

**Terms of reference for the selection of a consultant for:**

**Elaboration of technology roadmap for the deployment of solar photovoltaic power station technology in Guinea Equatorial**

**Elaborated by: ENDA Energie**

1. **Background**

As the operational branch of the technology mechanism, the CTCN provides technical assistance to developing countries to overcome barriers for the development and transfer of climate technologies. In this regards, a specific program entitled Request Incubator has been designed for LDCs countries to enhance the technology transfer with the view of contributing to the implementation of their NDCs adaptation and mitigation targets (Decision -/CP.22). In the same line, the [Decision 25/CP.19](http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=26) shed light on the needs for the CTCN to provide technical assistance for the development of technology roadmap (TRM). In fact, the TEC and CTCN have been pushing forward the elaboration of the TRM[[1]](#footnote-1) as a planning tool to better ease the access to the different climate funding mechanism including the GCF.

From this perspective, the government of Equatorial Guinea received the approval of CTCN to conduct the incubator program throughout the technical assistance of ENDA Energie, a consortium partner of CTCN. Throughout a participatory and inclusive approach, ENDA Energie, the NDE and a national consultant conducted an analytical review of climate policies, sectors, climate technologies and key stakeholders. This first activity allowed on the one hand, to prioritize key sectors (Agriculture and Energy) and on the other hand, to identify and to elaborate 10 technology factsheet considering both NDC adaptation and mitigation targets in terms of technology deployment in Equatorial Guinea. In addition, the technologies were selected by taking into consideration the divergent vulnerability profile of continental and insular district and also by integrating national strategic priorities and policy guidance.

Subsequently, ENDA Energie in close collaboration with the NDE conducted a national consultation workshop with policymakers and sectorial experts to prioritize one technology that will be the focus of the TRM. Following the technical discussions among experts, the solar photovoltaic technology to be deployed in power stations was prioritized on the basis of the result of the working group exercise using multi-criteria analysis and sensitivity analysis. In fact, Equatorial Guinea stakeholders (policymakers and experts) highlighted the current need to face the low access to cleaner electricity for productive services (enterprises, industry, home use, etc.) and social services (electricity for hospitals, schools, etc.). End-users in Guinea Equatorial (industries, home use, etc.) are still relying on fossil fuel-based electricity generation which is adversely marked by an inefficient subsidy policy and the continuous rise of fuel cost. To face this issue, the Government is committed to reduce its reliance on fossil-fuel based power generation towards the efficient deployment of renewable energy technology to increase the cleaner power access for the end-users and also to contribute to the global goal of climate change mitigation in the energy sector.

Despite the ongoing political will and initiatives, current projects such as the national project of 5MV PV solar power unit planned to enhance the power access to the 5,000 inhabitants of Annobón island[[2]](#footnote-2) are still facing execution delay due to lack of appropriate financial mechanism and human resources that are necessary for the deployment of such technologies. In this perspective, Equatorial Guinea is seeking to build up bankable projects/programmes on the basis of the detailed information of the TRM that will be developed. Indeed, the TRM will shed light mainly on:

1. Solar PV systems
* Main climate benefits
* Main performance parameters (e.g. capacity factor)
* Environmental impacts (air, water and land impacts)
* Forecast on technology advancements
* Grid connection
1. Country-relevant information
* Current status of the development and deployment of solar PV systems
* Technology costs
* Technology forecasts (performance /efficiency, cost trends)
* Technology potential (saturation levels/other limitations)
* Market penetration (analysis of actors and interlinkages)
* Market forecast in the country and subregional context (cost/benefit analysis, financial incentives)
* National and subregional policies for fostering the enabling framework of the technology:

barriers (economic/financial, policy/regulatory, technology, information/capacity, social) to large scale deployment

Current market linkages with all relevant actors

Potential links to other technologies and market

1. Implementation
	* + objectives of the TRM considering climate policies (e.g. NDC) and national and sectoral economic development plan (e.g. National Development Plan “Horizonte 2020”)
		+ Theory of change and recommendations for achieving the objective of the TRM (key measures and strategy for diffusion)
		+ Implementation plan
		+ Mechanisms for review and revision (e.g. Monitoring & Evaluation system) to follow appropriately the implementation of TRM,
		+ risk analysis
2. Source of funding and
	* Assessment of support requirement (financial, technology transfer, capacity building, etc.) at national and international level
	* Assessment of eligibility funding sources
3. **Objective of the ToR for the selection of a consultant**

The selected consultant will have one main objective: the elaboration of the TRM for the deployment of PV power stations in Guinea Equatorial with the technical guidance of ENDA Energie and of great importance, the close collaboration with national experts and policymakers to ensure the bankability and political buy-in of the final product.

1. **Main tasks of the consultant**

In close collaboration with the NDE, the consultant will need to perform the following tasks (more detailed in section 4):

* First, the elaboration of the methodological process outlining the main steps that will be undertaken, approaches for the data collection and analysis on the relevant parameters (i.e. costs, measurable benefits, concrete actions, potential funding sources, etc.)
* Second, the elaboration of a TRM by ensuring the integration of the technical guidance and feedbacks of the review conducted by ENDA Energie and the CTCN. The TRM needs to be well elaborated in a way that the detailed information (cost/benefits, barriers, measures, implementation plan, potential funding opportunities, etc.) will facilitate the deployment of the PV solar system throughout appropriate funding mechanism suggested by the consultant. The TRM should follow the outlines presented in Annex 1.
1. **Detailed activities, expected deliverables and timeline**

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| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **Month 1** | **Month 2** | **Month 3** |
|  | **Activities** | **Deliverables** | **Responsible** | **Week 1** | **Week 2** | **Week 3** | **Week 4** | **Week 1** | **Week 2** | **Week 3** | **Week 4** | **Week 1** | **Week 2** | **Week 3** | **Week 4** |
| 1 | 1. Contract/Service agreement between the consultant & ENDA Energie | 1. Final contract of the consultant  | ENDA Energie |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | 2. Elaboration of the methodological approach for the elaboration of the TRM | 2. Report on the methodological approach for the elaboration of the TRM | International consultant |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 3. Elaboration of a service agreement/MoU between the Consultant and a national expert who have a good understanding of strategic policy orientation and skills for the deployment of the PV power plants in Guinea Equatorial | 3. Signed service agreement/MoU between the Consultant and a national expert | International consultant |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 4. Elaboration of TRM outline, reviewed by ENDA | 4.TRM outlines validated | International consultant |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5. Desk study (policy documents, technical reports, etc.) in close collaboration with the national expert and NDE  | 5. Inputs for the first draft of the TRM | International consultant |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 6. In-country data collection (as per activities in Annex I) conducted by a national expert with key national stakeholders (need to prepare data collection tools as appropriate). Data should cover all the four main sections of the TRM including the technology performance (sub-regional and international level) , the country-relevant context, the implementation strategy and funding scheme  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 7. In-depth analysis of data collected (technology baseline, cost/benefit, technology forecast, barriers, etc.) |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 8. Elaboration of the first Draft of the TRM submitted for technical review | 8. First draft of the TRM | International consultant |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 9. Technical review of the first draft of the TRM | 9. Technical feedbacks (comments, suggestions, recommendations) provided by ENDA | ENDA Energie |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 10. Integration of technical feedbacks from ENDA Energie | 10.First draft TRM revised | International consultant |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 11. The consultant submit the revised first draft to the NDE and national consultant. Subsequently, the NDE and national consultant will submit the document to the national stakeholders for their comments and feedbacks. The national consultant and NDE will coordinate the first consultative review of the revised draft TRM. | 11. Feedbacks from national stakeholders of the draft of the TRM | NDE and National consultant |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 12. Integration of technical feedbacks from national stakeholders  | 12. Final draft of the TRM | International consultant |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 13. Validation of the final draft of the TRM by the final approval of CTCN/ENDA.The consultant will generate all the deliverables in Spanish and will translate the final TRM in English | 13. TRM validated in SpanishTranslation of the final TRM in English | ENDA Energie & CTCN |  |  |  |  |  |  |  |  |  |  |  |  |

1. **Qualification & skills required**
* Master or equivalent degree in engineering science, with specialisation in MW size solar PV power stations, including economics aspect of solar PV installations, technology studies or related disciplines.
* 8 years of experiences in climate technology deployment and especially on PV power plants:
* barriers analysis: authorisation procedure to grid connection; analysis of local market condition; technical reporting and recommendations for deployment; good understanding of strategic policy for the deployment of PV power plants in Guinea Equatorial, etc. )
* Demonstrated successful experience in developing projects/programs related to technology transfer mechanism and climate funding mechanism especially as far as PV installations are concerned.
* Fluency in both written and spoken Spanish and English. French language skills will be a relevant advantage.
1. **Duration**

20 working days are allocated for the whole duration of the tasks to the consultant over a period of 3 months.

1. **Evaluation criteria.**

The submission will be assessed on the basis on the recruitment rules of the UN Environment and will be conducted by ENDA Energie. The approval of the NDE of the consultant selected is required before the signature of the contract between the consultant and ENDA Energie.

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| Annex 1: Outline of Technology Roadmap1. **TRM executive summary**
2. **Introduction**

A brief introductory section should provide a quantitative as well as qualitative justification of how the chosen technology is relevant and important for the country and its NDC implementation. The section should include, but not limited to, description of technology and climate relevance, development and other environmental benefits (e.g. air, water, land, land, biodiversity etc.), suitability of technology in country context and NDC implementations and forecast on advancement of technology and its market.1. **The TRM development process**

Description of the methodological approach for developing the TRM adopted by the consultant should include, but not limited to, stakeholder consultation, review of literature, policy and market conditions, approach for developing baseline, identification of drivers and/or barriers of technology diffusion, assessment of potential etc. To ensure transparency necessary data or information must be provided in the TRM.1. **Technology baseline for the country**

The TRM should define the baseline scenario for the chosen technology. Inter alia, it should provide following assessments:* 1. **Status of technology deployment:** should describe the status of technology deployment in the country and answer, inter alia, following questions:

i. Is the technology deployed commercially or only pilot projects have been / in the process of implementation? What is the extent / trend of deployment?ii. What are the supporting and competing (alternative) technologies? What is their status of availability/ deployment and competitiveness compared to chosen technology?iii. Are various components of technological system domestically manufactured or dependent on imports? Where are they imported from?* 1. **Cost of technology:** Provide the best available estimates for various aspects of cost of technology deployment e.g. cost of capital equipment , system costs (including the cost of supporting technology and required infrastructure), cost of capital, IPR induced costs, transaction costs (e.g. time and/or monetary expenses incurred in getting all clearances, assembling technology, mobilizing resources and setting market linkages) etc. A comparison of costs with competing (alternative) technologies is desirable.
	2. **Current practices for assessing viability of technology:** Provide the approaches adopted/ parameters used by different actors for assessing the viability of investment in technology, in particular, the practices adopted by industry and financial institution. The practices may include, for example, Internal Rate of Return (IRR), Economic Rate or Return (ERR), Depreciation rate, system cost analysis, financial cost-benefit analysis, environmental cost benefit analysis etc.
	3. **Current policies:** Provide summary of policies affecting diffusion of technology. These should include regulations (standards, norms), financial and fiscal incentives, market based flexibilities and incentives, public procurement policy, specific agencies and their mandates with respect to the identified technology etc. The summary may be organized as follows (illustrative):
1. Policies relevant for market creation for technology (e.g. standards, developmental goals)
2. Policies to address specific barriers to diffusion of technology
3. Incentives (disincentives) to promote the technology and its supporting technologies (e.g. ICT is supporting technology system for smart grids)
4. Policies relevant for competing (alternative) technologies (e.g. biofuels are an alternative to electric vehicles)
5. Policies on R&D
	1. **Current market linkages:** Provide various actors involved in the supply chain including:
6. Manufacturers / suppliers of different components
7. Technology system integrators
8. Distributors
9. End users
10. Financiers at different stages of supply chain
11. Government agencies/regulators involved at different stages of supply chain
12. Provisions of financial incentives at different stages of supply chain
13. Cost-built up through the supply chain
14. **Technology forecast in country context**

An overview of how the diffusion of technology may evolve in future in the country provides a necessary background for designing necessary interventions. Such an overview may be based on literature review; expert opinions; modelling based simulations; policy driven; trend analysis etc. It is recommended that the forecast is presented with multiple scenarios. It should include, at least, the following:1. Technical advancements in the technology and its alternatives (e.g. efficiency improvements) at national and/or global level
2. Growth in the size of market compared to current status and potential
3. Likelihood of change in price and cost of components/ support technologies
4. Description of distribution network (market linkages)
5. Description of end users (where would the demand come from?)
6. Stakeholders (whether new stakeholders are expected to enter the scene such as actors involved in management of e-waste once ICTs reach a certain level of penetration?)
7. **Barriers to large scale deployment**

Barrier analysis for realizing the future of market for the technology identified in section 4 above is pre-requisite for TRM. Clear identification of barriers to large scale deployment is essential to plan and implement appropriate strategies. These barriers can be of different types and may affect different actors in the supply chain differently. Hence, barrier types must be identified in relation to different actors and/or different stages of supply chain as indicated in the table below:

|  |  |
| --- | --- |
| **ACTORS/ Stages in supply chain** | **BARRIERS\*** |
| **Technological capability (adoptability to local context, R&D, experience)** | **High upfront capital cost** | **Long pay-back period** | **Market size / Price** | **Regulatory** | **Social accept-ability** | **Market infra-structure (Distribution network)** | **Lack of finance / income** | **Competing technologies (viable Substitutes)** | **Servicing** **repair/** **spare**  **Etc.)** |
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\*Barriers listed here are not exhaustive. The consultant is expected to provide comprehensive listing of economic, financial, commercial, technological, institutional, social and infrastructural barriers.1. **Proposed TRM**
	1. **Objective of the TRM:** A well-defined time-bound objective of the TRM must be stated. Defining of this objective should take into account country’s NDC and possibilities of its ‘progressive revision’, potential role of identified technology in achieving NDC, technology baseline, technology’s future and barrier analysis. The objective of TRM should also take into account its eligibility for funding from sources such as the Green Climate Fund (GCF) and linkages with SDGs (Sustainable Development Goals).
	2. **Theory of change:** Dynamic interplay over time among different actors, their actions and their collective outcomes overtime co-determine the direction and magnitude of change and the dynamic interplay itself. Taking into account the findings of stakeholder consultations, literature review, technology baseline, technology’s future and barrier analysis, the TRM should propose a country specific theory of change with respect to the identified technology. This should include, at least, the following:
2. Stakeholders, their interests and dependence on each-other and its possible evolution over time
3. Key drivers of technological change: drivers of market expansion and dynamic interplay of stakeholders
4. Stages of achieving the objective of the TRM
5. Barriers and risks in achieving the objective of the TRM
6. Key assumptions (if any) and their justification
7. Best practice case studies to support theory of change and emerging recommendations
	1. **Recommendations for achieving the objective:** The TRM must recommend a set of measures to be implemented by different stakeholders aiming at removal of barriers and strengthening drivers. It is recommended that that these measures are defined with reference to each identified stakeholder’s interests and drivers. In any case, rationale for selection of recommended measures must be explained. Objectively measurable benefits (progress indicators), estimated costs, potential source of funding and key implementing actors should also be defined for each of the recommended measure. This may be organized as indicated in the table below:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Stakeholder** | **Barrier / Driver** | **Description of recommended measure** | **Objectively measurable benefit** | **Est. cost** | **Potential Source of funding** | **Implementing actors** | **International support requirement (Financial, technological, institutional, capacity building)** |
|  |  |  |  |  |  |  |  |
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* 1. **Implementation plan:** A time-bound implementation plan for each recommended measure should be provided with well-defined milestones. It is recommended that conditions in term of progress indicators or milestones for implementing a measure are also clearly spelled out. For example, a recommendation of making electric vehicles mandatory may not be implemented unless sufficient charging stations / battery replacement kiosks with adequate supply are established.The strategy may be summarised as illustrated in table below. A RACI (Responsible, Accountable, Consulted, Informed) Chart for implementation plan must be provided.

|  |  |
| --- | --- |
| **Measures** | **Time frame**  |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
| Measure 1 |  | Milestone 1.1 |  |  |  | Milestone 1.2 |  |  |  |
| Measure 2 |  |  | Milestone 2.1 |  |  | Milestone 2.2 |  |  |  |
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| Measure N |  | Milestone N.1 |  |  |  |  | Milestone N.2 (s.t. achievement of milestone 2.2) |  |  |

* 1. **Mechanism for review and revision:** A strategy for regular review and revision (if necessary) of the implementation plan should be provided. This may be included in the RACI chart (Responsible, Accountable, Consulted & Informed).
	2. **Risk analysis:** For each of the recommended measure, a risk analysis of implementation should be provided indicating the degree of risk (High, Medium, Low) along with potential risk mitigation measures/ alternative measures.
	3. **International support requirement:** In cases where a specific recommended measure requires international support, it should be elaborated in terms of specific type of support required (financial, technological, technical assistance, institutional, capacity building etc.) and additional recommendations should be made for getting international support.
	4. **Eligibility for funding:** In cases where international funding is required for a particular recommended measure, its eligibility for funding from different sources should be assessed. The assessment should include quantitative as well as qualitative justification where possible. Alternatively, justification for overall TRM’s eligibility for funding from preferred source of funding should be provided against the eligibility criteria.
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1. “A Technology Roadmap (TRM) serves as a coherent basis for specific technology development and transfer activities, providing a common (preferably quantifiable) objective, time-specific milestones and a consistent set of concrete actions; developed jointly with relevant stakeholders, who commit to their roles in the TRM implementation.”. Background paper on technology roadmaps, Technology Executive Committee, TEC/2013/5/5 [↑](#footnote-ref-1)
2. To reduce its reliance to the fossil fuel-based power generation, the Government of Guinea Equatorial is promoting the deployment of renewable energy to foster the power access of the industry sector and commercial and home end-users. Started from 2013, the Annobón solar microgrid of 5mW (with 3MW of battery recharge capacity) has been approved by the government of Guinea Equatorial with the aim to tackle efficiently the power need of end users including enterprise units and 5,000 inhabitants of such large and remote district. [↑](#footnote-ref-2)