



United Nations Industrial Development Organization

## TERMS OF REFERENCE (TOR)

### GREEN TECHNOLOGY DEPLOYMENT IN INDUSTRIAL ZONES - SENEGAL

CTCN request 2015-030/SEN-02

#### 1 BACKGROUND INFORMATION

The Climate Technology Centre and Network (CTCN) is the operational arm of the United Nations Framework Convention on Climate Change (UNFCCC) Technology Mechanism and co-hosted by the United Nations Environmental Programme (UNEP) in collaboration with the United Nations Industrial Development Organization (UNIDO) and supported by 11 partner institutions with expertise in climate technologies. The mission of the CTCN is to promote accelerated development and transfer of climate technologies at the request of developing countries for energy-efficient, low-carbon and climate-resilient development. These requests for Technical Assistance (TA) are being submitted to the CTCN by the National Designated Entity (NDE) of the respective country. Eligible requests are processed by a group of selected experts who develop a Response Plan. More information at <http://www.ctc-n.org/>.

**The scope of services under these Terms of Reference shall be executed based on a restricted solicitation process where only accepted Members of the CTCN Network are eligible to submit proposals.**

#### 2 PROJECT CONTEXT

Senegal benefits from a buoyant economy, nevertheless facing a number of challenges. In the country's development plan - Plan Senegal Emergent (PSE) - a key component to address these issues is the development of integrated industrial zones. These shall attract foreign investment, bring new technologies and increase productivity and competitiveness.

The CTCN, as a response to the abovementioned request for technical assistance, aims to provide expert advice on appropriate technologies to reduce impacts on climate change and improve the environmental performance of industrial agglomerations, while boosting socio-economic development. Concretely, the CTCN will assist in promoting technological and process upgrading in existing industries as well as deliver advice on the planning of eco-industrial zones with the view to utilize the full potential of industrial symbiosis (common water, energy and material resources and treatment systems; energy and material recovery; waste valorisation; use of renewable energy and sustainable material substitutes; material and by-product reuse and recycling; etc.).

To achieve the above, in particular but not exclusively the priority technologies identified<sup>1</sup> during the Technology Needs Assessment (TNA) will be given due consideration. The technologies and

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<sup>1</sup> Those are: Direct biomass combustion: either as sole fuel or co-fired, from non-edible (waste stream or bi-product); Cogeneration: as efficient way of responding to the demand of electricity and thermal energy; Energy efficiency, in particular power factor improvement: reduction of generation and transmission costs through



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improvements to be promoted will be analysed from a technical and financial perspective in the local context. The result shall be usable for replication in further industrial development projects.

For a comprehensive understanding of all relevant elements of the project the bidders are encouraged to read the response plan attached (Annex I) to these Terms of Reference.

### 3 AIM OF THE CONTRACT

The overall objective of the CTCN technical assistance is to unfold the potential for green technologies in selected industrial agglomerations. Technology upgrading, system optimization, material management, by-products exchange and economic recovery of residues have the potential to improve the environmental performance, notably in terms of greenhouse gas emissions, of the industries whilst simultaneously increasing competitiveness.

The CTCN intervention, and hence the scope and activities described in these Terms of Reference, is designed as a two-pronged strategy. One stream of work deals with existing industries in selected priority sectors (e.g. agro-food, textile/leather) with the objective to improve resource productivity and lessen pollution intensity, notably by reducing greenhouse gas emissions. The second stream of work pertains to Greenfield industrial parks (e.g. Diamniado) and aims at feeding notions of industrial symbiosis in the planning process.

The estimated budget for this contract is estimated at between USD 40,000 and 80,000. The bidders should however develop a detailed budget in the proposal based on the set of activities described in the following section.

A second phase of activities, not captured in these Terms of Reference, is envisaged upon satisfactory completion of the first phase and subject to the availability of funding. These activities would be covered by an extension of contract, upon agreement over the additional activities to be carried out and respective budget. Both phases together can amount to a maximum of USD 250,000.

### 4 SCOPE AND ACTIVITIES OF THE PROPOSED CONTRACTED SERVICES

The CTCN intervention aims at delivering technical assistance on both work streams, and produce:

1. An assessment of 5 existing enterprises with recommendations on resource efficient and cleaner production, with an emphasis on industrial symbiosis, including support for the implementation.
2. Expert advice on the design of eco-industrial parks, capturing international best-practice.

The activities to be carried out under this response as defined by the Response plan are as follows:

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management of reactive power; Thermal solar energy, notably for industrial applications: hot water production for industrial processes, as well as cooling; and Photovoltaic: to displace or complement grid electricity.



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### Activity 1 – Resource efficient and cleaner production assessments in 5 enterprises

#### 1.1 Selection of target enterprises:

In close collaboration with a recognized local institution, such as the Bureau de Mise à Niveau, identify prospective target enterprises in priority sectors (e.g. agro-food, textile/leather, minerals, chemicals) within an industrial agglomeration with opportunities for improvements on resource productivity and pollution intensity. This also includes the mapping and high-level assessment of symbiotic potentials (sharing infrastructure/recycling/reusing and valorizing wastes) in and around the industrial zone.

The enterprises will be selected in close coordination with the request proponent based on relevant criteria, including the ability to showcase replicable demonstration of the economic and environmental value of such improvements. The selection of enterprises will consider, aside from geographical location, the potential for technology upgrading (notably in light of the TNA), size, export orientation, type and sector, etc.

#### 1.2 RECP assessments:

Carry out full-fledged assessment on resource efficient and cleaner production (RECP), considering industrial symbiosis in and among the 5 selected enterprises, including capacity building activities. The assessment will not try to enforce implementation of each of the technologies identified by TNAs, but rather identify the technologies and processes improvements most suitable for optimization in the selected enterprises. The assessments will lead to a set of recommendations delivered to the management of the enterprise spelling out the costs, benefits, and relevant issues and opportunities related to each possible improvement and upgrading. Data from previous audits carried out by the Bureau de Mise à Niveau will be used as information source. The contractor will need to ensure confidentiality with regard to the data needed for this activity.

#### 1.3 Implementation of recommendations

Provide technical support, including on the financing aspects, to the enterprises in the implementation of the recommendations stemming from the RECP assessments.

#### 1.4 Stakeholder workshop

Present the results of the assessment including the recommendations for implementation in a workshop for all relevant stakeholders and present a compendium of the recommendations with the view to promote replication and upscaling.

Deliverables	Delivery date
<i>Short-list of 5 target enterprises</i>	<i>Month 1</i>
<i>RECP assessments in 5 selected enterprises</i>	<i>Month 5</i>
<i>Detailed studies on particular recommendations requiring additional</i>	<i>Month 6</i>



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<i>support, either on the technical or financial aspects</i>	
<i>Workshop, including logistical and substantive preparations</i>	<i>Month 7</i>

**Activity 2 – Study on eco-industrial park**

2.1 Selection of case study

Ascertain the choice of industrial park (e.g. Diamniado) as case study.

2.2 Best-practice review

Review and compile knowledge on industrial symbiosis and international best-practice in green field eco-industrial parks. This includes issues pertaining to technology aspects, as well as institution and capacity.

2.3 Recommendations

Develop a set of recommendations (policy, regulatory, financial, technical, etc.) for the specific context of the selected case study.

2.4 Awareness-raising and consultations:

Engage with key stakeholders to validate recommendations and raise awareness on the benefits of industrial symbiosis.

<b>Deliverables</b>	<b>Delivery date</b>
<i>Assessment of potential target industrial parks</i>	<i>Month 1</i>
<i>Report on industrial symbiosis and eco-industrial parks</i>	<i>Month 4</i>
<i>Report with recommendations</i>	<i>Month 6</i>
<i>Consultations</i>	<i>Month 7</i>

**5 GENERAL TIME SCHEDULE**

The expected duration of the proposed contract for this portion of the Project is 1 year, with possible extensions for a subsequent phase. The initial contract will be issued for a period of 12 months. The extensions will be issued thereafter subject to the satisfactory completion of activities, approved updated list of activities and new work plan, and availability of funds.

Bidders are requested to confirm their interest in providing services for the following phase, and to agree that, for contract extensions the fee of the original cost proposal will prevail<sup>2</sup>. Details of the scope of services will be submitted to the Contractor for review and for the submission of a technical proposal. A provisional time line can be found in the attached response plan.

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<sup>2</sup> Adjustment based on the consumer price index possible.



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### 6 PERSONNEL IN THE FIELD (PROFESSIONAL EXPERIENCE AND QUALIFICATIONS)

The Contractor is expected to provide the services of a team - ideally integrating a recognized local institution and experts - that should ideally comprise the following competencies:

- Proven experience and in depth expertise in technical and financial analysis climate mitigation measures in Small and Medium Enterprises (SMEs)
- Demonstrated experience in dealing with industries in Senegal, notably in the sectors of agro-food, textile/leather, minerals, chemicals
- Proven experience in identifying and facilitating climate finance opportunities with domestic and international financiers in the public and private sector, including existing knowledge of potential sources of financing for such projects in Senegal
- The staff assigned must have previous experience providing technical assistance, including interacting with government institutions in developing countries, preferably in Africa
- Capacity to work closely with the national counterparts, and integrate local institutions and experts in the team
- Team members should hold advanced degrees in their respective areas of expertise (economy, climate technologies, sustainable development, or other relevant fields)
- Very good conceptual and writing skills
- Very good networking and facilitation skills

The CVs of the respective experts assigned to this project by the Contractor must be provided.

### 7 LANGUAGE REQUIREMENTS

The working language for the purposes of this project is French, thus an excellent command of French is required of the proposed personnel. The final deliverables must be submitted in French and/or in English, depending on the requirements of national counterparts and potential donors/investors.

All delivered documents must be of sufficient enough quality so that no further editing shall be required.

## Annex I – CTCN Response Plan

<b>Country:</b>	Senegal
<b>Request Identification Number:</b>	2015-030/SEN-02

<b>Title:</b>	Green technology deployment in industrial zones
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### Project summary

Senegal benefits from buoyant economy, nevertheless facing a number of challenges. In the country's development plan - Plan Senegal Emergent (PSE) - a key component to address these issues is the development of integrated industrial zones. These shall attract foreign investment, bring new technologies and increase productivity and competitiveness.

The CTCN, as a response to the abovementioned request for technical assistance, aims to provide expert advice on appropriate technologies to reduce impacts on climate change and improve the environmental performance of industrial agglomerations, while boosting socio-economic development. Concretely, the CTCN will assist in promoting technological upgrading in existing industries as well as advice on the planning of eco-industrial zones with the view to utilize the full potential of industrial symbiosis (common water, energy and material resources and treatment systems; energy and material recovery; etc.).

To achieve the above this action plan will take into consideration the technologies prioritized during the TNA, use of renewable energy and sustainable material substitutes, material and by-product reuse and recycling, and advice for process optimization. The technologies and improvements to be promoted will be analyzed from a technical and financial perspective in the local context. The result shall be usable for replication in further industrial development projects.

### 1. Overview of the assistance

#### 1.1 Objectives (outcomes)

The overall objective of the CTCN technical assistance is to unfold the potential for green technologies in selected industrial agglomerations. Technology upgrading, system optimization, material management, by-products exchange and economic recovery of residues have the potential to improve the environmental performance, notably in terms of greenhouse gas emissions, of the industries whilst simultaneously increasing competitiveness.

The CTCN intervention is designed as a two-pronged strategy. One stream of work deals with existing industries in selected priority sectors (e.g. agro-food, textile/leather) with the objective to improve resource productivity and lessen pollution intensity, notably by reducing greenhouse gas emissions. The second stream of work pertains to greenfield industrial parks (e.g. Diamniadio) and aims at feeding notions of industrial symbiosis in the planning process.

#### 1.2 Results (outputs)

The CTCN intervention aims at delivering technical assistance on both work streams, and produce:

- 1) An assessment of 5 existing enterprises with recommendations on resource efficient and cleaner production, with an emphasis on industrial symbiosis, including support for the implementation.
- 2) Expert advice on the design of eco-industrial parks, capturing international best-practice.

### **1.3 Technology aspects**

Priority technologies have been identified through the Technology Needs Assessment (TNA) process. Those are:

- Direct biomass combustion: either as sole fuel or co-fired, from non-edible (waste stream or bi-product);
- Cogeneration: as efficient way of responding to the demand of electricity and thermal energy;
- Energy efficiency, in particular power factor improvement: reduction of generation and transmission costs through management of reactive power;
- Thermal solar energy, notably for industrial applications: hot water production for industrial processes, as well as cooling; and
- Photovoltaic: to displace or complement grid electricity.

Those technologies will be given particular attention. Nonetheless, other technological options will also be considered as and if appropriate. Aside from this, relevant issue pertaining to aspects related to the institutional framework and capacity will also be given due consideration.

## **2. Description of the Assistance**

### **2.1 Activities**

#### **Activity 1 – Resource efficient and cleaner production assessments in 5 enterprises**

##### **1.1 Selection of target enterprises:**

Identify prospective target enterprises in priority sectors (e.g. agro-food, textile/leather, minerals, chemicals) within an industrial agglomeration with opportunities for improvements on resource productivity and pollution intensity. This also includes the mapping and high-level assessment of symbiotic potentials (sharing infrastructure/recycling/reusing and valorizing wastes) in and around the industrial zone.

The enterprises will be selected in close coordination with the request proponent based on relevant criteria, including the ability to showcase replicable demonstration of the economic and environmental value of such improvements. The selection of enterprises will consider, aside from geographical location, the potential for technology upgrading (notably in light of the TNA), size, export orientation, type and sector, etc.

##### **1.2 RECP assessments:**

Carry out full-fledged assessment on resource efficient and cleaner production (RECP), considering industrial symbiosis in and among the 5 selected enterprises, including capacity building activities. The assessment will not try to enforce implementation of each of the technologies identified by TNAs, but rather identify the technologies and processes improvements most suitable for optimization in the selected enterprises. The assessments will lead to a set of recommendations delivered to the management of the enterprise spelling out the costs, benefits, and relevant issues and opportunities related to each possible improvement and upgrading. Data

from previous audits carried out by the Bureau de Mise à Niveau will be used as information source.

**1.3 Implementation of recommendations:** Provide technical support, including on the financing aspects, to the enterprises in the implementation of the recommendations stemming from the RECP assessments.

**1.4 Stakeholder workshop:** Present the results of the assessment including the recommendations for implementation in a workshop for all relevant stakeholders and present a compendium of the recommendations with the view to promote replication and upscaling.

Deliverables	Delivery date
<i>Short-list of 5 target enterprises</i>	<i>Month 1</i>
<i>RECP assessments in 5 selected enterprises</i>	<i>Month 5</i>
<i>Detailed studies on particular recommendations requiring additional support, either on the technical or financial aspects</i>	<i>Month 6</i>
<i>Workshop, including logistical and substantive preparations</i>	<i>Month 7</i>

## Activity 2 – Study on eco-industrial park

**2.1 Selection of case study:** Ascertain the choice of industrial park (e.g. Diamniado) as case study.

**2.2 Best-practice review:** Review and compile knowledge on industrial symbiosis and international best-practice in green field eco-industrial parks. This includes issues pertaining to technology aspects, as well as institution and capacity.

**2.3 Recommendations:** Develop a set of recommendations (policy, regulatory, financial, technical, etc.) for the specific context of the selected case study.

**2.4 Awareness raising and consultations:** Engage with key stakeholders to validate recommendations and raise awareness on the benefits of industrial symbiosis.

Deliverables	Delivery date
<i>Assessment of potential target industrial parks</i>	<i>Month 1</i>
<i>Report on industrial symbiosis and eco-industrial parks</i>	<i>Month 4</i>
<i>Report with recommendations</i>	<i>Months 6</i>
<i>Consultations</i>	<i>Month 7</i>

The intervention would take the form of a so-called quick response. During the implementation, the potential for follow-up activities, notably in terms of pursuing higher impact opportunities through investment, will be assessed. Should that potential be confirmed, part of the resources ought to be allocated into developing a Plan for the subsequent phase. Additional financial resources could then be allocated based on needs and funds availability.

### 2.2 Expertise required

- Technical experts on resource efficiency and cleaner production (international/national)
- Technical experts on industrial symbiosis (international)
- Technical experts on green technologies for industry (international/national)

### 2.3 Main partners



<i>Partner</i>	<i>Role</i>
National Designated Entity(NDE)	Oversight, strategic guidance, M&E
Bureau de Mise à Niveau des Entreprises du Sénégal	Request proponent; substantive contribution to the request implementation; coordination with the Upgrading Programme and Fund
Bureau Opérationnel de Suivi (BOS)	Leader of flagship project on integrated industrial hubs
Enterprises (in key sectors)	Engage in RECP assessment and implement recommendations as appropriate and desired
Financial institutions	Provide guidance on financing aspects during the response implementation, and ultimately consider opportunities for financing the implementation of some of the recommendations
Ministry of Industry	Validate the consistency with sectorial Industry, energy and environmental policies
AEME (Energy Efficiency Agency)	
DEEC (Directorate of the Environment and Classified Establishments)	
ANER (Renewable Energy Agency)	
ONAS (National Agency of Sanitation)	
ENDA	Substantive contribution and oversight, as well as facilitation in liaising with relevant stakeholders

## 2.4 Synergies

The request has strong linkages to the development of Integrated Industrial Zones, one of the flagship projects of the country's national level development plan Plan Senegal Emergent (PSE). Outputs from the technical assistance will help to integrate resource and environmental issues in the planning and development processes of such industrial zones and thus maximize the economic and environmental benefits as well as possibly acceptance among the general public.

Close coordination and synergies will also be sought with the flagship Programme Country Partnership (PCP) in Senegal which UNIDO has recently launched. As the main advisor of the Government of Senegal with respect to industrialization, UNIDO will develop and implement the PCP in accordance with the PSE pillars and priorities. The PSE regards the inclusive and sustainable industrial development as a key approach to achieve Senegal's structural economic transformation. Therefore, the design of PCP interventions will focus on three strategic pillars and a comprehensive framework, to ensure that partnership interventions will have the highest impact on Senegal's industrialization. The three strategic pillars will enable a vertical and integrated delivery of technical cooperation services, with strong spill-overs on PSE projects. The three strategic pillars are:

- 1) Advice on design and implementation of industrial policy;
- 2) Establishment of competitive and integrated agro-poles; and
- 3) Upgrading of existing industrial parks and establishment of new ones.

UNIDO's technical cooperation will be deployed as an integrated service package to facilitate crosscutting interventions under various components of the Organization's technical assistance, such as the SME Upgrading Programme, the Environmental Management Programme, and the Green

Industry Development, as well as renewable energy promotion, institutional capacity building, investment promotion, private sector development, and SME financing.

## 2.5 Timeline

1 year for Quick Response, possibly with follow-up activities if potential is confirmed.

Months	1	2	3	4	5	6	7
<b>Activity 1: 5 RECP assessments</b>							
Selection of target enterprises	■						
RECP assessments		■	■	■	■		
Recommendations for implementation					■	■	
Stakeholder workshop							■
<b>Activity 2: Development of EIEZ framework</b>							
Selection of case study	■						
Best-practice review		■	■	■			
Recommendations					■	■	
Awareness raising and consultations							■

## 2.6 Indicative budget

The estimated budget for this contract is between USD 40,000 and 80,000.

## 2.7 Gender considerations

The intervention under this request, although not having a particular emphasis on gender issues, will be gender-sensitive, which is a prerequisite in all CTCN technical assistance interventions. This intervention is expected to have overall limited direct influence over gender equality and/or women's empowerment in the countries. The aim to increase competitiveness in Senegal's industry by facilitating access to technologies for more efficient resource utilization has the superior target to boost growth and employment.

CTCN recognizes that due to diverging needs and rights regarding natural resources, energy consumption and production, women and men are expected to be affected differently by the CTCN intervention (in terms of their rights, needs, roles, opportunities, etc.). The CTCN intervention will make sure to include women in all related capacity building activities to ensure women will receive the necessary skills and education to benefit from the development and become successfully integrated in the workforce.

It is important to ensure that gender relations do not become invisible under assumptions of neutrality especially in projects related to climate technologies. In many countries women possess valuable knowledge relevant to sustainable energy solutions due to their roles in households and communities and can, therefore, play a critical role in energy provision and consumption (for instance as entrepreneurs or decision takers regarding energy efficient household appliances). The CTCN will make sure to harness these potentials.



## 2.8 Risk identification and risk mitigation

Risks	Consequence	Probability	Mitigation
Low degree of collaboration between different businesses/sectors	Lack of trust and low willingness to cooperate and share resources/facilities	Medium	Early stage stakeholder consultations and knowledge sharing activities
Unawareness of benefits of industrial symbiosis	Low willingness among stakeholders to collaborate/contribute	Medium	Early stage stakeholder consultations and knowledge sharing activities
<i>Lack of data on past operations of industrial park/factory</i>	<i>Difficult to evaluate performance improvements</i>	<i>Medium</i>	<i>Chose pilot enterprises with sound data available</i>

## 2.9 Monitoring and Reporting

Type of M&E activity	Responsible Parties	Time Frame
Inception report (1-2 pages) with updated workplan/milestones for the assistance	Response implementer (Coordinator of the expert team)	Week 1
Monthly progress updates (1-2 pages)	Response implementer	
Country Feedback Report to CTCN on assistance received	NDE and relevant stakeholders	Within 4 weeks after completion of intervention
Final activity report focusing on achievements, challenges, lessons learnt and post-assistance plans	Response implementer	End of intervention

## 2 Long-term impacts of the assistance

### 3.1 Expected climate benefits

The CTCN assistance will help enterprises to make improvements and possibly invest in appropriate technologies to reduce their greenhouse gas emissions. Furthermore it will facilitate the utilization of industrial symbiosis potentials at an early planning stage of new industrial parks and thus contribute significantly to a low-carbon growth of the economy of the country, which is planning to invest heavily in industrial zones.

### 3.2 Co-benefits

Implementation of RECP will reduce waste and emission of pollutants, which will have positive impacts on the local environment and human health, including workers and local residents. A successful implementation of industrial symbiosis elements in industrial zones can have far-reaching co-benefits. Smart waste management with reuse and recycling of wastes and by-products will minimize the need for landfilling and thus spare land that can be conserved or used in a more productive way. Deployment of waste pre-treatment technologies will enable substitution of imported fossil fuels with local wastes thus reducing greenhouse gas emissions and potentially creating new local markets including smallholders in the agricultural and forestry sector. This again will reduce costs and increase competitiveness and create local employment.

No.	Sustainable Development Goal	Contribution from CTCN assistance
8	Promote inclusive and sustainable economic growth, employment and decent work for all	Industrial symbiosis in Integrated Industrial Zones will make them sustainable and create local jobs
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Shared water and waste management and energy generation facilities will reduce GHG emissions and foster collaboration among different sectors
12	Ensure sustainable consumption and production patterns	Reusing and recycling materials in up-stream processes makes production more sustainable
13	Take urgent action to combat climate change and its impacts	Substitution of fossil fuels and reduction of landfills decreases GHG emissions
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Smart use of agricultural wastes will decrease the need for fuel wood and reduce space needed for landfills.

### 3.3. Post-assistance plans and actions

As mentioned above, the quick response described herein could lead to another phase of CTCN activities, should the need and potential be identified. Follow-up activities could include the promotion of further RECP measures, including technology upgrading, as well as the implementation more deeply rooted of industrial symbiosis concepts, for instance through the establishment of dedicate financing mechanisms or policy/regulatory frameworks.

## 3 Formal agreement and signatures

### Signatures of the requesting country

#### For the NDE

Name: Issakha Youm  
Title: Professor  
Date:

#### For the Request Applicant

Name: Ibrahima Diouf  
Title: Director  
Date:

Signature:

Signature:

**Signatures of the CTCN**

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**For the CTCN Director**

Name: Jukka Uosukainen

Title: CTCN Director

Date:

Signature:

**For the Climate Technology Manager**

Name: Patrick Nussbaumer

Title: Climate Technology Manager

Date:

Signature:

