UN environment programme | CTCN UN 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:	Papua New Guinea
Request title:	Pre-feasibility study on Salinity Gradient Energy Technology
NDE	Mr. Danny Nekitel Manager Mitigation and Low Carbon Growth, Climate Change & Development Authority +675 7700-7838 danny.nekitel@ccda.gov.pg; dan.nekitel@gmail.com Enchi Bldg | Ground Floor | Wards Rd, Hohola, Port Moresby | NCD | Papua New Guinea
Request Applicant:	Organisation: National Energy Authority Contact Person: Larsen Daboyan Position: Manager Research and Statistics Email: Larsen.Daboyan@nea.gov.pg Address: Goada Herea Building, Waigani Dr., P.O. Box 494, WAIGANI, National Capital District, Papua New Guinea.

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):

Papua New Guinea (PNG) signed the United Nations Framework Convention on Climate Change (UNFCCC) in June 1992, and became a Party after its ratification in March 1993. On 21 September 2016, PNG ratified the Paris Agreement in New York during the 72nd Session of the United Nations General Assembly. PNG is also a member of the Small Island Developing States (SIDS) and aligns itself with the Alliance of the Small Island Developing States (AOSIS) in the context of the UNFCCC.

PNG is facing adverse impacts of climate change, such as rising sea levels, changing precipitation patterns, and increased frequency of extreme weather events. These changes are threatening the country's coastal communities, biodiversity, and economic sectors like agriculture and fisheries. One of the major challenges is the limited access to reliable and sustainable sources of energy, particularly in remote coastal areas. The use of fossil fuels is worsening greenhouse gas emissions and making PNG more vulnerable to energy supply disruptions, further exacerbating climate change impacts.

The energy sector is the largest net emitting sector in Papua New Guinea, accounting for approximately 87.7 percent of the total emissions (excluding LULUCF) in 2015. The lack of access to reliable and clean energy is hindering economic development, affecting health, and limiting access to education, health, and other services in rural areas.

To transition towards renewable energy sources, PNG is aiming to increase the share of installed capacity of renewables from 30 percent in 2015 to 78 percent in 2030 for on-grid connection managed by PNG Power Limited. However, this target is conditional and depends on the availability and timing of international support.

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

Numerous initiatives have been implemented in Papua New Guinea to address the impact of climate change and promote sustainable development. These efforts include policy reforms, capacity-building programs, and community-based adaptation projects. For instance, the government has set up the Climate Change and Development Authority (CCDA) to coordinate climate change actions and establish a regulatory framework to tackle climate change in the country.

The government of PNG is committed to fulfilling its obligations under the United Nations Framework Convention on Climate Change. This includes mainstreaming climate change in its development priorities, as reflected in the national long-term political vision, plans, and strategies, such as PNG Vision 2050, the National Development Strategic Plan 2010-2030, and the Medium Term Development Plan IV. These strategies are founded on the principles of strengthening and diversifying the foundations of PNG's economic growth, while taking action to increase the country's resilience to climate change and reduce emissions.

The development of PNG's Nationally Determined Contributions (NDC) aligns with the national strategies mentioned above and builds on the first NDC submitted in 2016. This NDC further aligns with sectoral policies, plans, and strategies that stakeholders will implement in response to existing challenges and circumstances. PNG's NDC outlines a comprehensive package of policies and measures, sectoral targets, and sector-specific actions that aim to address climate change through both immediate action and developing the enabling environment and technical capacity for an ongoing process of increased ambition.

The NDC outlines key pathways towards sustainable economic development in line with the United Nations Sustainable Development Goals, particularly Goal 13 on Climate Action. The primary element of this is maintaining PNG's high forest cover (currently reported at 78 percent) and reducing emissions from both the Agriculture, Forestry and Other Land Use (AFOLU) and Energy Sectors, covering two of the four emitting sectors from PNG's first Biennial Update Report submitted in 2019.

Adaptation is a high priority due to the climate-related hazards that pose significant risks to PNG today. PNG's commitment to adaptation for 2020-2030 will focus on four priority development sectors, namely agriculture, health, transport, and infrastructure. The PNG National Adaptation Plan, due for completion in 2021, will align with this enhanced NDC.

Moreover, international organizations and non-governmental organizations have implemented projects focused on renewable energy, energy efficiency, and coastal resilience in partnership with local communities and government agencies.

Specific technology[1] barriers (up to one page):

Papua New Guinea faces technology barriers in harnessing renewable energy sources, particularly in coastal areas. Salinity Gradient Energy Technology holds promise as a sustainable solution for generating electricity from the salinity difference between seawater and freshwater. However, specific barriers hinder the deployment of this technology in PNG, including:

- Limited technical expertise and capacity to assess the feasibility and potential of salinity gradient energy projects.
- Lack of data and research on salinity gradients and their variability in PNG's coastal waters.
- Challenges in integrating salinity gradient energy systems into existing energy infrastructure and regulatory frameworks.
- Initial investment costs and uncertainties regarding the economic viability of salinity gradient energy projects.
- The level of knowledge and awareness of applying Salinity Gradient Energy Technology is low in PNG and so is the knowledge of opportunities and obstacles to the application of this technology for productive and social uses.

The requested CTCN technical assistance will complement national efforts by addressing these

[1] *"**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)*

technology barriers and providing support to initiate a pre-feasibility study on Salinity Gradient Energy Technology in PNG.

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):

Papua New Guinea requests technical assistance from the CTCN to conduct a pre-feasibility study on Salinity Gradient Energy Technology in the country.

Overview of the technology

Salinity Gradient Power Generation is a renewable energy source from the ocean that has recently gained popularity as a blue energy with a high potential for generating energy, low volatility power production, and high utilization. Salinity gradient power is the energy created from the difference in salt concentration between two fluids, commonly fresh and salt water, such as when a river flows into the sea.

Two technologies for which demonstration projects are running and both use membranes. Pressure Retarded Osmosis (PRO) uses a membrane to separate a concentrated salt solution such as sea water from freshwater. The freshwater flows through a semipermeable membrane towards the sea water, which increases the pressure within the seawater chamber. A turbine is spun as the pressure is compensated and electricity is generated. Reversed Electro Dialysis (RED) uses the transport of (salt) ions through membranes. RED consists of a stack of alternating cathode and anode exchanging permselective membranes. The compartments between the membranes are alternately filled with

seawater and freshwater. The salinity gradient difference is the driving force in transporting ions that results in an electric potential, which is then converted to electricity. Two main applications exist: as standalone plants in estuaries where freshwater rivers run into the sea; and as hybrid energy generation processes recovering energy from high salinity waste streams, such as desalination or salt mining, as well as wastewater treatment plants. A possible third application is salinity gradient technologies applied to land-based saltwater lakes or other types of saltwater reserves.

The specific assistance requested includes the following activities:

- Conducting a comprehensive assessment of the potential for salinity gradient energy projects in PNG's coastal areas, including site selection and resource mapping.
- Identifying and analyzing technical, economic, and environmental considerations for deploying salinity gradient energy systems.
- Assessing the feasibility and scalability of salinity gradient energy technology in PNG, considering local conditions and constraints.
- Developing recommendations and action plans for further project development and implementation, including capacity-building initiatives and stakeholder engagement strategies.

The expected outcomes of this technical assistance are:

- Increased capacity of non-GHG action-based targets in line with NDC of PNG.
- Enhanced data collection on Salinity Gradient Energy Technology potential in PNG.
- Increase penetration of Salinity Gradient Energy Technology in the country's energy mix.
- Develop a National Policy on Salinity Gradient Energy Technology in PNG.
- Training and capacity building on Salinity Gradient Energy Technology in PNG.

The technical assistance will support PNG in diversifying its energy mix, reducing dependence on fossil fuels, and enhancing resilience to climate change impacts. It aligns with national priorities and international commitments towards sustainable development and climate resilience.

Expected timeframe:

The expected duration period for this requested technical assistance is 12 months.

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

The technical assistance activities will prioritize gender-responsive approaches and ensure the meaningful participation of women and vulnerable groups throughout the project cycle. Access to electricity or affordable renewable energies will improve the livelihood of women and young people in particular through decreased workloads, improved cooking, processing of food and Non-Timber Forest Products (NTFPs), increased safety and security from reliable lighting, engaging in home-based businesses and educational activities in the evenings, and reducing air pollution. Furthermore, the promotion of renewable energy solutions, such as Salinity Gradient Energy Technology, is expected to generate multiple co-benefits, including:

- Economic: Creating job opportunities, particularly in rural coastal areas, and stimulating local entrepreneurship in renewable energy sectors.
- Social: Improving energy access and reliability for marginalized communities, enhancing social equity and resilience to climate change impacts.
- Environmental: Contributing to biodiversity conservation through reduced reliance on fossil fuels and mitigating greenhouse gas emissions.
- Cultural: Strengthening traditional knowledge systems and cultural practices related to sustainable resource management and energy utilization.

Key stakeholders:

Stakeholders	Role to support the implementation of the technical assistance
National Designated Entity	The NDE will approve and provide guidance to its final deliverables of this technical assistance. It will serve as a coordination body across different stakeholders in the relevant sector.
Request Applicant	The applicant will closely monitor the design and execution of this technical assistance in close discussion with other national authorities, policymakers and citizens.
Private Sector	Engaging in project development, technology deployment, and investment in renewable energy initiatives.
Climate Change and Development Authority (CCDA)	Leading national agency responsible for coordinating climate change actions and policies.
National Energy Authority	Responsible for energy planning, regulation, and infrastructure development in Papua New Guinea.
Academic Institutions and Universities	Providing technical expertise, research support, and capacity-building opportunities in renewable energy and climate change adaptation.
Community Organizations and Civil Society	Representing local communities and facilitating participatory approaches in project implementation and decision-making processes.

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

Reference document	Extract
Nationally Determined Contribution (NDC)	The Government of Papua New Guinea believes that the NDC will significantly contribute to responding to climate change issues and implementing the initiatives as well as engaging in renewable energy development, climate risk governance, nature-positive growth and transition, low carbon development, climate change adaptation and resilience building with national and international support. PNG Second NDC.pdf (unfccc.int)
National Adaptation Plan (NAP)	Papua New Guinea's NAP framework document outlines the process for integrating climate change adaptation considerations into national policies, programs, and strategies. It highlights priority sectors and vulnerable regions, offering insights into adaptation needs and opportunities related to energy security and infrastructure resilience. The NAP is well aligned with its Nationally Determined Contribution (NDC) to the Paris Agreement.

	National Adaptation Plan of Papua New Guinea | UNFCCC
Papua New Guinea Vision 2050	The government of Papua New Guinea is convinced that they must empower their people with the right education and life skills and provide them with the opportunity to earn an honest living. Only then can they guarantee the nation's continued prosperity and security. This document provides every man, woman, boy, and girl in this nation with the opportunity for personal development and positive engagement. PAPUA NEW GUINEA NATIONAL STRATEGIC PLAN 2010-2050 (un.org)
Medium-Term Development Plan IV 2023-2027 (MTDP IV)	The MTDP IV has been framed to incorporate the Government's development agenda to grow the economy to K200 billion by 2030, double country's internal revenue, double exports revenue, and create one million new jobs. One of the twelve strategic priority areas included in the MTDP IV is climate change and natural environment protection. Download MTDP IV – Medium Term Development Plan IV 2023-2027
Framework for the National Climate Change Strategy and Action Plan	This document outlines a preliminary Framework for the National Climate Change Strategy and Action Plan to reduce Papua New Guinea's vulnerability to climate change and limit greenhouse gas emissions. The Framework is based on previous consultations and reports conducted by the government in 2008 and 2010. World Bank Document

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

The technical assistance request was developed through a collaborative process involving stakeholders from government agencies and academic institutions, under consultation with the UN Climate Technology Centre and Network. The National Designated Entity (NDE) of Papua New Guinea initiated the process by facilitating consultations with relevant stakeholders to identify priority areas for renewable energy development in line with the country's national plans and its Nationally Determined Contribution (NDC) to the Paris Agreement.

During the COP28 period in Dubai, the NDE had a meeting with the CTCN, where they expressed interest in seeking an ocean-based energy technology. The CTCN then introduced the Korean Energy Research Institute (KERI), a government research institute with expertise in Salinity Gradient Power Generation, who offered to provide support to undertake a pre-feasibility assessment.

After several stakeholder meetings and workshops to discuss project objectives, scope, and potential benefits, the NDE approved the request before submitting it to the UN CTCN. The Salinity Gradient Energy Technology will be of national importance and will be further developed to seek a scale-up opportunity after completing this technical assistance for pre-feasibility study on Salinity Gradient Energy Technology.

Background documents and other information relevant for the request:

- Nationally Determined Contribution (NDC) (2020)
- Papua New Guinea Vision 2050
- Medium-Term Development Plan IV 2023-2027 (MTDP IV) (2023)
- National Adaptation Plan (NAP) (2023)
- Framework for the National Climate Change Strategy and Action Plan (2010)

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 Mechanisms[2].

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.

☐ 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:

Date:

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

[2] Please see:
https://unfccc.int/files/meetings/marrakech_nov_2016/application/pdf/auv_cop22_i8b_tm_fm.pdf

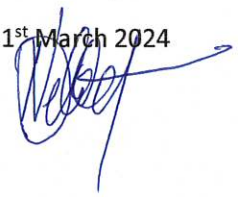
impacts in the country.

Signature:

NDE name: Mr. Danny Nekitel

Date: 1st March 2024

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.