

The below team comprising of International and National Experts (including Gender Expert – Fathimath) will be the part of the study supporting with their expertise to achieve the desired outcomes.

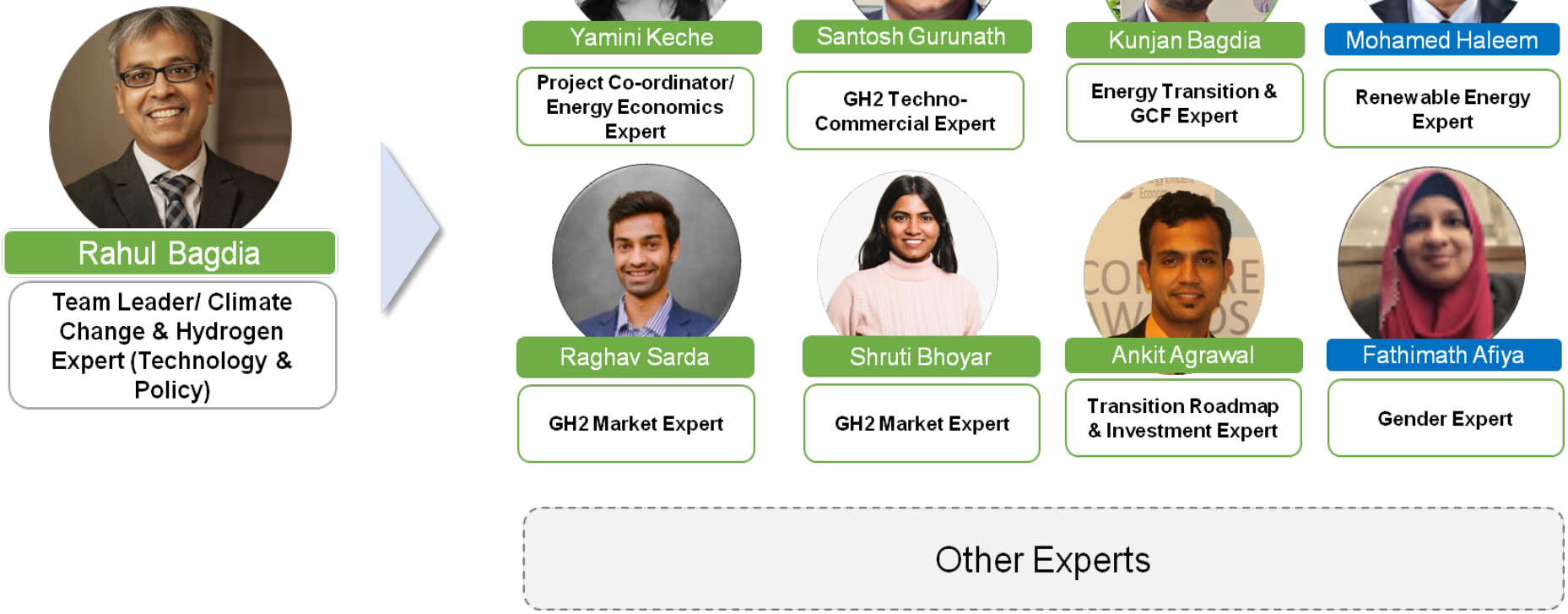


Figure 2: Team Structure

NE (National Experts)

6. WORKPLAN

The workplan has been revised in alignment with the contract and discussions from the kick-off meeting as shown in below table. The deadlines remain the same, however the scope for GH2 roadmap is replaced with policy gap analysis.

SN.	Phase	Tasks	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	**Inception Phase**													
1.1	Project Kick-Off	Organize a project kick-off meeting with UNEP team to build a common understanding of the project's outcomes, work plan, and approach												
		Discuss roles, responsibilities, timelines, and communication protocols to ensure smooth coordination												
		Align expectations and deliverables for the inception workshop and baseline assessment activities												
		Identify list of participants and experts in consultation with UNEP team to be involved for the inception workshop												
Deliverable-0		**Kick-Off Meeting**												
1.2	Stakeholder Engagement & Inception Workshop	Establish contact with stakeholders and identify primary contact persons from each entity including representation across sectors (e.g., government, private, NGOs, academia) and gender-disaggregated (at least 30% female participants)												
		Plan the multi-stakeholder inception workshop, including scheduling and sending invitations to key stakeholders such as government department representatives (transport, industries, sustainability, climate, etc.) local industry representatives – OEMs, importers, traders, etc., GCF NDA, GEF focal persons to explore scaling-up opportunities												
		Study the existing top-level country landscape across energy, transport, land availability, industries, etc. and plans to initiate discussion with identified stakeholders for inception workshop												
		Co-ordinate with UNEP team and plan inception workshop logistics along with the local expert for smooth delivery of the workshop												
		Plan consultative meetings with the confirmed participants and prepare semi-structured interview questions for discussion with the key stakeholders												

SN.	Phase	Tasks	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
		Conducts consultative meetings with each member of the Steering Committee to review prior initiatives, understand views on GH2 potential (off-takers, infrastructure capacity, target industries, etc.) and align on project objectives												
		Facilitate discussions during the workshop to inform stakeholders of the project goals, expected outcomes, and planned activities, and ensure active participation												
		Confirm the outline of the feasibility study, including project outcomes, outputs, activities, deliverables, and time schedule												
		Prepare the Inception workshop report and share with UNEP team for review												
		Incorporate feedback, update the report and share for final submission of the deliverable												
Deliverable-1A		**Inception Report: Detailed work plan; M&E plan; gender assessment and gender output action plan**												
1.3	As-Is Baseline Assessment	Conduct a mix of primary and secondary research to collect data on 'As-Is' country landscape including current energy use patterns, existing renewable energy sources in the Maldives, etc.												
		Assess the 'As-Is' Energy, Transport, Policy and Infrastructure landscape in Maldives												
		Understand the existing energy production, consumption, and distribution infrastructure to assess whether it is compatible with hydrogen production and future integration												
		Evaluate the existing regulatory framework and market readiness for hydrogen adoption, including government policies on energy transition and green technologies												
		Evaluate current transportation and industrial sectors to assess potential demand for hydrogen and its integration												
		Prepare the draft baseline assessment report consolidating the analysis findings and share for review to the UNEP team												
		Incorporate feedback, update the final report and share for submission to UNEP team												

SN.	Phase	Tasks	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Deliverable-1B		**Baseline Assessment Report**												
2	**Feasibility Assessment Phase**													
2.1	GH2 Production Feasibility Assessment	Develop GH2 production feasibility framework and corresponding data templates to collect quantified data through mix of primary and secondary consultations												
		Assess renewable energy potential to identify feasible sources like solar, wind, or ocean energy for green hydrogen production												
		Assess the feasibility of integrating renewable energy systems into the national hydrogen energy infrastructure												
		Assess and select suitable electrolyzer technologies (e.g., PEM, alkaline, or solid oxide) based on efficiency, scalability, and cost-effectiveness												
		Calculate the Levelized Cost of Hydrogen (LCOH) in USD/kg based on renewable energy input, water costs, and capital/operational expenditures												
		Estimate greenhouse gas (GHG) emissions reductions (tons of CO_2/year) achievable through green hydrogen production												
		Evaluate the availability and quality of water resources for electrolysis, including any need for purification or desalination												
		Identify optimal sites for hydrogen production facilities based on proximity to renewable energy sources, water resources, and infrastructure												
		Identify and recommend suitable technology for Maldives for Hydrogen production based on all the above assessments												
		Consolidate the findings and highlight key recommendations for GH2 Production in Maldives												
		Review the findings, incorporate if any discrepancies observed and finalize the findings												
2.2		Prepare a framework to evaluate the feasibility of GH2 Transportation in Maldives												

SN.	Phase	Tasks	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	GH2 Transportation & Storage Feasibility	Analyze transportation methods for potential hydrogen production sites												
		Conduct a technical evaluation of transportation vehicles and facilities for storing liquid hydrogen												
		Select essential infrastructure for hydrogen transportation and assess associated costs for future implementation												
		Identify and recommend suitable technology for Maldives for Hydrogen transportation based on the above feasibility assessments												
2.3	GH2 Utilisation Feasibility Assessment	Examine energy demand and collaborate with potential hydrogen and green hydrogen off-takers												
		Analyze the specific energy requirements of identified off-taker industry/ sector												
		Evaluate the most effective and efficient energy combinations utilizing green hydrogen												
		Analyze the climate benefits of hydrogen adoption, focusing on emissions reduction and economic viability												
		Use multicriteria analysis and stakeholder consultations to prioritize sectors for hydrogen interventions												
Deliverable-2A		**Feasibility Study Report**												
Deliverable-2B		**Potential Use of H2 Assessment Report**												
Deliverable-2C		**Resources & Technology Assessment Report (Production, Storage and Transportation**												
3	**GH2 Policy Framework Development**													
3.1	Policy Gap Assessment	Map the existing energy and hydrogen-related policies, regulations, and strategies in the country												
		Conduct stakeholder consultations with ministries (energy, transport, industry, and finance), utilities, and private sector players to identify perceived and real barriers.												

SN.	Phase	Tasks	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
		Identify possible policy enablers, such as carbon pricing, tax incentives, green certification schemes, and public procurement support												
		Prepare a gap analysis matrix highlighting missing or weak policy areas and recommendations for improvement												
3.2	GH2 Policy Framework Development	Identify critical enablers across regulation, finance, infrastructure, technology, and capacity domains for Maldives												
		Define actionable interventions and instruments to operationalize each enabler												
		Conduct Stakeholder Consultation and Validation with government agencies, private sector, and experts to refine and prioritize measures												
		Consolidation and prioritize policy vision, principles, enablers, and measures into a coherent national framework												
		Recommend structures and responsibilities for policy coordination, monitoring, and review												
		Review global GH2 policies to ensure compatibility, alignment and investment readiness												
		Prepare draft GH2 Policy Framework and share for review with UNON and Ministry												
		Incorporate the feedback from Ministry, Steering Committee and finalise the framework												
Deliverable-3		**GH2 Policy Gap Analysis and GH2 Policy Framework**												
4	**GCF Concept Note Development Phase**													
4.1	Concept Note Development	Review the latest GCF Concept Note template to understand if any changes to the template												
		Identify potential projects/ solutions to be included in the GCF concept note using MCA analysis / prioritization in consultation with UNEP team												

SN.	Phase	Tasks	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
		Develop project log-frame comprising of technical assistance and investments to detail the components like project details, outputs, deliverables, etc. as per the template using the inputs from pre-feasibility study conducted during the previous phases of the project												
		Develop theory of change (TOC) explaining how the project will lead to the desired outcomes												
		Analyze other key sections–gender, institutional arrangements, risks, etc.												
		Estimate project budget, funding source, instruments and others												
		Review draft concept note with UNEP and other key stakeholders												
		Incorporate feedback and finalise the note												
4.2	Dissemination	Compile all deliverables into a report and prepare presentation materials												
		Organize in-person dissemination workshop and invite GCF NDA, GEF focal person, government representatives, and key stakeholders												
		Conduct Workshop and present project outcomes, explore scaling opportunities, and gather stakeholder feedback												
		Organise the webinar to disseminate the study outcomes												
		Submit the final report, summarizing outcomes and recommendations												
Deliverable-4		**GCF Concept Note**												
		Capacity Building Workshop Report												
		Final report and in-person presentations												

Table 2: Work Plan

7. COMMUNICATION PLAN

pManifold will coordinate with the UNON team and Ministry of Tourism and Environment's focal person on a periodic basis (monthly) to share project progress and next steps. Yamini Keche would be the Project Co-ordinator and single point of contact from pManifold. She will coordinate between all experts and organize meetings with UNON as required.

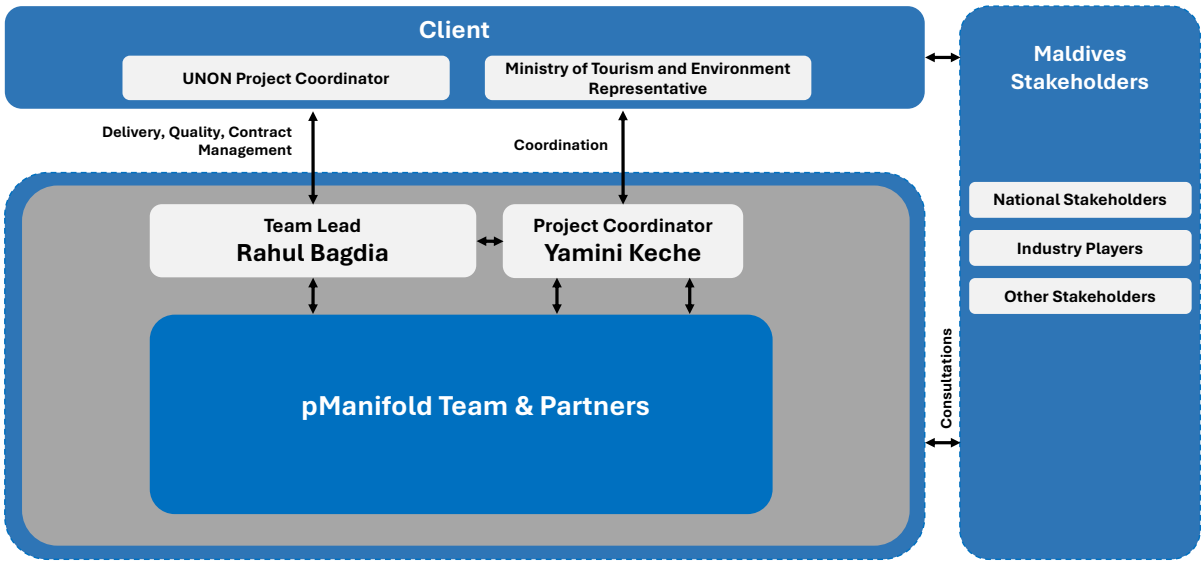


Figure 2. Communication Plan

8. ANNEXURES

ANNEXURE A: GENDER ASSESSMENT & GENDER ACTION PLAN REPORT TOC

1. Executive Summary

This section will provide a concise overview of the key findings, insights, and recommendations from the Gender Assessment. It will summarize the existing gender landscape in the Maldives, major barriers to women's participation in the green hydrogen (GH2) sector, and highlight actionable measures proposed under the Gender Action Plan

1.1. Background
1.2. Methodology
1.3. Barriers to gender diversity in GH2 economy in Maldives
1.4. Recommendations

2. Background

This section provides contextual information on gender dynamics in the Maldives and their implications for participation in the emerging GH2 economy

2.1. National Gender profile of Maldives (policies, institutional landscape, etc.)

Reviews the national gender policy framework, institutional mechanisms, and ongoing programs supporting gender equality, with emphasis on energy and climate-related sectors

2.2. Importance of gender diversity in GH2 economy in Maldives

Explains why integrating gender considerations is critical for equitable growth, innovation, and sustainability in the GH2 sector

2.3. Current state of gender diversity in GH2 and associated sectors in Maldives

Analyzes available data and evidence on women's representation in energy, engineering, research, and related sectors that form the base for GH2 workforce development

3. Barriers to Gender Diversity in GH2 Economy in Maldives

This section identifies and analyzes key barriers hindering gender inclusion in the GH2 value chain. It will cover systemic and sector-specific challenges, including cultural norms, limited access to technical education, lack of gender-sensitive policies, restricted access to finance, and underrepresentation in leadership roles. The section will also explore institutional and capacity constraints affecting gender mainstreaming in the energy sector

4. Recommended Gender Action Plan to Improve Gender Diversity in GH2 Economy in Maldives

This section outlines a strategic action plan with targeted interventions to enhance gender diversity across the GH_2 ecosystem. It will include short-, medium-, and long-term measures addressing policy, capacity building, skill development, and institutional strengthening. The Action Plan will also define responsible entities, potential partners, timelines, and performance indicators to ensure implementation and monitoring of gender-inclusive initiatives within the GH2 sector.

ANNEXURE B: MINUTES OF MEETING (MOM) | PROJECT KICK-OFF MEETING

Project: Feasibility Study on Green Hydrogen Potential in Maldives and Development of a National Roadmap for Sustainable Energy Transition

Date	14th Oct 2025
Time	10:30 am MV time (10:00 pm IST)
Attendees	**UNON:** • Mr.Hoyoung Jo **Ministry of Tourism and Environment:** • Mr. Ahmad Waheed • Mr. Ahmad Masoon • Mr. Hameed Ali • Ms Hawwa Liuza **pManifold:** • Rahul Bagdia • Yamini Keche • Shruti Bhoyar • Raghav Sarda • Srishti Sharma • Mr. Santosh Gurunath
Key Discussion and Action Points	The discussed points are: 1. **Scope and Implementation Plan:** ○ The project to be focused on assessing the potential and feasibility study of green hydrogen in Maldives. Key components will include capacity building and GCF Concept Note rather than roadmap development. ○ Instead of the full roadmap development the study shall emphasize on identifying the policy gaps and recommending key policy actions and interventions necessary for enabling GH2 ecosystem ○ While GCF will be the primary target for the funding note, other agencies can also be explored in this study ○ The Ministry of Climate Change, Environment and Energy team approved the overall approach of the study and the deliverable timeline ○ The Mission Visit is tentatively planned for December; confirmation by Ministry shall follow. Meanwhile, pManifold team can initiate stakeholder consultations 2. **Project Specifics:** ○ The study will primarily use secondary data sources considering potential limitations in primary data availability. Key data gaps can be addressed through stakeholder consultations ○ The study should also on high-potential hydrogen applications like transport, energy storage than on highly challenging and niche use cases ○ The study should explore different Hydrogen production technologies and assess potential use of sea water as feedstock

	○ While local hydrogen production will be key focus, the import and re-export of hydrogen should be analyzed for cost effectiveness Next Steps: ○ Ministry of Tourism and Environment to provide Key focal point ○ Ministry to share a letter introducing this project which can be used to initiate stakeholder consultations ○ Ministry to share existing studies done on H2 storage and others ○ pManifold team to share the data requirements with Ministry focal point and start organizing stakeholder consultations ○ pManifold team to schedule monthly meetings with team to share project updates ○ Ministry to facilitate formation of a Steering Committee by this month ○ pManifold team to schedule quarterly virtual meetings with the Steering Committee once formed