REPUBLIC OF RWANDA

MINISTRY OF INFRASTRUCTURE

Market analysis and (pre-) feasibility study on a fuel switch project for the use of locally produced Compressed Natural Gas (CNG) to power vessels on Lake Kivu and other related land transport vehicles around the Lake

TERMS OF REFERENCE

FINAL

11th March, 2024

1. BACKGROUND

1.1. The Central Corridor Transit Transport Facilitation Agency (CCTTFA)

CCTTFA is a multilateral agency formed in 2006 through an agreement by the 5 governments of the Republic of Burundi, the Democratic Republic of the Congo (DRC), the Republic of Rwanda, the United Republic of Tanzania, and the Republic of Uganda. CCTTFA is charged with the mandate of promoting the optimal utilization of the Central Corridor, encouraging the maintenance, upgrading, improvement and development of infrastructure and supporting service facilities covering ports, railways, inland waterways, roads, land border posts along the Corridor to meet the needs and requirements of all stakeholders, ensuring open competition and reducing the cost of transit transport for land-locked Member States. In December 2023, Malawi joined CCTTFA as its 6th Member State and Zambia is in the process of acceding to the organisation which should be finalised by June 2024. Once this process is completed, the Central Corridor will have integrated the Dar es Salaam Corridor connecting Zambia's Copperbelt region and Lusaka with the Indian Ocean via the port of Dar es Salaam.

1.2 The Ministry of Infrastructure, Repulic of Rwanda

The Ministry of infrastructure was established to ensure sustainable infrastructure development covering transport, energy, water supply and sanitation, housing and human settlement sectors aiming to drive Rwanda's economic growth and enhance quality of life of the citizen.

1.3 Production of Compressed Natural Gas at Lake Kivu

Since 2011, Rwanda has been implementing the Rwanda Methane Gas Project with private sector funding: Contour Global invested USD 142M in KivuWatt. KivuWatt is an integrated methane gas extraction and production facility. Lake Kivu is up to 480m deep and is one of three known meromictic (stratified) lakes which feature naturally elevated concentrations of methane (CH4) and carbon dioxide (CO2) in their permanently stratified deep water. Lake Kivu's gases pose both a risk and an opportunity. A risk since they could erupt from the Lake with potentially fatal consequences for the local population. An opportunity since stored methane presents an important energy source. The methane which lies in the depths of Lake Kivu is being converted into electricity through its use as fuel for a turbine at KivuWatt. What started in 2011 with electricity generation of 25 MW, is to reach a total 100 MW in two phases.

In addition to KivuWatt, the private companies Shema Lake Kivu Ltd invested $180 M which is in process of generating 56 MW from methane gas and GasMeth which is in the process of investing a total of USD 530M to extract methane gas and compress it into CNG where the gas will be used for different purposes (e.g. cooking, automotive, and Industrial).

The report of the "Feasibility Study for the Enhancement of Transport and Trade Connectivity on Lake Kivu", conducted in 2017 with funding from Trademark Africa (Rwanda Office) and carried out by Hamburg Port Consulting, contains a preliminary assessment of the potential use of alternative energy to power vessels on Lake Kivu with Compressed Natural Gas (CNG) or

Liquified Natural Gas (LNG). The report recommends conducting further studies. The 2017 study did not include a detailed climate assessment.
As a follow-up to the 2017 Feasibility Study, CCTTFA, in collaboration with Lake Kivu riparian States and Partners, launched the Lake Kivu Integrated Transport Programme (LKITP) in 2016. Under this Programme, the Government of Rwanda through the Ministry of Infrastructure (MININFRA) requested the CCTTFA Secretariat for technical and financial assistance to undertake a market analysis/detailed pre-feasibility study on the use of CNG as alternative fuel for vessels on Lake Kivu and other related land transport vehicles around the Lake, considering that GasMeth had not foreseen any preparatory work/investment to promote CNG use in vessels.

The requested study, as a follow-up on the recommendation of the 2017 study report, was subsequently approved by the CCTTFA Board for implementation.[1]

1.4 Preliminary work by CCTTFA and MININFRA

In 2023, CCTTFA held an introductory meeting with GasMeth which revealed that the company was ready to fuel vessels directly at their production facility and to supply other fuelling stations around the Lake with their gas transport barges.

Further, CCTTFA found out that AFRINEST Engineering, a private ship building project with a shipyard on the Lake shore close to the GasMeth facility, is in the process of building cruise ships for high-end eco-tourism on Lake Kivu and some of the other Great Lakes with investments from ACCOR Hotel Group/France. AFRINEST is seeking to build vessels with the lowest possible ecological footprint (GHG emissions, air and water pollution) to provide the "greenest" possible experience to its clients and therefore intends to use CNG as alternative fuel to ship diesel, considering that CNG generates less noise and vibrations. Thus, AFRINEST constitutes an interested purchaser/user of CNG produced by GasMeth. AFRINEST is also considering acting as distribution agent for CNG in Lake ports on the DRC side of Lake Kivu. AFRINEST and the ACCOR Group also have longer-term plans to let their cruise ships navigate between various Lakes, as navigable waterways become available.

CCTTFA and the Ministry for Infrastructure of Rwanda-MININFRA (through the Rwandan Transport Development Agency-RTDA) are looking at distribution of CNG from Lake Kivu from both the national perspective of its Member State Rwanda and the regional perspective of crossborder fuel-dependent transportation of goods and people along the entire Central Corridor:

- The immediate interest that lies in fuel switching of the existing and future fleet of vessels operating on Lake Kivu from ship diesel/petrol to CNG is to promote a greener and cheaper fuel that is locally produced and enables Rwanda to subsitute importation of (more expensive) fossil fuel the price of which is fixed by the world market beyond the control of Rwanda.

[1] *The Government of Rwanda via the Ministry of Infrastructure (MININFRA) had earlier requested support from the AUDANEPAD Service Delivery Mechanism (SDM) for the preparation of the ToR of the study and for resource mobilization for its realization, under the AUDA-NEPAD/GIZ/CCTTFA tripartite cooperation programme on green infrastructure development for intra-African trade, focusing on the Central Corridor. However, the proposed study/project was not selected for SDM support*.

- The more regional and longer-term interest is to establish a CNG fuelling station network along the main truck (and bus) routes of the Central Corridor, which would be supplied from two "homegrown" sources of supply: (i) Lake Kivu right in the heart of the Corridor; and (ii) Mtwara (off-shore exploration) in south-eastern Tanzania which is transported via pipeline to Dar es Salaam, the anchor point of the Corridor. Additionally, the much larger vessel fleet on

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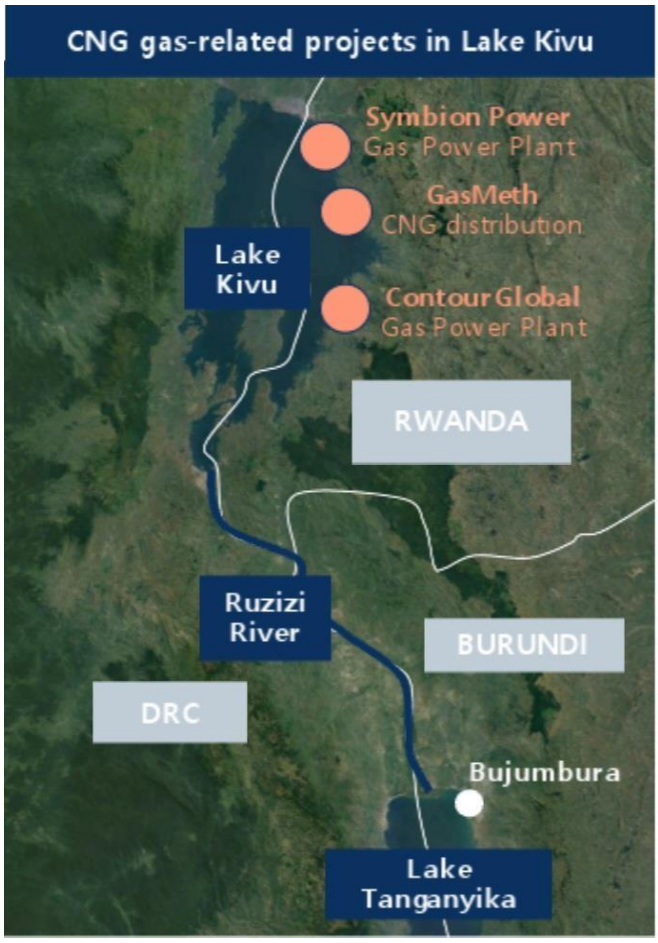
Lake Tanganyika would benefit from access to CNG produced in Lake Kivu. Thus, the navigability of the Rusizi River connecting the south of Lake Kivu with the north of Lake Tanganyika for CNG transport constitutes a longer-term interest for CCTTFA and the respective Member States Rwanda, Burundi, DRC, Tanzania and Zambia.



Map showing gas-related projects in Lake Kivu

2. ASSIGNMENT

2.1 Objective

The overall objective of the project is to carry out a market analysis/detailed pre-feasibility study on the use of CNG by GasMeth (and in future possibly also other companies) to propel the fleet of vessels on Lake Kivu and other related land transport vehicles around the Lake.

In light of the progress with the exploration of methane gas from Lake Kivu and its transformation into CNG, the results of the proposed study are expected to guide MININFRA/Government of Rwanda and the private companies producing and using CNG in defining and implementing an effective fuel switch programme from diesel/petrol-propelled vessels and vehicles to CNG powered vessels and vehicles in an around Lake Kivu and beyond.

2.2 Scope and tasks

The scope/tasks of the assignment include the following:

Task 1: Status-quo analysis of the existing Lake Kivu vessel fleet, estimated GHG emissions, and operational patterns of vessels and vehicles on and around Lake Kivu:

This task will include the collection and analysis of relevant data such as operators, type, usage, engine size and fuel, berth and refuelling locations, etc. Based on this analysis, the Consultant will provide a first assessment of the potential usage of CNG as an alternative fuel for diesel/petrolpowered cargo and passenger vessels on Lake Kivu under a potential fuel switch programme.

Task 2: Requirements & technical feasibility for fuel shift on Lake Kivu (vessels & infrastructure):

This task will analyse and outline respective dual fuel retrofitting/conversion options for vessels (and vehicles), and the infrastructure requirements for a fuel shift to CNG, including proposed design of a CNG fuelling station network covering the major ports around Lake Kivu including the main island of Ijwi, followed by a high-level technical feasibility assessment. The work should also include:

- **a)** Rapid assessment of the existing regulatory framework pointing out gaps and weaknesses that a fuel switch programme would have to address;
- **b)** CNG distribution network and value chain;
- **c)** Detailed vessel drawings/specifications and fuelling stations/facilities layouts; and
- **d)** Detailed operations planning and resulting capacity, equipment, energy and human resource requirements.

Task 3: Preliminary cost analysis for fuel shift on Lake Kivu (vessels & infrastructure):

This task covers estimations of the costs to implement the fuel switch programme, including approximate costs for vessel retrofitting/conversion, infrastructure development, and operation of CNG refuelling stations/facilities.

Task 4: Identification of potential funding sources for fuel shift on Lake Kivu (vessels & infrastructure):

This task includes the identification of realistic operations/implementation models, including roles of private and public sector parties, and the mapping of potential financiers and investors.

Task 5: Technical orientation on the overall feasibility of the navigability of Rusizi River between Bukavu and Bujumbura:

In view of a potentially separate project aiming at the creation of a navigable waterway connection between Lake Kivu and Lake Tanganyika for future distribution of CNG for powering vessels on Lake Tanganyika and expansion of trade, under this task the Consultant will recommend whether it is advisable to conduct a separate full Feasibility Study on the navigability of the Rusizi River. Tasks 1-4 focus on the Rwandan side of Lake Kivu. However, a high-level appraisal should be provided for the implementation of a potential fuel switching programme also on the DRC side of the Lake.

Task 5 concerns both Burundi in addition to Rwanda and DRC, as the Rusizi River first runs between DRC and Rwanda, and then between Burundi and DRC.

2.3 Methodology

In their proposal, the Consultant shall provide a description of their approach, methodology and work plan. This will be refined and approved by CCTTFA & MININFRA upon commencement of the contract at the Inception Report stage. The Consultant shall be responsible for evolving an appropriate methodology in accordance with relevant industry standards which is acceptable to CCTTFA & MININFRA and shall undertake all fieldwork and ensure all data gathered is quality assured and corrected wherever appropriate.

It will be necessary to engage collaboratively with the full range of people affected by a future fuel shift programme. These stakeholders include MININFRA, RTDA and municipalities around Lake Kivu, managers/operators of ports and landing sites with fuelling equipment, GasMeth, vessel owners and operators of all different categories, marine technicians (in both the formal and informal sector), shippers, traders, logistics companies, relevant private sector companies including shipyards, dry dock/ship repair operators and vehicle mechanics interested or already involved in engine conversion, relevant unions, maritime associations, fisheries organisations, Non-Governmental Organisations (NGOs) and Community Based Organisations (CBOs) working on environmental and economic issues around Lake Kivu. MININFRA and CCTTFA will assist in facilitating these meetings. Special attention must be paid to the valid concerns of stakeholders, and the recommendations in view of a fuel shift programme must address these concerns.

The findings of existing reports/documents should be taken into account.

Travel and field visits are anticipated to take place in Kigali and at all relevant locations around Lake Kivu, including a technical visit by vessel to the island of Ijwi. To be able to conduct a rapid appraisal on the overall feasibility and technical options for the navigability of Rusizi River between Bukavu and Bujumbura, the Consultant will have to drive along the river and/or explore it from a vessel. The physical visit to the Rusizi River should be conducted after consultation of existing documentation, interviews with resource persons and remote sensing based on publicly available satellite images (Google Earth). Unconfirmed information obtained by CCTTFA points to a technical study supposedly conducted by Belgian experts, most likely a long time ago and therefore not available in electronic format. The Consultant should inquire from resource persons if and how this study can be found and consulted in view of assessing the possibility of updating it in future.

The assignment is split into three stages, an Inception Report, a Draft Study Report and a Final Study Report. A presentation of the Draft Study Report will be made at a Stakeholders Workshop.

CCTTFA will assist with visa application support letters to be provided to the Consultant. Visa for Rwanda and Burundi (a visit to the latter is required for the task regarding the navigability of the Rusizi River) are issued upon arrival. Visa for DRC are to be applied for via the responsible DRC Embassy.

MININFRA/RTDA will provide the Consultant with office space, access to the lake ports, necessary information, records, and documents; arrange for meetings where necessary under the support of CCTTFA; and any other support the Consultant may need within MININFRA/RTDA mandate. The Consultant shall keep in mind that the work will form the basis for making important investment decisions and must therefore be authentic and thorough. To this end, the Consultant shall exercise all reasonable skill, care and diligence in the performance of the assignment and undertake the works according to recognized professional standards. The Consultant shall at all times act as faithful advisors to CCTTFA and MININFRA and shall supply all expertise, knowledge and skills required to carry-out and complete the works expeditiously and in accordance with the conditions of engagement.

MININFRA/RTDA and its development partners also favour and work to build their own capacity and that of national research/consulting firms at large. In this regard, the Consultant shall build meaningful partnerships with counterpart staff within MINIFRA/RTDA. Where possible, the Consultant should involve/associate with national research institutions and/or consultancy firms in the assignment.

CCTTFA and MININFRA promote gender mainstreaming in all activities. This includes assessment of implications for women and men of all activities, in all areas and at all levels. The Consultant will ensure that their proposed methodologies substantively address gender mainstreaming.

2.4 Deliverables and timeline

Upon signing of the contract, CCTTFA and MININFRA will hold a **kick-off meeting** with the Consultant to further clarify the roles and responsibilities of each party as well as the overall modalities for conducting the assignment. Thereafter, the Consultant will prepare the following deliverables:

Deliverable 1: **Inception Report** containing the Consultant's understanding of the work assigned and her/his methodological approach together with analytical tools intended to be used for the assignment. The Consultant will define what is meant by each process and clearly lay out how the assignment will be practically conducted. Comments and amendments communicated by CCTTFA and MININFRA as feedback to the draft version of the Inception Report will be reflected in the final version of the Inception Report, which will determine how the rest of the assignment will be conducted.

Deliverable 2: **Draft Market Analysis & Detailed Pre-Feasibility Study Report** on use of CNG to power vessels on Lake Kivu (and other related land transport vehicles around the Lake).

Deliverable 3: PowerPoint presentation summarizing the Market Analysis & Detailed PreFeasibility Study Report on use of CNG to power vessels on Lake Kivu (and other related land transport vehicles around the Lake) to be delivered at a *Stakeholders Workshop* (to be organized by MININFRA and CCTTFA).

Deliverable 4: **Final Market Analysis & Detailed Pre-Feasibility Study Report** on use of CNG to power vessels on Lake Kivu (and other related land transport vehicles around the Lake) incorporating the inputs/recommendations from the *Stakeholders Workshop*.

Deliverable 5: Technical note on the overall feasibility of the navigability of Rusizi River between Bukavu and Bujumbura

The services will be provided over an estimated period of 3 months. The following indicative schedule shall be observed in carrying out the assignment:

Deliverable/Milestone	Timeline (Weeks)
0) Kick-off meeting	1
1) Inception Report	3
2) Draft Market Analysis & Detailed Pre-Feasibility Study Report	10
3) Presentation of the main findings of the Draft Market Analysis & Detailed Pre-Feasibility Study (PowerPoint) at the Stakeholders Workshop	11
4) Technical note on the overall feasibility of the navigability of Rusizi River between Bukavu and Bujumbura	12
5) Final Market Analysis & Detailed Pre-Feasibility Study Report	13

2.4 Supervision

The study will be carried out under the supervision of the CCTTFA Secretariat with support from MININFRA. The CCTTFA Executive Secretary will provide the overall supervision of the assignment. The Executive Secretary will nominate an expert within the CCTTFA Secretariat with whom the Consultant will liaise on a day-to-day basis. The CCTTFA expert, in close cooperation with MININFRA, will ensure sharing of all draft deliverables with Partners/Stakeholders for their review and input. All relevant CCTTFA and MININFRA officials are expected to get involved as much as required in critical stages of the assignment in their respective areas of expertise and responsibility.

2.5 Inputs provided by CCTTFA and MININFRA

CCTTFA, in collaboration with MININFRA, will make available all documents and other materials at their disposal which are likely to facilitate the fulfilment of this assignment.

CCTTFA and MININFRA will prepare and organize the *Stakeholders' validation Workshop*.
CCTTFA, in collaboration with MININFRA, will provide any other assistance that may be needed in the course of this assignment.

3. CONSULTANT QUALIFICATIONS AND WORK EXPERIENCE

The Consultant should have the following experience:

1. Technical advisory, planning and/or analysis in the area of inland waterways transportation (IWT) with an integrated focus on economic, social and environmental aspects in at least 5 countries and 3 different world regions.

2. At least 2 proven assignments such as feasibility studies or similar technical studies during the last 10 years on inland waterways transportation and related logistics, vessel technologies, port & fuelling infrastructure development, and other relevant aspects in the Great Lakes region in East Africa; this documented work must have covered at least 2 current Members States of the Central Corridor.

3. Familiarity with Lake Kivu and its 2 riparian states.

4. Ability to analyse documents in English and French.

5. <u>Required specialisations in the Consultant's team</u>:
   a) Marine mechanical engineering for fuel switching
   b) Supply chain management/logistics in fuelling and IWT, including PPP arrangements c) River navigability
   d) Rapid appraisal/field survey techniques

e) Gender-responsive approach to IWT development

Please note that it is not necessary that the Consultant's team comprises of 1 expert for each of the above-listed specialisations. Each proposed team member can cover several areas of specialisation, which are to be evidenced through the respective CV.

The Consultant is required to come up with their own team composition/size and estimation of staff inputs for each staff (key staff and support staff) as well as the total staff inputs.

4. SUBMISSION REQUIREMENTS

Invited consultants are requested to submit a technical and financial offer by **11th April 2024 at 12.00 Noon East African Time (EAT).**

The technical offer should outline the proposed methodological approach and indicate the Consultant's relevant qualifications and work experience, as well as composition of the proposed team (with CVs) including the number of work days estimated to complete the deliverables. The technical offer shall also include a proposed calendar for the field work around Lake Kivu and along the Rusizi River.

The financial offer should indicate the daily rates (in USD) – local taxes included and number of work days of the team proposed for this assignment.

NB: Considering that the assignment is a lump-sum type of contract, the financial offer needs to include all travel related costs.