CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

CTCN Technical Assistance
Request Submission Form

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:	Mongolia
Request title:	Feasibility study of a combined heat and power supply using green hydrogen
NDE	**Name of organization:** Climate Change Department, Ministry of Environment and Tourism of Mongolia **Name:** Ms. Narangaravuu A **Position:** Climate change officer **Phone:** +976-51-266288 **Emails:** narangaravuu@mne.gov.mn **Address:** Government Building II, United Nations Street 5/2, Ulaanbaatar 15160
Request Applicant:	**Name of organization:** Climate Change Department, Ministry of Environment and Tourism of Mongolia **Name:** Ms. Narangaravuu A **Position:** Climate Change Officer **Phone:** +976-51-266288 **Emails:** narangaravuu@mne.gov.mn **Address:** Government Building II, United Nations Street 5/2, Ulaanbaatar 15160

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):

1. GHG emissions from coal-fired heat and power supply systems

Mongolia is one of the world's leading countries in terms of coal resources. Although the amount of electricity generated from renewable energy sources, especially solar power and wind power, has been increasing in recent years, more than 70% of the electricity supply is still provided by coal-fired power generation.

In Mongolia, heating is essential to sustain life as temperatures range from -30°C to -40°C in winter. More than 90% of heating is provided by coal combustion, and Mongolia's per capita GHG emissions in 2018 were 6.67 t-CO2/year, higher than the global average of 4.42 t-CO2/year (IEA [1]). Back in 2016, when economic conditions have started to improve, Mongolia's GHG emissions have been increasing as well, and so the country needs to take immediate and voluntary action to reduce its emissions.

2. Air Pollution Problems in Urban Areas

In addition to GHG emissions, air pollution caused by the use of coal has become a serious problem. In the capital city of Ulaanbaatar in particular, air pollution caused by the combustion of coal used for heating and car exhaust has rapidly worsened since around 2010, and the annual average value in 2016 was 7.5 times the World Health Organization (WHO) standard value (25 micrograms/m3N) in the city center, and in December, the value was about 80 times the WHO standard value (1985 micrograms/m3N) in the Ger district (peripheral area). In December, a value of about 80 times the WHO standard (25 micrograms/m3N) was recorded in the Ger area (surrounding area). At present, health hazards due to air pollution have become apparent, and the reduction of air pollutants is an urgent issue.

3. Destabilization of power grid due to massive introduction of renewable energy

Mongolia's Nationally Determined Contributions (NDCs) set a target of reducing GHG emissions by 22.7% through renewable energy sources by 2030 compared to 2010 levels. In order to achieve the NDC target, solar power and wind power were introduced using funding from the Green Climate Fund (GCF), the Japanese government through the Joint Crediting Mechanism (JCM), and the Japan International Cooperation Agency (JICA)'s overseas investment and loans. However, this has resulted in instability of the power grid due to large amplitude of frequency by dependence of renewable energy on weather conditions.

4. Energy Security Issues with Russia

Mongolia's main energy source has been its own coal, but due to the above-mentioned GHG reduction and air pollution control measures, and divestment from coal capital, Mongolia needs energy sources other than coal. However, the Mongolian government wants to avoid excessive dependence on only one country as an energy source from the perspective of energy security, and the creation of its own energy source to replace coal is a long-cherished desire of the Mongolian government.

5. Risk of water resource shortage due to drought

Since 1940, the frequency of droughts has been increasing. Moreover, since 2000 droughts continued for consecutive years. Among them, 2000, 2002 and 2015 are the years mostly affecting the socio-

[1] IEA Key World Energy Statistics "CO2 emission by region" (2020)

economy of the country. More specifically, droughts have induced shortage of water resources. According to climate model projection, intensity and fluctuation of droughts in Mongolia are expected to increase constantly in comparison to current conditions (1986-2005)[2].

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

1. Countermeasures against GHG emissions from coal-fired heat and power supply systems

In conjunction with the import of natural gas and liquefied petroleum gas from Russia, plans are being made to install gas turbines in coal-fired combined heat and power plants and to convert district heat supply boilers from coal to gas.

2. Air pollution problems in urban areas

Regarding air pollution, the Mongolian government issued the Capital No. A/62 Directive (on banning the use of unprocessed fuels) in February 2018 as a regional level initiative. This means that the use of raw coal (unprocessed coal) in district heat supply boilers in the city will be banned starting from May 15, 2019, and only processed charcoal would be allowed to be used, with heavy fines to be applied to violators.

3. Destabilization of the power grid due to the massive introduction of renewable energy

Currently, when introducing renewable energy, the Ministry of Energy requires new projects to install storage batteries equivalent to 20% of the rated capacity x 4 hours in the case of solar power, and 40% of the rated capacity x 4 hours in the case of wind power. At present, however, the introduction of storage batteries into the power system has not make a good progress, and new storage functions are essential in addition to conventional storage batteries.

4. Risk of water resource shortage due to droughts

No specific action has been taken at this time regarding drought countermeasures in relation to water resources. The existence of risk of water resource shortage due to droughts is worrisome.

Specific technology[3] barriers (up to one page):

[2] Third National Communication of Mongolia under the United Nations Framework Convention on Climate Change (May 2018)

[3] ***"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)*

This Request Submission Form proposes a feasibility study (FS) of GHG and air pollutant emission-free thermoelectric supply projects in collaboration with manufacturer which owns and is developing hydrogen fueled gas turbines. The hydrogen fuel will be green hydrogen utilizing renewable energy sources in Mongolia, and its production, storage and transportation will also be an element of the FS. Each technology has already been developed, and in this FS, we aim to contribute to solving the above-mentioned problems in Mongolia by connecting technology providers and stakeholders, and considering financing measures.

1. Coal Fired Heat and Power Supply System to Address GHG Emissions and 2. Air Pollution Problems in Urban Areas

In Mongolia, a coal-based energy supply system has been established based on the country's coal resources. Although there are plans to convert the power and heat sources from coal-fired to gas-fired, GHG emissions and nitrogen oxide emissions from gas-fired power generation is expected to remain in the future.

On the other hand, Mongolia has a high potential for renewable energy thanks to the large amount of solar input, continuous wind, and vast land area. If this renewable energy sources can be used to produce green hydrogen through electrolysis of water, and if the hydrogen can be burned in a hydrogen fueled gas turbine to supply heat and electricity, the electricity and heat will be completely free of GHG emissions and air pollutants.

3. Measures to counter the destabilization of the electric power system caused by the massive introduction of renewable energy

In green hydrogen production, electricity generated by solar and wind power is used to produce hydrogen by electrolyzing water with an electrolyzer. This means that when the supply of renewable energy exceeds demand due to weather-related fluctuations, electricity can be converted into hydrogen to prevent instability in the power system and to store the electricity as hydrogen. In this way, green hydrogen production and storage will function as storage batteries to absorb the excess renewable electricity that disrupts the balance between supply and demand. In addition, by strengthening the storage capacity through green hydrogen production, it will contribute to increasing the amount of renewable energy that can be connected to the Mongolian power grid and to NDCs' goal of reducing GHG emissions by 22.7% from renewable energy sources by 2030, compared to 2010 levels.

4. Risk of water resource shortage due to droughts

Mongolia has experienced frequent droughts in the past and securing water resources for green hydrogen production is an issue. According to future projections by a climate model (ECHAM, Germany), the region of South Gobi, a potential site for hydrogen production between 2020 and 2050, is at risk of increased droughts frequency and intensity if compared with present conditions (Source: Third National Communication 2018, Mongolia toward UNFCCC). Due to the large amount of water required for hydrogen production, adaptations for reservoirs and deep wells should be considered in the feasibility study to ensure adaptability to any climate situation.

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CTCN Technical Assistance
Request Submission Form

Sectors:

Please indicate the main sectors related to the request:

☐ Coastal zones	☐ Early Warning and Environmental Assessment	☐ Human Health	☒ Infrastructure and Urban planning
☐ Marine and Fisheries	☒ Water	☐ Agriculture	☐ Carbon fixation
☐ Energy Efficiency	☐ Forestry	☒ Industry	☒ Renewable energy
☒ Transport	☐ Waste management		

Please add other relevant sectors:

Cross-sectoral enablers and approaches:

Please indicate the main cross-sectoral enablers and approaches

☐ Communication and awareness	☐ Economics and financial decision-making	☐ Governance and planning	☐ Community based
☒ Disaster risk reduction	☐ Ecosystems and biodiversity	☐ Gender	

Technical assistance requested (up to one page):

1. Overall objective
(1) Overall objective
To conduct a feasibility study to determine potential of green hydrogen production and installation of hydrogen fueled gas turbines for heat and power supply in Mongolia.

(2) Tentative title
Feasibility study of a combined heat and power supply using green hydrogen

(3) Justification
A feasibility study will be conducted in order to determine possibilities regarding the use of green hydrogen production using electricity from renewable energy farms already in operation in Mongolia, as well as storage, transportation and installation of hydrogen fueled gas turbine for heat and power supply. In relation to technologies of hydrogen production, storage, transportation, and combined heat and power supply, the study will research the requirements for actual implementation by teaming up with global companies that have experience introducing commercial-level products to the market. The purpose of this study is to determine the necessary elements for the next stage of trial demonstration,

and to achieve GHG emissions reduction while at the same time, solving air pollution problems in Mongolia and climate risks such as droughts. We will also explore the possibility of exporting Mongolian hydrogen to other countries.

(4) Participating organizations

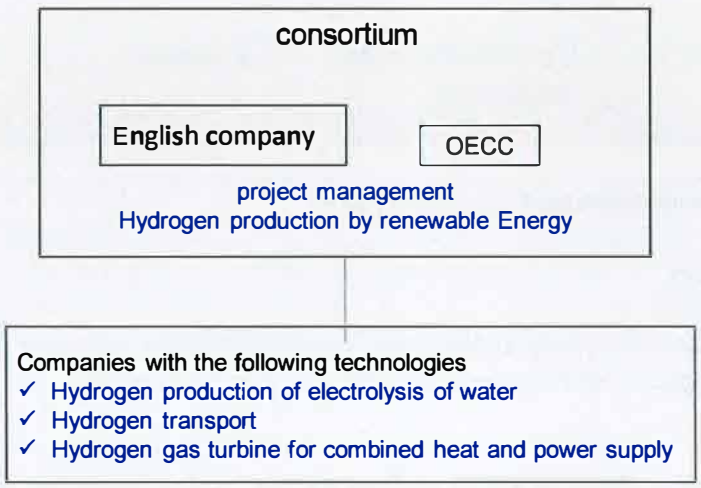
- English investment company
- OECC, Japan
  OECC is an organization that develops environmental projects overseas and is a member of the CTCN network.

(5) Supporting organizations

- Ministry of Environment and Tourism of Mongolia
- Ministry of Energy of Mongolia
- Ministry of the Environment, Japan

(6) Site

- Heat and power supply site
- Solar and wind farm under development
- Heat and power off-taker



Schematic chart on members of the feasibility study

2. Anticipated groups of activities to be performed by the technical assistance

- Activity 1: Technical data collection and assessment
  This activity refers to conduction of data collection in relation to current renewable energy sources in Mongolia, and technical analysis of green hydrogen production potential.

- Activity 2: Socio-economic and financial analysis

This activity will cover a socio-economic analysis, weighing the socio-economic costs against the socio-economic benefits of the proposed technology introduction. It will include a financial analysis, assessing the viability and profitability of a potential implementation project, including assessment of potential alternative financial sources.

- Activity 3: Market analysis of green hydrogen
  This activity is intended to measure potential output of green hydrogen for local consumption and potential to export abroad.

- Activity 4: Drafting of Green Climate Fund (GCF) concept note
  Based on the results obtained in the technical and socio-economic analysis, a GCF concept note will be drafted in full collaboration with the GCF NDA, to request for funding assistance to perform the implementation phase.

- Activity 5: Conduction of stakeholder's consultation
  As the final activity, study results and draft GCF concept note will be presented to stakeholders in order to discuss potential implications and obtain final inputs in order to prepare the final version of the GCF concept note.

3. Anticipated products to be delivered by the technical assistance.
   - Inception report
   - Draft feasibility study
   - Final feasibility study
   - GCF draft concept note

[Rationale]

The study aims to establish a renewable energy power station in Mongolia that could generate Green Hydrogen per day, as well as to store, transport and supply the local market demand. After testing the local market, the consortium will explore opportunities to export Hydrogen into Japan and China in a scale of more than 20-30 tonnes of Hydrogen per day. As a part of a prospective feasibility study, anticipated gropes are aiming to explore possibilities of generating Hydrogen from Mongolia's rich natural resources, such as coal and methane within territory of Mongolia.

- Create a Hydrogen source that could operate under all regimes of the Mongolian energy system.
- Reducing pollution, greenhouse gases emitted in Mongolia, assisting meeting the country's greenhouse goals under the Paris Agreement.
- Improving the expansion opportunities of solar and wind energy sources;
- Laying groundwork for hydrogen energy sources

- Details of off-taker heat and power demand
- Electricity for hydrogen production from renewable energy sources
- Electrolysis equipment that can meet the heat and power demand
- Amount of water resources for hydrogen production

- Measures to secure stable water resources (adaptation measures)
- Hydrogen storage and transportation method (assuming cooperation with Japanese companies)
- Trial design of hydrogen gas turbine installation
- Potential for hydrogen export
- Financing sources (GCF + various subsidies + investment, etc.)

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.

1. Completion of bidding for FS implementation: March 2022
2. FS Start: April 2022
3. FS Completion: December 2022

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

In terms of gender equality and gender mainstreaming in Mongolia, the lack of information represents a major challenge.

As of December 2020, only 42.7% of indicators needed to monitor the SDGs from a gender perspective were available. In addition, many areas – such as gender and poverty, physical and sexual harassment, women's access to assets (including land), and gender and the environment – lack comparable methodologies for regular monitoring.

From the political and economic perspective, as of February 2021, only 17.3% of seats in parliament were held by women. Women and girls aged 10+ spend 17.6% of their time on unpaid care and domestic work, compared to 6.4% spent by men. But in terms of economic benefits, the proportion of women in managerial positions has reached a promising 43.7%.

In relation to social, economic, and environmental variables to be analyzed in this project, there is a clear relation between the high levels of pollution and the effects on the population. Age-standardized mortality rate attributed to household air pollution represents 95 deaths per 100,000 populations. The proportion of population using safely managed drinking water services, remains in a disappointing 23.7%. And although the proportion of population with primary reliance on clean fuels and technology reached 52%, this means that there is still half of the population that needs to get access to clean energy sources.

By considering the benefits of hydrogen as a source of energy, the current project aims at drastically reducing pollution levels while providing clean energy and water to the population. Co-benefits in the form of clean air and reduction of respiratory diseases are all expected, but most importantly, the mitigation potential will be a main contributor in the country's NDC, since hydrogen is expected to reduce the use of fossil fuels.

In this study, site visits, focus groups discussions and stake-holder meetings will be organized by a Gender analysis consultant and local resources persons to acquire further information and to address

validity what are found and suggested through analysis and studies. The goal will be to provide a community level (and if possible, a national level) gender profile expected

The study will provide suggestions on Gender-responsive policy making considering women's needs, women's participation and leadership in the design of energy policies and expand training and educational opportunities of women. Gender balance in energy-related institutions by supporting women's career development/ employment and training opportunities in science, technology, and engineering fields or by providing incentives to encourage women to enter the energy field; and finally, capacity raising for local women to learn about, install, operate, and maintain ocean energy generation technology in their communities.

Key stakeholders:

Stakeholders	Role to support the implementation of the technical assistance
National Designated Entity	Climate Change Department, Ministry of Environment and Tourism of Mongolia
Request Applicant	Climate Change Department, Ministry of Environment and Tourism of Mongolia
Please add as many stakeholders and lines as required.	• Energy business jurisdiction organization: Ministry of Energy • License management for renewable energy and energy supply: Energy Regulatory Committee • Potential off takers • •

Alignment with national priorities (up to 2000 characters including spaces):

Reference document (please include date of document)	**Extract** (please include chapter, page number, etc.).
Nationally Determined Contribution (NDC)	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.). ▪ Mitigation Mongolia intends to achieve a target to mitigate its greenhouse gas emissions by 22.7 percent by 2030, compared to the business as usual scenario, excluding LULUCF (NDC 2020 pp3). ▪ Adaptation

	Enhance the resilience of the water sector through the utilization of appropriate technologies for conservation, restoration, sustainable use and increase water resources (NDC 2021 pp6).
Technology Needs Assessment	
National Adaptation Plans	
Nationally Appropriate Mitigation Actions	
Add others here as relevant	Mongolia has experienced frequent droughts in the past, and securing water resources for hydrogen production is an issue. According to future projections, the South Gobi, a potential hydrogen production site between 2020 and 2050, is at risk of increased drought frequency and intensity compared to the present (Third National Communication 2018, Mongolia toward UNFCCC, pp 207).

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

This request was prepared by the Ministry of Environment and Tourism, Mongolia (NDE), based on a proposal prepared by OECC and an English consultancy company (Request applicants).

The Special Envoy of Mongolia for Climate Change acting as the National Focal Point (NFP-GCF), who coordinates climate change policy, was also consulted on the appropriateness of this project and commented that the project is in line with Mongolia's climate change policy and should be promoted by the government.

Background documents and other information relevant for the request:

- Please list all relevant documents that will help the CTCN analyze 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.

References

(1) MONGOLIA'S NATIONALLY DETERMINED CONTRIBUTION TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANG (2021)

(2) Third National Communication of Mongolia under the United Nations Framework Convention on Climate Change (May 2018)

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CTCN Technical Assistance
Request Submission Form

OPTIONAL: Linkages to Green Climate Fund Readiness and Preparatory Support

Given the scale of the proposed project and the importance within national plans and strategies, this feasibility study is intended to include the preparation of a concept note for the GCF.

It is expected that the implementation phase will require a major funding source, hence, the concept note will describe financing requirements for technology introduction in the implementation phase. The NDA of Mongolia has been involved from the planning stage of the current feasibility study and confirmed the importance and impact that this feasibility study may have.

☐ 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.

☒ 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:

Ministry of Environment and Tourism
Mr. Batjargal Zamba
National Focal Point for the GCF
Suite 203, Margad Center 8th Khoroo, Student Street, Ulaanbaatar, Mongolia

Date: 03/03/2022

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:	Name: Ms. Narangaravuu Altangerel Position: Climate Change Officer

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CTCN Technical Assistance
Request Submission Form

	Name of organization: Climate Change Department, Ministry of Environment and Tourism of Mongolia
Date:	03/03/2022
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.