

TC Document

I. Basic Information for TC

• Country/Region:	REGIONAL
• TC Name:	A Green Hydrogen Facility to accelerate Latin America and the Caribbean decarbonization through green recovery
• TC Number:	RG-T3904
• Team Leader/Members:	Carvalho Metanias Hallack, Michelle (INE/ENE) Team Leader; Correa Poseiro, Cecilia (INE/ENE) Alternate Team Leader; Visconti, Gloria (CSD/CCS) Alternate Team Leader; Aiello, Roberto Gabriel (INE/ENE); Alarcon, Arturo (INE/ENE); Angulo Rodriguez, Emilio Jose (INE/ENE); Ballon Lopez, Sergio Enrique (INE/ENE); Baltodano Carrasquilla, Fabiola (INE/ENE); Cubillos Prieto, Fernando (INO/IEN); Eric Daza (INE/ENE); Gischler Blanco, Christiaan (INE/INE); Gomez, Jose Ramon (INE/ENE); Juarez Olvera, Mariel (CSD/CCS); Machado Lemus, Ziza (INE/ENE); Malagon Orjuela, Edwin Antonio (INE/ENE); Marquez Barroeta, Fidel (INE/ENE); Prado, Veronica Rodrigues Do (INE/ENE); Snyder, Virginia Maria (INE/ENE); Vila Saint-Etienne, Sara (LEG/SGO)); Daza, Eric (INE/ENE)
• Taxonomy:	Client Support
• Operation Supported by the TC:	.
• Date of TC Abstract authorization:	15 Apr 2021
• Beneficiary:	Bolivia through the Ministry of Hydrocarbons and Energy, Paraguay through the Vice Ministry of Energy and Mines, Panama through the National Secretariat of Energy of Panama, and Perú through the Ministry of Energy and Mines.
• Executing Agency and contact name:	Inter-American Development Bank
• Donors providing funding:	NDC Pipeline Accelerator Multidonor Trust Fund(ACL); OC Strategic Development Program for Infrastructure(INF); Sustainable energy and Climate Change Multi-donor Trust Fund(MSC)
• IDB Funding Requested:	NDC Pipeline Accelerator Multidonor Trust Fund (ACL): US\$250,000.00 OC Strategic Development Program for Infrastructure (INF): US\$150,000.00 Sustainable energy and Climate Change Multi-donor Trust Fund (MSC): US\$150,000.00 Total: US\$550,000.00
• Local counterpart funding, if any:	US\$0
• Disbursement period (which includes Execution period):	24 months (included execution period)
• Required start date:	March 2022
• Types of consultants:	Consultant Firms and Individual Consultant
• Prepared by Unit:	INE/ENE-Energy
• Unit of Disbursement Responsibility:	INE/ENE-Energy
• TC included in Country Strategy (y/n):	No
• TC included in CPD (y/n):	No
• Alignment to the Update to the Institutional Strategy 2010-2020:	Environmental sustainability; Institutional capacity and rule of law; Productivity and innovation

II. Objectives and Justification of the TC

- 2.1 The objective of the proposal is to contribute to the decarbonization of the energy services (energy sector and hard-to-electrify sectors) and to the economic recovery of Latin America and the Caribbean (LAC) through an Initiative that will support the development of Green Hydrogen (GH2) ecosystems. The Initiative aims to allow select countries to explore the role that GH2 may play in their energy transition. The specific objectives of the TC are (i) to support the creation of a GH2 regional initiative; (ii) to identify potential GH2 projects; and (iii) to provide policy support and promote knowledge sharing for the development of GH2 ecosystem in the region.
- 2.2 The need to reach net-zero emissions and the role of GH2. Paris Agreement aims to: (i) limit the global temperature rise this century to well below 2°C—aiming for 1.5°C—above pre-industrial levels; (ii) reduce vulnerability and increase climate resilience; and (iii) make finance flows consistent with a pathway toward low-GHG emissions and climate-resilient development. The World Economic Forum (WEF), International Renewable Energy Agency (IRENA), International Energy Agency (IEA), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), and the Governments of Japan, Australia and Germany have concluded that the use of hydrogen as an energy carrier is key to the rapid, sustained, and cost-effective reduction of GHG emissions. Hydrogen can carry energy, which can be transformed into electricity or heat, with geographic and time flexibility, and may or not use the power grid. Furthermore, GH2 can be used as a feedstock, as fuel, and energy storage, showing its high versatility. It is also highlighted that the production or consumption of green hydrogen does not emit GHG, as hydrogen is produced by introducing water in an electrolyser which separates the water into hydrogen and oxygen and in this process, it uses only renewable energy. Finally, through its use in a fuel cell, green hydrogen is combined with oxygen to produce water and generate electricity, therefore serving as a source of green energy.
- 2.3 The development of green hydrogen production at a large scale could support emission reduction in hard-to-electrify industries (such as steel making, cement manufacturing, heavy transport, among others) and the development of a new export product leveraging existing local advantages and capabilities. The reduction in renewable energy costs has allowed a reduction in GH2 generation costs. GH2, produced using renewable energy, is increasingly becoming a feasible alternative to overcome those barriers and which will not only accelerate decarbonization plans in LAC but will transform the energy and transport industry. Even if hydrogen is not properly a new technology, its adoption as an energy carrier is new in the context of decarbonization.
- 2.4 GH2 can support (1) the decarbonization of the electricity sector by providing short and long-term storage services which will contribute to higher penetration of renewable energies, by giving more flexibility to electricity systems and allowing the substitution and phasing-out of fossil fuel peak load plants; and (2) the decarbonization of hard-to-electrify sectors with the traditional electricity grid-based industry, such as industrial heating and transportation. Hydrogen could become a game-changer, interconnecting

international electricity markets (without grids). Furthermore, the use of existent natural gas infrastructure for the hydrogen industry can be a way to smooth the economic transition, decreasing costs and avoiding sunk costs.

- 2.5 GH2 deployment. Different countries have started to develop structured strategies to use hydrogen in their energy transition to set specific targets for these technologies or to promote hydrogen projects. This is the case of Japan, France, the US and China. The European Commission presented the Hydrogen Strategy for a climate-neutral Europe, which establishes specific targets for hydrogen in the short, medium, and long term. LAC countries started to see the potential of GH2 as an alternative energy source for internal use and as an export product (such as a new commodity) that will contribute to the decarbonization targets of other countries. As consequence, the IDB has received increasing demand for support from countries such as Argentina, Barbados, Chile, Colombia, Costa Rica, Jamaica, Paraguay, Trinidad and Tobago and Uruguay. IDB is already supporting the “Promotion of the Green Hydrogen Market in LAC Countries” (ATN/OC-18386-RG), benefiting Trinidad and Tobago and Uruguay with technical studies and national strategies for hydrogen; and the “Support for the Creation of a Hydrogen Ecosystem in Uruguay: Promoting a Sustainable Mobility System” (ATN/OC-17723-UR) contributing with a first hydrogen pilot project in Uruguay through Ordinary Capital funding. Also, the IDB is supporting Chile with the “Promotion for the Development of a Green Hydrogen Market in Chile” (ATN/JF-18347-CH) with the development of pre-investment studies for flagship projects and the support for the development of the regulatory framework and institutional capacity building which are being funded by Japan Special Funds. The proposed TC will complement and apply lessons learned from these projects, such as the importance of (i) having an appropriate regulatory framework to allow the participation of the different institutions or actors in the different stages of the development of the technology, (ii) promoting the dissemination of knowledge to contribute to technically sound decision making, and (iii) fostering the articulation of the different stakeholders of the industry and public visibility of the benefits of the technology to promote greater acceptance.
- 2.6 The Green Hydrogen Initiative (GH2I). This Technical Cooperation (TC) will support the creation of the Green Hydrogen Initiative (GH2I) which will contribute to attend these regional demands. GH2I will support the development of GH2 ecosystems through (i) training, knowledge, and dialogue support; (ii) contribution to the development of National Hydrogen Strategies, roadmaps and regulation, and the inclusion of GH2 targets in countries’ NDCs (Nationally Determined Contributions) and related climate change action plans; (iii) support to the GH2 value chain and new business models to promote private sector participation and public companies’ sustainable transformation; (iv) assisting and financing pilot projects; (v) supporting and financing the preparation and implementation of commercial GH2 projects. Furthermore, the TC will contribute to the development of prefeasibility studies and the dissemination of knowledge and dialogue support.

- 2.7 Beneficiary countries. All IDB borrowing member countries are eligible to participate in this TC. The TC activities will be focused on supporting countries which are preparing 2021 operations to overcome the COVID-19 crisis and focus on the economic recovery. The resources of the TC will be administered by the Bank. It is expected that the TC will be able to support four countries; this number can be extended if new letters are received by the Bank from countries developing activities to recover from COVID-19. These countries will be identified, and resources will be allocated on a need basis determined by the project team. This support will be formalized with letters of request and no-objection from the country liaison offices identified as beneficiaries, which will be requested by the Bank before the activities are initiated in the corresponding country. No activity will be initiated unless the letters of request from the corresponding ministry has been received¹.
- 2.8 The focus countries are Bolivia, Paraguay, Panama, and Peru. These countries are selected for this TC due to their urgent demand and potential participation in the economy of hydrogen. The direct beneficiary in Bolivia is the Minister of Hydrocarbons and Energy; the direct beneficiary in Paraguay is the Vice-Ministry of Energy and Mining; the direct beneficiary in Panama is the National Energy Secretariat of Panama; and the direct beneficiary in Peru is the Minister of Energy and Mining.
- 2.9 Paraguay electricity generation was 46,327GWh in 2020 (practically 100% hydropower) of which only 38.6% was consumed internally, therefore, Paraguay has a great opportunity to explore GH2 as an alternative fuel to decarbonize its energy matrix which still has 22% of fossil fuels and expand its exports. This TC will also be able to support another initiative underway in Paraguay that will support, among other activities, the development of a pilot in the country. Panama has the potential to not only produce hydrogen but also to use the Panama Canal as a logistic hub for the regional hydrogen trading. This TC will finance the elaboration of a hydrogen national strategy that will contemplate both the role of Panama as Hydrogen Logistic Hub and as producer and consumer of GH2. The market and feasibility studies that will permit the estimation of the potential production use and transport of international hydrogen are included in the strategy. Bolivia is a country framed around the objective to change the energy matrix (which is currently based on fossil fuels) and to decarbonize the transport and industrial sector. Also, the Ministry of Hydrocarbons is introducing a policy for the use of renewable and alternative combustibles, including hydrogen. Peru created the Multisectoral Commission for the Reform of the Electric Subsector (CRSE) which supports the modernization of the sectoral regulatory framework. Peru is looking to assess the hydrogen potential of the country as well as to design the GH2 roadmap.

¹ Bolivia has presented a written request to the Bank to execute this TC. According to OP-619-4 Annex II Section 2.1., the activities in Panama, Paraguay and Perú will only begin to be executed and the respective funds disbursed once the letters of request have been obtained from the relevant official liaison entities with the Bank or, a non-objection letter is received from them in cases where the requests come from bodies or entities other than the country's official liaison entity with the Bank.

GH2 in Peru is expected to be developed by the private sector following the current strategy for the expansion and development of the energy sector in the country.

- 2.10 Strategic alignment. The development of Hydrogen Industry is strongly aligned with the IADB 2025 vision which includes regional integration and strengthening value chains; support for small and medium-sized businesses; digitalization and the digital economy; work toward gender equality; and action on climate change.
- 2.11 This TC is aligned with the Corporate Results Framework (GN-2727-12) with the indicators of Productivity and Innovation as it will contribute to growth of rate of number of people employed, and with the indicator of Climate Change and Environmental Sustainability as it aims at reducing the amount of CO2 emissions from fuel combustion. It is also consistent with the Update to the Institutional Strategy (AB-3190-2) and is aligned with the development challenges of Productivity and Innovation since it supports the development of the green hydrogen ecosystem as an innovative energy carrier. It is also aligned to the cross-cutting themes of: (i) Climate Change and Environmental Sustainability, by promoting the use of GH2 as an energy carrier that will contribute to the decarbonization of the economies; and (ii) Institutional Capacity and the Rule of Law by supporting the development of GH2 strategies, roadmaps, and regulation.
- 2.12 This TC is aligned with the Ordinary Capital Strategic Development Program for Infrastructure (Infra-fund) (GN-2819-1), as it will support the development of green hydrogen ecosystem in LAC and therefore enhance the sustainability of the infrastructure services, promote the origination of infrastructure projects, and prepare member countries for their successful implementation.
- 2.13 The TC is also aligned with the Energy Sector Framework (GN 2830-8), by supporting the diversification of energy resources by the use renewable energies to substitute the use of fossil fuels in different industries; the Science and Technology Sector Framework (GN-2791-8); and the Climate Change Sector Framework (GN-2835-8) by promoting innovation, a sustainable economic growth, and the reduction of greenhouse gas emissions.
- 2.14 Additionally, the TC is aligned with the Sustainable Energy and Climate Change Multi-Donor Trust Fund (MSC) (GN-2435-6) as it will expand IDB sustainable energy portfolio in the beneficiary countries, and it will support activities related to project identification and preparation as well as capacity building. The TC is aligned with the cross-cutting theme of Gender Equality and Diversity since it will identify opportunities to promote gender equality. Lastly, it is aligned with the NDC Pipeline Accelerator Multi-Donor Trust Fund (ACL) (GN-2890) as it will support the LAC national entities to plan investments in infrastructure aligned with the countries NDCs. For the same reason, this TC is aligned with the participant countries' NDCs as it intends to support countries to massify the use of renewable energy, to clean transportation and industrial sectors which are key elements to achieve the countries' NDCs and, especially, to meet the objectives of the Paris Agreement in 2050 using GH2. This initiative aims to

allow countries to better explore and develop the use of GH2 to accelerate the decarbonization and as a result, achieve the NDCs ambitions. The adoption of GH2 would contribute to the reduction of greenhouse gas (GHG) emissions replacing fossil fuels and enable an alternative path for more resilient electricity systems (by allowing more distributed systems with greater storage capacity).

- 2.15 Furthermore, the proposal will support the development of technology that will contribute to retaining energy-intensive industries through more reliable and affordable energy and therefore retain formal jobs. In this context the development of green hydrogen industry opens enormous opportunity for gender equality policies and progress. In LAC, the gender gaps in the energy sector are wider – women represent 19.7% of the total energy sector employees, 9% of all directors and 17% of managers in power and utilities companies. By nature, this TC will contribute to gender equality as IRENA had identified that renewables tend to have higher gender equality. This TC will enhance social sustainability by designing a Green Hydrogen Facility to promote gender equality and inclusion by prioritizing the participation of women and the LGTB communities. The prefeasibility analysis will include gender equality analysis when possible and the knowledge dissemination and dialogues events will advocate for gender equality in the creation of the GH market and related policies. In previous studies, we had concluded that the inclusion of gender equality during training is a key tool for the development of the emerging energy industry. Also, the design of the GHI will promote local industries and the engagement of local communities.
- 2.16 This TC is aligned with Bolivia's Country Strategy (CS) (AB-3190-2) by supporting activities that will contribute with the diversification of the economy, with Panama's CS (GN-3055) by supporting quality public services based on environmental sustainability criteria, with Paraguay's CS (GN-2958) with by promoting the expansion of nonconventional renewable energies and Peru's CS (GN-2889) by promoting a new technology that will contribute with the environment through the decarbonization of the energy sector and economy. It is also aligned with Paraguay's EBP (GN-2468-9) in terms of energy, and innovation and technology which are part of transversal topics, as it accompanies the country in the development of new technology in a productive sector.

III. Description of activities/components and budget

- 3.1. Component I: Structuring of GH2 Facility (US\$200,000):** This is a component with the objective to structure the GH2F based on existing studies for green hydrogen market and financing. This component will contribute to the structuring of the GH2F including: (i) the identification of potential needs and projects to conform an appropriate and representative sample of projects; (ii) the analysis of different financial models to support each of the GH2F main activities; (iii) the establishment of program SMART outcomes and outputs indicators and a methodology for evaluation; (iv) the determination of the best structure and location of the funding facility; and (v) the development of regional studies of demand and supply potential, among others.

- 3.2. **Component II: Prefeasibility analysis of GH2 projects (US\$150,000).** This component will finance the development of technical, economic, and environmental prefeasibility studies for GH2 projects in the beneficiary countries based on the results obtained from Component I item (v). The specific objectives are (1) to evaluate the technical, economic and social inputs, including a gender analysis to identify opportunities to promote the gender equality in the sector, regarding the green hydrogen value chain in the focus countries, and (2) to develop the technical and economic study of production, associated logistics, and uses of green hydrogen as energy carrier.
- 3.3. **Component III: Hydrogen Roadmaps and Technical Dialogue (US\$200,000).** This component will support the development of ministerial and technical dialogues that will allow sharing experiences, lessons learned, technical knowledge, estimate national potentials to supply GH2 and motivate the deployment of the technologies in the region that include gender-equality principles. This component will also finance the studies to create a hydrogen roadmap, identifying and describing the regulatory aspects and incentives necessary for the production, storage, transportation and use of green hydrogen in the focus countries, according to international references, and advocating for gender equality. Countries that do not yet have a general vision for their hydrogen industry are the priority.
- 3.4. **Results.** The overall outcome of this TC will be governments strengthened with new capacities and tools developed on green hydrogen. The output of component I is to identify the demand of potential green hydrogen projects that can be aligned with funds from NAMA, CIF, TAF, GEF, UK SIP channeled through IADB. One (1) evaluation methodology and financial model will be developed. The output of component II will be two (2) prefeasibility studies executed on a first-come first-served basis based on the submitting of the letters of request from the countries themselves as described in 2.7. The output of component III will be one (1) policy dialogue event delivered and two (2) technical studies as inputs for hydrogen roadmaps.
- 3.5. The team will ensure that the knowledge generated because of this TC is transmitted to all interested areas of the Bank through workshops and technical notes
- 3.6. The TC's total budget is US\$550,000 financed by INF (US\$ 150.000), ACL (US\$ 250.000) and MSC (US\$ 150.000)

Indicative Budget (US\$)

Activity/ Component	Description	IDB (Infra- fund)	IDB (ACL)	IDB (MSC)	Total Funding
Component I	Structuring of Green Hydrogen Facility	150,000	50,000	0	200,000
Component II	Prefeasibility Analysis of GH2	0	0	150,000	150,000

	Projects, with a gender perspective				
Component III	Hydrogen Roadmaps and Technical Dialogue	0	200,000	0	200,000
Total		150,000	250,000	150,000	550,000

IV. Executing agency and execution structure

- 4.1. At the request of the beneficiary countries, considering this is a regional TC and there is an absence of a regional entity for its execution, and in accordance with the guidelines established in the TC Operational Guidelines (GN-2629-1), the Bank through its Energy Division (INE/ENE) will execute this TC. In accordance with OP-619-4 the Bank may execute TC following the exceptional case of Regional Technical Cooperation where a regional entity with legal capacity to execute the TC can't be identified. The Bank will carry out the contracting of consultants in accordance with the GN-2765-4 vis a vis the sustainability of the implementation of the project and will provide its experience and close relationship with the authorities of the countries to enable a successful implementation of the TC. The Bank, as an executing agency, will lead the structuring of the GH2I which will allow for a better organization of the support given to the countries and facilitate the articulation among the different countries, stakeholders, and donors of the region. The Bank will contribute to the harmonization of the activities at a regional level, by providing a linkage between existing projects, and guaranteeing that experience and lessons learned from the project are shared with all countries.
- 4.2. Activities at the country level will be coordinated by the field ENE specialist. This coordination will be formalized with letters of request and no-objection from the countries, which will be requested by the Bank before the activities are initiated in the country. The IADB coordinates at the country level for all topics related to pilots. This includes dialogue with IDB Lab for studies of pilots in Paraguay and sharing of lessons learned from pilot for green hydrogen in Costa Rica, the first pilot supported by the Bank¹.
- 4.3. The Bank will be responsible for the selection and hiring of consulting firms and individual consultants which will be in accordance with IDB policies and procedures (GN-2350-15). In addition (i) the individual consultants will be hired in accordance with appendix 10 of GN-2629-1 and guidelines set out in AM-650 and the Bank will only hire consulting services of intellectual nature and not works or goods as updated in OP-619-4; (ii) the procurement process for consulting firms will follow IDB Policy for the Selection and Contracting of Consulting Firms for Bank-executed Operational Work (GN-2765-4) and its related Operational Guidelines (OP-1155-4); and (iii) the procurement of non-consultant services will follow the IDB Corporate Procurement Policy (GN-2303-28). Following IDB Operational Guidelines for Technical

Cooperation Products revised version (GN-2629-1), this TC is classified as a product for Client Support.²

- 4.4. INE/ENE will work coordinated its activities and share experiences with Special Group for Mining, Geothermal Energy, and Hydrocarbons (INE/MGH). The coordination with IDB Invest and IDB Lab will be done through four main mechanisms: (1) frequent conversations between both teams, especially concerning specific countries in which the projects are more advanced, such as Chile; (2) the organization of Hydrogen Working group, in which all the areas of IDB group involved are invited. This Working group is a platform to share document, seminars and also to share experiences among all the players involved; (3) co-organization and co-hosting of events; and (4) the development of a Regional Public Good, that aims to develop a dialogue platform to integrate the knowledge from all the countries, but also from the different teams within the IADB.
- 4.5. All knowledge products derived from this Technical Cooperation will be the Bank's intellectual property.

V. Key issues

- 5.1. The main implementation risk of this TC is potential difficulties to organize and canalize the interest of different donors and the private sector in the GH2. This risk will be mitigated with permanent contact with the potential donors and with the structuring of a multidisciplinary team from the bank that will include members from the different Bank's focal points with the financing institutions, IDB Invest and IDB Lab.
- 5.2. Another risk is the difficulty to maintain the priorities of the countries, especially if there are changes of governmental authorities. This risk will be mitigated by constant communication with the beneficiary countries and by assigning a focal point with a technical background who might be more likely to surpass political cycles.
- 5.3. Another risk for the implementation of the technical cooperation is delays in the implementation of activities involving local authorities or site visits. The COVID-19 pandemic has impacted the speed of response from authorities and public companies to different projects because of the teleworking conditions. Similarly, travel restrictions could impact local data gathering for international consulting studies. To mitigate this, the project team will implement all activities in close coordination with IDB country offices and key country stakeholders, including representatives from government, industry, and civil society. In addition, consulting services will foresee the use of remote communication tools to ensure the scope of work completion. These measures apply to all three components. Furthermore, if COVID-19 poses restrictions for the ministerial and technical dialogues included in component III, these will be done through virtual meetings.

² The pilot was developed in the project CR-T1194 "The Road to Decarbonization: Promoting the Hydrogen Economy in Costa Rica"

- 5.4. There is a potential risk of lack of appropriation and actual usage of the products from this TC by the governments/companies/beneficiaries. This risk is mitigated by creating frameworks that are applicable at country level and by working with the private sector, the public sector, and the regulators.

VI. Exceptions to Bank policy

- 6.1. This project will not require any exception to the Bank's policy.

VII. Environmental and Social Strategy

- 7.1. According to the Environment and Safeguards Compliance Policy (OP-703), this TC has been classified as a Category "C". No environmental assessment studies or consultations are required for this category (see: Safeguard Policy Filter Report (SPF) and Safeguard Screening Form (SSF)).

Annexes:

[Request from the Client - RG-T3904](#)

[Results Matrix - RG-T3904](#)

[Terms of Reference - RG-T3904](#)

[Procurement Plan - RG-T3904](#)