

Guidelines:

- This Request Submission Form should be completed by the organisation requesting technical assistance from the Climate Technology Centre & Network (CTCN) in collaboration with the National Designated Entity (NDE) of the country in question
- The Form must be signed by the NDE. Please see updated contact list of NDEs here: <http://unfccc.int/ttclear/support/national-designated-entity.html>
- The Form can be submitted as a Word file containing a digital signature or as a signed and scanned PDF file in combination with an un-signed Word file
- For requests submitted by multiple countries, all the NDEs of the respective countries shall sign identical Forms before official submission to the CTCN
- NDEs have the opportunity to submit CTCN requests in collaboration with National Designated Authorities (NDAs) for the Green Climate Fund (GCF) if targeting the GCF Readiness Programme.

Requesting country or countries:	Lao People's Democratic Republic
Request title:	<i>Please reflect the objective of the technical assistance in the title (maximum 200 characters).</i> Developing a green gas masterplan in Lao PDR
NDE	<i>Please add name of organization, name of individual, position, email and address.</i> Syamphone Sengchandala (Mr.) Deputy Director General, Department of Climate Change, Ministry of Natural Resources and Environment Email: syamphone.s@gmail.com / Phone: +856 21 255261
Request Applicant:	<i>Please add name of organization, contact person, position, email and address of the organization requesting assistance from the CTCN.</i> Seumkham Thoummavongsa (Ph.D) Deputy Director General, Institute of Renewable Energy Promotion, Ministry of Energy and Mines

Email: seumkham@gmail.com / Phone: (+85620) 2221-2619

Climate objective:

- Adaptation to climate change
- Mitigation of climate change
- Combination of adaptation and mitigation of climate change

Geographical scope:

- Community level
- Sub-national
- National
- Multi-country

If the request is at a sub-national or multi-country level, please describe specific geographical areas (provinces, states, countries, regions, etc.).

Problem statement related to climate change (up to one page):

This section should answer the question "what is the problem?" Please summarise the problem related to climate change and/or the negative impacts of climate change in the country that the request aims to address.

Owing to its relatively high annual rainfall and the geographical proximity to the Mekong River, Laos PDR has been providing most of the country's electricity from hydro electricity generation.¹ On the other hand, the country is also experiencing an increasing demand for and reliance on imported fossil fuels for the transport and industry sectors, contributing to a CO₂ emission that is expected to rise to 526,000 tons per year by 2030.² While there are a several factors contributing to this increase, some of the most notable ones are population growth, urbanization, and GDP growth.

¹ OECD, <http://www.oecd.org/dev/asia-pacific/saeg-2019-Lao-PDR.pdf>

² JICA, http://open_jicareport.jica.go.jp/pdf/12086070_02.pdf

http://open_jicareport.jica.go.jp/pdf/12086088_02.pdf

With the current population growth rate, the country's total population is expected to increase by at least 1.71 million between 2015 and 2030, and 10.25 million between 2015 and 2050. Of these, up to 50% will live in urban areas by as early as 2030, pushing the population in Vientiane to 2 million.³ For economic development, Laos has enjoyed an average GDP growth rate of 7.7% over the past decade, which resulted in a GDP per capita of 2,460 USD in 2018.⁴ At this current rate, Laos is expected to move into the middle-income class as early as 2030, joining other Southeastern countries including Vietnam, Indonesia, and the Philippines.⁵

With such socio-economic growth, motor vehicle ownership is expected to increase to approximately 3 million units by 2030, nearly doubling in number in comparison to 2015.⁶ This will be accompanied by an increase in the amount of imported liquified petroleum gas (LPG), which has so far nearly doubled between 2005 (1,936 tons) and 2015 (3,650 tons)⁷, and will continue to increase in the coming years.

To mitigate the growing GHG emissions from increasing demand for fossil fuels for the transportation sector, as well as to reduce the amount of imported LPG and ensure energy security and continued sustainable socio-economic growth, Laos has been striving to deploy various technologies to increase the share of renewable energy within the country, as illustrated in the National Determined Contributions (2015) and the Renewable Energy Development Strategy in Lao PDR (2011). While there are several ways to lower GHG emissions particularly from the transportation and industry sector, the Ministry of the Energy and Mines (MEM) has identified the power-to-gas technology, which can be used to produce carbon-neutral gases to fuel motorized vehicles, as one of the promising technologies to replace fossil fuels. Power-to-gas process includes, first of all, splitting water into hydrogen and oxygen via electrolysis using electricity, which is mostly generated from hydropower plants in Laos. This hydrogen can be used on its own, or it can be combined with carbon dioxide to produce methane gas, which can be used to in place of LNG to fuel motorized vehicles. Gases produced via the power-to-gas

³ UNPFA, https://lao.unfpa.org/sites/default/files/pub-pdf/Population%20and%20Development%20in%20Lao%20PDR_Eng.compressed.pdf

⁴ World Bank, <https://www.worldbank.org/en/country/lao/overview#1>

⁵ JICA, http://open_jicareport.jica.go.jp/pdf/12086088_02.pdf

⁶ Basic data collection study on low-emission public transport system in Lao PDR (http://open_jicareport.jica.go.jp/pdf/12086088_01.pdf)

⁷ Lao PDR Energy Statistics 2018, p.5: http://www.eria.org/uploads/media/0_Lao_PDR_Energy_Statistics_2018_complete_book.pdf

technology, when using renewable energy generated from hydropower which is the case of Laos, is not only carbon-neutral, but it will also contribute to reducing CO2 emission.⁸

Various ministries, including the Ministry of the Energy and Mines (MEM) and the Ministry of the Natural Resources and Environment (MONRE), are beginning to explore ways to undertake feasibility and demonstration studies on the power-to-gas technology to produce hydrogen and methane fuels, in some cases with support from the world's leading private companies such as Hitachi Zosen Corporation from Japan.

At the same time, as a country with no existing source of natural gas within its borders, Laos currently lacks gas-related laws, regulations, and infrastructure to allow commercial use of hydrogen and methane produced via power-to-gas process. While the Ministry of the Energy and Mines has been tasked to create such regulations by the executive order from the President of Laos, the challenge still remains as there is little to no expertise on this topic in the country to begin the process of preparing to use green gas at a commercial scale.

As such, guidance and assistance from CTCN to create a gas-related masterplan, which will guide the MEM and other concerned parties on what steps are needed to be taken in order to use green gases widely will greatly benefit the overall efforts to make green gas produced by power-to-gas technology commercially available and replace fossil fuels in the future.

Past and on-going efforts to address the problem (up to half a page):

This section should answer the question "what has been done or is currently being done to address the problem?" Please describe past and on-going processes, projects or initiatives implemented in the country or region to tackle the climate problem as described above.

The potential to produce green gas from animal and livestock wastes, agro-industrial wastes, municipal solid wastes and waste-water treatment plants has been explored. So far, two small-scale demonstration

⁸ Power-to-gas: Linking electricity and gas in a decarbonizing world? P.10:

<https://www.oxfordenergy.org/wpcms/wp-content/uploads/2018/10/Power-to-Gas-Linking-Electricity-and-Gas-in-a-Decarbonising-World-Insight-39.pdf>

projects to produce electricity using biogas, with a total installed capacity of 290 KW for self-consumption at livestock farms, have been undertaken.

In 2016, the Institute of Renewable Energy Promotion (IREP), located within the MEM, signed a Memorandum of Cooperation (MOC) with Hitachi Zosen Corporation from Japan to conduct a feasibility study and undertake a long-term plan to utilize power-to-gas technology at a commercial scale. The purpose of the feasibility study is to analyse the content of exhaust gas/CO₂ from cement factory; the test-run methanation reactor with auxiliary parts such as electrolyzer and CO₂ separator; and conduct other analyses to understand necessary changes to be made to the future facilities.

In addition, IREP created and endorsed a renewable energy development plan for 2021-2025, which includes goals relevant to this project, such as development of regulations for hydrogen, as well as production of 10,000 tons of hydrogen with support from Hitach Zosen Corporation.

Lastly, MEM is also organizing a one-day workshop to be held in March 2020 on power-to-gas technology. This workshop will be used as an occasion to disseminate information and benefits of the technology, and it will be attended by the Ministry of Natural Resources and Environment (MONRE); Ministry of Industry and Commerce (MOIC); Ministry of Science and Technology (MOST); Ministry of Foreign Affairs (MOFA); Ministry of Planning and Investment (MPI); Prime Minister's Office; National Electricite du Laos (EDL); and the National Institute of Economic Research (NIER).

While Laos enjoys abundant electricity production from hydropower facilities during the wet season, it has become reliant on imported electricity in the dry season in the recent years. Green gases provide a possible solution to this problem, if the country can be provided with a way forward in the form of a master plan.

Specific technology⁹ barriers (up to one page):

This section should answer the questions "what are the technology barriers that hinder national efforts described above" and "how will the CTCN technical assistance complement these efforts?" Building upon the problem statement and taking into consideration the existing efforts described above,

⁹ "any equipment, techniques, practical knowledge and skills needed for reducing greenhouse gas emissions and adapting to climate change" (Special Report on Technology Transfer, IPCC, 2000)

please describe the specific technology barriers encountered by the requesting applicant to identify, assess or deploy climate technology(ies) in an effort to address the problem statement. The described barriers should be within the scope of the requested CTCN technical assistance (described in the section below).

While there is a wide range of challenges in making green gases available for commercial use, the main barriers as it pertains to this request can be summarized as lack of regulatory and legal foundation and gas-related expertise within Laos.

As mentioned above, Laos does not produce nor import LNG, and it relies on imported LPG which comes in barrels. This means that the country lacks regulations, standards, and codes to oversee the production, storage, distribution, and usage processes within the country, which will be required for the power-to-gas technology to become a viable option to replace fossil fuels. While the successful deployment of the power-to-gas technology requires overcoming a range of non-regulatory challenges that are technical and financial in nature, including, for instance, identifying optimal specifications for the facilities; verifying its commercial feasibility; and securing adequate finance, it is of equal importance that regulatory and policy preparation takes place simultaneously to the technical development. At the same time, laying down the regulatory foundation requires careful and thorough planning that can guide the relevant personnel through the process. At the moment, however, Laos is in its early phase of this endeavor and does not have any concrete plans.

This challenge is further confounded by the fact that Laos and IREP lack personnel with expertise or practical knowledge on gas to create such plans. In addition, since the power-to-gas is a relatively new and advanced technology whose potential for commercial use is just beginning to become viable in the last five years¹⁰ mostly in the developed countries, creating plans for the deployment of this technology requires substantial level of knowledge and experience specifically pertaining to it. As such, IREP is in need of support from experts who are not only knowledgeable on gas-related regulations and masterplans, but also the power-to-gas technology as well.

Sectors:

¹⁰ Power-to-gas: linking electricity and gas in a decarbonizing world?

<https://www.oxfordenergy.org/wpcms/wp-content/uploads/2018/10/Power-to-Gas-Linking-Electricity-and-Gas-in-a-Decarbonising-World-Insight-39.pdf>

Please indicate the main sectors related to the request:

<input type="checkbox"/> Coastal zones	<input type="checkbox"/> Early Warning and Environmental Assessment	<input type="checkbox"/> Human Health	<input type="checkbox"/> Infrastructure and Urban planning
<input type="checkbox"/> Marine and Fisheries	<input type="checkbox"/> Water	<input type="checkbox"/> Agriculture	<input type="checkbox"/> Carbon fixation
<input type="checkbox"/> Energy Efficiency	<input type="checkbox"/> Forestry	<input type="checkbox"/> Industry	<input checked="" type="checkbox"/> Renewable energy
<input type="checkbox"/> Transport	<input type="checkbox"/> Waste management		

Please add other relevant sectors:

Cross-sectoral enablers and approaches:

Please indicate the main cross-sectoral enablers and approaches

<input type="checkbox"/> Communication and awareness	<input type="checkbox"/> Economics and financial decision-making	<input checked="" type="checkbox"/> Governance and planning	<input type="checkbox"/> Community based
<input type="checkbox"/> Disaster risk reduction	<input type="checkbox"/> Ecosystems and biodiversity	<input type="checkbox"/> Gender	

Technical assistance requested (up to one page):

Founded on the problem statement, past/on-going efforts and technology barriers, please describe the requested technical assistance. The technical assistance should clearly contribute to mitigation or adaptation to climate change as described in the problem statement and contribute to overcome the specific technology barriers.

Within a clearly defined scope, the description of technical assistance should be structured into the following:

- *Overall objective*
- *Anticipated groups of activities to be performed by the technical assistance*
- *Anticipated products to be delivered by the technical assistance.*

Please note that the CTCN facilitates technical assistance and is not a project financing mechanism.

The overall objective of this technical assistance is to produce a masterplan that will allow IREP and other relevant stakeholders to understand what steps are needed to be taken in order to operationalize power-to-gas technology at a commercial basis in the future. This means that the masterplan will serve as a map for further detailed and actionable roadmaps, strategies, and action plans to create regulations and other policy measures to support the development and management of production, storage, distribution, and usage of green gases produced via the power-to-gas technology, as well as other actions necessary to deploy the technology at a commercial basis, including conducting technical and commercial feasibility studies, piloting, and other relevant research activities as necessary.

The masterplan should first include an examination of the practical implications and benefits of the power-to-gas technology, particularly as it pertains to its potential on replacing fossil fuels in the transport and industry sectors and supplying electricity during the dry season and replacing fossil fuels in transport and industry sectors in Laos. In addition, drawing from similar masterplans and strategies from countries where hydrogen and methane gas use is more advanced, such as Japan and Australia, the masterplan should also clearly outline steps to help Laos prepare both regulatory framework as well as physical infrastructure to support the operationalization and management of production, storage, distribution, and usage of green gases produced using the power-to-gas technology. This means, for example, that the masterplan should include benchmarks for feasibility study on how to secure necessary resources required for the production of hydrogen and methane (water, electricity, CO₂); or how to develop infrastructure to transport such resources in a way that is safe and commercially viable.

As the commercial deployment of the power-to-gas technology requires a wide range of actions, and because IREP is yet to take any steps towards making plans for such actions, a masterplan will bear even more importance in terms of setting forward Laos's endeavour in replacing fossil fuels with carbon-neutral ones.

Expected timeframe:

Please indicate the expected duration period for the requested technical assistance. Please note CTCN technical assistance is limited to a maximum duration of 12 months.

We expect that, given the fact that this will be the first plan for green gases in Laos, it will take 12 months for the technical assistance to complete.

Anticipated gender and other co-benefits from the technical assistance:

Please describe the activities with gender linkages as well as the anticipated gender and other co-benefits (e.g. biodiversity, economic, social, cultural, etc.) that are likely to be generated as a result of the technical assistance.

For more information you can find guidelines on the CTCN's website here:

<https://www.ctc-n.org/technologies/ctcn-gender-mainstreaming-tool-response-plan-development>

Further reading on gender can be found on the CTCN website here:

<https://www.ctc-n.org/technology-sectors/gender>

Through working with experts on gas, we expect that this technical assistance will also benefit the personnel at IREP and other relevant stakeholders in terms of sharing and acquiring new knowledge.

Key stakeholders:

Please list the stakeholders who will be involved in the implementation of the requested CTCN technical assistance and describe their role during the implementation (for example, government agencies and ministries, academic institutions and universities, private sector, community organizations, civil society, etc.).

Stakeholders	Role to support the implementation of the technical assistance
National Designated Entity	Ministry of Natural Resources and Environment
Request Applicant	Ministry of Energy and Mines

Please add as many stakeholders and lines as required.	
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<p>Alignment with national priorities (up to 2000 characters including spaces):</p> <p><i>Please describe how the technical assistance is consistent with national climate priorities such as: Nationally Determined Contribution, national development plans, poverty reduction plans, technology needs assessments, Low Emission Development Strategies, Nationally Appropriate Mitigation Actions, Technology Action Plans, National Adaptation Plans, sectorial strategies and plans, etc.</i></p> <p>This project will address the need to reduce GHG emissions from the transport and industry sectors, which are expected to increase with economic development and growth of the country, as explained in the Technology Needs Assessment conducted in 2013. Power-to-gas technology will help Laos not only meeting the growing demand for fuels, but also do by meeting the goals described in the Nationally Determined Contribution, as quoted below.</p>	
<p>Reference document (please include date of document)</p>	<p>Extract (please include chapter, page number, etc.).</p>
<p>Nationally Determined Contribution (NDC)</p>	<p><i>Direct alignment and contribution to NDC implementation is required for all CTCN technical assistances. Please include a direct reference to the INDC/NDC document (chapter, page number, etc.).</i></p> <ul style="list-style-type: none"> • “For transport fuels the objective is to increase the share of biofuels to meet 10% of the demand for transport fuels by 2025.” (p.3.) • “In addition to reduction in GHG emissions the activity will lead to a reduction in NOx and Sox emissions which will have significant co-benefits such as improvement in air quality which in turn will have positive impacts on human health. (p.4.)
<p>Technology Needs Assessment</p>	<ul style="list-style-type: none"> • “[...] the energy demand is forecasted to increase 3.6 percent per year from 1.8 Mtoe to 3.9 Mtoe from 2005 to 2025. In regard to different sectors, energy consumption is expected to increase from

	6.1 percent in 2005 to 16.9 percent in 2025 in the industrial sector; 6.8 percent in 2005 to 34 percent in 2025 in the transport sector.” (Chapter 3, p. 26.)
National Adaptation Plans	N/A
Nationally Appropriate Mitigation Actions	N/A
Add others here as relevant	<ul style="list-style-type: none"> • The government promotes and encourages domestic and foreign, public and private sectors, to invest in research, development and demonstration as well as in feasibility studies of other alternative energy technologies and sources for transportation sector. (Renewable Energy Development Strategy in Lao PDR, Section 2, p. 23-24.)

Development of the request (up to 2000 characters including spaces):

Please describe how the request was developed at the national level and the process used by the NDE to approve the request before submitting it (who initiated the process, who were the stakeholders involved and what were their roles?) and describe any consultations or other meetings that took place to develop and select this request, etc.

The request was developed by IREP in order to address the challenge that they face in terms of preparing the regulatory framework and taking other actions necessary to operationalize the power-to-gas technology in Laos. IREP has consulted the Hitachi Zosen Corporation (Hitz) on this challenge, to which the latter introduced the possibility of taking advantage of technical assistance provided by CTCN.

This project was also presented at the COP25 in Madrid, Spain, at the Japan Pavilion, organized by the Ministry of the Environment Japan, to showcase a way that the private and public sector to create synergy in deploying low-carbon technology in developing countries. The presenters for this event included a representative from Hitachi Zosen, as well as Mr. Tomoo Machiba, the Deputy Director of CTCN.

Background documents and other information relevant for the request:

- *Please list all relevant documents that will help the CTCN analyse the context of the request and national priorities. Please note that all documents listed/provided should be mentioned in this request in the relevant section(s), and that their linkages with the request should be clearly indicated. For each document, please provide web-links (if available) or attach to the submission form. Please add any other relevant information as required.*
- *Please indicate if this request has been developed with the support of the CTCN Request Incubator.*

OPTIONAL: Linkages to Green Climate Fund Readiness and Preparatory Support

The CTCN is collaborating with the GCF in order to facilitate access to environmentally sound technologies that address climate change and its effects, including through the provision of readiness and preparatory support delivered directly to countries through their GCF NDA. These actions are in line with the guidance of the GCF Board (Decision B.14/02) and the UNFCCC, particularly paragraphs 4 and 7 of 14/CP.22 that addresses Linkages between the Technology and the Financial Mechanisms¹¹.

The CTCN is therefore implementing some of its technical assistance using GCF readiness funds accessed via the country's NDA. Any application for GCF support, including the amount of support provided, is subject to the terms and conditions of the GCF and should be developed in conjunction with the NDA.

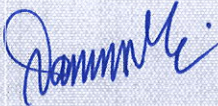
Please indicate whether this request has been identified as preliminarily eligible by the NDA to be considered for readiness support from the GCF.

Initial engagement: The GCF NDA of the requesting country has been engaged in the design of this request and the NDA will be involved in the further process leading to an official agreement for accessing GCF readiness support.

¹¹ Please see:

https://unfccc.int/files/meetings/marrakech_nov_2016/application/pdf/auv_cop22_i8b_tm_fm.pdf

Advanced engagement (preferred): The GCF NDA of the requesting country has been directly involved in the design of this request and is a co-signer of this request, the signature indicating provisional agreement to use readiness national funds to support the implementation of the technical assistance.


NDA name: Syamphone Sengchandala
Date: 13 March 2020
Signature: 

Monitoring and impact of the assistance:

By signing this request, I affirm that processes are in place in the country to monitor and evaluate the technical assistance provided by the CTCN. I understand that these processes will be explicitly identified in the CTCN Response Plan and that they will be used in the country to monitor the implementation of the technical assistance following standard CTCN procedures.

I understand that, after the completion of the requested assistance, I shall support CTCN efforts to measure the success and effects of the support provided, including its short, medium and long-term impacts in the country.

Signature:

NDE name: Syamphone Sengchandala
Date: 13 March 2020
Signature: 

THE COMPLETED FORM SHALL BE SENT TO THE CTCN@UNEP.ORG

The CTCN is available to answer all questions and provide guidance on the application process.