**PART I: PROJECT INFORMATION**

| Project Title: Sustainable industrial production in the cassava and other agro-food sectors through the use of renewable energy applications and low-carbon technologies |
|---|---|---|
| **Country(ies):** | Côte d'Ivoire | **GEF Project ID:** 9468 |
| **GEF Agency(ies):** | UNIDO | **GEF Agency Project ID:** 150434 |
| **Other Executing Partner(s):** | Ministry of Environment, Urban Sanitation and Sustainable Development in collaboration with: Ministry of Energy and Oil, Ministry of Industry, Ministry of Agriculture, Polytechnical University of Yamoussoukro (INHDP), OPEIF Afrique | **Submission Date:** 10/20/2017 |
| **Resubmission Date:** | 10/27/2017 |
| **GEF Focal Area(s):** | Climate Change | **Project Duration (Months):** 36 |
| **Integrated Approach Pilot:** | IAP-Cities | **Corporate Program:** SGP |
| | IAP-Commodities | |
| | IAP-Food Security | |
| **Name of Parent Program** | [if applicable] | **Agency Fee ($):** 82,008 |

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**A. FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES**

<table>
<thead>
<tr>
<th>Focal Area Objectives/Programs</th>
<th>Focal Area Outcomes</th>
<th>Trust Fund</th>
<th>(in $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC-1: Promote innovation, technology transfer, and supportive policies and strategies</td>
<td>Program 1: Promote timely development, demonstration and financing of low-carbon technologies and mitigation options</td>
<td>GEFTF</td>
<td>863,242</td>
</tr>
</tbody>
</table>

**Total project costs:** 863,242

**Co-financing:** 4,000,000

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**B. PROJECT DESCRIPTION SUMMARY**

**Project Objective:** Promote the sustainable industrial production in the agro-food sector through the use of renewable energy applications and low-carbon technologies

<table>
<thead>
<tr>
<th>Project Components/Programs</th>
<th>Financing Type</th>
<th>Project Outcomes</th>
<th>Project Outputs</th>
<th>Trust Fund</th>
<th>(in $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component 1: TA</td>
<td></td>
<td>Outcome 1.1:</td>
<td>Output 1.1.1: National</td>
<td>GEFTF</td>
<td>40,000</td>
</tr>
</tbody>
</table>

1. Project ID number remains the same as the assigned PIF number.
2. When completing Table A, refer to the excerpts on GEF 6 Results Frameworks for GETF, LDCF and SCCF and CBIT programming directions.
3. Financing type can be either investment or technical assistance.
Strengthening of the institutional framework to promote the development of low-carbon technologies in the agro-food value chain

Secondary legislation is reinforced to promote low-carbon development for agro-food value chains, within the overarching policy framework on environmental sustainability. Regulatory mechanisms promoting the development of renewable energy systems in agro-food value chains and low carbon technologies are proposed to the government counterpart.

Output 1.1.2: A sectoral roadmap for improved energy performance in the cassava sector and other relevant sectors is developed.

| Component 2: Technology demonstration of low-carbon applications in the agro-food value chain | TA | Outcome 2.1: Low carbon technologies are promoted in the agro-industrial processing of agricultural products | Output 2.1.1: Feasibility studies consolidated on potential uses of renewable energy in agro-food sectors | GEFTF | 160,000 | 700,000 |
| | Inv | Outcome 2.2: A viable pilot production site is operationalised, engaging the private sector | Output 2.2.1: Operationalisation of a innovative and highly replicable pilot projects | GEFTF | 385,000 | 2,100,000 |
| Component 3: Enabling partnerships in place for replication across the agricultural food-sector | TA | Outcome 3.1: Sustainable replication across cassava and other agricultural sub-sectors ensured | Output 3.1.1: Mapping of medium-term potential across agro-food sector developed and roadmap for its activation in place | GEFTF | 149,766 | 800,000 |
| Component 4: Monitoring and Evaluation | TA | Outcome 4.1: Project’s progress towards objectives continuously monitored and evaluated | Output 4.1.1 A monitoring and evaluation plan will be prepared and carried out. | GEFTF | 50,000 | 100,000 |
C. CONFIRMED SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE

Please include evidence for co-financing for the project with this form.

<table>
<thead>
<tr>
<th>Sources of Co-financing</th>
<th>Name of Co-financier</th>
<th>Type of Cofinancing</th>
<th>Amount ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recipient Government</td>
<td>Ministry of Environment, Urban Sanitation and Sustainable Development</td>
<td>In-kind</td>
<td>1,900,000</td>
</tr>
<tr>
<td>Recipient Government</td>
<td>Ministry of Environment, Urban Sanitation and Sustainable Development</td>
<td>Grants</td>
<td>1,000,000</td>
</tr>
<tr>
<td>CSO</td>
<td>Locally active entities (e.g. NGO OPEIF and others)</td>
<td>Grants</td>
<td>1,000,000</td>
</tr>
<tr>
<td>GEF Agency</td>
<td>UNIDO</td>
<td>Grants</td>
<td>50,000</td>
</tr>
<tr>
<td>GEF Agency</td>
<td>UNIDO</td>
<td>In-kind</td>
<td>50,000</td>
</tr>
<tr>
<td>Total Co-financing</td>
<td></td>
<td></td>
<td>4,000,000</td>
</tr>
</tbody>
</table>

D. TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES), FOCAL AREA AND THE PROGRAMMING OF FUNDS

<table>
<thead>
<tr>
<th>GEF Agency</th>
<th>Trust Fund</th>
<th>Country Name/Global</th>
<th>Focal Area</th>
<th>Programming of Funds</th>
<th>(in $)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UNIDO</td>
<td>GEF TF</td>
<td>Côte d'Ivoire</td>
<td>Climate Change</td>
<td>(select as applicable)</td>
<td>863,242</td>
</tr>
<tr>
<td>Total Grant Resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>863,242</td>
</tr>
</tbody>
</table>

a) Refer to the Fee Policy for GEF Partner Agencies

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4 For GEF Project Financing up to $2 million, PMC could be up to 10% of the subtotal; above $2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.
E. PROJECT’S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS

Provide the expected project targets as appropriate.

<table>
<thead>
<tr>
<th>Corporate Results</th>
<th>Replenishment Targets</th>
<th>Project Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maintain globally significant biodiversity and the ecosystem goods and services that it provides to society</td>
<td>Improved management of landscapes and seascapes covering 300 million hectares</td>
<td>hectares</td>
</tr>
<tr>
<td>2. Sustainable land management in production systems (agriculture, rangelands, and forest landscapes)</td>
<td>120 million hectares under sustainable land management</td>
<td>hectares</td>
</tr>
<tr>
<td>3. Promotion of collective management of transboundary water systems and implementation of the full range of policy, legal, and institutional reforms and investments contributing to sustainable use and maintenance of ecosystem services</td>
<td>Water-food-ecosystems security and conjunctive management of surface and groundwater in at least 10 freshwater basins; 20% of globally over-exploited fisheries (by volume) moved to more sustainable levels</td>
<td>Number of freshwater basins, Percent of fisheries, by volume</td>
</tr>
<tr>
<td>4. Support to transformational shifts towards a low-emission and resilient development path</td>
<td>750 million tons of CO2e mitigated (include both direct and indirect)</td>
<td>12,857 (tCO2) direct emissions; 102,854 (tCO2), indirect bottom-up emissions</td>
</tr>
<tr>
<td>5. Increase in phase-out, disposal and reduction of releases of POPs, ODS, mercury and other chemicals of global concern</td>
<td>Disposal of 80,000 tons of POPs (PCB, obsolete pesticides)</td>
<td>metric tons</td>
</tr>
<tr>
<td></td>
<td>Reduction of 1000 tons of Mercury</td>
<td>metric tons</td>
</tr>
<tr>
<td></td>
<td>Phase-out of 303.44 tons of ODP (HCFC)</td>
<td>ODP tons</td>
</tr>
<tr>
<td>6. Enhance capacity of countries to implement MEAs (multilateral environmental agreements) and mainstream into national and sub-national policy, planning financial and legal frameworks</td>
<td>Development and sectoral planning frameworks integrate measurable targets drawn from the MEAs in at least 10 countries</td>
<td>Number of Countries:</td>
</tr>
<tr>
<td></td>
<td>Functional environmental information systems are established to support decision-making in at least 10 countries</td>
<td>Number of Countries:</td>
</tr>
</tbody>
</table>

F. DOES THE PROJECT INCLUDE A “NON-GRANT” INSTRUMENT?  No
(If non-grant instruments are used, provide an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/CBIT Trust Fund) in Annex D.
PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN WITH THE ORIGINAL PIF

A.1. Project Description. Elaborate on: 1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed; 2) the baseline scenario or any associated baseline projects, 3) the proposed alternative scenario, GEF focal area strategies, with a brief description of expected outcomes and components of the project, 4) incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, CBIT and co-financing; 5) global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF); and 6) innovativeness, sustainability and potential for scaling up.

The key changes in alignment with the project design with the original PIF are explained below:

- **Linkage between agro-value chain development and low carbon technologies:** Following a mapping of potential agricultural sectors, the PPG phase narrowed down the final selection focusing more exclusively on cassava residues at the pre-selected project sites. Pre-feasibility studies focused on the rehabilitation activities that need to be undertaken in order to strengthen the production side and put in place cassava processing units, while identifying the appropriate bio-energy systems to support the production. To this end, two project sites were pre-identified by the government and technical experts.

- **Necessity of supply chain demonstration and policy improvement:** PPG activities showed that the biomass supply chain is still underdeveloped in the country and needs special focus to enable farmers and agricultural companies to build up a local biomass fuel market. It has also seen that biomass producers face a lack of technical information concerning the biomass supply chain practices. Also there are no support mechanisms for supply chain investments in place. Therefore, the emphasis of this project is placed on developing the supply chain through the rehabilitation of cassava processing sites. The according policy activities and recommendations for secondary legislation are included to project under Component 1.

- **Project site selection:** The team of experts carried out first pre-feasibility studies at potential project sites and presented options to the government during a validation meeting with the Ministry of Environment in August 2017. Two sites were retained and cofinancing letters submitted by the locally present NGO OPEIF Afrique which will act as a partner during this project.

- **Institutional arrangements consolidated:** Following consultations with the government counterpart, roles and responsibilities of the main stakeholders were sketched out. Besides OPEIF Afrique which is active on the community level and has a vast expertise in the cassava processing business, the Institut Polytechnique de Yamoussoukro will assist in the quality control and technical backstopping of the installations at the project sites and feasibility studies to be carried out.

### A 1.1 Global environmental/adaptation problems, root causes and barriers that need to be addressed:

Developing countries and emerging economies are increasing their energy consumption for their economic and industrial development. A carbon-intensive industrialization, as observed especially in economies with a large dependency on imported fossil fuels, presents a particular challenge in taking measures against climate change.

In Côte d’Ivoire, high dependency on fossil fuels for power generation and lack of clean energy access remain a major challenge in the country’s rural areas. According to World Bank and African Development Bank data, currently about 60% of the country’s electricity is produced by thermal power stations while 40% is generated by hydropower plants. In its strategic plan 2013-2030 for the development of the electricity sector in Côte d’Ivoire, the Government has identified 66 projects that will require massive investment from the private sector, including through Public-Private
Partnerships (PPPs) with Independent Power Producers (IPP), to expand power capacity production and to modernize the transport and distribution of electricity throughout the country. Efforts are underway to increase hydroelectric and thermal electricity generation with construction of new hydroelectric dams (such as a 275 MW hydroelectric plant at Soubre) and thermal power plants as well as expansion projects at the CIRPEL and AZITO thermal power plants. In addition, the Government also wants to develop a balanced energy portfolio by encouraging the production of new and renewable energy sources.

In terms of barriers, the current policy and legislative framework still needs to be reinforced to actively promote the development of renewable energy and low carbon technologies. Secondary legislation is still missing and to this end the project will develop proposal to enhance the existing framework. Demonstration sites are also missing to pilot the particular approach of applying low carbon technologies in agro-food value chains and showcase the feasibility of PPP business models.

A 1.2 The baseline scenario or any associated baseline projects

A 1.2.1 Baseline scenario

The new Electricity Code has been passed which introduces some major changes in the electricity sector of Côte d'Ivoire and further liberalizes the power sector by ending the State monopoly on transport, distribution, commercialization, import and export activities of electricity. All those activities may now be operated by one or more private operators pursuant to a convention agreement to conclude with the State.

All relevant conventions are concluded by the Minister in charge of Energy and Environment and the Minister of Economy and Finance on behalf of the State, and enter into force only after having been approved by decree adopted by the Council of Ministers. The terms and conditions of such conventions, as well as their nature will be specified by future decree or by inter-ministerial decree for the distribution and commercialization activities. UNIDO, through its GEF-4 project on the promotion of solar PV mini-grids in rural areas, has assisted the Government in drafting the necessary policy documents and legislation and will continue to help strengthen the regulatory framework. This work is currently expanded with additional technical support from the European Union.

As in many countries in the region, electricity tariffs in Côte d'Ivoire have been considered too low and not cost effective to encourage IPPs to invest in the sector. Social tariffs have also been put in place affecting the profitability of the sector and discouraging private sector involvement. According to the International Monetary Fund (IMF), Côte d'Ivoire has designed a new pricing strategy which consists of taking a large volume of consumers out of the social tariffs, implementing gradual price increases to bridge the generation cost difference and renegotiating export prices. The Electricity Code reflects this pricing strategy by setting new pricing principles for electricity sector. Electricity pricing should now take into account the financial equilibrium of the electricity sector, the development of the electricity sector, equity and non-discrimination principles for same categories of electricity consumers, the costs, charges and expected profits arising from the obligations of the public service as well as the financial equilibrium of the operator and its return on investment. Electricity tariffs are set and revised by the Minister in charge of Energy. This also means that tariffs can be site specific, depending on the social context and purchasing power of the local population and these aspects will be studied in detail in the technical and financial feasibility studies that will be elaborated during this project. The aim will be to identify the opportunities which the decentralized power generation sector offers for private and foreign investors.

A first review of the current framework shows that successive Ivorian governments, from 1985 to the present day, have adopted important decrees (legislative framework) aimed at organizing, modernizing and strengthening the total liberalization of the electricity sector. Specifically the following ones were put into effect:

- Law No. 85-583 of 29 July 1985 on the production, transmission and distribution of electricity in Cote d'Ivoire with a state monopoly on transport, distribution, export and import;
- Decree No. 90-1390 of 25 October 1990 approving the concession agreement for the national public service of production, transmission, distribution, export and import of electric power, as amended by Decree No. 2005-520
of 27 October 2005 approving the Addendum No. 5 to the concession agreement for the said national public services;

- Decree No. 2016-785 of 12 October 2016 on the organisation and functioning of a regulatory authority for the electricity sector known as ANARE-CI;
- Decree n° 2011-472 of December 21, 2011 on the creation of a state company called Energies of Côte d'Ivoire abbreviated CI-ENERGIES;
- Law No. 2014-132 of March 23, 2014 on the Electricity Code, adopted by the Parliament and promulgated by the President of the Republic, which, among other things, promotes and develops new and renewable energy in this field. It addresses them explicitly in several of its provisions, thus offering prospects for the realisation, operation and installation of renewable energy based applications by investors;
- The legal approach contained in this code has been to open all fields of activity of the electricity sector to ENRs so that the provisions of this law encompass both the energy produced from the conventional sources as well as renewable origins. Thus, the practical interpretations and applications that this Code could raise include the organisation of the ENR sector, the activities of the ENR sector, the protection of assets allocated to the production of electricity from ENRs, Regulation, tariff, financial, tax and customs regulation in respect of ENR, and the repression of breaches of the rules applicable to ENR. Most recently, this 2014 law was strengthened by the following decrees:
- Decree No. 2016-782 of 12 October 2016 on the terms and conditions for the conclusion of concession agreements for production, transport, dispatching, import, export, distribution and commercialisation of electricity;
- Decree No. 2016-783 of 12 October 2016 laying down the terms and conditions for the sale of electricity produced by an independent producer or the sale of excess of electrical energy produced by a self-producer;
- Decree No. 2016-782 of 12 October 2016 laying down the conditions and procedures for the exercise of the production activity associated with the distribution and marketing of electrical energy by mini-grid or by independent autonomous production systems of electric energy.

These more recent decrees reinforce existing ones in the electricity sector and provide a legislative and institutional framework. As regards the legislative framework, the existing texts, which determine the investment code in the sector, favor, inter alia:

- Exemption from taxes on capital goods for investment;
- Tax benefits on operating activities;
- Securing investments

The first project component will support this work of the Government to reinforce the current legislative framework and more specifically develop application texts.

Several opportunities have been identified in consultation with the Government during the PPG phase for the sustainable development of renewable energies in Côte d'Ivoire:

- A strong political will;
- Recent regulations in accordance with the national development plan have recognized the need to strengthen the legal, regulatory and institutional framework for the development and promotion of renewable energy and to establish tax incentives that can attract the private sector;
- National energy consultations and seminars have been conducted in the country and a portfolio of projects were identified in nexus areas of education, health, drinking water, street lighting, agriculture and SME upgrading;
- The country has a rich agricultural sector with an important potential of agricultural residues, agro industrial and household wastes.

However, the major take-off in the promotion of low carbon technologies is not yet felt in practical terms through concrete projects on the ground, especially those dealing with the nexus issues. It is therefore appropriate to formulate, in the light of good practice in other countries, a number of mechanisms likely to stimulate this practical development in Côte d'Ivoire.
Key recommendations for the development of the RE sector which were identified and taken up under this project component are the following:

- Development of national policy and action plan for RE and demonstrations through pilot projects in some major regions of Côte d’Ivoire;
- Development of green jobs targeting artisans, youth and technical and professional training centres;
- Strengthening of training and research in the field of RE technologies involving local universities in prospect of developing a critical mass of professionals necessary for the creation of SMEs in the RE sector;
- Creation of investment funds to support Renewable Energies initiatives: Operating subsidies, incentive schemes for the banking and financial sector to set up environmental credit lines;
- Creation of a synergy and coordination mechanism between the different institutional actors (governmental institutions, financial institutions, stakeholders working in renewable energies);
- Creation of a critical mass of professionals necessary for the emergence of SMEs / SMIs in the RE sector.

The baseline framework which more generally applies as a reference point to the project is the National Development Plan (NDP), especially the following two pillars: (i) Strengthening, Governance and Accountability; and (ii) Infrastructure Development in support of Economic Recovery. Thus, in support of NDP strategic objectives 1 and 2, the project aims to support the social and economic insertion process, and address the concerns of the population, especially of the most underprivileged, as regards access to modern energy services and income generating activities. It furthermore supports the NDP strategic objective 2, which aims to promote the optimal use of natural resources through the development of high quality infrastructure in the agriculture, transport and energy sectors, in order to bolster economic recovery. By focusing on the promotion and maximization of growth opportunities through sustainable natural resource management, specifically enhanced agricultural productivity as well as improved economic infrastructure quality, the project aims to contribute to efforts aimed at ensuring a smooth transition to green growth. According to the Second National Communication on Climate Change (SNCC, 2010), agriculture is the main source of Nitrous oxide emissions (N₂O) with 185, 504.40 Gg - EqCO₂ or 99.84 % of N₂O emissions. This trend is confirmed by the document Intended Nationally Determined Contributions for the COP 21 (INDC) of the Côte d’Ivoire, prepared in September 2015, indicating that the country recorded in 2012 (year of reference) a total of 15,964.35 kteq CO₂ emissions including:

- Electricity production: 3,442.63 or 21.56%
- Transport: 2,389.36 or 14.97%
- Industry: 1,000.81 or 6.27%
- Energy supply : 781.64 or 4.90%
- Buildings: 627.03 3.93 %
- Agriculture: 6,140.80 or 38.47 %
- Waste: 1,582.08 9.91 %

As shown through these figures, the agricultural sector is the largest contributor to greenhouse gas emissions at the national level. Together with waste, it contributes to almost 50% of GHG emissions in the country.

In Côte d’Ivoire, cassava is among the main agricultural crops. It’s produced all over the country but mainly in the South, West and Central areas of the country. Annual production reached 5.189 million tons (world bank, 2016), with an average yield of 6.5 tons per hectare (CNRA, 2013). This production needs the use of approximately 370,770 hectares, resulting mostly from extensive farming. Cassava producers in Côte d’Ivoire do not, in general, use improved varieties. The local varieties are susceptible to attack from pests and generally low yielding. These producers are
generally characterized by a very low level of technical efficiency. The average index of technical efficiency of cassava producers in the Centre and in the Centre-West of Côte d’Ivoire is about 50% (Diarra et al., 2003).

Most of the small producers of cassava are driven by a need to meet household food security. Cassava processing has the following objectives (Kwatia and Jeon, 1990):

- Reduction of losses in fresh roots after harvest;
- Elimination or reduction of quantities of cyanide;
- Improvement of the taste of derived cassava products;
- Establishment of small rural processing enterprises.

This establishment of small rural processing enterprises is handicapped both by the irregularity of the quality of the product which varies in relation to the cassava variety used and also by the traditional way of processing using mainly firewood for energy needs (heat and steam for cooking and drying issues).

The product attiéké is widely consumed in Côte d’Ivoire and the entire sub-region which notoriously imports the product from Côte d’Ivoire. The market potential is thus significant and in the past, products such as the one labeled “attiéké d’or”, a signature product of the partnering NGO OPEIF Afrique, was successfully marketed in the country and abroad. Without a sound strategy and the implementation of projects like this one, the attiéké industry would be even more strongly linked to the increasing consumption and degradation of forest resources, thus contributing to deforestation and dependency on the main electricity grid. This scenario corresponds to analyses by the Ivorian Government which now seeks to address the challenge of accelerating rural economic development with the need to reduce GHG emissions and improve the level and quality of life of the population. The INDC document (September 2015) reflects this approach by emphasising that sustainable development should be based on increasing agricultural production, agro-processing, the fight against deforestation and accelerating the provision of sustainable energy sources to reduce GHG emissions. However, Côte d’Ivoire needs to be supported to pursue the path of sustainable development in an environmentally conscious way.

To achieve the goal, the INDC proposed an alternative low-carbon scenario to reduce the GHG emissions by 2030 (28% off). Agriculture and waste GHG reductions are supposed to be as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Baseline scenario (2030) (kteq CO₂)</th>
<th>Low carbon scenario (2030) (kteq CO₂)</th>
<th>% of reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>7,059.16</td>
<td>4,722.58</td>
<td>-6,82</td>
</tr>
<tr>
<td>Waste</td>
<td>2,336.09</td>
<td>1,623.90</td>
<td>-2.08</td>
</tr>
</tbody>
</table>

In this context, this project will be among the low carbon projects endorsed by the Government in the different nexus areas: agriculture, energy, waste, forestry, etc.

The proposed project will thus focus on using low-carbon technologies, especially organic waste streams which are currently not or inefficiently valorized, for industrial renewable energy applications to provide part or all of the enterprises’ energy demand (especially process heat), with the overall aim for promoting application of innovative and adaptive technology in the target sector to reduce their dependency on fossil fuels.

The innovation of the proposed project compared to the classical or existing applications of bio-energy is targeted at the technology and sectorial levels. Côte d’Ivoire has not thus far experienced any significant government-steered application of bio-energy technologies to support agro-food processing industries. The use of modern bio-energy technologies has not trickled down to the agro-food sector, which regroups small and medium sized enterprises...
The management of organic waste streams in the agro-food sector in Côte d’Ivoire is currently not developed. For instance; crop residues and other biological waste is mostly being burnt on the field. The project will therefore promote the valorization of certain waste streams in identified agricultural sectors by bringing innovative technologies which respond to a high demand for (process) heat in the manufacturing sector, co-generation (power and heat) and possibly tri-generation (power and heat and cooling) and have not yet been pioneered in Côte d’Ivoire.

The above demonstrates that there is an opportunity for a more effective and efficient use of the waste streams for conversion to energy. This is new as these sectors have not yet been exposed to the use of the bio-technologies at enterprise level, and could diversify the business activities, increase the competitiveness and decarbonise the energy use of the local economic sectors. As for the application of an innovative business model (such as PPPs, third-party financing etcetera), appropriate business models were sketched out during the PPG phase of the project to maximize private sector participation, and map out potential agro-industrial sectors. The project’s scope is thus highly relevant to national energy targets of using local, sustainable and clean sources to support the low-carbon development in Côte d’Ivoire. The project is innovative and pioneering in the sense that it will do so by addressing sectors (SMEs in agro-food) and outputs (RE based heating and cooling) which are currently largely overlooked in policy and development plans. Village cooperatives and small scale family businesses integrated in the interurban distribution network are representative of the attiéké sector where they play an increasing role in supplying urban areas such as Abidjan, Bouaké, San Pedro or Yamoussoukro. Their dynamism is the main factor of the cassava sector boom witnessed in recent years. This sub-sector is a major provider of direct and indirect employment and is mainly composed of women from disadvantaged social backgrounds. SMEs operating in the attiéké sector, although not very numerous for now, usually have access to a solid distribution network and exporting capacities, are very dynamic and well integrated in the modern economy. Furthermore, their possible integration in regional and international markets offers new prospects to the attiéké industry.

During this project’s PPG phase, studies were carried out of the potential application of low-carbon technologies in the agro-food processing sector. Agricultural waste forms the highest share of available biomass resources, especially in the cassava production. According to the studies and Government estimates, there is a vast potential for available agricultural waste (based on cultivated areas and remaining residues post-harvest), which is often burnt in open fields or abandoned to decay, to be used for energy production. Techno-economic potentials of bio-energy were analysed at potential project sites identified by the Government for technology demonstration to foster economic development in less industrialised regions. Detailed calculations and analyses were carried out to retrieve the quantitative information required for the formulation of the project targets.

Furthermore, the agricultural sector constitutes 26% of GDP, 40% of export revenue and about 75% of non-oil export revenue. About 75% of the country’s land is arable and soil quality and agro-climatic conditions are conducive to the production of a variety of tropical crops, but only 42% of the arable land is farmed. The sector remains one of the main drivers of economic growth despite a decrease due to the fall in the price of cash crops and the decade of military/political crisis. The adoption of the National Agricultural Investment Programme (PNIA) provides new opportunities for the sector’s recovery based on a public-private partnership and the development of production marketing and processing infrastructure. These factors argue well for the achievement of the food security objectives and an increase in the production and export of processed products. The growing importance and involvement of the private sector observed in recent years provides another opportunity for the country to increase financing in the sector and develop smallholder farming into modern competitive agriculture fully integrated into the regional and world market.

Côte d’Ivoire is the world’s largest producer of cocoa and cashew and a top world producer of rubber, coffee, palm oil, plantains, yams and cassava. Its strong and diversified agricultural industry offers remarkable opportunities to renewable energies through the recycling of agricultural wastes. The biomass potential of agricultural residues is substantial. It is one of Africa’s largest and has the capacity to address a significant part of Côte d’Ivoire’s energy needs.
Côte d’Ivoire’s energy needs amount to 14.2 million tep (2015). Although renewable energies cover 73.5% of these needs, this ratio calls for some nuance, charcoal and wood-fuels sector alone amounts to 72.6%.

The length and the hypothetical nature of wood renewal process combined with the negative impact of its use on climate and the environment, through deforestation, implies that this resource has to be accounted separately. Wood fuels and charcoal excepted, renewable energies cover only 1% of the country’s energy needs and 25% of its electricity demand, mostly from hydroelectricity. Energy production deriving from agriculture wastes biomass amounts to a mere 5 ktep, 0.05% of energy needs 1% of electricity demand. Relate to agriculture energy needs, estimated to 96ktep, the share of bioenergy deriving from agricultural wastes accounts for 5%. This situation shows the vast potential of replication across other agricultural sub-sectors.

**Agricultural waste management**

This agricultural waste has an energy potential of 182.8 million GJ (2016), equivalent to 4.36 million tep, 31% of the country’s energy needs and 8 times its electricity demand. While it possesses these enormous amounts of biomass resources, Côte d’Ivoire is merely using 0.1% of it. Energy generation from agricultural wastes residues is mainly done by three major agro-industrial companies involved in palm oil and sugar cane sectors: SUCAF, SUCRIVOIRE and PALM-CI. These companies recycle about 7% of their residues to produce biofuels for their machinery or electricity for their processing plants. Two smaller actors are also involved in the bioenergy chain by recycling their wastes: Mantezo (sawmill) and Novis (Cocoa processing). Therefore, 99.9% of the biomass potential is left unused. This potential is related to residues: left or burnt on the farm fields (stalks, leaves, logs, trunks) ; disposed or burnt nearby processing sites (husks, shells, peels, grains, liquid wastes) ; ending in landfills with households garbage (peels, husks) ; used for livestock feeding (peels, husks). Although the residues left or burnt on the farm fields may play a role as fertilizers or pesticides they contribute to the emission of greenhouse gases.

**Biomass potential by feedstock**

The energy resources derived from agricultural wastes depends on the feedstock and the type of residue. Residues tonnages, moistures content and lower calorific values enable to estimate the potential of energy extractable for each feedstock. The availability of the residues may also be a factor to be taken into consideration as some residues may potentially be used in other recycling chains or end up as household’s wastes.

**Accessibility of biomass resources**

As mentioned previously, certain types of residues are not harvested; others end up in household’s garbage or play a role in others values chains, such as crops fertilizers or livestock feeding. Thus, their availability for the bioenergy production chain has to be determined. Therefore, it seems important to distinguish the residues potential resources based on their access readiness. It appears that only 14% of the agricultural wastes biomass resource potential can be considered as readily accessible. 71% present collection challenges and 15% are potentially used in other commercial recycling chains.

The biomass potential from residues that we can consider as readily accessible amounts to 25.2 million GJ. It concerns the residues that are harvested and disposed at artisanal or industrial processing sites and do not interest competing recycling chains such as livestock feeding and heating. This category includes cashew shells, cashew shells liquid, cassava water wastes, cocoa pods, coffee husks, palm kernel empty fruit bunches palm oil mill effluents and sugar cane bagasse.

The biomass potential from residues interesting other recycling chains amounts to 27.7 million GJ. Only a share of this amount is actually recycled. No recent estimation of this share is available to date. This category concerns the residues that are harvested and may potentially be monetized notably for livestock feeding and heating. It includes cassava peelings, coconuts shells, cotton husks, maize cobs, rice husks and rubber logs. The access to this resource will depend on the competitive edge of the bioenergy recycling chain.

The biomass potential from residues presenting collection challenges amounts to 129.9 million GJ. This category concerns the residues that are not harvested, and end up in households’ garbage or are exported with the raw
feedstock. It includes banana leaves and trunks, cashew shells, cashew shells liquid, cassava taros and yam stalks, cotton stalks, groundnuts stalks, groundnuts shells, maize stalks, rice, millet and sorghum straws, plantain, taros and yam peeling. The access to this resource will require additional operations in order to harvest the residues that use to be left on fields or to collect households’ organic wastes. With regard to cashew residues, 90% of its production is de facto exported with the raw shells representing a loss of 11.3 million GJ; the only option is to increase the capacity of local processing.

In terms of bio-waste potentials in different agro value chains, the following were studied for the baseline assessment:

**Yam**
Côte d’Ivoire produces 5.8 million tons of yams per year most exclusively consumed as staple food. Yam is a main carbohydrate supply in Côte d’Ivoire, especially in rural areas. Cultivated all over the country, Yam is mainly produced and consumed in central and north eastern regions. With over 47.1 million GJ, Yam has the largest potential resource in terms of biomass residues. Two different types of residues can be recycled. Stalks and leaves which account for 84% of the energy potential and peels 16%. However, collecting those residues may be cumbersome as stalks and leaves are usually left on the farm fields contributing to soils fertilisation while peelings typically end as household’s garbage.

**Rice**
Côte d’Ivoire rice production stands around 2 million tons per year. Rice is the main staple food, especially in urban areas. It is mostly cultivated in west central, western and northern regions. With 42.5 million GJ, Rice has the second largest potential resource in terms of biomass residues. Two different types of residues can be recycled: straws, which account for 89% of the energy potential and husks 11%. Farmers mostly leave rice straws on the fields while husks can easily be collected in husking plants.

**Cocoa**
Cote d’Ivoire is Cocoa world’s largest producer with a production of 1.8 million tons. Cocoa beans and derived products are most entirely destined to exportation, this commodity being the country’s main source of foreign currency.

Being the flagship product of the Ivorian agriculture, cocoa farming is widely spread in the forest regions, mainly in the south west and centre-west. Cocoa residues have a biomass potential estimated at 22 million GJ, making it the third largest resource. The recyclable residue is the pod which is harvested in order to extract the beans, and thus can easily be collected for recycling in the bioenergy production chain.

**Cotton**
Cote d’Ivoire is Africa 5th largest cotton producer with a 230,000 tons produced in 2015. Mostly exported, cotton is produced in the northern regions and ginned locally in industrial units. Cotton residues biomass potential is estimated at 13.7 million GJ, making it the fourth largest resource. Stalks account for 73% of this potential, husks making the remaining 27%. Cotton stalks are burnt on the farm fields contributing to soils fertilisation and may therefore be difficult to collect. On the other hand, cotton ginning being processed in industrial units, significant volumes of shells can be expected from these sites.

**Cashew**
Since 2015 Cote d’Ivoire is world’s top cashew producer with an output of 703,000t in 2016. Beans and derived products are most entirely destined to exportation. Cashew is mostly farmed in the northern and north eastern regions. Cashew residues biomass potential is estimated at 12.6 million GJ, making it the 5th largest agricultural wastes bioenergy resource potential. Two recyclable residues emanate from cashew, the shell and the shell liquid. Both are disposed at hulling units, and should be available for recycling in the bioenergy production chain. Unfortunately only 10% of the national output is processed locally meaning that 90% of the bioenergy potential is lost through exportation.

**Cassava**
With an annual output of 5.2 million tons, Côte d’Ivoire is Africa’s 7th largest cassava producer. Cassava is most exclusively consumed as staple food, notably in form of Attiéké, the flagship meal of Ivorian cuisine. Cassava is mainly
produced in central and southern regions, around the main urban areas to which a significant part of the production is
destined. 12.5 million GJ can potentially be derived from cassava residues, making it the 6th largest bioenergy
potential resource in the agricultural wastes segment that interests this study. Three different types of residues can be
recycled. Peelings which account for 64% of the energy potential, stalks 33% and water wastes 3%. Similarly yam
stalks, cassava stalks are left on the farm fields contributing to soils fertilisation. But unlike yam peels, cassava peels
rarely end in household’s garbage. Most of the tubers being processed for the fabrication of Attiéké or Placali
semolina, peelings and water wastes are disposed at processing units. Mostly small artisanal units located in rural or
peri-urban areas. Collection of those two types of residues for bioenergy production is possible, however, an
increasing share of cassava peelings is recycled for livestock feeding. Though it is difficult to estimate the importance
of this share, as no recent studies are available, this matter has to be taken into account.

Other food crops
Plantain, groundnuts, sorghum and taros are exclusively farmed as food crops while maize, and millet are also
destined to livestock feeding and brewery. Residues from maize, plantain, groundnuts, millet, sorghum and taros
represent a 24 million GJ bioenergy potential from which stalks, leaves and trunks account for 83%, peelings for 10%,
cobs and husks and groundnuts shells for 3%. Stalks, leaves and trunks being left on farm fields and peelings and
shells disposed in households garbage, collection of these types of residues may be challenging. On the other hand,
cobs and husks can easily be collected from processing units, typically small artisanal units in rural or peri-urban areas
but also, in the case of maize, industrial plants such as poultry food processing units or breweries.

Other cash crops
Côte d’Ivoire is Africa’s largest producer of rubber and banana and among Africa’s top 5 producers for commodities
such as coffee, palm oil, sugar cane and coconut. While sugar cane, banana and coconut are farmed in large scale
plantations owned by agro industrial groups, coffee is grown in small plantations. Palm oil and rubber are grown in
plantations from both scales. Residues from these agricultural products have a potential estimated at 9.0 million GJ.
Shells, kernels and husks estimated at 47%, leaves trunks and bagasse 32%, rubber logs 18%, palm oil liquid wastes
3%. All these types of residues can easily be collected for recycling. Rubber logs and banana leaves and trunks might
be harvested if value added is at stake. Coffee husks are disposed of at hulling sites while coconuts shells, sugar cane
bagasse and palm oil kernels are disposed at industrial processing plants. The participants in the palm oil and sugar
cane sectors have already invested a big deal in recycling their residues to meet part of their energy needs. Almost half
of their residues are recycled to produce either biofuels or power, representing a capacity equivalent to 45MW.

Suitability of cassava wastes to produce bioenergy
Cassava peels/barks have a low ash content (<5%) and an ash fusion temperature above 1200°C. Their bulk density
remains above 250 even after drying; this makes them to flow easily and burn well. The peels have a high moisture
content (~60%), which makes their drying a necessity to bring the moisture content under 20%, technical threshold for
gasification.

The laboratory analysis of cassava processing wastewaters from several samples resulted in the following:

- Total solids: 4,000 – 5,500 mg/L
- Total suspended solids: 1,300 - 1600 mg/L
- Total volatile solids: 1,900 – 2,100 mg/L
- BOD: 3,800 – 5,000 mg/L
- COD: 4,000 – 6,000 mg/L
- Free Sugars: 840 – 1,845 mg/L
- Nitrogen: 65 – 71 mg/L
- PH: 5.14
The results above indicate that the liquid waste is acidic and has good amount of volatiles matters. Based on the value of the organic load reported above, one liter of cassava wastewater has a potential to generate from 2.4 to 3.2 liters of biogas.

**Availability of cassava wastes at attiéké processing sites**

Out of a total output of 5,189,000 tons of cassava roots (World Bank, 2016), 1,038,000 tons are estimated to be wastes, shared as follows:
- 675,000 tons (13%) of peelings
- 363,000 tons (7%) of discarded roots and barks;
- 12,972,000 liters of liquid wastes

All these Cassava wastes are available at processing units. These small-scale units are scattered all over the production areas and are limited in both solid and liquid residues.

**Cassava processing wastes biomass potential**

Cassava wastes biomass resource totals 12.5 million GJ, from which 8.4 million GJ can be easily recovered as disposed at processing units. The 4.1 million GJ differences being related to stalks which are usually left on farms. Out of those 8.4 million GJ, solid wastes account for 8 million GJ and liquid wastes represent the 0.4 million GJ.

Solid wastes derive from peeling, discarding, grinding and sifting while liquid wastes derive from washing and pressing. Solid wastes biomass resource availability may be challenged in livestock areas where cassava solid residues could potentially be used for livestock feeding. Further surveys would have to be carried out to have a better understanding on the extent of this phenomenon and the economic challenges that it raises. Although their potential may appear marginal, recycling of liquid wastes must be given a high priority. In spite of their toxicity, these residues are usually abandoned in open air or in nearby gutters exposing the processing sites users and the neighbourhood to serious sanitary challenges.

In terms of partnerships during this project, the following counterparts were identified and will be consulted during the project to enhance national ownership.

Main institutional counterparts:
- The Ministry of Environment and Sustainable Development, main governmental counterpart
- The Ministry for Energy and the Promotion of Renewable Energies, the ANARE-CI, CI-energies, as state actors responsible for guardianship, regulation of the sector, asset management and prime contractor
- The Ministry of Industry
- The Ministry of Agriculture
- The National Agency for the Development of the Environment (ANDE)
- The Ministry in charge of Planning and Development
- The Ministry in charge of Higher Education and Scientific Research
- The Institute of Technological Transformation (I2T)
- The National Centre for Agronomic Research (CNRA).

**A 1.2.2 Associated baseline project**

The baseline project consists of the Government’s policy direction to accelerating rural economic development while reducing GHG emissions, with a focus on rural enterprises. A number of initiatives are under way or under preparation to strengthen the value-chain for agro-food products such as cassava, under the overarching objective to restore the country as an agricultural hub and regional exporter of quality and value-added food products. The Ministries of Agriculture and Industry are among those working in this area, as well as development partners such as African
Development Bank (AfDB) and West-African Development Bank (BOAD). Specifically, consultations were held during the PPG phase with key partners and the coordinating body of all ongoing projects in this area is the Ministry of Environment’s Directorate for green economy and social responsibility (DEVRS). The latter identified the following projects to work in synergy with the proposed one and elaborate collaboration agreements under the project’s Partnerships component (project component 3):

Furthermore, the following GEF projects were identified by the Ministry of Environment as complementary to the current proposal. Once the Project Steering Committee has been constituted and representatives from different ministries been associated, formal cooperation modalities will be defined.

Numerous local NGOs and SMEs have oriented their actions towards food security closely linked to environment conservation. These actions include intensive agricultural production with improved crop varieties launched through capacity building on promising technologies, woodlots, and transformation and conservation techniques. Following the request of the Government one such NGO, OPEIF Afrique, was identified as a main executing entity it has a long standing history of working in the area of cassava processing and supporting local community associations to create jobs and enhance the attié ké production. This NGO already disposes of project sites at one of the most promising cassava processing regions and has agreed to make these sites and existing infrastructure available to the project. Linking this approach with energy production in rural areas, the biomass can be an alternative for rural industrial development as promoted by UNIDO in other parts of the world. OPEIF Afrique, has also carried out a number of activities to support the development of cassava processing industries as specified in the attached cofinancing letter. At the proposed project site, the NGO has put in place a women’s association of workers formerly active at the now derelict cassava processing site. These people have been trained.

**NGO OPEIF-Afrique**

Multiple working sessions were held between the team of technical experts, Government counterpart (Ministry of Environment and GEF OFP) and the NGO OPEIF-Afrique specialized in the promotion of entrepreneurship in Africa. The NGO OPEIF-Afrique is the initiator of the Attié ké d'Or concept which had been piloted at the two proposed production sites prior to the crisis of 2010. The Attié ké d'Or concept project originated from voluntary assistance that the promoters have committed to groups of women in rural and urban areas, in order to promote their economic activities. From the above, a whole strategy of approach was born which led to various actions and activities: prospecting trips abroad, research and development of processes, creation of structures, including production, management and structuring of the social partners’ activities, support for the creation of cooperatives in a pilot phase of the project, etc. The process developed by the promoters, called "process of stabilization and reconstitution of fresh attié ké", solves the problem of the fragility of the traditional fresh attié ké whose shelf life does not exceed 2 to 3 days. With this innovation the conservation of the product goes to 2 years. The promoters have broadened their invention to design a line of specific and unique equipment for the industrial manufacture of the Attié ké d'Or products. Attié ké d'or is one of the few "ethnic" products to have directly entered GMS (Large and Medium Surfaces)

<table>
<thead>
<tr>
<th>Title</th>
<th>Objectives</th>
<th>Amount</th>
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<tr>
<td>Implementation of the National Action Plan for the Development of Sustainable Bioenergy in Côte d'Ivoire</td>
<td>Create pathways for the valorization of agricultural residues and by-products in fertilizers and bio energies in order to ensure the energy and food security of populations</td>
<td>FCFA 4,154,410,680 (USD7,613,331)</td>
</tr>
<tr>
<td>Development of Smart Agriculture in face of Climate (AIC)</td>
<td>Strengthening the climate resilience of the food sector in Côte d'Ivoire</td>
<td>FCFA 2,500,000,000 (USD4,581,475)</td>
</tr>
<tr>
<td>Capacities development and integration of young people into the green sectors</td>
<td>Fighting unemployment through the development and promotion of green jobs, especially among young people in rural and peri-urban areas</td>
<td>FCFA 3,250,520,000 (USD5,956,870)</td>
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by successfully benefiting from an "African Commercial Week" in France in 2008, to the shelves of one of the first French distribution chains. A number of activities have already been carried out by the NGO as specified in detail in their cofinancing letter, and essentially more than 6,000 women and young people from the cassava sector were trained. Cooperatives were also constituted as integrated structures (cooperatives, networks of distributors ...) to contribute to the realization of the Attiéké d'Or project at different levels. A partnership agreement and sub-contract will be elaborated with OPEIF Afrique and UNIDO so the former takes charge of the backstopping at the project sites and facilitates the management of the production side.

**INPHB**

Institut National Polytechnique Felix Houphouet Boigny de Yamoussoukro is Côte d’Ivoire’s main technical university. INPHB will play a key role in monitoring project activities, training local producers and beneficiaries on the use of the chosen technology and ensure a smooth implementation of the project.

### A 1.3 Proposed alternative scenario and components of the project

The proposed project is structured under Program 1 (‘promote timely development, demonstration and financing of low-carbon technologies and mitigation options”) to “promote innovation, technology transfer and supportive policies and strategies”, which is focal area strategy of GEF, in scope of “Climate Change Mitigation”. By means of this project, appropriate policy recommendations and institutional capacity building activities will be carried out which reflects the thematic area of the GEF, climate change, and are directly related to capacity development and expansion of appropriate technological applications.

As a result of this project, the market environment for industrial applications of biomass will be improved and sustained, including through the setting up and strengthening of the biomass supply chain from agriculture residues (cassava) and by reducing the risk of biomass investments through an established linkage with development mechanisms that already exist on the ground through the partnering entities (OPEIF Afrique). The project thus aims to harness the potential of introducing low-carbon technologies in the development of agro-food value chains. The aim is to decrease dependence on fossil fuels, reduce CO2 emissions and create employment in the “green” economy while adding value to local products through productive activities. A mapping of existing SMEs active in the agro-food processing sector has been carried out during the PPG phase to analyse the potential of introducing low-carbon technologies which will be tested through a viable business model approach. The NGO OIPF Afrique, regrouping different producers of cassava, has shown readiness to partner in this project to identify pilot sites and consolidate a business model which can be used to upscale activities in the long run. In terms of policy support, the aim is to contribute to the strengthening of the regulatory framework which allows for greater environmental protection, and the promotion of low carbon technologies and renewable energy systems in the agro-food production process. The agro-forestry sector also bears a significant potential for the application of biomass technologies and thereby valorizing residues from forestry for the production of energy.

GEF assistance will catalyze private sector based scale-up and replication for introducing low-carbon technologies in the agro-food processing, specifically, the cassava sector, through a viable business model approach. It will permit to address barriers related to capacity building and awareness, increasing know-how of the technical feasibility and economic viability of these technologies, and promoting financial mechanisms which will attract the involvement of the private sector. Feasibility studies will further sketch out the appropriate business model to be adopted and how to encourage private sector involvement in the operation of the production site and energy systems.

GEF funds will be used to pilot an approach of establishing at least one demonstration site of biomass-based renewable energy services. The proposed project sites are Didoko and Bagrom, located in the zone of Divo, previously
known as the administrative region of Sud-Bandama which is so called Lôh Djiboua and capitalizes on the actions undertaken by the NGO OPEIF Afrique. The latter has already put in place the necessary infrastructure in terms of buildings, trained staff, associations and basic equipment for cassava processing which the project can build on; OPEIF Afrique has issued a letter of cofinancing so that the funding available in this project through the GEF grant and cofinancing covers both the rehabilitation and energy system installations. Further feasibility studies during the project’s implementation phase will refine the financial calculations and assess how many sites can finally be incorporated.

The generated energy is to be supplied to the local isolated units of processing cassava into attiéké. The project is expected to lay the foundation for a market environment for low-carbon technologies in Côte d’Ivoire, and will have a significant demonstration effect, in the context of pursuing the objectives of reduction of GHG emissions proposed by the INDC COP21. After a successful implementation of this project and demonstrating the technology, the GEF support will enable the Government to scale up and replicate the project achievements across the country. The Government has expressed strong commitment to this project during the consultations that were held as part of the PPG phase and emphasized the crosscutting benefits of the approach in terms of agro-food value chain development, job creation, energy access and protection of the environment. As such, GEF support will ensure that (i) the commercialized development of low-carbon technologies and GHG avoidance are sustained by removing technical, policy and capacity barriers; and (ii) it is demonstrated that the energy generated from renewable sources (biomass-waste residues) can be used sustainably in rural areas for the development agro-food processing. The activities of the project will contribute towards GHG emission reduction through avoidance of potential future emissions of fossil fuels, avoidance of currently produced emissions through connection to main grid and traditional sources of energy, as well as avoidance of firewood in the economic and social development of Côte d’Ivoire’s rural areas.

Synergies will be established with other ongoing development programmes in the area of sustainable energy and agro-food value chain development such as the ones specified earlier. To this end, technical and financial development partners have been targeted and collaboration agreements are being negotiated.

GEF involvement, therefore, adds value through the application of low-carbon technologies while creating awareness in the long-run and triggering future financing, mainly from multilateral agencies and the private sector, to upscale the approach.

**Project components**

The project objective is to promote sustainable industrial production in the agro-food sector through the use of renewable energy applications and low-carbon technologies. To achieve this objective, the project will focus on the following components, results, and expected outputs:

**Component 1: Strengthening of the institutional framework to promote the development of low-carbon technologies in the agro-food value chain**

The aim of this project component is to enhance the necessary institutional and policy framework in the country to actively steer the promotion of renewable energy applications and low-carbon technologies in the agro-food processing sector. The appropriate secondary legislation will be developed to encourage the development of the priority sectors, such as the valorization of bio-waste in the cassava production and others. An analysis of the present regulatory framework will be conducted and key enhancement recommendations formulated with respect to the agro-food sector and in line of the best practice worldwide. The sharing of data, joint review of the different draft reports will allow for greater complementarity. The business climate will equally be targeted in the analysis in order to propose a management model for the involvement of private sector actors in the conception and operation of renewable energy based power stations. As part of the policy and regulatory framework related work, barriers to the deployment of low carbon technologies will be identified such as tax or import duty related considerations and how to overcome them by identifying relevant governmental instruments and institutions.
As part of this component the regulations and capacities for functional and supportive instruments (such as exemption of import tax for renewable energy technologies) will be focused on. In fact, substantial preparatory work has been done on this aspect under the present UNIDO implemented GEF-4 project on renewable energy (solar) based mini-grids (GEF ID 4005), in which the existing regulatory framework was critically assessed and a number of recommendations have been formulated, which formed the initial basis for the preparation of a number of new decrees. Under the proposed project the focus will be on strengthening the relevant policy instruments, and respective institutions, entities, using the demonstration as the concrete case. One area of particular focus will be to improve the fiscal regime for the import of all types of renewable energy equipment; the current system allows for a tax exemption for solar (photovoltaic) panels and related equipment such as inverters and batteries, but not for other renewable energy (and energy efficiency) equipment.

**Outcome 1.1**: Secondary legislation is reinforced to promote low-carbon development for agro-food value chains, within the overarching policy framework on environmental sustainability

**Responsibility**: UNIDO, Institut Polytechnique de Yamoussoukro

**Output 1.1.1**: National regulatory mechanisms promoting the development of renewable energy systems in agro-food value chains and low carbon technologies are proposed to the government counterpart

The activities foreseen will support the measures of the Government which have already been put in place to promote the renewable energy sector and offer recommendations on how to further strengthen the legislative framework. As pointed out in the baseline section, there are recent decrees that reinforce existing codes in the electricity sector and provide a legislative and institutional framework which the project seeks to further refine. This legislative framework enshrines the liberalisation of the electricity sector, defines a legal regime applicable to production operations and favours the development of self-production for consumption and sale of the surplus to the distributor service dealer. This aspect is particularly relevant for this project and the use of the surplus energy produced by the bio-energy systems into the local grid. It also allows greater flexibility in setting tariffs for electricity produced by freelancers from ENR. The Government is thus determined to improve access to electricity and has put in place strategies that have favored the opening of the sector to the private sector through partnerships. This made it possible to record the entry of investments, which, although still on a limited scale, made it possible to modernise some means of production. However, the low return on investment in rural electrification, the challenges set out in the context section of this paper, should prompt the Government to consider other strategies to further promote the development of renewable energy and low carbon technologies in the country and the project will seek to identify the appropriate ones.

**Key activities**:  
- Draft reports with proposals of secondary legislation  
- Organise validation sessions with government counterpart

**Output 1.1.2**: A sectoral roadmap for improved energy performance in the cassava sector and other relevant sectors is developed

Legal incentive mechanisms for the acceleration of low carbon technologies in Côte d’Ivoire will be assessed under this output. The Government seeks to pass secondary legislation in the field of production, transmission and distribution of renewable energy sources. Similarly to other comparable countries in the region, it is a question of adopting specific regulations, in addition to decrees Nos. 2016-782, 2016-783 and 2016-787.

The incentive for investment in renewable energies in the agro-food sector, which demands electricity, thermal energy and gas, can be triggered by the fixed goal to reduce the dependency on fossil fuels (Natural Gas, DDO, HVO), and on
the other hand, an attractive taxation framework. Regulatory texts drawn up in accordance with the national energy plan must be widely disseminated to accompanying bodies, NGOs, national and multinational decision-makers and even to final users.

In the context of coordination and execution of this project component, a partnership agreement is envisaged with the Institut Polytechnique de Yamoussoukro (INPHB) which assembles a pool of renewable energy experts and researchers who would be able to contribute to the analytical work. The Institute will furthermore be associated in monitoring project activities under the remaining components for quality insurance and coordination purposes.

Key activities:

- Draft a more detailed study on the potential uses of waste stemming from the cassava and other relevant agricultural sectors in the country
- Link with project component 3 and define project proposals for future upscaling in other agricultural sectors

Component 2: Technology demonstration of low-carbon applications in the agro-food value chain

The activities under this component will proceed with the feasibility studies to prepare the rehabilitation of the production sites and installation of energy systems at the two project sites which have been identified during the PPG phase. The aim will then be to demonstrate the low-carbon technology and test a possible private sector driven business model for future upscaling through the involvement of a local NGO. Following the consultations with the Government and technical experts during the PPG phase, two project sites were put at the project's disposal and a partnership agreement proposed with the local NGO OPEIF Afrique. The idea is to rehabilitate a cassava processing site which was destroyed during the crisis of 2010 and which still disposes of a certain infrastructure of buildings and machinery but which requires additional investments to revive the production process. The production will be supported through the installation of appropriate bio-energy systems connected to industrial processing activities and the local grid. A cofinancing letter has been signed by OPEIF Afrique and a cooperation agreement or contract as per UNIDO rules and regulations, will be formalised with this executing partner under the project to oversee the production process on the ground, coordinate between the different stakeholders and reinforce capacities of local workers, especially from among the existing women associations. A detailed list of activities already undertaken by this NGO as a baseline for this project and envisaged activities in the framework of this project can be found in the Annex E1.

Outcome 2.1: Low carbon technologies are promoted in the agro-industrial processing of agricultural products

Responsibility: UNIDO (provides procurement services, and in cooperation with OPEIF Afrique, will confirm the equipment installations), OPEIF Afrique (overseeing installations and providing training at the project sites), INPHB (technical specifications, monitoring and quality control)

Output 2.1.1: Feasibility studies consolidated on potential uses of renewable energy in agro-food sectors

As a first stage, a study was undertaken during the PPG phase of the relevant technologies for the generation of bioenergy from cassava residues as cassava was selected as the priority sector by the Government. Two types of wastes result from cassava processing. Solid wastes made of peels and barks and wastewaters. The most appropriate technology to derive energy from cassava solid wastes is gasification while biomethanisation allows extracting biogas from wastewaters. The plants will have to be customised according to specifics such as type and quality of feedstock.

Gasification consists in the conversion of solid biomasses into a mixture of combustible gases (carbon monoxide, methane, hydrogen), called producer gas. Gasification concerns the partial combustion of biomass. A partial
combustion process occurs when oxygen is not sufficient to allow a full combustion. The gasifier is essentially a chemical reactor where various physical and chemical processes take place. The reactor is fed with biomasses that may need to be previously cut into pieces and need to have moisture content below 20%. The gasifier generates “producer gas” which cannot be stored and has therefore either to be burnt inside a burner or fed to a power generator or an engine. The producer gas can, therefore, be used to generate electricity, mechanical power or heat.

Biomethanisation consists of the generation of a mixture of combustible gases (methane, carbon, dioxide, hydrogen sulphide and ammonia) through anaerobic fermentation (biodigestion or biomethanisation) of organic wastes (both liquid and solid). The gas is then stored and turned into electricity or mechanical power. Three fermentation processes can be used to digest different bio wastes: wet, dry and biphasic. Digestion time ranges from few hours to several days. Digestion is typically faster for wastewaters than for solid biomasses.

The mixture of biogases generated through biomethanisation comprises, in volume terms: Methane ($\text{CH}_4$) 55 to 80%, carbon dioxide ($\text{CO}_2$) 20 to 45%, hydrogen sulphide ($\text{H}_2\text{S}$) 0 to 1.5% and ammonia ($\text{NH}_3$) 0 to 0.05%.

**Key activities:**

- Recruitment of international and national experts to carry out feasibility studies at the proposed project sites
- Consolidate business model based on the feasibility assessment

**Outcome 2.2: A viable pilot production site is operationalised, engaging the private sector**

The agro-food sector is one of the most active productive sectors in the western regions of Africa. Residues of this sector offer a very good source of renewable energy that can be converted into energy use application. But due to various obstacles, the majority of industries, including SMEs involved in agribusiness, lack information with regards to the benefits associated with the production of energy from waste; for example, through cogeneration electricity and heat or gasification. Côte d’Ivoire is deemed to have significant potential for use of renewable energy in its industries, including the food industry. Indeed, it has large quantities of agricultural waste not recovered from the cocoa, coffee, oil palm, sugar cane, rice, cassava, and residues stemming from the forestry sector.

Following the analysis of the agro-food priority sectors identified by the government, the potentials of the installation of renewable energy applications in the production chain were assessed. Prefeasibility assessments were conducted in the PPG phase in order to assess the economic viability of a biomass based energy system at a given site to support the production chain of agro-food products.

**Output 2.2.1: Operationalisation of an innovative and highly replicable pilot project**

**Demonstration selection**

The prioritization of the cassava industry sub-sectors for the demonstration of the technology was based on the following criteria:

- The sub-sector’s representativeness, to allow a widespread duplication in the cassava industry.
- The sub-sector’s integration into the local economy.
- The sub-sector’s economic dynamic.
- The impact of the sub-sector’s activities on employment.
- The impact of the sub-sector’s activities on fighting poverty.
- The impact of the sub-sector’s activities on gender equity.

Considering the criteria mentioned above and the socio-economic structure of the local cassava industry, the three following sub-sectors have been identified and validated by the Government counterpart as a priority for the demonstration of the technology:
Attiéké processing village cooperatives integrated in interurban distribution networks.
- Small scale family attiéké processing business in peri-urban areas integrated in local distribution network.
- SME operating in the attiéké sector having a solid distribution network and exporting capacities.

The selection criteria used for the processing site selection were the following:
- The volume of cassava processed;
- The availability of residues;
- The organisation capability of the site operator;
- The belonging to one of the sub-sectors identified as priority;
- The location of the site in one of the main cassava producing or processing regions;
- Cofinancing commitments.

Based on the criteria mentioned above, five sites were initially shortlisted by the team of experts of the Institut Polytechnique de Yamoussoukro and results of feasibility studies subsequently shared with the Government counterpart for validation:

- **Attiéké Dame Clotilde**, small scale family business located in Assabou, Yamoussoukro. It is an artisanal unit, specialized in attiéké production, processing volumes in the order of 0.9 tons per day. This structure is well integrated into the local distribution network and is one of the main suppliers of Yamoussoukro, Côte d’Ivoire’s administrative capital.

- **Coopérative des Productrices d’Attiéké de Sakiaré**, located in Sakiaré, Tiebissou in central Côte d’Ivoire. It is a cooperative specialised in the production of attiéké, processing about 7.3 tons per day. In the heart of the main cassava production region, this dynamic cooperative supplies the Abidjan market 300kms southward.

- **Coopérative des Productrices d’Attiéké de Grand-Morié**, located in Agboville prefecture in southern Côte d’Ivoire, homeland of attiéké. It is a cooperative specialized in the production of attiéké, processing about 5 to 10 tons per day. Based in Grand Morié, 100kms north from Abidjan, its main market, this cooperative shows a remarkable organisation.

- **Coopérative des Productrices d’Attiéké de Didoko**, located in Divo prefecture in South-Western Côte d’Ivoire. It is a cooperative specialized in the production of attiéké, processing about 5 tons per day. Based in Didoko, 200kms west from Abidjan. This structure is associated to Attieke d’Or its main client and monitored by the NGO OPEIF Afrique.

- **Coopérative des Productrices d’Attiéké de Bagrom**, located in Divo prefecture in southern Côte d’Ivoire. It is a cooperative specialized in the production of attiéké, processing about 25 tons per day. Based in Didoko, 200kms west from Abidjan. This structure is associated to Attieke d’Or its main client, and monitored by the NGO OPEIF Afrique.

Field studies have been carried out at these sites and the data and information collected have been used to assess the feasibility of the implementation of a biomass technology. Bagrom and Didoko have been added to the list after the completion of the field surveys following the Government request. Therefore the information related to these sites are partial and need to be substantiated after project start. Bagrom and Didoko have been selected by the GEF focal point in consultation with the Ministry of Environment as pilot sites of this project and validated by the team of technical experts as these sites bear the biggest potential in terms of upgrading of the attiéké processing, access to markets, existing infrastructure and cofinancing commitment by the operating NGO OPEIF Afrique.

The following sites were examined during the PPG phase:
Figure 1: Location of sites used for this study

Capacities and energy balances

This is the evaluation of capacities and energy balances for the demonstration sites. The selected equipment is a CHP gasifier in order to produce both heat and power combined with a biomethaniser producing electricity.

The assumption is that the power and heat output will be primarily used to cover the drying and processing unit’s energy needs. Any surplus could be commercialised.

Table 1 shows the production capacities of the gasifier and the biomethaniser for the demonstration sites.

<table>
<thead>
<tr>
<th></th>
<th>Cassava volume (t/day)</th>
<th>Gasifier Heat Output (1000kCal/day)</th>
<th>Gasifier Electricity output (kwh/day)</th>
<th>Biomethaniser Electricity output (kwh/day)</th>
<th>Total Heat (1000kCal/day)</th>
<th>Total Electricity (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Didoko</td>
<td>5</td>
<td>488</td>
<td>240</td>
<td>139</td>
<td>488</td>
<td>379</td>
</tr>
<tr>
<td>Bagrom</td>
<td>25</td>
<td>2,442</td>
<td>1,199</td>
<td>698</td>
<td>2,442</td>
<td>1,897</td>
</tr>
</tbody>
</table>

Table 1: Energy Production Capacities

Table 2 shows the energy needs of the demonstration sites based on industrial processing equipment, including grinder, dewaterer, semolina unit and cooker, solely powered by electricity and a heat based dryer.
Table 2: Energy Needs

<table>
<thead>
<tr>
<th></th>
<th>Cassava volume (t/day)</th>
<th>Heat needs (1000kCal/day)</th>
<th>Electricity needs (kwh/day)</th>
<th>Electricity installed capacity required (kWe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Didoko</td>
<td>5</td>
<td>274</td>
<td>336</td>
<td>33</td>
</tr>
<tr>
<td>Bagrom</td>
<td>25</td>
<td>1,371</td>
<td>1,754</td>
<td>99</td>
</tr>
</tbody>
</table>

Table 3 shows the demonstration sites energy balances based on the implementation of a gasifier and the biomethaniser along with an industrial processing unit solely powered by electricity and a heat based dryer.

<table>
<thead>
<tr>
<th></th>
<th>Heat needs coverage</th>
<th>Electricity needs coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Didoko</td>
<td>178%</td>
<td>113%</td>
</tr>
<tr>
<td>Bagrom</td>
<td>178%</td>
<td>108%</td>
</tr>
</tbody>
</table>

Table 3: Energy Balances

It appears that both power generation and heat generation generate surpluses that can be valued through other uses or commercialisation but this not taken into consideration at PPG stage. This will feature in the feasibility studies to be conducted during the project implementation phase.

Investment Costs and Operation and Maintenance cost

Investment costs are the sum of the estimated costs for feasibility, development, engineering, power generation, heat, and installation, related infrastructure, and other miscellaneous expenses.

The tables 4, 5 and 6 below indicate the investment costs of the manufacturers the gasifiers and biodigestors and their financial analysis.

### Gasifiers

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Capacity</th>
<th>Investments Cost (FCFA)</th>
<th>Operation and Maintenance Cost (FCFA)</th>
<th>Annual Fuel Cost (FCFA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td>40 kWe</td>
<td>77.7 Millions</td>
<td>8.7 Millions</td>
<td>1.1 Millions</td>
</tr>
<tr>
<td>Large</td>
<td>150 kWe</td>
<td>220.6 Millions</td>
<td>27 Millions</td>
<td>5.5 Millions</td>
</tr>
</tbody>
</table>

Table 4: CAPEX AND OMC

Energy Balance of Bagrom and Didoko

In Bagrom, based on energy balance studies, large size gasifiers of capacity 150 kWe and a medium size biomethaniser can be installed. And In Didoko, medium size gasifiers of capacity 40 kWe and a small/medium size biomethaniser can be installed. Note: Financial and economic analysis will be conducted separately for each technology.

**Bagrom**

- Gasifiers

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Capacity</th>
<th>Investments Cost (FCFA)</th>
<th>Operation and Maintenance Cost (FCFA)</th>
<th>Annual Fuel Cost (FCFA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>150 kWe</td>
<td>220.6 Millions</td>
<td>27 Millions</td>
<td>5.5 Millions</td>
</tr>
</tbody>
</table>

Table 5: CAPEX AND OPEX
Didoko

- Gasifiers

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Capacity</th>
<th>Investments Cost (FCFA)</th>
<th>Operation and Maintenance Cost (FCFA)</th>
<th>Annual Fuel Cost (FCFA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td>40 kWe</td>
<td>77.7 Millions</td>
<td>8.7 Millions</td>
<td>1,1 Millions</td>
</tr>
</tbody>
</table>

Table 6: CAPEX AND OPEX

Financing of demonstration technology

Description of Pilot Sites:

The two pilot sites are Bagrom and Didoko, both in the region of Divo.

Field visits at pilot sites had shown the existence of infrastructures such as buildings and broken equipment. Even though, no additional construction is needed, except a fence construction of the site at Didoko, however a complete restoration of these buildings is necessary in order to make them operational. In addition, new cassava processing and renewable energy generating units will have to be purchased.

Proposed Scenario: GEF funding and Co-financing

With the co-financing available a better deployment of technologies can be pursued with additional purchase of generating units and agroindustry processing units.

<table>
<thead>
<tr>
<th>Pilot Sites</th>
<th>Restoration</th>
<th>Cassava processing equipment purchase</th>
<th>Renewable Energy equipment purchase</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Didoko</td>
<td>$ 35,000</td>
<td>$ 50,000</td>
<td>$242,884</td>
<td>$327,884</td>
</tr>
<tr>
<td>Bagrom</td>
<td>$ 35,000</td>
<td>$ 75000</td>
<td>$511,593</td>
<td>$621,593</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td><strong>$ 70,000</strong></td>
<td><strong>$ 125,000</strong></td>
<td><strong>$754,477</strong></td>
<td><strong>$949,477</strong></td>
</tr>
</tbody>
</table>

Table 8: Cost calculations

Note: The GEF funding of $345,000 with a co-financing funding of $604,477 corresponds to $949,477 necessary to execute this scenario.

Key activities:

- Launch calls for proposals towards international technology suppliers based on the findings of the feasibility assessment
- Prepare sub-contracts for technology suppliers of cassava processing equipment and biogas systems

Component 3: Enabling partnerships in place for replication across the agricultural food-sector

The aim of this component is to mobilise partners and stakeholders and involve them in the dissemination of project results in order to ensure upsaling of the model and replication elsewhere. In coordination meetings with the government counterpart, keen interest was expressed in replicating the innovative project approach combining rehabilitation of key strategic agro-value chains with the installation of low carbon technologies to support the production process and protect the environment. Different sub-sectors were studied to this effect during the PPG phase and as pointed out in the baseline section of this document. The government has agreed to set up coordination...
platforms to bring together different financial and technical partners and create synergies among ongoing projects as well as mobilise funding for future initiatives. The methodology applied under the technology demonstration component will serve as model to be applied to different agricultural sectors when designing similar projects. The executing partners Institut Polytechnique de Yamoussoukro will be involved in refining this further during the project implementation phase and, together with OPEIF Afrique, will consolidate a number of bankable project proposals for replication.

**Outcome 3.1: Sustainable replication across cassava and other agricultural sub-sectors ensured**

**Responsibility:** OPEIF Afrique, INPHB

**Output 3.1.1: Mapping of medium-term potential across agro-food sector developed and roadmap for its activation in place**

The potential for replication was assessed during the PPG phase of the project and it is clear that there is significant scope for upscaling and replication across other agricultural sectors once a viable approach has been piloted.

The purpose of this project output is thus to substantiate the mapping of available resources and ensure that the approach piloted at this project’s demonstration sites can be replicated across other sectors. The involvement of local associations and NGOs will ensure that skills are enhanced and transferred so that local actors are able to design similar projects in other sectors. The partnership with OPEIF Afrique, especially, will enshrine activities under this project component to develop project proposals that can be replicated in other sectors.

**Key activities:**

- Draft report on the possibilities of upscaling and replicating the approach piloted under this project elsewhere in the country and in other agricultural sectors
- Organise stakeholder consultation sessions to disseminate the results and create awareness among financial and technical partners

**Output 3.1.2: Pipeline of bankable projects developed, local capacities established and quality assurance in place**

In terms of the main national executing partners, a mapping of potential institutions has been carried out and validated by the Government counterpart during the PPG phase. To this effect, the Institut Polytechnique de Yamoussoukro was identified as a suitable partner to carry out the technical backstopping of project activities on the ground and take charge of the quality insurance. The operational side of the project will be overseen by the NGO OPEIF Afrique when it comes to piloting the demonstration activities at the project sites, organizing the local associations and stakeholders and marketing the product, and develop a pipeline of bankable replication projects, as specified in the cofinancing commitment.

In this set-up, UNIDO will ensure the overall coordination and monitoring of the project and be in charge of the procurement of equipment for the rehabilitation of the production site and installation of the energy systems.

**Pilot Sites**

Beside the three cassava processing units where the field surveys were conducted, two pilot sites have been selected according to criteria proposed as a basis for selection of pilot sites for the demonstration of technologies:

Bagrom and Didoko. This selection has been endorsed by the Ministry of Environment, Sustainable Development, and Urban Safety. A field visit has been conducted to these two sites and more substantial feasibility studies will be conducted during the project’s implementation phase.

**Financial partnerships and investment promotion**
The purpose of the analysis that was carried out during the PPG phase was to evaluate the feasibility of carrying out the project of valorization of cassava biomass for producing biogas and electricity and to highlight the need of seeking financial assistance from investment banks or development banks. Two types of technologies have been chosen for the production of electricity and biogas. This involves gasification and bio-methanation. Gasification consists of the conversion of solid biomass into a mixture of combustible gases (carbon monoxide, methane, hydrogen), called producers gases. Biomethanation consists in the generation of a mixture of combustible gases (methane, carbon, dioxide, hydrogen sulphide and ammonia) through anaerobic fermentation of organic wastes. Note that the studies carried out can be replicated for other types of biomass, such as sugar cane bagasse, cocoa pod, rice straw etc.

The criteria for financial evaluations used are the Net Present Value (NPV) and the Internal Rate of Return (IRR). It should be noted that the economic profitability of the project here is considered from the point of view of the lender. A project is viable if its NPV value is positive. However, the NPV value as a criterion of investment decision is an absolute criterion that does not often give a good assessment of the profitability of a project. On the other hand, the IRR which corresponds to the discount rate that nullifies the NPV, is a relative criterion that gives a better appreciation of the profitability of the project.

**Key activities:**
- Following stakeholder consultations, consolidate a list of follow-up projects for submission to donors
- Organise capacity building trainings for government counterparts and stakeholders of the project in order to be able to replicate such projects

**Component 4: Monitoring and Evaluation**

**Responsibility: UNIDO, INPHB**

The objective of this component is to facilitate a detailed and extensive M&E structure to be put in place under the project in compliance with UNIDO and GEF procedures and executed by the executing partners of the project under UNIDO’s overall guidance. This will allow not only the monitoring of the project’s progress in terms of the components and outcomes, including GHG emission reductions, to be achieved, and the roiling out of the project according to the work plan. The analysis of the M&E and impact assessment results of the different components will allow for periodic reviews of the project’s ‘Theory of Change’ and subsequent implementation strategies and work plans. Beyond this, proposed GEF Project would also come under UNIDO’s standard M&E approach for GEF funded projects.

The activities included are the preparation of the M&E plan and its acceptance, semi-annual progress reports, annual project implementation reports (PIRs), and independent final evaluation.

**Key Activities:**
- Demonstration projects monitored throughout project cycle and independently evaluated;
- Regular project reports submitted;
- GHG emission reduction monitoring established and reported.

**Overview of roles and responsibilities**

<table>
<thead>
<tr>
<th>COMPONENTS</th>
<th>OUTPUT</th>
<th>MAIN RESPONSIBILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPONENT 1: Strengthening of the institutional framework to.....</td>
<td>Output 1.1.1 National regulatory mechanisms promoting the development of renewable energy systems in agro-food value chains and low carbon technologies are proposed to the government counterpart</td>
<td>Institut Polytechnique Yamoussoukro (INPHB)</td>
</tr>
</tbody>
</table>
A sectoral roadmap for improved energy performance in target subsectors (including cassava) is developed

Feasibility studies consolidated on potential uses of renewable energy in agro-food sectors

Operationalisation of an innovative and highly replicable pilot project

Mapping of medium-term potential across agro-food sector developed and roadmap for its activation in place

Pipeline of bankable projects developed, local capacities established and quality assurance in place

A monitoring and evaluation plan will be prepared and carried out

promote the development of low carbon technologies in the agro food value chains

COMPONENT 2: Technology demonstration of low-carbon applications in the agro-food value chain

Output 1.1.2

Output 2.1.1

Output 2.2.1

COMPONENT 3: Enabling partnerships in place for replication across the agricultural food-sector

Output 3.1.1

Output 3.1.2

COMPONENT 4: Monitoring and Evaluation and Overall Project Implementation

Output 4.1.1

INPHB

INPHB, OPEIF Afrique

UNIDO, OPEIF Afrique

OPEIF Afrique

OPEIF Afrique, INPHB

UNIDO, INPHB

A 1.4 Incremental cost/cofinancing:

The GEF support of the sustainable agricultural production and promotion of renewable energy applications and low-carbon technologies in the agro-food sector in Côte d’Ivoire will promote the sustainable production of agricultural commodities (such as cassava and others), and strengthen the competitiveness of the local agro-food sector. The GEF grant will support the activities pertaining to the elaboration of secondary legislation as well as the realization of highly innovative and replicable pilot project as specified in component 2 on the technology demonstration but also component 3 on replication and partnership building to maximize the demonstrative effect and trigger upscale throughout other economic sectors.

In order to ensure a sustainable linkage between the increase in energy consumption and environmental sustainability, there is a need to shift from imported fossil fuels to an increased and efficient use of domestic energy resources and direct the national economy towards a green industry and low-carbon development path. The potential use of biomass for energy generation is significant to substitute a considerable portion of fossil fuel use and achieve a reduction in GHG emissions. Organic waste can thus be transformed into a source of sustainable energy, income and socio-economic benefits.

In the recently carried out industrial policy document, elaborated by UNIDO, the cassava sector was identified as a potential growth sector in terms of processing (adding value to the raw product) and energy production by using the vast amount of left-over waste. A detailed analysis of the energy savings and associated emission reduction will be performed during the project preparation phase, contemplating fuel types, efficiency rates and selected efficiency technologies.
Sustainable results will be obtained from this project through a cost-effective approach. The technical assistance and financial support from the GEF combined with the support of the Government and local executing partners will function as an important leverage for biomass investments in agro-food and forestry sectors. By all these means, the capacity needed by the country will be developed, a safe technical and financial ground will be set and finally new enterprises will be triggered and also longer term development and investment impacts will be created, which will bring national success to global environment management indicators in scope of GEF’s focus areas.

As part of the technology demonstration component, SMEs will be targeted which are currently using diesel generators, coal or burning firewood to generate energy. The substitution of coal or diesel fuel meets the national development goals of Côte d’Ivoire by choosing renewable energy technology. The GEF grant will thus be used to cover the increment between a less costly, more polluting option and a more environmentally friendly option which is more costly at the beginning when introduced to the market.

The incremental reasoning for this project thus lies in the provision of a state-of-the-art and low-carbon energy solution when upgrading these enterprises. More quantitative details on the costs will be collected during the PPG phase, through visits and energy audits in representative target companies. These visits will provide a conclusion on which size of enterprises should be targeted, and which low-carbon applications are most commercially and technically appropriate.

Opportunities to enter into cofinancing agreements with other financial partners will be further pursued under project component 3 on enabling partnerships. Preliminary consultations have already been held during the PPG phase with development banks and private sector partners but once the project approach has been piloted and first results showcased, other stakeholders will be targeted to upscale and replicate elsewhere in the country or enhance the current production sites.

### A 1.5 Global environmental benefits (GEFTF) and/or adaption benefits (LDCF/SCCF)

An increased use of renewable energy applications (such as bio-energy) and other low-carbon technologies in agro-food value chains will substitute the use of fossil fuels for heat or power generation and thus, GHG emissions arising from combustion of these fossil fuels will be prevented. In this way, Côte d’Ivoire will contribute to national, as well as global targets to reduce GHG emissions. The emissions of greenhouse gases from the Attiéké sector are mainly due to heating and the fermentation of liquid effluents. The main GHGs emitted are carbon dioxide and methane. The latter with a GWP of 23 is much more harmful than CO2. According to the calculations carried out during the PPG phase according to the latest GEF methodology, 12,857 (tCO2) direct emissions and 102,854 (tCO2) indirect bottom-up emissions will be saved by the project and on the basis of the assumptions below.

The assumptions used to carry out the calculations feature in table 9 below.

<table>
<thead>
<tr>
<th>Component 1: On-Site co-generation (heat and power) -- General Inputs</th>
<th>kWt/d</th>
<th>MWh thermal</th>
<th>kW</th>
<th>h/d</th>
<th>d/y</th>
<th>FLH</th>
<th>MWh/y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Didoko</td>
<td>0.318</td>
<td>116.07</td>
<td>40</td>
<td>16</td>
<td>365</td>
<td>5840</td>
<td>233.6</td>
</tr>
<tr>
<td>Bagrom</td>
<td>1.593</td>
<td>581.445</td>
<td>150</td>
<td>16</td>
<td>365</td>
<td>5840</td>
<td>876</td>
</tr>
</tbody>
</table>

Total 697.515 Total 1109.6

Table 9: On site co-generation (heat-power)

The assumption here is that the sites operate on daily basis as the cassava has to be processed fresh throughout the year.

In terms of replication, the following table 10 shows the relevant figures when assuming that the electricity produced meets 100% of the energy needs (both electricity and heating) and no surplus is sold to the national grid. These are
first assumptions based on initial research at PPG stage but more detailed studies will be conducted during the project implementation phase to substantiate the date and assess possibilities to sell surpluses to the national grid.

<table>
<thead>
<tr>
<th>Indirect Bottom-up Estimate</th>
<th>Default</th>
<th>User-Specified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Cassava Processing Biogas Systems Implemented During Project Period</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Number of Replications Post-project as Spillover</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

Table 10: Indirect bottom-up estimate.

Direct emission reductions
Direct emission reductions within this project result from the investment in a minimum of 2 technical demonstration projects. These projects will be installed and commissioned during the project’s 3 year implementation phase resulting in direct GHG emission reductions. For each of these projects an economic lifetime of 15 years is assumed. For the 2 technical demonstration projects this results in total direct emission reductions of 12,857 tons of CO₂ equivalent (tCO₂eq) over the lifetime of the investments.

In the non-GEF base case the energy needs of each project would be met in a variety of ways. In all cases fossil fuels such as coal (local lignite) or gas would be used. A smaller amount of electricity would also be generated, which otherwise would be taken from the national grid with their natural gas and coal dependent generation. The exact quantification of these emission savings will be conducted during the project implementation phase.

In addition there are emission reductions resulting from implementing rules and regulations for sustainable handling of biomass residues, and hence soil improvements, reduction in burning on the field and displacement of synthetic fertilizers. Further emission reductions are available from the avoidance of previous waste disposal methods. Again these differed between projects from open lagoons and open dumping.

Indirect emissions reductions
The project is expected to catalyze further investment in biomass to energy technologies due to its policy, technical and capacity building activities that are designed to address the current barriers to investment. These are likely not only in the agricultural industry but also in other industries, resulting in indirect emissions reductions. Using the GEF bottom-up methodology, indirect emission reductions attributable to the project are expected to be 102,854 tCO₂eq. This figure assumes a replication factor of 3 (GEF uses 3 for a market transformation initiative and 4 where a credit guarantee is introduced).

A 1.6 Innovativeness, sustainability and potential for scaling up
The market development for a biomass supply chain for energy purposes, either by energy farmer cooperatives or other commercial business models, and combining this with the rehabilitation of agro food processing sites for industrial development is considered highly innovative in Côte d’Ivoire. In line with these new activities, new regulations and recommendations will be introduced for sustainable management of agricultural residues and soils. Also the aspect of waste heat from power plants for cassava processing in order to replace existing practices using fire wood will be discussed on regulatory levels for the first time and have a considerable positive impact on the environment while enhancing the production process. To underline these innovations and developments, the project will be backed up by specific research and dissemination activities and supported by the country’s leading research institutions.

In terms of sustainability, the long term benefits of modern bio-energy conversion technologies are multiple: emission reductions, diversity of fuel supply and energy security, reduction in fuel costs and reliance on fossil fuels, a reliable energy supply, economic growth, job creation, as well as the global potential for technology transfer and innovation. Long term ownership and sustainability will be ensured through working closely with the government partners (such as Ministries of Environment and Energy, Agriculture and Industry) and through the development of policy
instruments such as the strategic road map. This roadmap will set out steps for these technologies to remain a focus beyond the timeframe of the project and will also ensure the steps are outlined for future investments to ensure that Ivorian manufacturers, SMEs and academic institutions are aware of technology development in this area. A highly innovative and replicable pilot enterprise (or more, depending on the amount of confirmed co-financing) will be selected during the PPG phase, taking into account criteria such as innovation, replicability, level of CO₂ emissions in the current production process, willingness to contribute to co-financing etc., so that a viable business model and appropriate technology can be show-cased and used for future upscaling.

The demonstration projects will be prepared and realized in direct cooperation with the private sector enterprises and facilitated by the NGO OPEIF Afrique already active in the processing of cassava (traditional or semi-traditional experience), with a strong involvement of the cassava producers. OPEIF Afrique has committed cofinancing to the operationalization of the project sites and will coordinate activities on the ground in the long run to ensure the transfer of knowledge to properly operate and maintain the system. The involvement of international technology suppliers will include tailored training of local staff and ideally through local subcontractors. The experience of the GEF4 project on solar mini grids (ID 4005) has provided valuable lessons in terms of ensuring local capacity building to handle common operation and maintenance activities and problem solving, with only major maintenance or incidences requiring physical visits of the international technology suppliers. Apart from the demonstration project(s) (including investment support), the project will also develop a pipeline of investment projects through technical assistance (through feasibility studies, business plans, etc.), in order to facilitate the replication of the technology application throughout the cassava and other subsectors.

In terms of scaling up, the purpose of the project is to demonstrate the technical feasibility and commercial viability of industrial bio-energy systems in the agro-food value chain and provide national examples that can be replicated across the sub-sector and into other agro-food sub-sectors. The pilot units within ongoing food-processing (cassava sub-sector) SMEs were selected on a number of criteria including their current production, GHG emission reductions and their replicability.

The project, through its policy, capacity building and technology demonstration components, will enable the government to scale up and replicate the project approach across the country. The project will contribute to strengthen the necessary regulatory framework to clarify the context and conditions of operating the new low-carbon processing units according to the business model designed for the project. The Government is expected to actively promote and help the private sector scale up and replicate the project, instead of taking this on themselves.

The transformational effect will thus be achieved by the joint efforts of modernizing and upgrading the value-chain of the agro-food processing sectors, and the improved energetic performance of the enterprises on which this project will particularly focus. The economic sector of focus will be the agro-industry, due to its importance for the national economy. The project will be used as an opportunity to drive economic development in currently less developed regions of the country. The proposed project will focus on using bio waste streams in the agro-food which are currently not or inefficiently valorized, for industrial renewable energy applications to provide part or all of the enterprises' energy demand with the overall aim for promoting the application of innovative and adaptive technology in the target sectors to reduce their dependency on fossil fuels.

The pilot sites that were selected for this project used to be hubs for cassava processing before the crisis of 2011 and generate employment and wealth to local communities. The aim is to revive these processing sites and their potential to process significant quantities of cassava for local consumption and export while relying on green energy supply and valorizing agricultural waste.

A.2. Child Project? If this is a child project under a program, describe how the components contribute to the overall program impact.

N/A
A.3. Stakeholders. Identify key stakeholders and elaborate on how the key stakeholders’ engagement is incorporated in the preparation and implementation of the project. Do they include civil society organizations (yes ☑/no ☐) and indigenous peoples (yes ☑/no ☐)?

The Ministry of Environment, Sustainable Development, and Urban Safety through the Permanent Secretariat of Sustainable Development will ensure the overall governmental backstopping of the project. In collaboration with other line ministries including energy, industry and agriculture, it will establish the Project Steering Committee, a mechanism to coordinate the process of project activities and future scaling up.

The primary target beneficiaries of the project are small and medium-sized enterprises (SMEs) in the cassava and other agro-food sectors (e.g. cashew, cotton), and this project will assist in increasing the energetic and economic performance of such enterprises by applying modern renewable energy applications (such as generating renewable heat and power from available organic waste streams) and other low-carbon technologies (e.g. energy efficiency and solar thermal systems). At the same time, the project will target the production side and look at upgrading possibilities for cassava processing sites to become more energy efficient and dispose of the necessary equipment to produce attiéhé. Only by enhancing the production side, will there be sufficient biomass and industrial activities which can be supported through the energy access. Cassava has been prioritized during the consultations with Government counterparts as an important crop to pilot this approach, based on its economic importance, regional export and employment creation potential. The anticipation is that the approach, once successfully piloted, is replicable in equally important crops like cotton, cashew and other subsectors of the agro-food chain. In this context, the NGO OPEIF Afrique has been identified as an executing partner of the project given its long standing experience in the area of cassava processing and setting up women associations in rural areas to facilitate the production process, provide trainings and market the product.

As for the institutional framework, it has been reformed several times to include five (5) main actors and some support bodies promoting renewable energy in Côte d'Ivoire. The governance structures of the sector (ministry, regulatory authority) have been renamed and reoriented to take into account this full liberalisation.

The overall structure of stakeholder involvement in the project is thus as follows:

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Nations Industrial Development Organization (UNIDO)</td>
<td>UNIDO will act as the GEF Implementing Agency (IA) for the project and will provide project implementation oversight. As agreed with national counterparts, UNIDO will also provide execution services for procurement activities related to the purchase of low carbon technologies and cassava processing equipment.</td>
</tr>
<tr>
<td>Ministry of Environment</td>
<td>Principal government counterpart (“Ministère de tutelle”), backstopping the project and presiding the Project Steering Committee (PSC), coordinating with other relevant line ministries and GEF operational focal point.</td>
</tr>
<tr>
<td>OPEIF Afrique</td>
<td>This NGO was identified by the government as the project’s main executing partner with its long standing experience in the cassava processing sector. The NGO initiated the concept “attiéké d’or” which was funded under the GEF small grants programme in 2004 and led to the creation of a successful attiéhé producing pilot enterprise with significant export capacities. During the crisis, the production site was destroyed and at the request of the</td>
</tr>
</tbody>
</table>

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5 As per the GEF-6 Corporate Results Framework in the GEF Programming Directions and GEF-6 Gender Core Indicators in the Gender Equality Action Plan, provide information on these specific indicators on stakeholders (including civil society organization and indigenous peoples) and gender.
government, the current GEF project offers the possibility to rehabilitate the site, build on the already existent local capacities and structures and add the component of clean energy access to reinforce the production process. The NGO will be in charge of local coordination and management of the project sites as well as the partnership component in order to upscale and replicate the approach in the long run.

Institut National Polytechnique Felix Houphouet Boigny de Yamoussoukro (INPHB)

The INPHB is Côte d’Ivoire’s main technical university. The institute was selected based on the Government’s recommendation and for its strong reputation in the country. INPHB will play a key role in the technical monitoring the project, offering training and capacity building activities in order to enable beneficiaries and executing partners to use the selected technology.

Bilateral and international financial institutions (IFIs)

(IFIs via local banks provide several loans and funding opportunities on renewable energy for different types of investors (SMEs, medium and large companies) in Côte d’Ivoire for replication. Collaboration modalities with these partners as well as ongoing governmental projects will be determined under project component 3.

A.4. Gender Equality and Women’s Empowerment. Elaborate on how gender equality and women’s empowerment issues are mainstreamed into the project implementation and monitoring, taking into account the differences, needs, roles and priorities of women and men. In addition, 1) did the project conduct a gender analysis during project preparation (no /yes)?; 2) did the project incorporate a gender responsive project results framework, including sex-disaggregated indicators (yes/no)?; and 3) what is the share of women and men direct beneficiaries (women 80%, men 20%)? 6

To ensure that men and women can equally benefit from development projects and that gender inequalities in activities and outcomes are reduced or eliminated, gender differences are considered during the entire project cycle – from design and implementation to monitoring and evaluation. UNIDO recognizes that gender equality and the empowerment of women have a significant positive impact on sustained economic growth and inclusive industrial development, which are key drivers of poverty alleviation and social progress. Commitment of UNIDO towards gender equality and women’s empowerment is demonstrated in its policy on Gender Equality and the Empowerment of Women (2015), which provides overall guidelines for establishing a gender mainstreaming strategy, UNIDO has also developed an operational energy-gender guide to support gender mainstreaming of its sustainable energy initiatives. In order to provide practical guidance on how to systematically address existing or potential gender inequalities specific to UNIDO’s energy and climate change interventions, a tailored guide has been developed aimed at helping UNIDO’s staff to apply a gender perspective to their work and, more specifically, to mainstream gender throughout the project cycle. The project sites are located in villages where unemployment ratios are high especially among women. In this context, explicit attention was given to ensuring that both women and men participate in and benefit from capacity-building activities and training. Many of the end-beneficiaries of the energy systems in the remote areas are women as they are active in agro food processing activities, especially as a majority in the cassava processing sector.

At the selected pilot sites, the NGO OPEIF-Afrique provides voluntary assistance to women’s associations with a view to promoting their economic activities. Within the framework of its awareness-raising and organizational activities, the NGO has trained more than 6,000 women and young people in the cassava sector. This project will help create sustainable jobs and promote the involvement of women in the creation of income-generating activities and the

6 Same as footnote 8 above.
development of agro-food value chains. Approximately 5,000 permanent jobs will be created through agricultural cooperatives and industrial cassava processing and renewable energy production units.

Visits to studied sites and pilots sites (Bagrom and Didoko) showed high involvements of women.

UNIDO recognizes that energy interventions are expected to have an impact on people and are, therefore, not gender-neutral. In fact, due to diverging needs and rights regarding energy consumption and production, women and men are expected to be affected differently by the project (in terms of their rights, needs, roles, opportunities, etc.). The project aims to demonstrate good practices in mainstreaming gender aspects into promoting sustainable use of biomass to strengthen the economy in Côte d’Ivoire towards a low carbon development path, wherever possible and avoid negative impacts on women or men due to their gender, ethnicity, social status or age. Consequently, it will be considered to systematically include the gender dimension during the whole project cycle.

A guiding principle of the project will be to ensure that both women and men are provided equal opportunities to access participate in and benefit from the project, without compromising the technical quality of the project results.

In practical terms:

- The project will ensure that the developed regulations are gender sensitive.
- Efforts will be made to promote participation of women in training activities, both at managerial and technical levels.
- Gender-sensitive recruitment will be practiced at all levels where possible, especially in selection of project staff. Gender responsive TORs will be used to mainstream gender in the activities of consultants and experts. In cases where the project does not have direct influence, gender-sensitive recruitment will be encouraged. Furthermore, whenever possible existing staff will be trained and their awareness will be raised on gender issues.
- All decision-making processes will consider gender dimensions. At project management level, Project Steering Committee meetings will invite observers to ensure that gender dimensions are represented. Also, at the level of project activity implementation, effort will be made to consult with stakeholders focusing on gender equality and women’s empowerment issues. This is especially relevant in policy review and formulation.
- When data-collection or assessments are conducted as part of project implementation, gender dimensions will be considered. This can include sex-disaggregated data collection, performing gender analysis, etc.
- In sum, the project design will acknowledge the differences of energy access impacts considering distribution of economic activities and social roles between women and men in Cote d’Ivoire, in line with the GEF 6 Programming Directions.
**A.5 Risks.** Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation. (table format acceptable):

<table>
<thead>
<tr>
<th>Risks</th>
<th>Level</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low stakeholder involvement on the part of the national government</td>
<td>Low</td>
<td>The project is embedded within the current institutional arrangement in the sector particular within the Ministry of Environment and Ministry of Oil and Energy. The creation of a Project Steering Committee will furthermore increase multi-stakeholder ownership and ensure continuity throughout the project duration.</td>
</tr>
<tr>
<td>Regulatory framework risk: uncertainty in the application of legislation that involves renewable energy production</td>
<td>Moderate</td>
<td>Elaboration of a policy document in close consultation with government counterpart to ensure that recommendations are validated and consensus created with respect to the application in national legislation. Especially when it comes to passing the appropriate legislation for private operators to get involved not only in the production but also selling of electricity, revisions need to be made and the project will make suggestions for secondary legislation which are to be validated by the government.</td>
</tr>
<tr>
<td>Economic and Sustainability Risk: The risk of raw material supply</td>
<td>Low</td>
<td>Considering the large potential in existing biomass resources from agro-industrial waste streams, the partial use of these resources is not expected to have any impact on food production. In contrast, the project will promote use of post-harvest agricultural wastes and by-products and biomass wastes generated in production processes, especially in the cassava processing sector. Sustainable use of modern biomass will be promoted in the project; relevant standards and certification schemes will be applied where necessary. A preliminary study on the sustainability of biomass feedstock for production of electricity was conducted during the PPG phase which clearly states the potential of the cassava feedstock. Another economic risk is the volatility of the oil price which may discourage enterprises from moving away from traditional sources of energy (diesel generators). This aspect was also analysed in the PPG phase to assess the economic viability of biomass energy systems.</td>
</tr>
</tbody>
</table>
### Risks, Level, Mitigation Measures

<table>
<thead>
<tr>
<th>Risks</th>
<th>Level</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate change risk</td>
<td>Low</td>
<td>Increased drought periods may affect the availability of biomass resources, both agriculture residues and livestock manure. The design of the project will include climate risk analysis and integrate mitigation strategies. During the project preparation phase, an assessment of the availability of those resources based on different scenarios was be carried out and is to be substantiated during the implementation phase by more detailed feasibility studies.</td>
</tr>
<tr>
<td>Land use risk</td>
<td>Low</td>
<td>Farmers might be incentivised to change production to cassava instead of other important feedstock in order to benefit from the project. In the project context, this is a marginal issue as there is enough land available around the project sites. It might however become a risk when replicating and upsaling the approach. Close involvement of local authorities will be pursued in order to pre-empt issues related to land-use and also reflect further during the ESMP and when developing replication projects.</td>
</tr>
</tbody>
</table>

### A.6. Institutional Arrangement and Coordination

Describe the institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.

The overall structure is thus as follows:
The project will be implemented by UNIDO in consultation with the Ministry of Environment, which has already associated other relevant ministries (Energy, Industry, Agriculture, Development, and Economy) from the consultations that were held during the PPG phase and for the establishment of the Project Steering Committee.

UNIDO is responsible for the overall implementation and relies on national institutions to take charge of specific activities under execution. The main national executing entities in this respect are the NGO OPEIF Afrique for the coordination of activities at the pilot sites, management of the production process and capacity building, and the university, INPHB, for the technical backstopping, policy advice, feasibility studies and quality control. The respective roles and responsibilities of these stakeholders have been specified in previous sections of this document. In summary, the contractual arrangements foresee a contractual agreement with OPEIF Afrique for the provision of services related to coordination and capacity building at the project sites. A contractual agreement with INPHB foresees the provision of services related to policy advice, quality assurance, monitoring and capacity building events for the government counterpart and other stakeholders in order to reinforce the necessary institutional capacities. Any project amendments will be done in accordance with the GEF Council Document GEF/C.39/Inf.03”. In order to support project execution, UNIDO will recruit the National Project Manager to directly liaise with and support project executing entities.

With regards to project beneficiaries, the direct beneficiaries will be the receivers of the project development support and grant financing for the demonstration projects (e.g. industry, SMEs, farmers, cooperation’s, and municipalities, and further the participants in the numerous trainings. Full or partial title and ownership of equipment purchased under the project may be transferred to national counterparts and/or project beneficiaries during the project implementation as deemed appropriate by the UNIDO Project Manager in consultation with project stakeholders.

Coordination:
Coordination and cooperation with other GEF projects and programmes will be developed and animated by the various coordinating teams of the project. UNIDO will make sure that this coordination is effective. The GEF National
Commission coordinated by the Permanent Secretariat headed by the operational Focal Point coordinates the various GEF initiatives in Ivory Coast. More specifically, the collaboration will be developed and maintained with projects:

- UNEP/GEF Reforestation project under GEF-6 aiming to promote the sustainability and scaling up aspects for transforming the management, restoration and conservation of forests and biodiversity in Côte d’Ivoire. Collaboration could be envisaged in terms of prioritizing project sites, assessing the environmental impact of project interventions (setting up pilot enterprise) and assessing related CO2 emissions reductions.

- UNIDO/GEF4 project on promoting renewable energy for rural electrification and productive uses. The project will permit to avoid fossils fuels uses for remote mini-grids in the country. It will contribute to national emission reduction targets.

The UNIDO GEF-4 funded project (GEF ID 4005) on the promotion of renewable energy mini grids (solar PV) in rural areas has also led to a substantial accumulation of knowledge and best practice, developing policy documents and feasibility studies on the application of RE systems in remote areas and testing the solar PV technology at seven project sites, totaling over 200 kW of solar energy capacity. As part of this project UNIDO also co-organised with the government of Côte d’Ivoire a high-level Investment Panel for Renewable Energy in Abidjan in January 2014. The experience from this project forms the entry point for UNIDO activities in the RE and low carbon technology sectors in Côte d’Ivoire.

The counterpart Ministry of Environment intends to set up a coordination platform to harmonise activities between the different projects listed here and earlier in the section “relevant baseline projects”. Formal collaboration agreements are expected to be finalized once the project is operational and first coordination meetings have taken place. Collaboration agreements will also be fostered with ongoing Government projects as outlined under the relevant baseline projects section of this document and as specified in the cofinancing letter of the Government, especially:

<table>
<thead>
<tr>
<th>Title</th>
<th>GEF US$</th>
<th>Cofinancing US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability and Scaling Up Approaches for Transformational Management, Restoration and Conservation of Forests Landscapes and Biodiversity in Côte d’Ivoire (SSATMARC–FOLAB)</td>
<td>2,831,050</td>
<td>27,065,000</td>
</tr>
<tr>
<td>Assessment of Land Degradation Dynamic in Coffee-Cocoa production and Northern Ivory Coast to promote SLM practices and Carbon Stock Conservation – ALDD – SLM/CSC</td>
<td>1,726,027</td>
<td>9,750,000</td>
</tr>
</tbody>
</table>

A.7 Benefits. Describe the socioeconomic benefits to be delivered by the project at the national and local levels. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCF/SCCF)?

Through this GEF project, the following socio-economic and national environmental benefits are to be expected: more farmers will be able to generate additional income from selling their residues to biomass plants or by getting directly involved in the supply chains and upgrading of biomass residues. The introduction and enforcement of regulations for more sustainable residues management on agricultural land, will lead to a reduction of open combustion of residues on the field and hence to less local air pollution. This is particularly relevant at the pre-selected project sites where air quality is significantly reduced after harvest time due to massive burning of residues on the field.

The enhanced use of agricultural residues for heating and electricity production in the food processing industry will result in a reduction in energy demand, hence leading to improved competitiveness and working environment in industry. The use of local biomass as an energy source will reduce the demand for fossil fuels and the demonstration
of low carbon technologies in the agro food processing industry will create awareness about the required reforms not only in the electrical power sector. This will spur the development of new know-how and suppliers for technical equipment, energy efficiency solutions and industrial production process improvements in general. Above all, the rehabilitation of former production sites combined with the introduction of low carbon technologies will lead to job creation and community level where benefits are expected through additional income generation particularly in the underdeveloped regions as well as gender mainstreaming benefits as stated in A.4 Gender Equality and Women’s Empowerment section with details.

In terms of direct benefits for project beneficiaries, it is apparent that the profile of actors in the cassava processing chain is mainly composed of women. This project is expected to create multiple sustainable jobs (according to OPEIF Afrique 300-350 jobs alone at the production site) and promotes the involvement of women in the creation of income-generating activities and the development of agro-food value chains. UNIDO had previously carried out a diagnosis of the industrial and institutional sector in Côte d’Ivoire in 2014 to identify promising industrial sectors with significant potential for job creation. In this context, the agro-food sector has been identified and selected by the Government as a priority for development. Moreover, renewable energy technologies have a particular attraction for young people, which will enable them to be employed in this field of activity. The management of biogas production equipment and electricity will be entrusted to young trained technicians, which will contribute to increasing the employability of young people.

A.8 Knowledge Management

The project will work in collaboration with various stakeholders to develop different knowledge tools (e.g. training tools, roadmaps, guidebooks etc.) that will be disseminated widely. A knowledge management plan will be elaborated during the project’s initialization stage to define the specific knowledge creation and dissemination activities, the target groups and the time by when the materials will be made available and delivered. To ensure up-to-date know-how, UNIDO actively collaborates with a number of energy technology centers, networks and learning platforms worldwide, such as the International Centre for Science and High Technology in Trieste, the National Cleaner Production Centers (46 countries) and the Green Industry Platform to form strategic partnerships to promote knowledge management and best practices for technology transfer. UNIDO also already applies a strategy of establishing regional centres as centers of excellence and knowledge hubs (for instance the ECREEE center in Cape Verde for West-Africa, and similarly ongoing initiatives for East- and Southern Africa, as well as for SIDS) as a way to institutionalise capacities and support regional coordination and information exchange. This knowledge platform will be used to capitalize on expertise and methodologies developed by these centres in the area of training courses. ECREEE, for instance, has a vast experience working in Côte d’Ivoire and could assist in capacity building workshops which are to be organised under this project.

Under Component 1 on policy, the project will work with the relevant governmental agencies to develop the strategic biomass roadmap and action plan and work specifically on secondary legislation proposals which will be presented and validated at the coordination groups that are being put in place by the Ministry of Environment. The latter intends to set up a coordination platform to harmonise activities between the different projects listed here and earlier in the section “relevant baseline projects”.

Under Component 2 on technology demonstration, successful business cases demonstrating the modern bio-energy applications will be widely disseminated choosing the most appropriate medium to reach a large number of actual and potential stakeholders. The business cases will be based on technical, operational and financial information from the pilot projects. The targets of this dissemination will be potential users of the technology, servicing and maintaining sectors, governmental stakeholders and decision-makers, as well representatives from financing institutions. After successful implementation or construction of the demonstration projects, the cases will be monitored for their performance, analyzed and evaluated as a basis for replication. The executing partner NGO will be involved in the dissemination activities to ensure that the pilot approach can be replicated elsewhere.
As for the component 3 on enabling partnerships, the project will develop specific packages of tailored knowledge products on improved biomass technologies and facilitating technology transfer within the agro-industry research institutes as the one associated in this project. Training manuals will be readily available for use by different institutions like universities, research organization and industry associations. The project will also help local training institutions to adapt these training manuals into curricula for their institutions. Training programs will be provided for all steps necessary to develop and operate bio-energy projects for heat in industrial environments from the initial energy assessment, over feasibility studies and financing to aspects of monitoring, operation & maintenance. This kind of training will be provided to project developers, national consultants, and the target enterprises where the technologies are being applied.

On a more global level, UNIDO is well-placed to implement this project with its global network of experts and will be able to draw upon its experience from its wider portfolio of relevant and mainly GEF funded projects on bio-energy, including in Ukraine (low-carbon technologies in bakery industry, biogas from organic farm waste to provide heat and electricity for on-farm needs), gasification in wood-processing sector, Uruguay (biogas and other low carbon waste utilization technologies), the Dominican Republic (biomass for electricity generation), India (organic waste streams for biogas in agro-food sector), Albania (bio-energy in olive oil sector), Turkey and Chile (biogas for agro-industries). Furthermore, UNIDO has carried out projects in Nigeria (rice husks for electricity), Thailand (bamboo waste from chopstick industry and rice husks for energy), and Sri Lanka (bamboo waste processing into pellets).

All knowledge management activities will be gender mainstreamed. This includes integration of gender dimensions into publications, for instance, presenting sex-disaggregated data and gender-energy nexus theory; gender sensitive language in publications, photos showing both women and men and avoid presenting stereotypes; as well as assuring that women, men and the youth have access to and benefit from the knowledge created. The most suitable partners and stakeholders have been identified during PPG phase. All publications developed under this project will comply with GEF and UNIDO communication policies.

In terms of the legal context, the present project will integrate in the standard basic cooperation agreement between UNIDO and Côte d'Ivoire signed on 7 March 1996.

B. Consistency with National Priorities.

B.1. Consistency with National Priorities. Describe the consistency of the project with national strategies and plans or reports and assessments under relevant conventions such as NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

The proposed project is fully consistent and well aligned with Côte d’Ivoire’s national and international development objectives, priorities, strategies and targets. On a global level, it is in line with the country’s INDC. In this document, the Government outlines mitigation actions in the agriculture and forestry, energy and transport, and waste sectors. The INDC covers the following gases: carbon dioxide (CO2); methane (CH4); and nitrous oxide (N2O). Specific actions that the Government plans to undertake in the energy sector include, *inter alia*: investing in energy efficiency; putting in place a renewable energy and energy efficiency institutional and regulatory framework; creating a waste reduction strategy for industrial energy consumption through energy audits and reliable data on energy usage; encouraging industry to invest in energy-saving equipment; and developing national legislation on constructing and renovating buildings for heating efficiency.

In order to respond to the most pressing environmental problems, the Government of Côte d’Ivoire has drafted framework documents for environment and climate change mainstreaming, including a National Environment Policy in 2011, the Sanitation Sector Institutional Study and the Sanitation Sector Policy in 2010 as well as the Solid Waste Study in 2011. Côte d’Ivoire also revised its Climate Action Plan in September 2015 involving the different sector ministries and civil society organizations with emphasis being placed on the promotion of low-carbon technologies in the energy production sector. A Directorate-General (DG) of Sustainable Development was established in December
2011 which is expected to ensure the ministerial backstopping of this project, and a national sustainable development strategy is being prepared. However, major weaknesses persist, preventing the smooth implementation of environmental protection and climate change mitigation and adaptation policies that require environmental mainstreaming in all economic and social sectors, technical and financial capacity building and preparation of a national climate change adaptation plan. The institutional capacity building component 1 of this project will attempt to respond to these needs and identify priority areas for secondary legislation in consultation with the DG of Sustainable Development.

The main reference point to the project is the National Development Plan (NDP). It has recently been validated for the period beyond 2015 till 2020, through a participatory process with support from Côte d’Ivoire’s development partners. The Plan’s objective, as from 2015, is to lay the foundations of strong and inclusive growth allowing Côte d’Ivoire to ascend to emerging country status by 2020. The challenge for the NDP is to create the conditions required for lasting peace and stability, to engineer the long-term structural transformation of the economy and to restore Côte d’Ivoire’s regional leadership role. Implementation of the NDP should result in the restoration/construction of infrastructure by adopting a public-private partnership-based approach and, more generally, foster the development of the private sector which will finance 54% of the strategy’s total cost.

The proposed project focuses on the following two pillars of the NDP: (i) Strengthening, Governance and Accountability; and (ii) Infrastructure Development in support of Economic Recovery. Thus, in support of NDP strategic objectives 1 and 2, the project aims to support the social and economic insertion process, and address the concerns of the population, especially of the most underprivileged, as regards access to modern energy services and income generating activities. It furthermore supports the NDP strategic objective 2, which aims to promote the optimal use of natural resources through the development of high quality infrastructure in the agriculture, transport and energy sectors, in order to bolster economic recovery. By focusing on the promotion and maximization of growth opportunities through sustainable natural resource management, specifically enhanced agricultural productivity as well as improved economic infrastructure quality, the project aims to contribute to efforts aimed at ensuring a smooth transition to green growth. According to the Second National Communication on Climate Change (SNCC, 2010), agriculture is the main source of Nitrous oxide emissions (N2O) with 185, 504.40 Gg - EqCO2 or 99.84 % of N2O emissions. This trend is confirmed by the document Intended Nationally Determined Contributions for the COP 21 (INDC) of the Côte d’Ivoire, prepared in September 2015, indicating that the country recorded in 2012 (year of reference) a total of 15,964.35 kteq CO2 emissions.

The Second National Communication on Climate Change (2010) indicated that “The Ivorian agriculture contributes 27% to the GDP, employs 2/3 of the active population and provides with the agro-industrial sector 40% of export incomes. That important sector for the country is vulnerable to climate change, namely subsectors like coffee and cocoa. According to the study, the area that is the most affected is the N’Zi Comoé region, the former cacao belt. That belt moved gradually towards the center-west region of the country with its deforestation effects and important population migration”. The current project is therefore in line with the country SNC findings and the issues and area addressed by this project fall within the priority action and zone.

National Agricultural Investment Plan 2010-2015 which identified SLM as one of the important programme to increase agricultural productivity and its competitiveness with other sectors of the economy. Still in the agricultural sector, the project is line with the objective of restoration of forest cover indicated in the Agricultural Development Master Plan 1992 – 2015.

The Industrial Policy Report published by UNIDO/Ministry of Industry in 2012 defining the priority sectors for industrial development for the next 20 years and identifying the Cassava sector’s potentials in terms of growth and employment creation.

C. DESCRIBE THE BUDGETED M&E PLAN.
Project monitoring and evaluation (M&E) will be conducted in accordance with established UNIDO and GEF procedures. The overall objective of the monitoring and evaluation process is to ensure successful and quality implementation of the project by:

i) Tracking and reviewing project activities execution and actual accomplishments;

ii) Providing visibility into progress as the project proceeds so that the implementation team can take early corrective action if performance deviates significantly from original plans;

iii) Adjusting and updating project strategy and implementation plan to reflect possible changes on the ground, results achieved and corrective actions taken;

iv) Ensure linkages and harmonization of project activities with that of other related projects at national, regional and global levels.

According to the Monitoring and Evaluation policy of the GEF and UNIDO, follow-up studies like Country Portfolio Evaluations and Thematic Evaluations can be initiated and conducted. All project partners and contractors are obliged to (i) make available studies, reports and other documentation related to the project and (ii) facilitate interviews with staff involved in the project activities.

At the same time, M&E will comply with the rules and regulations governing the M&E of UNIDO technical cooperation projects, in particular the UNIDO Evaluation Policy and the Guidelines for Technical Cooperation, both in their respective current versions.

A detailed monitoring plan for tracking and reporting on project time-bound milestones and accomplishments will be prepared by UNIDO in collaboration with the PMU and project partners at the beginning of project implementation and then periodically updated. By making reference to the impact and performance indicators defined in the Project Results Framework, the monitoring plan will track, report on and review project activities and accomplishments in relation to:

a. Renewable energy heat/power delivered and GHGs emission reductions directly generated by the UNIDO/GEF project. These will include the type and the number of projects developed and implemented.

b. Renewable energy heat/power generation delivered and GHGs emission reductions in-directly generated by the UNIDO/GEF project. These will include type and the number of projects developed and implemented due to the increased capacity and conducive environment for the renewable energy projects.

c. Renewable energy investment generated by the UNIDO/GEF project, directly and indirectly

d. Development and amendments of policy, legislative and regulatory frameworks aimed to promote and support the bio-energy market

e. Level of awareness and technical capacity for the use of agricultural residues for energy within relevant institutions, in the market and within enterprises.

f. Overall and specific socio-economic impacts of the project, including the increase in productive capacities, access to modern energy services, job creation for women and men, and gender related aspects (such as gender balance of beneficiaries, budget spent on activities actively promoting GEEW).

The project management team will be responsible for day-to-day and local management of project activities execution, performance and the tracking of progress towards the achievement of milestones. However, monitoring and evaluation of the demonstration projects with respect to energy generation, technical performance, commercial viability and GHGs emission reduction will be integral part of the evaluation component of Project Component 4.

UNIDO will be responsible for oversight and tracking overall project milestones and progress towards the attainment of the set project outputs. UNIDO will be responsible for narrative reporting to the GEF. The UNIDO project manager will be responsible for the preparation of Annual Project Implementation Reviews (PIR).
A terminal evaluation (TE) will be prepared by an independent evaluator as established in the M&E Plan. This terminal evaluation will be carried out at least one month before the completion of the project. UNIDO will make arrangements for the independent terminal evaluation of the project. The UNIDO project manager will inform UNIDO Evaluation Group at least 6 months before project completion about the expected timing for the Terminal Evaluation (TE). The UNIDO Evaluation Group will then manage the terminal evaluation in close consultation with the project manager.

All monitoring and evaluation documents, such as progress reports, final evaluation report, and thematic evaluations (e.g. capacity needs assessment), as well as publications reporting on the project, will include gender dimensions wherever adequate. Table 9 provides the tentative budget for monitoring and the two evaluations, which has been included in Project Component 4. UNIDO as the Implementing Agency will involve the GEF Operational Focal Point and project stakeholders in order to ensure the use of the evaluation results for further planning and implementation.

**Budgeted M&E plan:**

<table>
<thead>
<tr>
<th>Type of M&amp;E Activity</th>
<th>Responsible Partner</th>
<th>Budget (USD)</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inception Workshop (IW) and inception report</td>
<td>UNIDO, government counterpart</td>
<td>N/A</td>
<td>Within first two months of project start up</td>
</tr>
<tr>
<td>M&amp;E design and tools to collect and record data</td>
<td>UNIDO, INPHB</td>
<td>10,000</td>
<td>Within first two months of project start up and mid project</td>
</tr>
<tr>
<td>Regular monitoring and analysis of performance indicators (technical, social, policy, environmental, gender)</td>
<td>UNIDO, INPHB</td>
<td>N/A</td>
<td>Regularly to feed into project management and Annual Project reporting towards the GEF</td>
</tr>
<tr>
<td>Project Implementation Reviews (PIRs)</td>
<td>UNIDO</td>
<td>N/A</td>
<td>Annually</td>
</tr>
<tr>
<td>Annual Project Review to assess project progress and performance</td>
<td>UNIDO</td>
<td>N/A</td>
<td>Annually prior to the finalization of APR/PIR and to the definition of annual work plans</td>
</tr>
<tr>
<td>Final survey to measure progress against baseline for projects</td>
<td>PMU and M&amp;E specialists as required</td>
<td>10,000</td>
<td>At least two months prior to end of the project</td>
</tr>
<tr>
<td>Project Terminal Evaluation</td>
<td>UNIDO Independent Evaluation Division (EVQ/IEV), PMU and Project Steering Committee, independent external evaluators</td>
<td>25,000</td>
<td>Evaluation at least one month before the end of the project; report at the end of project implementation</td>
</tr>
<tr>
<td>Lessons learned (in annual project review and PIRs)</td>
<td>PMU, external consultants</td>
<td>N/A</td>
<td>By the end of project implementation; annual as part of PIR</td>
</tr>
<tr>
<td>Visits to field sites</td>
<td>PMU</td>
<td>5,000</td>
<td>Annually and on project completion</td>
</tr>
<tr>
<td><strong>TOTAL indicative cost</strong></td>
<td></td>
<td><strong>50,000</strong></td>
<td></td>
</tr>
</tbody>
</table>
Table 10: Project’s Indicative Monitoring and Evaluation Budget
**PART III: certification by gef partner agency(ies)**

**A. GEF AGENCY(IES) CERTIFICATION**

This request has been prepared in accordance with GEF policies\(^7\) and procedures and meets the GEF criteria for CEO endorsement under GEF-6.

<table>
<thead>
<tr>
<th>Agency Coordinator, Agency name</th>
<th>Signature</th>
<th>Date (MM/dd/yyyy)</th>
<th>Project Contact Person</th>
<th>Telephone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philippe R. Scholtès, Managing Director, Programme Development and Technical Cooperation; UNIDO-GEF Focal Point</td>
<td><img src="signature.png" alt="Signature" /></td>
<td>10/27/2017</td>
<td>Mark Draeck, Industrial Development Officer, Department of Energy, UNIDO</td>
<td>+431-260-26-5317</td>
<td><a href="mailto:m.draeck@unido.org">m.draeck@unido.org</a></td>
</tr>
</tbody>
</table>

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\(^7\) GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, SCCF and CBIT
ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

<table>
<thead>
<tr>
<th>PROJECT STRATEGY</th>
<th>OUTCOME/OUTPUTS</th>
<th>INDICATOR (QUANTIFIED AND TIME-BOUND)</th>
<th>BASELINE</th>
<th>TARGET</th>
<th>SOURCE OF VERIFICATION</th>
<th>ASSUMPTIONS/RISKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROJECT OBJECTIVE:</td>
<td>Promote the sustainable industrial production in the agro-food sector through the use of renewable energy applications and low-carbon technologies</td>
<td>CO₂ emission reduced (tons of CO₂eq) due to new bioenergy projects [direct and indirect] Energy generated from bioenergy technologies supported or promoted by project (in kWh) No. of new bioenergy projects</td>
<td>60,988-111,729 tCO₂ (1,247 tCO₂ direct and 40,741-121,482 indirect) metric tons reduced 2 new agro bio-energy projects</td>
<td>Cumulative direct reduction of GHG emissions by about 12,857 tCO₂eq over the period 2018-2037 Indirect emission reduction greater than 102,854 tCO₂eq 2 GWh energy generated annually from bio-energy through projects installed over the period 2018-2037 related to project 5 new bio-energy projects at SMEs installed between 2018 and 2023</td>
<td>GEF project tracking tool Project documents</td>
<td>The Government remains committed to the development of RE Implementation of project activities will foster investment in bioenergy technologies Adequate resources mobilized</td>
</tr>
</tbody>
</table>

Project Component 1 - Strengthening of the institutional framework to promote the development of low-carbon technologies in the agro-food value chain

| OUTCOME 1.1 | Secondary legislation is reinforced to promote low-carbon development for agro-food value chains, within the overarching policy framework on environmental sustainability | Policy and regulatory framework for bio-energy projects from agricultural residues is developed / accepted among governmental stakeholders and private sector able to implement projects under that framework | The country has a policy framework and support mechanism with some significant gaps (e.g. heat supply, sustainable crop management) | One report with recommendations on secondary legislation, supporting- and financial mechanisms is elaborated | Report is available and validated by the government counterpart | Government of Côte d’Ivoire remains committed and plays active part in the validation sessions |
| Project Component 1 - Output 1.1.1 | | | | | | |
|---|---|---|---|---|---|
| **National regulatory mechanisms promoting the development of renewable energy systems in agro-food value chains and low carbon technologies are proposed to the government counterpart** | **Information database for bio-energy potentials in Cote d’Ivoire updated** | **Existing biomass energy atlas and national records for Cote d’Ivoire Renewable Energy Framework do not contain any targets for biomass use of biomass so far** | **Development and adoption of a “Strategic Bio-energy Roadmap” for Cote d’Ivoire (including social and gender mainstreaming impact section)** | **Biomass Energy Potential Atlas** | **Different government departments and agencies appreciate, support and adapt the biomass energy priorities within the country’s energy policy framework.** |
| **Appropriate policy and regulatory framework for bio-energy development developed and enforced. Biomass utilization guidelines developed and adopted. Bioenergy financing mechanism developed** | **Cote d’Ivoire does have a general policy framework for renewable energy installations, excluding a funding scheme for electricity generation. Missing guidelines for sustainable crop management (amount of residues to remain in fields)** | **Sectoral analysis report presented to the government and validated** | **Policy and regulatory guidelines document and its strategic implementation plan. Policy document on sustainable biomass extraction and utilization available** | **Relevant government agencies (specially the ministries responsible for agriculture, energy and environment) agree on the need and importance of the improved policy. Finance sector remains interested in financing bio-energy projects, and financing support mechanisms continuously developed further.** |

**Project Component 2 - Technology demonstration of low-carbon applications in the agro-food value chain**
<table>
<thead>
<tr>
<th>PROJECT STRATEGY</th>
<th>OUTCOME/OUTPUTS</th>
<th>INDICATOR (QUANTIFIED AND TIME-BOUND)</th>
<th>BASELINE</th>
<th>TARGET</th>
<th>SOURCE OF VERIFICATION</th>
<th>ASSUMPTIONS/RISKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTCOME 2.1</td>
<td>Low carbon technologies are promoted in the agro-industrial processing of agricultural products</td>
<td>Increase the number of installed bio-energy capacity with focus on biomass applications and increase the number of private sector players taking part in such project.</td>
<td>A number of private sector run projects on the introduction of low carbon technologies exist but this is not systemic yet and actively promoted by the government</td>
<td>State-of-the-art technology and best practices in Côte d’Ivoire in the form of highly replicable innovative technology applications using agricultural residues implemented</td>
<td>Responses counted to call for projects Project concepts submitted Feasibility studies Business plans Project commissioning reports</td>
<td>No. of applications received is sufficient expectations Commitment of project sponsors and investors maintained throughout project approval and implementation stage Timely approval of finances/funds and permissions available</td>
</tr>
<tr>
<td>Output 2.1.1</td>
<td>Feasibility studies consolidated on potential uses of renewable energy in agro-food sectors</td>
<td>No. of technologies adopted for bio-energy project development No. of project investors interested in developing bio-energy projects</td>
<td>N/A</td>
<td>Make available Feasibility studies for potential project owners.</td>
<td>Feasibility studies submitted and validated by the project manager</td>
<td>Government required feasibility studies before subsidizing and the bank before lending.</td>
</tr>
<tr>
<td>Output 2.1.2</td>
<td>Operationalisation of an innovative and highly replicable pilot projects</td>
<td>No of visitors at the pilots sites each year No of committed trainees each year</td>
<td>Not a systematic project piloting the introduction of low carbon technologies in the cassava processing sector</td>
<td>At least two project sites operational</td>
<td>Project reporting and report on the commissioning and installation of equipment at the pilot sites</td>
<td>All stakeholders work together to mobilize the outstanding cofinancing and operationalize the selected pilot sites</td>
</tr>
<tr>
<td>Project Component 3 - Enabling partnerships in place for replication across the agricultural food-sector</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUTCOME 3.1</td>
<td>Sustainable replication across cassava and other agricultural sub-sectors ensured</td>
<td>No of non-cassava projects initiated since the start of the project No of representatives from public and private sectors trained and sensitised at project site</td>
<td>No existing small scale production of biogas combined with cassava processing</td>
<td>At least 300 people visited and sensitised at project site Project proposals elaborated for future upscaling and replication of the piloted approach</td>
<td>Documentation of dissemination activities and visits at the sites Project proposal documents</td>
<td>Government validates the project proposals and is willing to promote follow-up upscaling and replication activities</td>
</tr>
<tr>
<td>Output 3.1.1</td>
<td>Mapping of medium-term potential across agro-food sector developed and roadmap for its activation in place</td>
<td>No of Government Agencies actively supporting the projects</td>
<td>Preliminary mapping has been carried out but not with a focus on the combination of developing agro value chains and promoting low carbon technologies</td>
<td>One report with an analysis of other potential agricultural sectors and a roadmap of how to replicate the approach in these sectors</td>
<td>Report available and roadmap validated by the government counterpart .</td>
<td>The Government has ratified all the climate change agreement.</td>
</tr>
<tr>
<td><strong>Output 3.1.2</strong></td>
<td>Pipeline of bankable projects developed, local capacities established and quality assurance in place</td>
<td>No of commercial banks interested in financing agro related renewable energy project.</td>
<td>No bankable projects available at the moment</td>
<td>At least three project proposals presented to the government for validation</td>
<td>Bankable project proposals Meeting minutes of validation sessions with the government counterpart</td>
<td>Government is committed to replicate the project approach and identifies funding sources</td>
</tr>
<tr>
<td>------------------</td>
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<td>---------------------------------------------------------------------------------</td>
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</tbody>
</table>

**Project Component 4 - Monitoring and evaluation**

<table>
<thead>
<tr>
<th><strong>Outcome 4.1:</strong></th>
<th>Project’s progress towards objectives continuously monitored and evaluated</th>
<th>Timely implementation of the project and project targets and indicators properly monitored throughout the project duration</th>
<th>N/A</th>
<th>Project progress and an overall project impact assessment periodically monitored and evaluated</th>
<th>Evaluation Reports Monitoring Reports Lessons learnt report</th>
<th>Capability and experience of project management unit Government and private sector are interested in the fact and figures</th>
</tr>
</thead>
</table>

| **Output 4.1.1** | A monitoring and evaluation plan will be prepared and carried out. | List of all progress reports prepared and terminal evaluation conducted Gender dimension taken into account: at least 50% of women representation in trainings and it terms of the work force at the project sites on all levels of involvement (manual workers, managers, logistics personnel) | N/A | M&E Plan ready within 3 months of project start Terminal evaluation completed by end of project closing time Project terminal report completed by end of project Dissemination materials ready by the end of project | Progress Reports Terminal evaluation Report Copies of dissemination material | All stakeholders (especially the ones associated to this activity such as INHBP and OPEIF Afrique) work in effectively together to retrieve the required data and monitor project progress as planned |
ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

n.a.
A. Provide detailed funding amount of the PPG activities financing status in the table below:

<table>
<thead>
<tr>
<th>Project Preparation Activities Implemented</th>
<th>GETF/LDCF/SCCF/CBIT Amount ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Budgeted Amount</td>
</tr>
<tr>
<td>Supporting activities (consultation and validation workshops; dissemination materials; detailed negotiation with governmental and private sector stakeholders; recruitment of national experts etc.)</td>
<td>50,000</td>
</tr>
<tr>
<td>Total</td>
<td>50,000</td>
</tr>
</tbody>
</table>

If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue to undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities. Agencies should also report closing of PPG to Trustee in its Quarterly Report.
ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)

Provide a calendar of expected refloows to the GEF/LDCF/SCCF/CBIT Trust Funds or to your Agency (and/or revolving fund that will be set up)

n/a