Country	Nepal
Request ID#	2026000001
Title	Comprehensive Feasibility Study for Nepal's Integrated Cement, Green Hydrogen, and Urea Production Plant Project
NDE	Maheshwar Dhakal Joint Secretary, Ministry of Forests and Environment, Singhadurbar, Kathmandu, Nepal, Tel: +977-1-4211641 Email: maheshwar.dhakal@gmail.com
Proponent	Biraj Singh Thapa Team Leader at Green Hydrogen Lab, Block-28 A, Kathmandu University, Dhulikhel-4, Kavre, Bagmati Province Email: bst@ku.edu.np

Summary of the CTCN technical assistance

Nepal faces a dual challenge of increasing climate vulnerability and continued dependence on imported fossil-fuel-based inputs for strategic sectors such as agriculture and industry. Although the country contributes only a negligible share of global greenhouse gas emissions, it is highly exposed to climate change impacts including rising temperatures, glacier retreat, erratic rainfall, floods, and droughts. At the same time, Nepal remains almost fully dependent on imported urea fertilizer, while its abundant hydropower resources remain significantly underutilized.

This CTCN technical assistance will support Nepal in undertaking a comprehensive technical and economic feasibility study for an integrated low-carbon industrial project combining renewable-electricity-based green hydrogen production, carbon capture and utilization from the Udayapur Cement Factory, and downstream ammonia/urea production. Over a 15-month period, the technical assistance will assess the technical, economic, financial, institutional, regulatory, environmental, and implementation feasibility of the proposed integrated project, while also strengthening national capacity, supporting stakeholder coordination, and identifying enabling policy and standards measures.

The expected outcome is an improved national evidence base and strengthened institutional capacity to support investment-ready decision-making on green hydrogen-based fertilizer production in Nepal. The technical assistance will help establish whether and under what conditions the proposed integrated project can move toward implementation, while also providing a roadmap for follow-up financing, policy action, and longer-term industrial decarbonization in line with Nepal's NDCs, Green Hydrogen Policy 2024, and broader sustainable development priorities.

Agreement:

(If possible, please use electronic signatures in Microsoft Word file format)

National Designated Entity to the UNFCCC Technology Mechanism
Name: Maheshwar Dhakal, PhD

Proponent
Name: Biraj Singh Thapa

Title: Joint Secretary

Date: 29 April 2026

Signature:

Title: Associate Professor & Team Leader, Green Hydrogen Lab, Kathmandu University, Nepal

Date: 10th April 2026

Signature:

UNFCCC Climate Technology Centre and Network (CTCN)
Name: Ariesta Ningrum
Title: Director, CTCN

Date: 30.04.2026

Signature:

1. Background and context

Nepal is among the countries most vulnerable to climate change despite contributing only around 0.04% of global emissions. The country is already experiencing significant climate-related stress through glacier melt, hydrological variability, extreme weather events, floods, and droughts. These impacts increasingly threaten food systems, infrastructure, water security, and long-term development prospects.

Agriculture remains central to Nepal's economy, and fertilizer availability is a strategic national concern. Nepal has approximately 3.1 million hectares of arable land and a growing demand for fertilizer, yet it remains almost entirely dependent on imported urea. Annual urea demand is estimated at approximately 800,000 metric tons, imposing a substantial foreign exchange burden even after public subsidies. Efforts to establish domestic fertilizer production have historically faced financial and technical barriers.

At the same time, Nepal possesses significant untapped hydropower potential. Although the country has an estimated electricity generation potential of around 120,000 MW, including approximately 48,000 MW from reservoir-based hydropower, only a small share has been installed and operationalized to date. This underutilization constrains industrial decarbonization and prolongs dependence on imported fossil-based energy and industrial inputs.

Against this backdrop, the Government of Koshi Province has initiated an integrated Green Fertilizer project that aims to combine renewable-electricity-based hydrogen production, carbon capture and utilization from the Udayapur Cement Factory, and low-carbon urea synthesis under a public-private partnership model. Previous studies and policy developments have created momentum for this concept, but a robust and comprehensive feasibility assessment is still lacking. Without such an evidence base, Nepal will face difficulty in de-risking the project, attracting follow-up investment, establishing enabling standards and policy measures, and moving toward implementation.

This technical assistance responds to that need by generating a rigorous feasibility basis for decision-making and investment mobilization, while also supporting capacity building, policy development, and stakeholder coordination for future scale-up.

2. Problem statement

Nepal's ability to advance low-carbon domestic fertilizer production is constrained by the absence of a comprehensive and investment-relevant assessment of the technical, economic, financial, regulatory, and institutional feasibility of integrating green hydrogen production, carbon capture and utilization, and downstream urea synthesis within the national context.

Although Nepal has a strong policy rationale for pursuing green hydrogen-based fertilizer production, several barriers continue to hinder progress. First, access to advanced technologies and engineering know-how for hydrogen production, carbon capture integration, ammonia/urea synthesis, and balance-of-plant design remains limited, increasing dependency on external technology providers and raising perceived project risks. Second, national institutions and stakeholders still face important technical and institutional capacity gaps related to project design, safety, regulation, operation, and long-term industrial deployment of hydrogen-based systems.

Third, Nepal currently lacks sufficiently developed technical standards, safety guidance, and policy recommendations for hydrogen production, storage, transport, industrial integration, and power system linkages. This weakens the enabling environment for future deployment and investment. Fourth, coordination among relevant actors, including national ministries, provincial authorities, academia, industry, financiers, and development partners, remains fragmented, limiting the emergence of a shared implementation pathway.

Finally, while various earlier studies and initiatives have explored fertilizer production or hydrogen opportunities in Nepal, there is still no integrated, project-oriented feasibility study that sufficiently addresses the combined technical, economic, financial, institutional, and implementation dimensions of a green hydrogen and low-carbon urea project linked to cement-sector CO2 utilization. Without targeted support to address these gaps, Nepal risks missing an important opportunity to convert its renewable energy potential into industrial decarbonization, fertilizer security, and climate-aligned economic development.

3. Logical Framework for the CTCN Technical Assistance:

(Guidance: Please note that multiple activities lead to one Output, and multiple Outputs lead to one Outcome. There can be several Outputs, but only one Outcome description capturing the CTCN technical assistance. Deliverables are the products or services to be delivered to the NDE/Proponent/CTCN based on the Activities and the Outputs.)

	Month														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Objective: To support Nepal in advancing climate-aligned domestic fertilizer production by assessing the technical, economic, financial, institutional, and regulatory feasibility of an integrated cement, green hydrogen, and low-carbon urea project, and by strengthening the enabling conditions for future investment, implementation, and replication.															
Outcome: Improved national capacity and evidence-based decision-making in Nepal for the development of green hydrogen-based fertilizer production, resulting in a validated feasibility basis for an integrated low-carbon urea project, stronger stakeholder coordination, enhanced policy and standards readiness, and clearer pathways for follow-up investment and implementation.															
Mandatory Output: Project management *All implementers must undertake the following project management activities at the beginning of, during and at the end of the CTCN technical assistance.*															
Activity A: Beginning of implementation A detailed work plan of all activities, deliveries, outputs, deadlines and responsible persons/organisations and detailed budget to implement the Response Plan. The detailed work plan and budget must be based directly on this Response Plan; Based on the work plan, a monitoring and evaluation (M&E) plan with specific, measurable, achievable, relevant, and time-bound indicators used to monitor and evaluate the timeliness and appropriateness of the implementation. The monitoring and evaluation plan should apply selected indicators from the Closure and Data Collection report template and enable the lead implementer to complete the CTCN Closure and Data collection report at the end of the assignment (please refer to item iv below and section 14 in the Response Plan). This M&E plan also includes a CTCN Impact Description formulated in the beginning of the technical assistance which will be revised in the Closure and Data Collection report once the technical assistance is fully delivered (templates will be provided). Other additional monitoring and evaluation indicators or templates may be required depending on the donor that is funding the technical assistance.															

Furthermore, a gender evaluation and gender action plan (GAP) will be prepared and followed throughout the technical assistance (a template will be provided).[1]															
Activity B: Implementation A project steering committee will be formed, consisting of the implementing team (international and local consultants), the NDE, the project proponent(s), beneficiary(ies), and CTCN. The objective of this steering committee is for the implementing partner to report on progress, and to guide the implementation of the project at a high level. It is recommended that this steering committee is virtually meeting on a monthly basis.															
Activity C: End of implementation A Closure and Data Collection report completed at the end of the technical assistance (a template will be provided). Potential project-end communication and dissemination activities (such as knowledge sharing webinar, dialogue with financial institutions, press release) may be conducted in collaboration with the CTCN Secretariat, subject to appropriateness.															
Mandatory deliverables: Deliverable A: Detailed work plan; M&E plan; gender assessment and gender action plan Deliverable B: Project Steering Committee meeting reports Deliverable C: Closure and Data Collection report; press release, webinar, dialogue with financial institutions	X X	X	X	X	X	X	X	X	X	X	X	X	X	X	X X
Output 1: Inception, baseline, and integrated feasibility framework established This output will establish the analytical and coordination foundation for the technical assistance. It will validate the scope and methodology of the assignment, consolidate key data and assumptions, and define the integrated feasibility framework for assessing green hydrogen production, carbon capture and utilization, and low-carbon urea synthesis in Nepal.															

[1] Additional information is available under Section 10 of the response plan.

Activity 1.1: Inception, stakeholder alignment, and baseline assessment An inception workshop and targeted consultations will be conducted with key stakeholders, including relevant ministries, Koshi Province institutions, Kathmandu University, industrial actors, financiers, and development partners. These consultations will validate the scope, objectives, data availability, priority questions, and implementation arrangements. A baseline assessment will review existing studies, policies, institutional roles, data gaps, and relevant technical and financial assumptions.															
Activity 1.2: Development of the integrated feasibility methodology and scenario framework A structured feasibility methodology will be developed to assess the integrated project concept. This will define the analytical boundaries, project configurations, scenario options, technical assumptions, demand and supply parameters, and evaluation criteria to be used across the technical, economic, financial, environmental, and institutional analyses.															
Activity 1.3: Stakeholder mapping and data collection framework A stakeholder mapping and data collection framework will be prepared to support the subsequent feasibility work. This will identify data providers, responsible institutions, consultation pathways, gender-responsive stakeholder engagement arrangements, and information needed for engineering, market, finance, policy, and implementation analyses.															
Deliverable 1: 1. Inception workshop and stakeholder alignment report 2. Baseline assessment report 3. Integrated feasibility methodology and scenario framework 4. Stakeholder mapping and data collection framework															
Output 2: Integrated technical and economic feasibility assessment completed This output will generate the core analytical evidence base needed to determine the viability of the proposed integrated project. It will assess the technical, economic, financial, environmental, regulatory, and implementation dimensions of linking renewable electricity, green hydrogen production, captured CO2 from cement operations, and downstream ammonia/urea production.															
Activity 2.1: Technical feasibility assessment The technical assessment will evaluate potential technology pathways and system configurations for green hydrogen production, CO2 capture and utilization, and low-carbon ammonia/urea synthesis. It will assess key engineering parameters, energy and water requirements, integration options with hydropower supply and cement-sector emissions streams, site-related considerations, safety and operational requirements, and major infrastructure needs.															
Activity 2.2: Economic and financial feasibility assessment The economic and financial assessment will examine capital and operating cost structures, production economics, market assumptions, import substitution potential, sensitivity analysis, risk factors, and															

potential implementation models, including PPP options where relevant. It will identify the main cost drivers, financing considerations, and conditions under which the project could become financially attractive or require phased development.															
Activity 2.3: Regulatory, environmental, and implementation feasibility assessment The assignment will review the enabling policy and regulatory environment, permitting considerations, industrial standards and safety implications, environmental and social considerations, and institutional roles required for implementation. It will also identify major implementation risks and mitigation measures, including technology risk, power supply risk, market risk, coordination risk, and investment risk.															
Deliverables 2: 1. Main integrated technical and economic feasibility report 2. Financial and economic analysis annex, including scenarios and sensitivities 3. Regulatory, environmental, and implementation assessment note 4. Executive summary for decision-makers															
Output 3: Policy, standards, and capacity strengthening delivered This output will translate the feasibility findings into concrete institutional strengthening and enabling-environment support. It will build national capacity, support policy and standards development, and improve stakeholder readiness for follow-up action.															
Activity 3.1: Policy and standards brief development A policy and standards brief will be prepared to provide practical recommendations on hydrogen safety, industrial integration, power linkages, CO2 utilization considerations, and enabling policy measures for green hydrogen-based fertilizer production in Nepal. The brief will focus on feasible, near- to medium-term actions that national institutions can take following the TA.															
Activity 3.2: Capacity-building programme and training delivery Training materials, technical guidance notes, and workshop content will be developed and delivered for engineers, policymakers, regulators, industry actors, researchers, and other relevant stakeholders. The training will cover core issues such as green hydrogen value chains, industrial decarbonization, CCU integration, fertilizer-sector applications, safety and standards considerations, and financing readiness.															
Activity 3.3: Stakeholder coordination and technical validation A structured multi-stakeholder coordination process will be facilitated throughout implementation to support information exchange, review interim findings, and improve ownership of the outputs. Technical validation sessions will also be held to discuss feasibility findings, policy implications, and next-step options.															
Deliverables 3:															

1. Policy and standards brief 2. Training package, including manuals, workshop materials, and presentations 3. Training and workshop reports, including sex-disaggregated participation data 4. Stakeholder coordination and technical validation report															
Output 4: Scale-up roadmap, financing strategy, investment concept note developed and final workshop This output will convert the TA findings into an actionable pathway for follow-up implementation and investment mobilization. It will define practical next steps, financing options, and institutional arrangements for moving from feasibility assessment toward project preparation and deployment.															
Activity 4.1: Development of an implementation and scale-up roadmap A phased roadmap will be prepared identifying short-, medium-, and long-term actions needed to advance the project. This will include sequencing of additional studies where needed, institutional roles, regulatory actions, capacity needs, financing milestones, and possible pathways for piloting, phased development, or full-scale implementation.															
Activity 4.2: Financing and PPP strategy A financing strategy will be developed to identify potential funding sources and structuring options, including public finance, climate finance, development partner support, private investment, and PPP approaches. The strategy will highlight realistic financing pathways and the additional project preparation steps needed to engage potential financiers.															
Activity 4.3: Preparation of a concept note and final validation workshop A draft concept note will be prepared for follow-up engagement with relevant financing institutions and development partners, such as the GCF and other multilateral or bilateral sources, as appropriate. A final validation workshop will present the TA results, discuss the proposed roadmap and financing strategy, and build consensus on next steps.															
Deliverable 4: 1. Implementation and scale-up roadmap 2. Financing and PPP strategy 3. Draft follow-up concept note 4. Final validation workshop report, including agreed next steps															

4. Resources required and itemized budget:

Please provide an indicative overview of the resources required and itemized budget required to implement the CTCN technical assistance, including for M&E-related activities, using the table below. Important to note that minimum 5% of the budget should explicitly target gender specific activities related to the technical assistance (please see section 10 for further information on gender). A maximum of 20% of the budget can be allocated to procurement (e.g.

infrastructure purchase, technology piloting), Once the Response Plan is completed, a Response Implementation partner(s) will be selected by the Climate Technology Centre (CTC). A detailed activity-based budget for the CTCN assistance will be finalized by the CTCN and selected Implementer.

Activities and Outputs	**Input: Human Resources** *(Title, role, estimated number of days)*	**Input: Travel**[2] *(Purpose, national vs. international, number of days)*	**Input: Meetings/events**[3] *(Meeting title, number of participants, number of days)*	**Input: Equipment/Material** *(Item, purpose, buy/rent, quantity)*	**Estimated cost** *Please accumulate the costing (USD) at Activity and Output level and provide an estimated costing range for each activity and the total Response Plan*	
					Minimum	**Maximum**
Mandatory Output: Project Management					*USD 7,560*	*USD 8,400*
Mandatory Activities: A: Beginning of implementation B: Implementation C : End of implementation	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days NE3: 7 days	-	–	-	*7,560*	*8,400*
Output 1: Inception, baseline, and integrated feasibility framework established					*41,580*	*46,200*
Activity 1.1: Inception, stakeholder alignment, and baseline assessment	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days	International travel: 5 days	In-person workshop: 4 days	-	*26,460*	*29,400*

[2] All budget values related to Daily Subsistence Allowance or logistical support for local participants shall remain as indicated.
[3] All budget values related to the organization of meetings and events shall remain as indicated.

	NE3: 7 days					
Activity 1.2: Development of the integrated feasibility methodology and scenario framework	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days NE3: 7 days	-	-	-	*7,560*	*8,400*
Activity 1.3: Stakeholder mapping and data collection framework	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days NE3: 7 days	-	-	-	*7,560*	*8,400*
Output 2: Integrated technical and economic feasibility assessment completed					*22,680*	*25,200*
Activity 2.1: Technical feasibility assessment	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days NE3: 7 days	-	-	-	*7,560*	*8,400*
Activity 2.2: Economic and financial feasibility assessment	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days NE3: 7 days	-	-	-	*7,560*	*8,400*

Activity 2.3: Regulatory, environmental, and implementation feasibility assessment	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days NE3: 7 days	-	-	-	*7,560*	*8,400*
Output 3: Policy, standards, and capacity strengthening delivered					*41,580*	*46,200*
Activity 3.1: Policy and standards brief development	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days NE3: 7 days	-	-	-	*7,560*	*8,400*
Activity 3.2: Capacity-building programme and training delivery	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days NE3: 7 days	International travel: 5 days	In-person workshop: 4 days	-	*26,460*	*29,400*
Activity 3.3: Stakeholder coordination and technical validation	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days NE3: 7 days	-	-	-	*7,560*	*8,400*
Output 4: Scale-up roadmap, financing					*41,580*	*46,200*

strategy, investment concept note developed and final workshop						
Activity 4.1: Development of an implementation and scale-up roadmap	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days NE3: 7 days	-	-	-	*7,560*	*8,400*
Activity 4.2: Financing and PPP strategy	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days NE3: 7 days	-	-	-	*7,560*	*8,400*
Activity 4.3: Preparation of a concept note and final validation workshop	IE1: 7 days IE2: 7 days IE3: 7 days NE1: 7 days NE2: 7 days NE3: 7 days	International travel: 5 days	In-person workshop: 4 days	-	*26,460*	*29,400*
Estimated range of costing for the entire Response Plan					***154,980***	***172,200***

5. Profile and experience of experts

Based on the required Human Resources identified in section 4 (Resources required and itemized budget) please provide a description of the required profile of all involved experts for the implementation of the CTCN Response Plan. Please note that an expert with experience in gender mainstreaming is required. The CTCN Gender and Climate Technology Expert Roster can help you identify a suitable expert: https://www.ctc-n.org/networking-and-collaboration/gender-and-climate-technology-expert-roster

Experts required	Brief description of required profile
International Experts	
Project Manager / Industrial Decarbonization and Integrated Feasibility Lead (IE1)	• Advanced university degree (Master's or equivalent) in chemical engineering, energy systems, industrial decarbonization, climate policy, or a related field. A Bachelor's degree may be accepted with at least 12 years of relevant professional experience. • Minimum 10 years of professional experience in managing and delivering complex technical assistance projects related to industrial decarbonization, hydrogen systems, low-carbon industrial development, or climate technology deployment, preferably in developing countries. • Demonstrated experience in leading multi-stakeholder feasibility studies and coordinating technical, financial, institutional, and policy workstreams. • Strong expertise in project management, stakeholder coordination, monitoring and evaluation, quality assurance of deliverables, and engagement with governments, development partners, and private-sector actors. • Experience working with UN agencies, CTCN, MDBs, climate finance mechanisms, or public-private project preparation is highly desirable. • Excellent written and oral communication skills in English are required.

Green Hydrogen, CCU, and Industrial Process Engineering Expert (IE2)	• Advanced university degree (Master's or equivalent) in chemical engineering, process engineering, industrial energy systems, hydrogen technologies, fertilizer production, carbon capture and utilization, or a related field. A Bachelor's degree may be accepted with at least 9 years of relevant professional experience. • Minimum 7 years of relevant professional experience in green hydrogen production systems, electrolysis, ammonia/urea process design, industrial decarbonization technologies, carbon capture and utilization, and techno-economic analysis of industrial applications. • Demonstrated experience in assessing integrated industrial systems, including process configurations, energy and material balances, technology selection, system integration, infrastructure needs, and safety considerations. • Experience in feasibility studies for hydrogen, ammonia, fertilizer, cement, or related industrial sectors is strongly preferred. • Strong analytical and technical reporting skills are required. • Experience in developing-country contexts is an advantage. • Excellent written and oral communication skills in English are required.

Economic, Financial, Policy, and Scale-up Expert (IE3)	• Advanced university degree (Master's or equivalent) in economics, finance, public policy, energy economics, infrastructure planning, climate finance, or a related field. A Bachelor's degree may be accepted with at least 9 years of relevant professional experience. • Minimum 7 years of professional experience in economic and financial analysis, investment appraisal, PPP structuring, enabling policy analysis, and preparation of financing strategies or concept notes for climate-related or industrial projects. • Demonstrated experience in assessing project economics, financial viability, implementation models, market conditions, policy barriers, and financing pathways. • Experience with GCF, MDBs, bilateral donors, or climate finance project preparation is highly desirable. • The expert should also have demonstrated experience in supporting capacity building, stakeholder consultation processes, and preparation of roadmaps or investment-oriented follow-up strategies. • Excellent written and oral communication skills in English are required.
National Experts	
National Industrial and Energy Systems Expert (NE1)	• University degree (Bachelor's or higher) in chemical engineering, industrial engineering, energy engineering, mechanical engineering, or a related field. • Minimum 5 years of professional experience in Nepal's industrial, fertilizer, energy, hydropower, or manufacturing sectors. • Strong understanding of national industrial conditions, energy system characteristics, infrastructure constraints, and relevant technical and institutional actors. • Experience supporting technical data collection, validation of assumptions, engagement with industrial stakeholders, and review of engineering or feasibility-related materials is required. • Fluency in Nepali and good working knowledge of English are required.

National Policy, Institutional Coordination, and Stakeholder Engagement Expert (NE2)	• University degree (Bachelor's or higher) in public policy, environmental management, development studies, economics, engineering management, or a related field. • Minimum 5 years of relevant experience in policy analysis, institutional coordination, stakeholder consultation, and facilitation of multi-agency processes in Nepal. • Strong familiarity with Nepal's climate policy, energy policy, agriculture sector, industrial development context, and government coordination processes is highly desirable. • Experience supporting workshops, interviews, validation sessions, stakeholder mapping, and synthesis of institutional and regulatory inputs is required. • Fluency in Nepali and English is required.
National Gender and Social Inclusion Expert (NE3)	• Relevant university degree (Bachelor's or higher) in gender studies, social sciences, development studies, sociology, or a related field. • Minimum 5 years of professional experience in gender mainstreaming and social inclusion in climate change, energy, industry, infrastructure, or development projects. • Proven ability to integrate gender considerations into technical projects, including consultations, training programmes, monitoring frameworks, and reporting. • Experience in conducting gender assessments, preparing gender action plans, collecting and analysing sex-disaggregated data, and supporting inclusive participation of women, youth, and marginalized groups is required. • Experience in Nepal and familiarity with national gender and inclusion considerations are highly desirable. • Fluency in Nepali and English is required.

6. Intended contribution to impact over time

Short-term impact

In the short term, the technical assistance will provide Nepal with a structured and credible evidence base for decision-making on an integrated green hydrogen and low-carbon urea project. It will clarify technical options, identify key cost drivers and implementation barriers, strengthen stakeholder coordination, and improve institutional understanding of industrial hydrogen applications, CCU integration, and follow-up financing requirements. It will also enhance the readiness of national actors to engage in informed dialogue on project development, policy action, and investment.

Medium-term impact

In the medium term, the outputs of the technical assistance are expected to support policy and regulatory follow-up, more coordinated stakeholder action, and the development of investment-oriented next steps. The feasibility results, policy and standards brief, training materials, and financing strategy may be used by relevant ministries, provincial authorities, project developers, academic institutions, and financing partners to refine project design, mobilize additional technical support, and prepare follow-up proposals for climate finance or public-private investment.

Long-term impact

In the long term, and subject to subsequent investment and implementation, the technical assistance could contribute to a broader transition toward low-carbon domestic fertilizer production in Nepal, reduced dependence on imported fossil-fuel-based urea, strengthened industrial decarbonization pathways, greater use of renewable electricity in productive sectors, and enhanced national capacity to deploy green hydrogen technologies. The TA may also help create an enabling basis for replication in other industrial applications and regions of Nepal.

7. Relevance to NDCs and other national priorities

This technical assistance is strongly aligned with Nepal's national climate, energy, industrial, and agricultural priorities.

Alignment with Nepal's Nationally Determined Contribution (NDC) 3.0

The TA supports Nepal's climate mitigation ambitions by exploring green hydrogen production and use in a priority industrial application. It contributes to evidence-based implementation of Nepal's broader decarbonization and net-zero objectives by assessing a concrete pathway for renewable-energy-based industrial transformation.

Alignment with Nepal's Green Hydrogen Policy 2024

The TA directly responds to Nepal's Green Hydrogen Policy 2024, which identifies chemical fertilizer production as a strategic application for green hydrogen. The proposed feasibility study and enabling-environment support will help operationalize this policy direction by translating a strategic priority into an implementable project pathway.

Alignment with Nepal's Long-term Strategy for Net-zero Emissions (2021)

The TA is aligned with Nepal's long-term strategy, which highlights the need for low-carbon industrial transformation, increased clean energy use, and enabling measures to attract investment into climate-aligned sectors. By examining the integration of renewable electricity, industrial CO2 utilization, and fertilizer production, the TA contributes to this strategic vision.

Alignment with Nepal's Climate Change Policy (2019)
The TA supports Nepal's objective of mobilizing financial and technological resources for climate action and strengthening institutional capacity for climate-responsive development. Its emphasis on feasibility, standards, institutional capacity, and follow-up financing is consistent with this policy direction.

Alignment with the Agricultural Development Strategy (ADS 2015–2035)
The TA is relevant to Nepal's long-standing strategic interest in strengthening fertilizer supply, improving agricultural productivity, and identifying practical long-term options for domestic fertilizer production. By assessing climate-aligned domestic urea production, the TA responds directly to national concerns over fertilizer security and long-term resilience of the agricultural sector.

Alignment with broader national energy and industrial priorities
The TA also supports Nepal's efforts to better utilize its renewable energy potential, promote industrial innovation, reduce fossil-fuel dependence, and create higher-value productive uses of hydropower. It therefore sits at the intersection of climate mitigation, energy transition, agricultural resilience, and industrial development.

8. Linkages to relevant parallel on-going activities:

This technical assistance is designed to complement, rather than duplicate, existing and past efforts in Nepal.

Earlier studies by JICA, ADB, the World Bank, and national institutions have explored fertilizer production options, hydrogen potential, and related industrial pathways. These efforts have generated useful preliminary insights, but they have not yet resulted in an integrated, investment-oriented feasibility basis for the proposed Koshi Province project combining renewable-electricity-based hydrogen production, cement-sector CO2 utilization, and downstream urea production.

The technical assistance is also complementary to ongoing policy and institutional developments, including the Green Hydrogen Policy 2024, the establishment of national committees related to green hydrogen and green fertilizer production, and the growing policy interest in using green hydrogen for productive sectors. Likewise, it builds on technical work undertaken by Kathmandu University, GGGI, and other national stakeholders related to green urea and hydrogen hubs in Nepal.

The TA may also create useful synergies with Nepal's broader clean energy, climate finance, industrial modernization, and carbon market efforts by identifying a practical industrial decarbonization opportunity that links renewable energy, CO2 utilization, fertilizer security, and potential follow-up finance. In this regard, the TA can serve as a bridging intervention between strategic policy ambition and bankable project preparation.

9. Anticipated follow up activities after this technical assistance is completed:

Following completion of the technical assistance, the outputs are expected to support a range of follow-up actions, depending on the feasibility findings and stakeholder decisions.

Potential follow-up activities may include the preparation of additional pre-feasibility or detailed engineering studies; development of a bankable project proposal or concept note for climate finance and development-partner engagement; preparation of policy, regulatory, or standards measures for hydrogen-related industrial deployment; further technical due diligence and investment structuring for a PPP or other implementation model; continued capacity-building

activities through universities and technical institutions; and engagement with domestic and international financing institutions for project preparation and scale-up.

If the feasibility assessment indicates positive project potential, the TA outputs may also support phased pilot activities or early-stage implementation steps. More broadly, the knowledge, methodologies, and institutional coordination mechanisms developed under the TA could inform future green hydrogen applications in other sectors and locations in Nepal.

10. Gender and co-benefits:

Each technical assistance must integrate gender mainstreaming activities and lead to gender and other co-benefits. At least 5% of the technical assistance budget need to be allocated to gender mainstreaming activities. A suitable expert can be identified through the CTCN Gender and Climate Technology Expert Roster: https://www.ctc-n.org/networking-and-collaboration/gender-and-climate-technology-expert-roster

Gender benefits embedded in the implementation and as a result of activities:	Gender equality and social inclusion will be systematically integrated into implementation. A Gender Assessment will be undertaken during the inception phase to identify gender-related barriers, opportunities, and participation gaps relevant to industrial decarbonization, technical training, stakeholder engagement, and future employment pathways. Based on this assessment, the lead implementer will prepare and apply a Gender Action Plan throughout the TA. The TA will promote inclusive participation of women and youth in consultations, training activities, technical review processes, and stakeholder dialogue. Where feasible, the TA will aim for at least 40% participation of women and youth in workshops and consultations, and will encourage participation of women professionals, students, researchers, and early-career practitioners in technical learning and coordination activities. Sex-disaggregated data will be collected and monitored. As a result, the TA is expected to strengthen the visibility and participation of women and youth in an emerging technical field, improve institutional awareness of gender-responsive approaches in climate technology deployment, and support more inclusive capacity development in Nepal's green industrial transition.
Other co-benefits embedded in the implementation and intended as result of the activities:	The TA is expected to generate several environmental, economic, institutional, and social co-benefits. Environmentally, it will support analysis of a project concept that could reduce reliance on fossil-fuel-based fertilizer imports, promote productive use of renewable electricity, and enable utilization of captured industrial CO2. Economically, it could help Nepal identify a pathway toward import substitution, industrial value addition, and follow-up investment in a strategic productive sector. Institutionally, it will strengthen coordination among ministries, provincial authorities, academia, industry, and financiers, while improving national capacity to assess and prepare complex low-carbon industrial projects. Socially, the TA may contribute to more resilient fertilizer supply strategies and long-term opportunities for skills development, technical learning, and youth engagement in emerging green industries.

11. Main in-country stakeholders in implementation of the technical assistance activities:

Using the table below, please list and describe the role of in-country stakeholders, participants and beneficiaries who will be involved in or directly consulted during implementation of the assistance.

In country stakeholder	Role in implementation of the technical assistance

Ministry of Forests and Environment (NDE)	Overall national focal point for CTCN; ensures alignment with national climate priorities; supports coordination with ministries and stakeholders; participates in validation and follow-up discussions.
Kathmandu University / Green Hydrogen Lab (Project Proponent)	Main technical counterpart and proponent; supports technical inputs, stakeholder coordination, provision of background studies and data, validation of assumptions, and dissemination of results.
Ministry of Energy, Water Resources and Irrigation	Provides input on hydropower, electricity integration, renewable energy planning, and strategic energy considerations relevant to hydrogen production.
Ministry of Agriculture and Livestock Development	Provides input on fertilizer demand, agricultural policy relevance, national fertilizer supply issues, and possible downstream development implications.
Ministry of Industry, Commerce and Supplies	Supports industrial policy alignment, manufacturing and industrial development considerations, and institutional coordination with relevant industrial stakeholders.
Ministry of Finance	Provides input on public finance considerations, fiscal incentives, and broader financing and investment implications.
Department of Environment and other relevant regulatory bodies	Contribute to environmental compliance, permitting considerations, and policy/regulatory review.
Koshi Province Government and relevant provincial entities	Provide provincial project context, policy coordination, local implementation perspectives, and support for engagement with local stakeholders.
Udayapur Cement Factory	Provides relevant technical and operational information related to CO2 emissions streams, plant characteristics, and integration considerations for CCU-related analysis.
Nepal Green Hydrogen Company Pvt. Ltd. and/or relevant project development entities	Provide project concept information, assumptions, and inputs relevant to technical design, business model considerations, and implementation options.
Hydropower producers / power sector stakeholders	Provide data and perspectives related to electricity supply, generation characteristics, power availability, and integration requirements.
Financing institutions, including national and infrastructure banks	Participate in discussions on financing conditions, investment requirements, PPP options, and follow-up project preparation.
Development partners (e.g. ADB, World Bank/IFC, bilateral partners, others as relevant)	Provide strategic feedback, identify synergies with parallel programmes, and explore opportunities for future support or financing.
National Academy of Science and Technology and other research institutions	Support technical review, knowledge exchange, innovation linkages, and longer-term capacity development.

Women's organizations, youth networks, civil society and community stakeholders	Support inclusive participation, outreach, and incorporation of gender and social inclusion considerations into the TA process.

12. SDG Contributions:

*Instructions: Please complete the grey section below for **a maximum of three SDGs** that will be advanced through this TA. A complete list of SDGs and their targets is available here: https://sustainabledevelopment.un.org/partnership/register/.*

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
1	End poverty in all its forms everywhere	
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	By assessing options for climate-aligned domestic urea production, the TA supports longer-term fertilizer security and more resilient agricultural productivity in Nepal.
3	Ensure healthy lives and promote well-being for all at all ages	
4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	
5	Achieve gender equality and empower all women and girls	
6	Ensure availability and sustainable management of water and sanitation for all	
7	Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7)	
	7.1 - By 2030, ensure universal access to affordable, reliable and modern energy services	
	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix	
	7.3 - By 2030, double the global rate of improvement in energy efficiency	
	7.a - By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	
	7.b - By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	The TA supports sustainable industrialization by assessing an innovative low-carbon industrial project that links renewable electricity, green hydrogen, CO2 utilization, and fertilizer production.
10	Reduce inequality within and among countries	
11	Make cities and human settlements inclusive, safe, resilient and sustainable	
12	Ensure sustainable consumption and production patterns	
13	Take urgent action to combat climate change and its impacts	The TA advances climate mitigation planning by evaluating a concrete pathway for industrial decarbonization, reduced fossil-based fertilizer dependence, and increased productive use of renewable energy.
	13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	
	13.2 - Integrate climate change measures into national policies, strategies and planning	
	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	
	13.a - Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and	

	transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	
	13.b - Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities	
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	

13. Classification of technical assistance:

Please indicate primary type of technical assistance. Optional: If desired, indicate secondary type of technical assistance.

Please tick off the relevant boxes below	*Primary*	*Secondary*
☐ 1. Decision-making tools and/or information provision	☐	☐
☐ 2. Sectoral roadmaps and strategies	☐	☐
☐ 3. Recommendations for law, policy and regulations	☐	☑
☐ 4. Financing facilitation	☐	☑
☐ 5. Private sector engagement and market creation	☐	☑
☐ 6. Research and development of technologies	☐	☐
☐ 7. Feasibility of technology options	☑	☐
☐ 8. Piloting and deployment of technologies in local conditions	☐	☐
☐ 9. Technology identification and prioritisation	☐	☐

Please note that all CTCN technical assistance contributes to strengthening the capacity of in country actors.

14. Monitoring and Evaluation process

Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a monitoring and evaluation plan for the technical assistance. The monitoring and evaluation plan must include specific, measurable, achievable, relevant, and time-bound indicators that will be used to monitor and evaluate the timeliness and appropriateness of the implementation. The CTCN Technology Manager responsible for the technical assistance will monitor the timeliness and appropriateness of the Response Plan implementation. Upon completion of all activities and outputs, evaluation forms will be completed by the (i) NDE about overall satisfaction level with the technical assistance service provided; and (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance. Furthermore, the NDE together with the project proponent(s) will complete a periodic post-implementation form to track the impact of the activities beyond the technical assistance end date.

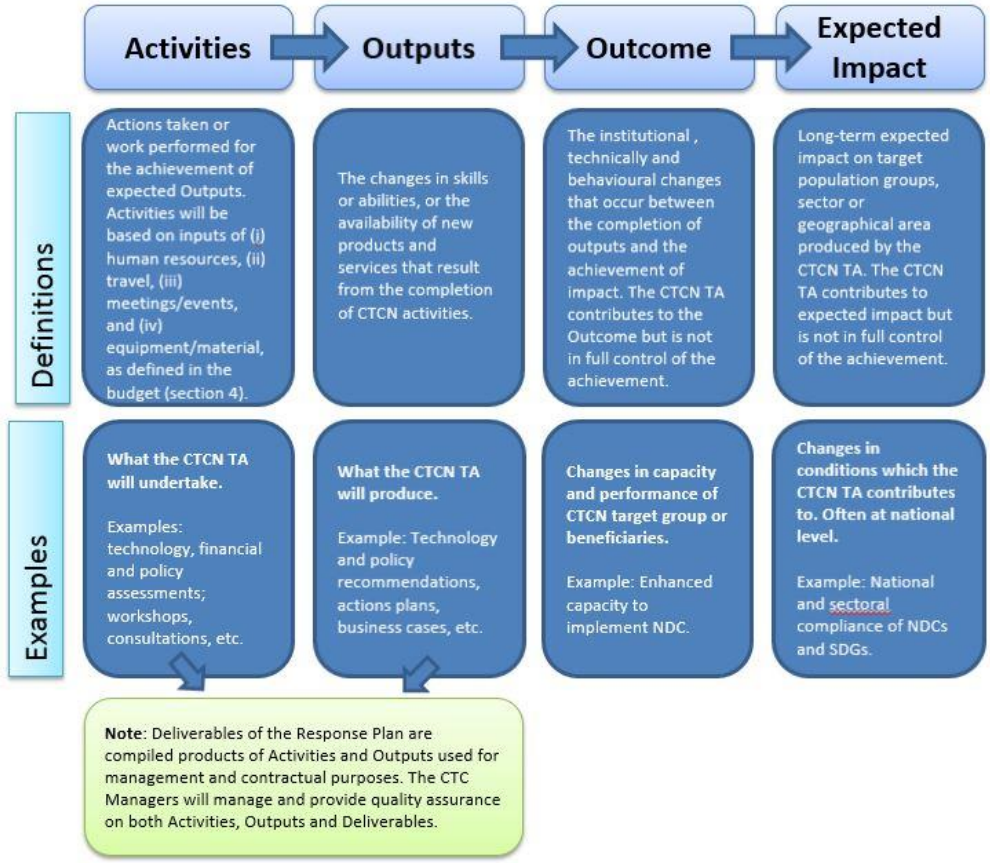
Annex 1: Guidance note for designing a Response Plan (to be deleted when submitting the Response Plan)

1. Objective of the Response Plan

The Response Plan is developed by CTCN specialists in response to a country request for technical assistance. It constitutes the Terms of Reference of the CTCN technical assistance that will be provided to the country and it provides the formulation of and subsequent basis for the monitoring and evaluation of the Response Plan implementation, as well as its expected outcomes and anticipated impacts.

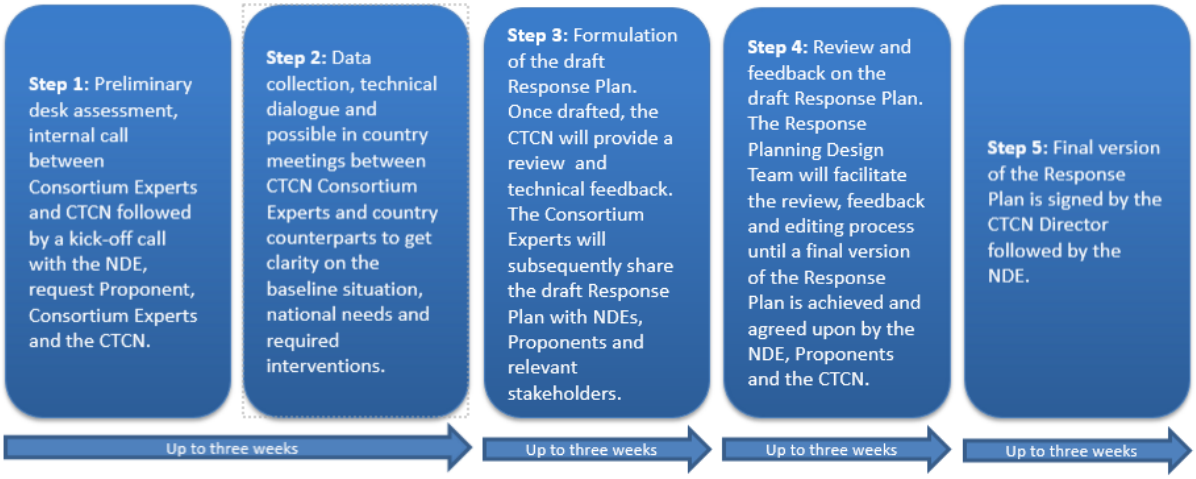
2. Results chain and Logical Framework Approach to be defined in the CTCN Response Plan

The result chain is the causal sequence that stipulates the necessary flow of actions and processes to achieve desired objectives and results – beginning with inputs, moving through activities and outputs, and culminating in individual outcomes. The outcome will contribute to the desired impact in the society. The Logical Framework Approach is an analytical process used to support objectives-oriented project planning and management. It provides a set of pre-defined concepts which are used as part of an iterative process to aid structured and systematic analysis and management of the CTCN technical assistance.



3. Process for designing the Response Plan

The Response Planning process should be completed over a period of up to 60 working days (12 weeks). Indicative steps and related timelines are laid out below:



4. Design Considerations

In order to maximize the impact of the technical assistance provided by the CTCN and provide an effective M&E process, the Response Plan should integrate as much as possible the considerations below:

Climate Technology focus: The Response Plan should have a clear focus on climate technologies, and identify activities that enable the identification, development, deployment or diffusion of one or several specific technologies (including equipment, techniques, knowledge and skills).

Barrier removal / Problem solving: The activities should contribute to address the specific problem statement identified in the Request. The barriers identified should be those hampering the identification, development, deployment or diffusion of one or several climate technologies or climate actions. Therefore, it may be necessary to limit the CTCN Response Plan to a set of activities for technical assistance commonly agreed with the NDE (and Proponent when needed) compared to the original request submitted. The CTCN will liaise with NDEs and Proponent in case the scope of the technical assistance deviates from the original request.

Use of the CTCN assistance by stakeholders: The Response Plan should identify clearly how the products of the CTCN assistance will be used in the short term once support is delivered, by who and when, to ensure it will lead to specific impacts in the country. The activities should engage the stakeholders that will use the concrete results of the assistance to deploy the technologies, including from the private sector, the public sector, research institutions, etc.

Within the scope of CTCN resources: The cost of the technical assistance provided by the CTCN cannot exceed USD 250,000 per Response Plan. Therefore, it may be necessary to prioritize activities and limit the CTCN Response Plan to a set of priority activities commonly agreed with the Proponent and the NDE to remain under this value. Under section 4 of the Response Plan template, an indicative activity based budget should be presented. The proposed budget is indicative and should present an estimated costing range per activity, output as well as a total costing range for the delivery of the

Response Plan. Once the Response Plan is finalised and published for tendering, interested parties will provide competitive offer against the indicative budget.

CTCN activities and outputs should be linkable to monitoring and evaluation indicators: All proposed activities and outputs must be linkable to monitoring and evaluation indicators that are specific, measurable, achievable, relevant, and time-bound. The monitoring and evaluation process and corresponding indicators will be developed by the Lead Implementer as part of the work plan and will allow the CTCN technology Manager to monitor the timeliness and appropriateness of the implementation.

Synergies with existing efforts: The Response Plan should focus on activities that are not already being fully supported or that are in the process of being fully supported by another national, regional or international organization. Synergies and complementarity also require that the CTCN assistance is not duplicating past activities. It is possible in the Response Plan to indicate co-financing from the government, the Proponent or another stakeholder, that will maximize the effectiveness of the CTCN assistance.

Gender mainstreaming: The CTCN mission is to build or strengthen developing countries' capacities to identify technology needs, to facilitate the preparation and implementation of technology projects and strategies taking into account gender considerations. The Response Plan must therefore describe how gender considerations will be included and monitored within the proposed activities, and any gender co-benefits that will be gained as a result of implementing the CTCN technical assistance. For that purpose, a Gender Assessment and Action Plan (GAAP) template has been designed to be followed by the implementation partner.