



# PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: FULL-SIZED PROJECT

TYPE OF TRUST FUND: GEF TRUST FUND

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## PART I: PROJECT INFORMATION

Project Title:	<b>Promotion of Sustainable Charcoal in Angola through a Value Chain Approach</b>		
Country(ies):	Angola	GEF Project ID: <sup>1</sup>	5719
GEF Agency(ies):	UNDP	GEF Agency Project ID:	5331
Other Executing Partner(s):	Lead implementing partner: Ministry of the Environment (MINAMB) Other partners: IDF ( <i>Instituto de Desenvolvimento Florestal de Angola</i> ) – MINADER (Ministry of Agriculture and Rural Development/ <i>Ministério da Agricultura e Desenvolvimento Rural de Angola</i> ); CETAC ( <i>Centro de Ecologia Tropical e Alterações Climáticas</i> ); Ministry of Economy - The National Institute of Support to Micro, Small and Medium Enterprises (INAPEM); Ministry of Energy and Water (MINEA); Ministry of Commerce; Ministry of Industry; Ministry of Family ( <i>Ministério da Família e Promoção da Mulher</i> ); Provincial Governments of Huambo, Benguela, Kwanza-Sul and/or Huila (TBD). NGOs: ADRA, CODESPA, ADPP and COSPE <sup>2</sup>	Submission Date: Resubmission Date:	March 5, 2014 March 18, 2014
GEF Focal Area (s):	CC Mitigation	Project Duration (Months)	48
Name of parent program (if applicable): • For SFM/REDD+ <input type="checkbox"/> • For SGP <input type="checkbox"/>	N/A	Agency Fee (\$):	438,900

### A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK<sup>3</sup>:

Focal Area Objectives	Trust Fund	Indicative Grant Amount (\$)	Indicative Co-financing (\$)
CCM 2 - Promote investment in energy efficiency technologies	GEF TF	4,620,000	13,164,095
Total Project Cost		4,620,000	13,164,095

### B. INDICATIVE PROJECT FRAMEWORK

<sup>1</sup> Project ID number will be assigned by GEFSEC.

<sup>2</sup> These NGOs will be considered as potential “Responsible Parties” for conducting certain field-level activities on behalf of MINAMB; the implementation structure of the project will be elaborated at PPG phase

<sup>3</sup> Refer to the reference attached on the [Focal Area Results Framework](#) when completing Table A.

**Project Objective: To reduce the current mode of unsustainable and GHG-intensive charcoal production and utilization from Angola's Miombo woodlands via an integrated suite of low-carbon interventions in the country's charcoal value chain.**

Project Component	Grant Type <sup>4</sup>	Expected Outcomes	Expected Outputs	Trust Fund	Indicative Grant Amount (\$)	Indicative Cofinancing (\$)
<p>1. Biomass data collection and institutional strengthening of biomass energy stakeholders</p> <p>Executing partners: MINAMB, MINEA (data clearing house), IDF</p>	TA/INV	<p>- Improved data collection, statistics and monitoring of biomass energy and charcoal production and use across Angola</p> <p>- Improved application of accurate biomass energy data to energy planning processes</p> <p>- Improved national knowledge of best practices in sustainable charcoal production and biomass energy management</p>	<p>1.1 National charcoal survey<sup>5</sup> conducted and standardized baseline report completed, including mapping of areas of production and consumption and organizations involved in charcoal trade (using a value chain approach) (INV)</p> <p>1.2 Biomass data information and statistics (collected under Output 1.2) mainstreamed into annual energy statistics collected by the Ministry of Energy and Water (MINEA)<sup>6</sup> and national energy planning mechanisms (TA)</p> <p>1.3 Biomass energy information hosted in an appropriate IT database with specific mechanisms in place to ensure it is updated and maintained post-project (INV)</p> <p>1.4 Completed assessment study of charcoal production-related environmental, economic and social impacts with recommended action plans for vulnerable areas (INV)</p> <p>1.5 Framework agreement for institutional coordination on biomass energy policies and charcoal regulation developed between MINAMB, IDF and MINEA covering both upstream and downstream biomass energy</p>	GEF	800,000	2,040,000

<sup>4</sup> TA includes capacity building, and research and development.

<sup>5</sup> The survey will provide an accurate, up-to-date and systematized national inventory of charcoal production, sales and consumption, using a value chain approach.

<sup>6</sup> MINEA is responsible for collecting and disseminating energy statistics in Angola serves as a clearing house for energy information sent to international bodies

			<p>issues (TA)</p> <p>1.6 Trainings conducted for relevant government and provincial staff on best practices in sustainable biomass management, policies, incentives and MRV systems (TA).</p> <p>1.7 Exchange visits and stakeholder participation in regional community of practice and knowledge exchange platforms on sustainable charcoal issues in the <i>Miombo</i> Eco-region<sup>7</sup> (TA)</p>			
<p>2. Dissemination of appropriate technologies for sustainable charcoal production (improved kilns) and efficient combustion in at least eight (8) selected charcoal-producing <i>municípios</i> (municipalities) in 1-2 target Provinces (selected from among Huambo, Benguela, Kwanza-Sul and/or Huila)<sup>8</sup></p> <p>Executing partners: MINAMB, IDF, INAPEM, NGOs</p>	TA/INV	<p>- Energy efficient charcoal production and wood-saving technologies have successfully replaced inefficient systems in targeted areas of target Provinces helping reduce deforestation of critical <i>Miombo</i> stocks</p> <p>- Sustainable charcoal recognized as a viable MSME in targeted provinces by end of project and for post-project sustainability</p>	<p>2.1. Sensitization campaign conducted with relevant provincial stakeholders and community groups on importance of sustainable charcoal technologies and practices (TA)</p> <p>2.2 Minimum sixty (60) sustainable charcoal producer associations (CPAs) selected from existing NGO-supported groups<sup>9</sup> across 8 municipalities in targeted Provinces. (TA)</p> <p>2.3 All CPAs selected will be legally registered as micro-enterprises according to regulations of the Angola Invest Programme (<i>Programa Angola Investe</i>)<sup>10</sup>(TA)</p> <p>2.4 Dissemination of approximately 200 Casamance kilns<sup>11</sup> and 80 retort (or other) kilns<sup>12</sup> to target CPAs (INV)</p>	GEF	1,700,000	7,136,595

<sup>7</sup> See Section A.4 and B.3. The exchange visits and participation in regional community of practice and knowledge exchange platforms will involve all stakeholders from other GEF-funded sustainable charcoal projects in the region and also build off the platforms and networks supported as part of the development of the Africa Sustainable Charcoal Policy Framework.

<sup>8</sup> The selection of the two provinces for targeting will be done during the PPG phase based on more in-depth consultations with stakeholders and a more detailed assessment of the most suitable structures available on the ground.

<sup>9</sup> NGOs such as ADRA, CODESPA, COSPE and ADPP have already formed and are working many farmer and charcoal producer groups in the targeted Provinces. The preferred option is to select these already-formed groups as the CPAs under this project but a detailed analysis of the suitability of such groups will be done at PPG phase.

<sup>10</sup> See information on Angola Invest Programme – Baseline Project #3

<sup>11</sup> Casamance or improved earth kilns were selected since they are the easiest improved production techniques to adapt from the traditional earth kiln and require minimal equipment.

<sup>12</sup> Exact type of retort kilns will be selected during the PPG phase.

			<p>2.5 Training of 60 CPAs on sustainable charcoal practices and improved kiln technologies, as well as group reporting, book-keeping and compliance with certification standards (established under Component #4) (TA)</p> <p>2.6 MRV, tracking and licensing system established for all improved kilns piloted and mapping completed of all targeted areas receiving kilns to track decrease in forest cover loss relative to baseline parameters<sup>13</sup> (TA)</p> <p>2.7 National model scheme for commercial financing for charcoal producing groups (a partnership with INAPEM and local financial institutions) proposed and in place by the end of project (TA)</p>			
3. Dissemination of charcoal briquetting machines to enterprises in selected peri-urban areas of Luanda and/or Benguela	TA/ INV	<p>- Energy efficient briquetting technologies have successfully reduced charcoal wastage in targeted areas</p> <p>- Briquetting enterprises are successfully proven as a viable MSME opportunity by end of project</p>	<p>3.1 Feasibility study and mapping of the best locations and production capacity for briquetting from charcoal dust production and/or other base sources in Luanda and Benguela (TA)</p> <p>3.2 Twenty (20) charcoal briquetting enterprises formally established, incorporated, trained and operational across selected peri-urban areas of Luanda and/or Benguela<sup>14</sup>. Activities under this output will involve:</p> <ul style="list-style-type: none"> <li>- Participatory mapping and consultations to identify, rank and select entrepreneurs for assistance</li> <li>- Legal formation of all enterprises as micro-enterprises according to regulations of Angola Invest Programme (<i>Programa Angola Investe</i>) (TA)</li> </ul>	GEF	800,000	1,940,000

<sup>13</sup> The baseline will come from data collected by the recent Angolan Forest Inventory undertaken by IDF and FAO.

<sup>14</sup> As with selection of the CPAs, where possible the enterprises will be selected based on consultations with existing INAPEM or other micro-enterprise networks operating in the same geographical area.

			<p>3.3 Training of all enterprises on briquetting practices, technologies and business models (including financing options) (TA)</p> <p>3.4 Dissemination of approximately 40-50 briquetting machines to selected enterprises targeted for assistance (INV)</p> <p>3.5 MRV, tracking and licensing system established for all machines piloted to monitor production and sales, as well as ensure compliance with certification scheme (linked to Component #4) (TA)</p> <p>3.6 Briquetting support platform integrated into Angola Invest Program for replication of support services and provision of commercial finance to enterprises post-project (TA)</p>			
4. Sustainable charcoal and briquetting certification and marketing scheme at selected retailers in Luanda and Benguela	TA/INV	<ul style="list-style-type: none"> <li>- Establishment of Angola's first certified green charcoal retail product at selected supermarkets in Luanda and Benguela</li> <li>- Availability of Angolan-produced charcoal briquetting products at selected retailers in Luanda and Benguela</li> <li>- Increased knowledge among urban consumers about "green" charcoal and "green" briquetting products</li> </ul>	<p>4.1 Feasibility study conducted on development of a "green charcoal" certification scheme to source and market charcoal produced under Component #2 to 2-3 selected retail outlets in Luanda and Benguela (INV)</p> <p>4.2 Feasibility study conducted on development of a market outlet for the sale of charcoal briquetting products supported under Component #3 (INV)</p> <p>4.3 Based on recommendations from F/S, pilot fair trade "green charcoal" product sourced and available for sale to the public at 2-3 retail outlets in Luanda and/or Benguela with packaging requirements and source tracking system in place (point of origin) (TA)</p> <p>4.4. Market survey conducted at end of project assessing consumer reception and competitiveness of "green</p>	GEF	1,100,000	1,407,500

			charcoal” and briquetting concepts and potential for scale-up (INV)			
			4.5. Sensitization campaign for consumers on “green charcoal” and “green briquetting” products and impacts of unsustainable charcoal production (TA)			
			4.6 Establishment and operationalization of a national certifying entity <sup>15</sup> with funding committed for its operation post-project			
Subtotal					4,400,000	12,524,095
Project Management Cost (PMC) <sup>16</sup>				(select	220,000	640,000
Total Project Cost					<b>4,620,000</b>	<b>13,164,095</b>

### C. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE AND BY NAME IF AVAILABLE, (\$)

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount (\$)
National Government	Ministry of Environment (MINAMB)	Cash and in-kind	2,000,000
National Government	Ministry of Agriculture and Rural Development (MINADER) / IDF (Institute for Forest Development – Angola)	Cash	1,500,000
National Government	Ministry of Economy - The National Institute of Support to Micro, Small and Medium Enterprises (INAPEM)	Cash	3,000,000
Provincial Government	Provincial Governments of Huambo, Huila, Kwanza-Sul and Benguela Provinces	Cash and in-kind	TBD at PPG phase
NGO	ADPP	Cash	1,779,095
NGO	ADRA	Cash	200,000
NGO	CODESPA	Cash	235,000
NGO	Development Workshop Angola (Local NGO)	Cash	50,000
NGO	COSPE	Cash	4,000,000
Private Sector	Retailers and financial institutions	Cash and in-kind	TBD at PPG phase
Beneficiaries	Community Groups/Charcoal Producer Associations/Briquetting Enterprises	Cash and in-kind	TBD at PPG phase
GEF Agency	UNDP	Cash	400,000
<b>Total Co-financing</b>			<b>13,164,095<sup>17</sup></b>

### D. INDICATIVE TRUST FUND RESOURCES (\$) REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY<sup>1</sup>

<sup>15</sup> The relevant government ministry where the certifying entity will be hosted will be determined during the PPG phase

<sup>16</sup> To be calculated as percent of subtotal.

<sup>17</sup> In terms of the ratio of GEF funds to co-financing, during the PPG phase UNDP will commit to mobilizing additional resources to achieve a minimum co-financing ratio of 1:3 before CEO endorsement. If such funds cannot be mobilized the budget and GEF funding request will be modified accordingly at the time of CEO endorsement to achieve such a ratio. Co-finance funds from Provincial Government authorities, retailers and financial institutions, and Community Groups/Charcoal Producer Associations/Briquetting Enterprises cannot be quantified at this time but will be provided at CEO Endorsement.

GEF Agency	Type of Trust Fund	Focal Area	Country Name/Global	Grant Amount (\$) (a)	Agency Fee (\$) (b) <sup>2</sup>	Total (\$) c=a+b
UNDP	GEF TF	Climate Change	Angola	4,620,000	438,900	5,058,900
<b>Total Grant Resources</b>				4,620,000	438,900	5,058,900

#### E. PROJECT PREPARATION GRANT (PPG)<sup>18</sup>

Please check on the appropriate box for PPG as needed for the project according to the GEF Project Grant:

	<u>Amount Requested (\$)</u>	<u>Agency Fee for PPG (\$)<sup>19</sup></u>
• No PPG required.	-- 0--	--0--
• (up to)\$100k for projects up to & including \$3 million	100K	9,500

### PART II: PROJECT JUSTIFICATION<sup>20</sup>

#### PROJECT OVERVIEW

##### A.1. Project Description

###### *Global environmental problems, root causes and barriers that need to be addressed*

Angola's indigenous forests and biomass stocks are under tremendous pressure, triggered by one of the highest growth and urbanization rates in Africa. The long duration of conflict and war in the country led to a significant urbanization of the population (since many internally displaced people fled the countryside for cities) and also meant that key environmental indicators were not monitored over many years. At present some 60-70% of the population is estimated to live in cities.

For much of the war years the major urban cooking fuel was charcoal. Although current data is unavailable, it is estimated that today some 80% of Angolans still rely on biomass for most of their energy needs<sup>21</sup>. MINADER's most recent forestry management plan indicates that "domestic consumption of firewood and charcoal represent 57% of the country's energy consumption, followed by the petroleum sector at 41.7% and butane and LPG gas at less than 1%."<sup>22</sup> Wood fuel is now mostly used in rural regions, while charcoal is preferred in peri-urban areas due to its higher heating value and lower transport weight. Angola produces domestic cooking gas as a by-product of oil production, and is continually reducing the amount of gas flared from production platforms to produce domestic gas. However while distribution of cooking gas to urban areas has improved considerably since the end of the war in 2002, the gas network still does not reach many parts of the country and the demand for charcoal remains strong in urban and peri-urban areas. Even in Luanda – where in central areas of the city charcoal is often not a household's main cooking fuel – charcoal is commonly used as a secondary cooking fuel for many dishes and there is especially high demand for charcoal from restaurants and commercial establishments. In most provincial towns and peri-urban areas of Luanda, charcoal continues to be the main cooking fuel. The per capita consumption of charcoal for urban and peri-urban dwellers in Angola was estimated at 0.96 m<sup>3</sup> per year (100 kg); in 2006 when Angola had a population of 18.9 million (it has now grown to 20. 8 million in 2012) the FAO reported that total national charcoal consumption was some 7,200,000 m<sup>3</sup> per year. As one can see from Figure 1 (see below) from Angola's First National Communication (INC) to the UNFCCC, biomass usage is predicted to exponentially increase up to 2030 even as other fuel types also increase in usage. With an estimated annual population growth rate above 3% per year and in light of the lag in reliable gas distribution keeping up with the country's rampant urbanization trajectory, the demand for charcoal

<sup>18</sup> On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

<sup>19</sup> PPG fee percentage follows the percentage of the GEF Project Grant amount requested.

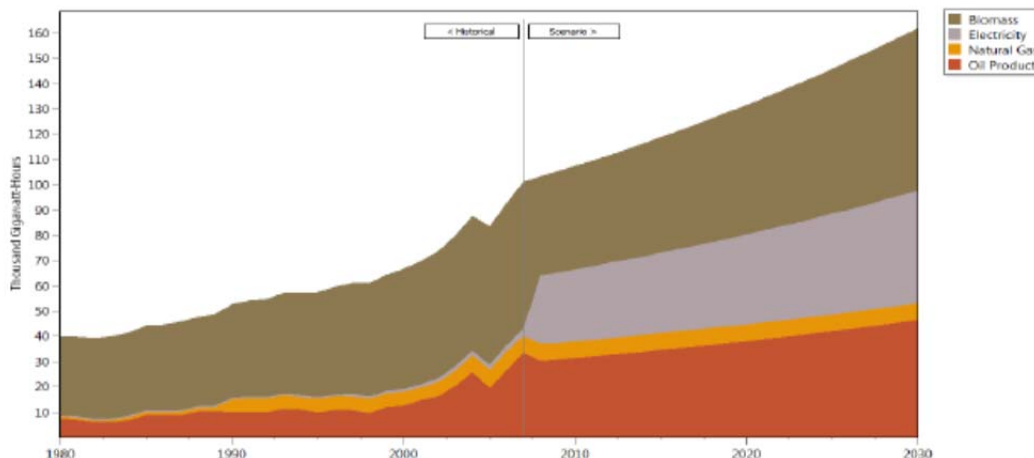
<sup>20</sup> Part II should not be longer than 5 pages.

<sup>21</sup> Angola: Towards an Energy Strategy, IEA, 2006

<sup>22</sup> PROGRAMA DE DESENVOLVIMENTO E GESTÃO PARA O SECTOR FLORESTAL, MINADER, 2008

and the associated pressures on the country's biomass stocks is therefore predicted to remain strong for the foreseeable future. Meanwhile almost nothing is being done to promote the use of agricultural and forestry residues for energy production. Much of Angola's small-scale industry was destroyed in the war, but the potential for using these residues for heat and power generation is considered to be very large.

**Figure 1 – Final energy used by type of fuel (mitigation scenario from Angola's INC)**



Source: LEAP, started data set and simulations, Angola. Unit: 10<sup>3</sup> GWh

Source: Angola First National Communication on Climate Change (INC), 2011

The inefficient production and consumption of charcoal results in a great deal of GHG emissions and many sources of literature confirm charcoal as a major source of deforestation in Angola. The high GHG emissions associated with the production of charcoal are the result of three factors:

- An unsustainable supply of biomass;
- The use of inefficient technologies to convert wood into charcoal; and
- The use of specific technologies/processes in which the conversion of wood into charcoal leads to a high level of methane emissions.

The excessive consumption of fuel wood and charcoal in Angola's main urban centers (collection of firewood and production of charcoal without management plans) has already led to indiscriminate destruction of the forest cover in these areas. Even valuable commercial species<sup>23</sup> from the country's tropical humid forests and *Miombo* woodlands have been cut as firewood or transformed into charcoal. The Luanda region, as the main consumption hub for charcoal in the country, provides a case study of the impact of the charcoal production on the country's biomass resources. Two-thirds of Luanda's residents live in peri-urban areas (this segment of the population increased from 2.6 million in 2006 to 3.861 million people in 2012). Based on a 2006 study by the IEA<sup>24</sup>, the accepted average fuel wood to charcoal conversion ratio for Angola is that it takes approximately 9.6 m<sup>3</sup> of fuel wood to produce 1 ton (1,000 kg of charcoal) using traditional methods. At that time charcoal for the Luanda region was produced from clearing forests in surrounding areas with a yield of about 20 m<sup>3</sup> of wood fuel per hectare. With an average kiln size of 9 x 4 meters, the IEA estimated that about 130,000 earth mound pits per year were required to meet the yearly charcoal demand in Luanda. Extrapolating those same assumptions and applying them to the latest population data for Luanda, the **amount of fuel wood needed each year to produce charcoal for Luanda's peri-urban population alone results in approximately 185,000 hectares of deforestation.** Moreover most of Luanda's peri-urban residents are not currently using improved charcoal cooking stoves.

<sup>23</sup> Such as *Milicia excelsa*, *Acacia welwitschii*, *Pterocarpus angolensis*, *Dalbergia sp.*, *Erythrophleum africanum*, and *Azelia quanzensis*

<sup>24</sup> Ibid



The traditional earth mound<sup>25</sup> is the most common method of carbonization used in Angola. Traditional earth mound (EM) kilns are favored across sub-Saharan Africa because they require very little capital investment, are flexible in size and shape, and are well-matched to the dispersed nature of the charcoal trade. Traditional charcoal production is a particularly damaging and degrading activity due to the destructive method of harvesting the entire tree, as well as the carbonization process which involves the controlled burning of piled logs in an improvised kiln of mounded earth. **The traditional earth kilns are very inefficient, seldom achieving a wood-to-charcoal conversion efficiency of more than 15%, and causing extensive local degradation and soil erosion due to the intense heat generated by kilns as well as deforestation due to the clear-cutting of trees and construction of kilns.** It is estimated that ~5% of an area cleared for charcoal production by earth kilns will not regenerate. Past studies of EM kilns in Angola indicate that an earth pit of approximately 9 x 4 meters produces 45-50 forty bags of (40) kg of charcoal. Production takes 20 to 25 days<sup>26</sup>, depending on the moisture content of the wood. Annual charcoal production per pit is some 2 tons. The government estimates that, in order to produce this quantity of charcoal, some 10-15 wood sticks with a diameter of 25-30 cm are required. In theory, all charcoal producers except subsistence farmers must be licensed by Ministry of Agriculture (MINADER) / IDF<sup>27</sup> and a new law *National Policy of Forest, Wildlife and Conservation Areas (Política Nacional de Florestas, Fauna Selvagem e Áreas de Conservação Lei 120)* regulates forest conservation in certain key areas. However while licenses are technically required for charcoal production, in practice most production and trade is unmonitored. Many charcoal producers only receive a small portion of the end value of the product; interviews conducted during the development of the PIF revealed that a 40 kg sack of charcoal could be purchased from producers for 500 Kwanza (@ \$5.2 USD) at the site of production and sold in Luanda for 3,000 Kwanza (@ \$31 USD).

As regards the resource base, natural forest is the most significant biomass resource in the country, comprising an estimated 59 million hectares according to the latest data with current deforestation rates estimated at 0.2 per year<sup>28</sup>. In some areas of the country, the resource base is still in relatively good condition, not least since the abandonment of large parts of the country during the civil war allowed for substantial natural recovery. However in many areas -- especially those surrounding urban centers -- wood fuel resources are under severe pressure, a fact reflected in increasing prices for charcoal due to scarcity of supply. Severe local deforestation from charcoal has occurred around most large cities, extending for a radius of 200-300 km from Luanda. In addition to demand for fuel wood for use by rural and peri-urban households in cooking, rural industry relies heavily on fuel wood for fish-smoking, brick-making, tobacco curing, food processing, furniture making, ceramics manufacturing and baking.

**Nowhere is the level of deforestation and degradation from charcoal production more severe than in the country's central highlands (Huila, Huambo, Benguela, and Kwanza-Sul).** The central plateau of Angola defines a central area of the Angolan territory, with average altitudes higher than 1,500 meters above sea level, enclosing several provinces, namely Benguela, Huambo, Bié, Kwanza Sul, and Huíla. Huambo lies in the center of Angola and covers most of the topographic zone known as the *Planalto Central*, literally the central

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<sup>25</sup> The earth mound is essentially a hole dug in the ground with wood piled up in horizontal stacks for air circulation. Branches and earth are used to cover the wood.

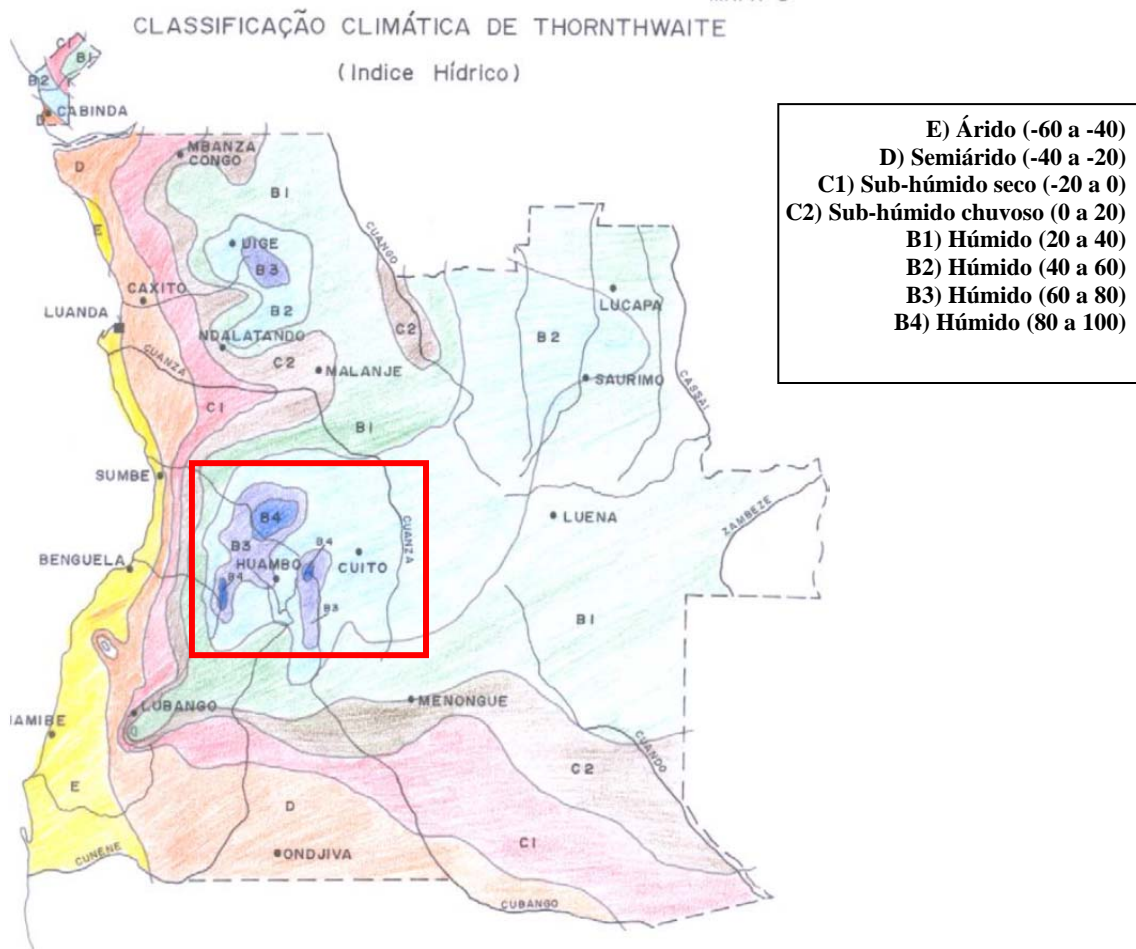
<sup>26</sup> *Apoio a Promoção de Plantações para a Produção de Carvão e Lenha nas Províncias de Luanda, Bengo e Huambo*, Project TCP/ANG/2802, draft, Institute of Forestry Development, 2004.

<sup>27</sup> The licensing procedure must contain the following elements: 1) A request to MINADER/IDF when the area to be deforested is greater than one hectare or when the quantity is greater than 1,500 m<sup>3</sup> of wood or 71,000 kg of charcoal; 2) An application to the Provincial Governor when the area is less than one hectare or when the quantities are less than those referred to above; 3) A declaration by the traditional and administrative authorities agreeing on the availability of the land; 4) proof of bank deposit, or guarantee issued by a bank, in favor of IDF relating to the taxes foreseen in the law; 5) A sketch of the location and description of the project; and 6) a declaration by the Provincial IDF authority.

<sup>28</sup> A.I.R. Cabral a, M.J. Vasconcelosa, D. Oom, R. Sardinha *Spatial dynamics and quantification of deforestation in the central-plateau woodlands of Angola (1990-2009)* Applied Geography 31 (2010) 1185-1193. The actual deforestation rate of Miombo woodlands in Huambo province is 1.49%.

highlands. The whole province is 1,300 meters above sea level and characterized by warm and humid summers and mild and dry winters, with rainfall averages ranging from 1,100 mm to 1,400 mm per year (see Figure 2 – the Aridity Map of Angola – which shows that most of the areas with the highest rainfall are in and around Huambo). It is from the *Planalto* that many of Angola’s biggest rivers flow because of this higher rainfall. Some of the major catchments emerge from the crest line stretching from Huambo to Bié, serving as the pathway for the Benguela railway, and drain towards the four corners of the country. The main rivers are the Kwanza and the Keve rivers draining towards northwest, the Cunene river draining southwest, and the Kubango river going Southeast. Altitude, latitude and the proximity to the ocean are the main factors shaping the tropical to sub-tropical climate in this region.

**Figure 2 – Aridity Map of Angola**



Source: ANGOLA 2025, ANGOLA UM PAÍS COM FUTURO, ESTRATÉGIA DE DESENVOLVIMENTO A LONGO PRAZO PARA ANGOLA (2025) (Versão Provisória)

Vegetation in the *Planalto* consists largely of four types, two of which are classified as forests: highland forests and *Miombo* woodlands (the other two vegetation types are swampy and dry grasslands).<sup>29</sup> In the *Planalto*, in addition to its preference as a wood fuel resource, *Miombo* woodlands provide critical support to cropping systems in the region and provide the bulk of the graze and browse for livestock. The woodlands also provide a range of products important to rural livelihoods, from medicines and food to timber, and are also central to the

<sup>29</sup> *Huambo: An Atlas and profile of Huambo, its environment and its people*, Development Workshop Angola (2013), Compiled and published with funds provided by UNDP Angola through the GEF ELISA project and the Integrated Development Research Center (IDRC)

spiritual needs of many ethnic tribes in the areas, with specified trees and even blocks of woodland being conserved by communities for cultural reasons.

The country's tremendous demand for charcoal has had a particularly negative impact on the natural *Miombo* woodlands of Huambo Province. According to a recent study Huambo Province has the highest deforestation rate of any province in the country; based on recent data from Angola's *Instituto de Desenvolvimento Florestal* (IDF) and a recent forest inventory done by FAO, deforestation in Huambo represents an area of almost 3.3 million hectares, corresponding to 31.26% of the total land in the country classified as severely degraded. According to that same study, three of the seven most deforested municipalities in the country are in Huambo Province, namely *Ecunha*, *Cadla* and *Tchicala Tcholoanga*. As one can see from Table 1, *Planoalto* Provinces such as Huambo and Huila had the second and third highest % transformation change in land use from 1975-2000 after Luanda.

**Table 1 – Map of Area (% of total) Transformed by Land Use Change 1975-2000 (by Province)**

Province	Hectars	2000	1990	1975
BENGO	3.904.042,37	2.38	2.20	0.30
BENGUELA	3.954.299,31	15.97	9.62	9.83
BIE	7.213.358,31	19.44	14.70	12.76
CABINDA	697.555,131	6.88	5.93	0.00
CUNENE	7.732.318,06	12.30	5.27	5.47
HUAMBO	3.318.128,46	31.26	16.32	26.26
HUILA	7.872.295,75	27.46	19.69	13.55
KUANDO KUBANGO	19.964.557,8	1.51	1.34	1.53
KUANZA NORTE	1.924.228,33	7.58	6.78	1.00
KUANZA SUL	5.538.725,34	11.31	8.12	6.33
LUANDA	243.488,568	52.91	36.35	5.35

Source: Excerpted from Angola's First National Communication on Climate Change (INC), 2011

As noted in Angola's NAPA, a recent study<sup>30</sup> conducted interviews with farmers close to Huambo town who indicated that while charcoal was originally about 10 kilometers from the town center some twenty years ago, at present charcoal production only happens at least 50 km or more from the city. Natural woodlands appear to have largely disappeared from much of the area closest to Huambo town and along the main east-west transport axis. While in the past charcoal-making used to be done in woodlands in coastal areas closer to cities such Luanda and Benguela, as those areas have become degraded the charcoal trade has now rapidly switched to other *Planoalto* Provinces. Interviews conducted with charcoal sellers in Luanda during the development of this PIF revealed that the majority of charcoal sold in Luanda originates in Huambo Province.<sup>31</sup> At the same time visits to charcoal markets in peri-urban areas of Luanda as well as production sites in Huambo revealed an astonishingly high amount of charcoal fine wastage due to inefficient packaging and transport practices. In other countries in Africa a significant volume (5 to 15 percent at production sites and 5 to 20 percent at retail areas) of charcoal in the form of charcoal dust is lost during transportation and improper storage (Knöpfler 2004); from preliminary anecdotal evidence a similar amount is lost in the current Angola charcoal chain.

<sup>30</sup> Concept Paper (draft), *Post-Conflict Angola: Climate Change, Deforestation and Charcoal*, Development Workshop Angola, 2013.

<sup>31</sup> Briquettes are compacted combustible material created from biomass residue, charcoal dust or coal dust and used as a form of fuel for heating or cooking. They are products of the densification process, which is a two-part process that involves compaction (reduction in volume) and binding (ensuring the product remains in the compacted state). No binders are required in some cases, for example when using wood waste, which is high in natural lignin. Clay, starch (e.g. rice flour, cassava flour, sweet potato paste), molasses and gum Arabic are common types of briquette binders

Most of the rural land in the *Planalto* is individually owned. While large farms (*fazendas*) are registered by the provincial administration, smaller land holdings owned by villagers are managed by customary law.<sup>32</sup> Due to lack of agricultural inputs, shifting cultivation and the absence of owners, people often work only a small portion of the available land. Commonage land that is not managed and used for agriculture is often used communally for charcoal production, hunting and grazing; thus resulting in over-exploitation and deforestation. A lack of sustainable incentives contributes to this problem; in communal lands there is little incentive to conserve forest, replant trees or practice low-impact harvesting techniques such as coppicing of trees to allow for regeneration. It is estimated that in Angola 100,000 people are involved informally and permanently in the activity of collecting firewood and production of charcoal. Only a small percentage of the charcoal trade is formalized. Most of the unsustainable use of biomass appears to come from cutting trees to make charcoal to supply peri-urban areas.

Although the natural *Miombo* forest has a considerable capacity of regeneration when left undisturbed for a certain period of time, it is now clear that the natural regeneration of Angola's *Miombo* woodlands is facing major challenges as regards soil degradation, competition with weedy species, and recurring disturbances (such as charcoal-making) which inhibit natural regenerative processes. Rapid deforestation in turn leads to increased soil erosion. Heavy rainfall on soils where vegetation has been processes activities. Rapid deforestation in turn leads to increased soil erosion. Heavy rainfall on vegetation that has been removed leads to increased movements of water down slopes concentrating into rills and then causing ravines which cut back into upland surfaces. Sediment from erosion is likely to be carried from these rivers and change the erosion-sediment balance lower down the basin or along the coast, which has further detrimental environmental impacts and underscores the wide-ranging impact that current charcoal practices are having on Angola's development trajectory.

**Problem Statement:** A high portion of Angola's final energy consumption is biomass -- particularly wood fuel in rural areas and charcoal in peri-urban areas -- and this is predicted to remain the case for at least another decade due to the unavailability of alternative fuels. Production of charcoal, which is growing annually due to the country's high urbanization rate, contributes heavily to deforestation and is a major emitter of greenhouse gases. Several current GEF-funded initiatives are working to promote more sustainable agriculture and forest management in charcoal-producing areas but other parts of the value chain remain extremely inefficient and disorganized, characterized by the use of highly inefficient charcoal production technologies and practices; lack of proper waste management (inefficient packaging and transport practices); and no product certification or differentiation at the retail level.

Nowhere is the impact from the charcoal sector more severe than in the central highlands, which have some of the highest deforestation rates in the country and are now the main production source for supply of charcoal to urban areas (namely Luanda and Benguela). At the same the charcoal sector currently provides one of the greatest opportunities to help to prevent emissions while fostering significant sustainable development benefits. Given that unsustainable biomass use is primarily a function of poverty and lack of alternatives, interventions need be undertaken in a coordinated way that deals with the full charcoal value chain. Unless Angola radically transforms its charcoal value chain into a less GHG-intensive model the continuous depletion of its valuable *Miombo* woodlands will continue unabated.

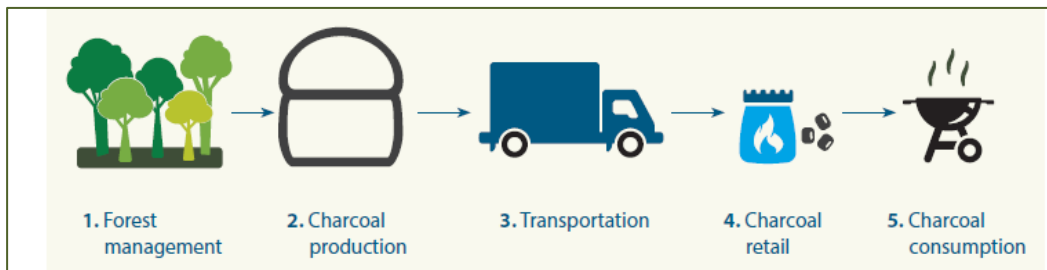
### ***Barrier Analysis – Root causes of the loss of forest area and lack of natural regeneration in Miombo woodlands***

Charcoal is the dark grey high-energy content residue consisting of carbon and ash particles obtained by removing water and other volatile constituents from biomass. It is produced by slow pyrolysis, which is the heating of wood or other substances in the absence of oxygen. Pyrolysis, or carbonization, is initiated by heating a pile of wood under controlled conditions in a closed space, such as a charcoal kiln, with a very

<sup>32</sup> See footnote 18

limited supply of air triggering endothermic and exothermic reactions. The biomass produces, as a result of the pyrolysis process, a mixture of gas, liquid and charcoal (Energypedia 2012). In most parts of Africa this process is usually carried out in traditional kilns. Once the charcoal has cooled, it is placed into bags and transported to retail centers, mainly in peri-urban and urban areas. Each component of the chain has a number of different actors and business model. A typical example of a Charcoal Value Chain is provided below.

**Figure 3 – Typical Charcoal Value Chain**



**Source: Nationally Appropriate Mitigation Action Study on Sustainable Charcoal in Uganda, UNDP, 2012**

As already mentioned, the charcoal value chain is one (but not the only) of the main drivers of deforestation of Angola’s *Miombo* woodlands and a large emissions source. More generally, the most common practices leading to the loss of forest area and lack of natural regeneration in *Miombo* woodlands are:

- (i) The opening of new land for agriculture;
- (ii) Inefficient production of charcoal and harvesting of wood fuel for domestic, commercial and industrial purposes and inefficient biomass cooking applications;
- (iii) Inefficient charcoal waste minimization and transport practices;
- (iv) Late burning and uncontrolled fires in the dry season;
- (v) Lack of reforestation;
- (vi) Uncontrolled logging of timber and over-harvesting of key species;
- (vii) Unsustainable agricultural methods; and
- (viii) Other land use practices, e.g. expansion of settlements.

The main barriers to development of a more sustainable low-GHG charcoal value chain in Angola (leading to less deforestation) can be summarized as follows:

**Barrier 1: Lack of data on the scope and severity of the charcoal trade, its characteristics and impacts**

Despite the fact that charcoal and wood fuel are the main source of energy consumption in the country, there is little mention of biomass energy in the PLANO DE ACÇÃO DO SECTOR DE ENERGIA E ÁGUAS 2013-2017 (the Energy and Water Sector Plan - 2013-2017), the main policy document guiding the development of the energy sector in the medium-term. Informality and lack of information often go hand in hand. Biomass energy data (supply and demand) is not included in national energy statistics collected and published by the Ministry of Energy and Water and most studies of the charcoal trade cover only selected areas of the country and are outdated. National emissions from charcoal production have not been quantified and the recently completed forest inventory does not specifically track land change trends driven by charcoal production. The country’s first national communication noted that “Due to difficulties to obtain concrete information, emissions derived from deforestation, soil and abandonment of deforested areas were not calculated (in the INC)”. At the same time the INC acknowledges that “To strengthen adaptation/mitigation capacities and management of climate risks, it can be said that the main challenges for Angola are at the knowledge, governance and lack of financial resources level.”

Knowledge of the role of biomass energy – particularly charcoal – and the importance of sustainable management and regulation of the sector in both protecting the environment and fostering local employment to



reduce poverty is extremely low in Angola. This is also compounded by weak institutional cooperation between the forestry department and energy stakeholders who operate in silos. Unless the use of fuel wood and charcoal is included (accurately) in national energy statistics and planning, the data on which decisions are made will be grossly distorted. The INC notes that: *“Without proper knowledge-based regulatory guidance, charcoal will continue to be produced in ecologically sensitive areas including wetlands, tropical forests, mangrove forests, riverine ecosystems and catchment areas at very low efficiency levels, resulting in environmental degradation including loss of biodiversity.”*

Moreover unless biomass is afforded equal status alongside other renewable and non-renewable energy technologies and monitored in a systematic fashion, it is likely that the market will be skewed to favor options that are perceived as ‘modern’ but are suboptimal for both citizens and the environment. There is an urgent need for a comprehensive national charcoal survey and regular monitoring of the biomass energy sector, as well as a standardized baseline<sup>33</sup> to account for current practices, emission factors and positive lists for fuel and technology switch. There is also a major need for increased knowledge among relevant government and provincial staff on best practices in sustainable biomass management, policies, incentives and applicable MRV systems.

**Barrier 2: Absence of Energy Efficient, Low-GHG Charcoal Production Technologies**

As already mentioned, the wood-to-charcoal conversion rate remains very low in Angola despite the availability of a wide range of improved charcoal production technologies in the region. The BAU practice in the country is the use of earth-mound and pit kilns with wood-to-charcoal conversion efficiencies ranging from 8-14%. Visits to Huambo during the development of the PIF revealed that in general at present charcoal in the *Planalto* is produced with little or no systematic planning that delineates suitable charcoal production zones or methods. Second-generation kilns (including the modified earth mound, Brazilian beehive, half-orange brick, drum and the Casamance kilns with higher efficiency rates) have only been piloted on a very limited basis.

The INC and other policy documents acknowledge the immediate and urgent need for improved low-GHG technologies for the forestry and biomass energy sector, particularly as regards charcoal production. The INC lists the following technology transfer needs of the forestry sector:<sup>34</sup>

Forestry
Forestry extraction
Seed production techniques
Energy production
Modern use of biomass and electric cogeneration
Technique for the promotion and carbonization of all forest species
Pyrolysis techniques and increase of stove efficiency
Development of new techniques for reduction of consumption and energy conservation
Reforestation of arid and semi-arid zones

**Barrier 3: Lack of Efficient Transport and Waste Utilization Applications in the Charcoal Value Chain**

In addition to a lack of technologies for improved charcoal production, there is also a lack of local production of charcoal briquettes obtained from the carbonization and agglomeration of biomass residues. As already mentioned field visits during the development of the PIF testified as to the large amount of wastage in the

<sup>33</sup> At the 73rd CDM Executive Board meeting, the standardized baseline (SB) methodology was formally approved as well as the related small scale methodology, allowing for significant simplification of the process to earn carbon credits from producing sustainable charcoal in Uganda. Similar SBs have been recommended to be undertaken in other countries. **SBLs can apply to both compliance and voluntary market carbon finance projects.**

<sup>34</sup> Angola’s First National Communication on Climate Change (INC), 2011

current charcoal value chain from inefficient packaging and transport. In other neighboring countries in SADC it is estimated that about 10% of the total charcoal sold in urban centers is discharged as charcoal dust (GVEP, 2010).

Stimulating the briquette markets is one intervention that constitutes supporting efficient use of biomass energy and is a major barrier to development of a more carbon-friendly charcoal value chain in Angola. Briquettes are compacted combustible material created from biomass residue, charcoal dust or coal dust and are used as a form of fuel for heating or cooking. Briquettes are widely viewed as substitutive or complementary to traditional biomass for cooking and heating purposes. Many machines have been developed for briquetting techniques on various scales worldwide. Low-capital solutions and small-scale technology have emerged in the informal sector in Eastern and Western Africa, while larger scale machinery is imported mainly from India.

There is tremendous potential to further transform the Angolan charcoal value chain in a more sustainable model and stimulate local employment via introduction of briquetting technologies for the agglomeration of biomass residues. This could apply to charcoal dust as well as bagasse residues (bagasse, which is readily available in the sugar-growing western zones of Angola, is also gaining prominence as a feedstock option for briquettes; Kenya is a prime example). The INC again recognizes this as a major constraint and in its section on the reform of the energy sector priorities the “*Establishment of financial incentive mechanisms (tax incentives, bonus interest rates to national companies etc.) for investments in environmentally friendly and highly efficient technology for the development of industry.*”

A recent major study on briquetting technologies in Eastern Africa<sup>35</sup> identified several barriers that need to be addressed in order to advance the briquette sector in Africa. The four main barriers identified in the report (which have applicability to Angola) are:

- Firstly, access to finance is a common and important barrier in the briquette sector. The initial outlay – especially for medium- to large-scale operations – is very high. As such, this limits the number of entrepreneurs who would venture into the business – especially when compared to other proven revenue-generating ideas.
- Secondary barriers include lack of lending experience, proven business models, financial management skills, as well as an inconsistency in profit generation. Secondly, technical expertise related to designing, manufacturing and operating briquette machines is limited across many countries in the region.
- Thirdly, a lack of knowledge on the supply and demand side dynamics limits design and innovation. Information creates the platform where innovation can be used to address issues and problems in a systematic manner. Information on raw material sources (type, availability, price, quality and quantity), as well as new markets beyond household charcoal use substitution will stimulate interest among local and international investors.
- Fourthly, legislation should facilitate and not prohibit private and public investment in cleaner energy solutions. Therefore, less regulation is better for the industry. Several policy gaps need to be addressed with regard to biomass energy production, distribution and use. A common example in Tanzania, Kenya and Uganda is the lack of clarity on which briquette types and producers require approval from the respective bureaux of standards before sale.

Finally, as regards transport practices and associated inefficiencies in the Angolan charcoal value chain another major problem is the current use of non-standardized sacks which are poorly made and not sealed during the transport process (leading to discharge of residues and massive wastage). Most charcoal transport sacks are sealed with cheap straw rope which often breaks.

**Barrier 4: Lack of Sustainable Land and Forest Management practices, including reforestation and**

<sup>35</sup> “Analyzing Briquetting Markets in Tanzania, Kenya and Uganda”, Camco Advisory Services (the report can be downloaded at [http://www.harvestfuel.org/wpcontent/uploads/2013/06/AnalysisReport\\_BriquetteMarkets\\_Final.pdf](http://www.harvestfuel.org/wpcontent/uploads/2013/06/AnalysisReport_BriquetteMarkets_Final.pdf)) The report was commissioned by the Energy and Environment Partnership Programme in Southern and Eastern Africa (EEP S&EA), an initiative of the Ministry for Foreign Affairs of Finland (MFA), Austrian Development Agency (ADA) and the UK Department for International Development (DFID). The study compares low-energy briquettes and high-energy briquettes with charcoal, kerosene and liquefied petroleum gas (LPG) in Tanzania, Kenya and Uganda.

### **production of renewable biomass for organized charcoal production**

Communities and private land owners will only manage their resources (land or woody vegetation) sustainably if they receive greater economic benefits from conserving forests than from degrading them. As already mentioned, a lack of sustainable incentives contributes to this problem; in communal lands there is little incentive to conserve forest, replant trees or practice low-impact harvesting techniques such as coppicing of trees to allow for regeneration. Charcoal production is often a by-product of unsustainable agricultural practices such as slash-and-burn which also promotes reduced fallow periods. These barriers are primarily being addressed via two GEF-funded projects: 1) **UNDP/GEF Project SLM Capacity Building in Angola** whose objective is to develop local capacity for SLM for key stakeholders, and mainstream SLM principles into national policies, plans and processes; and 2) **AfDB LDCF Project Integrating Climate Change into Environment and Sustainable Land Management Practices** which similarly builds off much of the foundational work done under the UNDP/GEF SLM Project (see Section A.4 for more information).

#### **Barrier 5: Lack of retail schemes to differentiate and prioritize sustainable charcoal products and absence of sustainable charcoal in the market**

At present almost all of the “formalized” (i.e. formally labeled and taxed) charcoal products sold in Angola (which is approximately 1-2% of the total charcoal sold) is imported; most charcoal is sold informally via informal sellers at open-air markets. The majority of charcoal sacks sold at supermarkets and retail outlets in Luanda and Benguela are imported from Namibia and are very expensive. Namibia’s charcoal is fairly organized at the producer level<sup>36</sup> and some of their products are marketed as having been produced in an environmentally-friendly way. However as noted in a recent major study on charcoal in Namibia, their charcoal sector is one of the least formalized sectors in Namibia with regard to labor and environmental issues so these claims are suspect.<sup>37</sup>

The Angolan charcoal industry suffers from an absence of a sustainable charcoal product produced locally in a certified sustainable way with verification of standards met at point of origin and adherence to a “fair trade” practice whereby consumers can pay a premium for charcoal produced in a more environmentally sustainable way. At present there are no sustainable charcoal certification schemes in the country and no separate labeling or marketing scheme for charcoal produced nationally in a more sustainable fashion; moreover there is no availability of briquetting products from charcoal residue. As such the broader challenge is that virtually none of the charcoal available in the market is produced in a certified sustainable way and what little formal charcoal products are sold are imported and are not subject to a verifiable certification scheme.

#### **Barrier 6: Absence of widespread uptake of energy efficient stoves and efficient biomass waste utilization (consumption-side)**

In addition to supply-side issues, the efficiency and safety of end-use technologies (e.g., more efficient charcoal stoves) and the lack of energy alternatives are key issues for the government to address in order to ensure sustainability of biomass and further reduce GHG emissions.

According to the latest data available,<sup>38</sup> wood and charcoal-burning stoves in Angola are inexpensive but generally not very energy efficient. A program to manufacture improved cook stoves in Luanda in the 1980s and early 1990s was halted when facilities were destroyed by the war in 1993. In 2003, the Institute of Forestry Development participated in a regional FAO program to review and improve charcoal production and charcoal stoves. New types of stoves were distributed to test performance and acceptability. While some models were found to be acceptable, they were generally found to be too small for the size of the typical Angolan family.

There are currently no national policies looking at improved stove programs in Angola. Experiences from some of the largest successful improved stove dissemination programs in the world (China, Kenya and India)

<sup>36</sup> The Namibia Charcoal Producers’ Association is a non-profit organization and is affiliated to the Namibia Agricultural Union. The Association deals with all charcoal related issues in Namibia.

<sup>37</sup> *Black Gold? Charcoal Production, Practices and Implications*, Ute Dieckmann and Theodor Muduva, Land, Environment and Development Project, Legal Assistance Centre, Windhoek, Namibia (2010)

<sup>38</sup> See Footnote #13



were be characterized by the following:

- They targeted regions with adequate interest, i.e. with fuel wood shortages or high charcoal prices, so that significant government subsidies were not necessary.
- Key stove components were produced centrally.
- Women's groups were used for stove dissemination in rural areas.
- Performance was evaluated through independent testing and monitoring, and designs were tailored to meet local conditions.
- Small enterprises were utilized to produce and market stoves in areas where users could afford to pay.

Factors that were found to limit the success of improved cook stove programs include:

- Absence of adequate training and support services.
- Lack of market research to determine concerns of the women who would be using the stoves.
- Lack of research into different cooking habits.

The rationale for choosing energy sources is fairly complex and certainly goes beyond the price and energy content considerations, although the two factors contribute the most towards informing energy choices. At household level, price, energy content, ash content, smoke and fumes, the available cooking appliance, availability of the fuel, type of food (meal) to be prepared and preparation time influence energy consumption options and patterns for cooking and heating applications. These choices rarely conform to the energy ladder model that projects a perfect substitution of one fuel for another as household income increases. Empirical evidence shows that a mixed use of energy sources is common even as household income levels increase (Masera, Saatkamp, & Kammen, 2000).

As part of the INC and NAPA the Angolan Government has invoked the need for public policies on science and technology that promote innovation. Mandates and activities related to science, technology and innovation (STI) are common to many Ministries in the central, and provincial governments, as well as in civil society organizations, where there are also different coordination mechanisms. This directive applies to the biomass energy sector and in particular there is a great need for further customized research and analysis on the best models and appropriate national policy for improved stove promotion and alternative energy use at the household level in an Angolan context. This barrier is now being addressed via a new proposed study and project by CODESPA (see baseline project #7).

Similarly on the supply-side, there is a need to better understand how best to promote the use of agricultural and forestry residues (biomass waste) for energy production. Much of Angola's small-scale industry was destroyed in the war, but the potential for using these residues for heat and power generation is considered to be very large and needs to be further analyzed.

### ***The baseline scenario and any associated baseline projects***

A variety of initiatives are underway by various actors to address the barriers mentioned. The major baseline activities of relevance to this project (excluding UNDP's baseline contributions which are highlighted in Section B.3) are as follows:

**Table 2. Summary Overview of all Relevant Baseline Activities**

#### **Baseline Project #1 – Ministry of Environment (MINAMB) – CC Unit and Provincial Staff**

As the lead government agency for climate change management and environmental protection, MINAMB is in process of developing the National Climate Change Program and also coordinates the Technical Multi-Sectoral Commission for the Environment (CTMA) created in 2000. They are the lead government coordinating agency on all climate change mitigation initiatives in the country and have provincial staff in all the areas targeted for intervention (as well as a national CC unit). They are working in cooperation with IDF, local NGOs and many community stakeholders as part of a collaborative effort to improve awareness of low-carbon technologies and improve integration of climate change considerations into economic development and forest management practices.

**Sub-total: USD \$2,000,000 indicative commitment (for the project period, including support for project management costs)**

**Baseline Project #2 – Ministry of Agriculture (MINADER) / IDF (Institute for Forest Development – Angola)**

IDF is the main government stakeholder working on sustainable forest management issues and practices. Most recently they have been working with FAO on completion of Angola’s first national forestry inventory since the Portuguese colonization period. Benguela, Huambo, Kwanza Norte and Kwanza Sul are scheduled for completion in March 2014. The aim of the inventory is to ascertain Angola’s potential in terms of forest resources, specifically flora and fauna, and their geographic location, as well as threats and trends. IDF is also working with many NGOs on field-level interventions in sustainable forest management and wood fuel production and utilization. Among others, they have recently developed a “Production Guide” and have been working on land titling for communities with FAO in Benguela and Kwanza Sul Provinces.

**Sub-total: USD \$1,500,000 indicative commitment from current budget allocation (for project period)**

**Baseline Project #3 – Ministry of Economy - The National Institute of Support to Micro, Small and Medium Enterprises (INAPEM) / Angola Investment Programme**

The Angolan government is reforming its private sector and has created a new institute, “*Instituto de Fomento Empresarial*”, to support medium to large enterprises while the *Instituto Nacional de Apoio a Pequenas e Médias Empresas (INAPEM)* has been restructured to focus on support for micro- and small enterprises. In 2011, it established a program directed at fostering entrepreneurship - “Programa de Fomento Empresarial” (PFE) or the Angola Investment Program. The PFE’s objectives are to reduce poverty and unemployment and to shrink the non-oil current account deficit by lowering import dependence. The PFE has a total budget of USD 700 million and aims to foster the creation of Angolan enterprises and provide subsidized credit. Under PFE legislation to support micro to medium enterprises with fiscal and financial incentives was established under the “*Lei das Micro, Pequenas e Médias Empresas*” which came into effect in 2012. A USD 30 million fund was created to specifically address the transformation of the informal economy in 2012.

**A key focus of PFE is to support informal sectors and formalize them through registration, licensing, training, capital grants for technology transfer and credit provision (matching them local banks).** A program is in place to integrate informal businesses into the formal economy through registration, improved credit access, the establishment of cooperatives and the recognition of micro-enterprises as legal entities. INAPEM has 183 offices throughout the country in almost all municipalities. Although INAPEM is not presently working with entities in the charcoal sector, the forestry and biomass sector have been discussed as potential key sectors for future support via PFE and INAPEM and they have expressed their strong interest to help formalize the charcoal sector via registration and licensing of charcoal producer associations and briquetting enterprises; provision of investment advisory assistance to those entities; and extension of credit and financial assistance for purchase of appropriate technologies.

**Sub-total: 3,000,000 USD<sup>39</sup> (2015-2019)**

**Baseline #4 – ADRA Angola (*Acção para o Desenvolvimento Rural e Ambiente*)**

ADRA is an NGO and independent, humanitarian agency established in 1991 that helps people without regard to age, ethnicity, gender, political or religious association. ADRA Angola has a long track record of supporting grassroots community development projects in Huambo Province and other parts of the *Planalto*. At present ADRA is implementing a sustainable forest management, energy and rural livelihoods project in the Municipality of Caála in Huambo Province, one of the areas with the highest deforestation rate in the country. The project takes place in the commune of Cuima in the *Aldeias* of Cachindongo, Sonjamba e Ndangala. The beneficiaries of the project are five (5) rural farmer associations and charcoal producer groups, comprised of some 476 families. The project is being implemented with different actors in the forestry sector including local IDF officials, MINAMB staff, the *OSC - Organizações da Sociedade Civil* and religious institutions.

Thus far the project (which is being done on a pilot basis) has resulted in the following achievements:<sup>40</sup>

<sup>39</sup> This is conservative assumption of potential funding that could be made available from the micro-enterprise fund administered by INAPEM’s Angola Investment Program to support project activities. The exact type and value of assistance from INAPEM to the project and its beneficiaries will be analyzed in detail at the PPG phase and provided at CEO Endorsement.

- 80 participants trained on compliance with the new law *National Policy of Forest, Wildlife and Conservation Areas (Política Nacional de Florestas, Fauna Selvagem e Áreas de Conservação Lei 120*
- 120 participants trained in climate-resilient and appropriate fire management
- 40 participants trained in the role of forests in environmental & climate change management and climate-resilient agriculture and soil conservation practices (conservation agriculture)
- 30 communities received training on silviculture management and Sustainable Forestry Management
- More than 60 members have been trained on improved charcoal production techniques (improved kiln construction) and several improved charcoal kilns (beehive kilns) have been piloted in selected sites.

**Sub-total: 200K USD (2014- 2016)**

#### **Baseline #5 – Development Workshop (DW) Angola (local NGO)**

Development Workshop has been working in Angola since 1981 at the national government’s request to assist in developing policies and programs for human settlements and self-help housing. Through the last decades, DW has adopted a strategy of supporting the emerging Angolan civil society and the process of local government decentralization while working closely with local community organizations. DW is the oldest NGO in Angola and worked for many years in the context of a protracted and complex humanitarian crisis. DW is engaged as a critical partner in the Government’s decentralization program in the areas of municipal participatory planning, environmental management (particularly around climate change issues) and land tenure reform. Their current program in Angola has parallel focuses on peri-urban communities where the provision of infrastructure, basic services and community economic development remains a major challenge. Much of their work has focused on Huambo Province and they recently published *Huambo: An Atlas and profile of Huambo, its environment and its people*, Development Workshop Angola (2013), which was compiled and published with funds provided by UNDP Angola through the GEF ELISA project and the Integrated Development Research Center (IDRC).

DW has recently developed a Concept Paper - “*Post-Conflict Angola: Climate Change, Deforestation and Charcoal*” (2013) that has as its objective “to contribute to understanding the trade in charcoal as it affects the Province of Huambo and deforestation in the Province, and to contribute to understanding of possible climate change impacts in Angola, particularly the Central plateau and areas immediately to the south.

They have expressed their strong interest in working with UNDP on the development and design of this project and the possibility of integrating their current work in Huambo with activities proposed under this project.

**Sub-total: USD 50,000 (2014-2016)**

#### **Baseline #6 – COSPE - Cooperazione per lo Sviluppo dei Paesi Emergenti / Cooperation for the Development of Emerging Countries (Italian NGO)**

COSPE, an Italian NGO, is currently implementing an integrated forest conservation project named “*Integrated Project for the Protection and Development of Angolan Coastal Forests*” or PIPDEFA. The project is divided into two phases; the first phase (which runs from 2011-2014) is funded by EU and the second one by Italian Ministry of Foreign Affairs (2014-2017). The main objective of the project is “*improve forests management in the Angolan coastal provinces, in line with national plans, international agreements and economic development of forest communities.*” The principal implementing partner of the project is IDF and the main locations of the interventions are the coastal provinces of Namibe, Benguela, Kwanza Sul and Bengo (first phase). COSPE is now working in Namibe, Bengo, K. Sul and Benguela. Their charcoal producer work is concentrated in Kwanza Sul. They have created a forest inventory to collect data and partnered with IDF for a baseline study. With the data they work with local producers of charcoal to create a Forest Management Plan with the producers, creating a participatory plan. They have created a new methodology of the “Annual Cutting Index,” which is adapted to the Miombe Forest, with support from University of Florence.

Starting from 2014 COSPE will concentrate the action in Benguela and Kwanza Sul provinces. The project intends to achieve its objective via support for three main components:

<sup>40</sup> Excerpt from PPT presentation to UNDP staff on ADRA “PROJECTO DE BOAS PRATICAS DE GESTÃO SUSTENTÁVEL DOS RECURSOS FLORESTAIS” (Pilot Project on Best Practices in Sustainable Forest Management) - Huambo, November 6, 2013

1. Reduction of deforestation in coastal provinces through a system of concessions for sustainable use of forest products, promotion of participatory forest management using participatory plans, support to alternative income generating activities for local communities, protection and sustainable use of traditional non-timber products;
2. Technical support and trainings to IDF, promotion of local community participation and provincial pilots actions in order to create good practices for forest management to be implemented through a national inter-sector policy for reducing deforestation and forest degradation (agriculture, protection and use of typical products, protection and management of the environment).
3. Identification of actions and programs to be funded under Payment for Ecosystem Services (PES) schemes through studies and consultation with stakeholders (MINADER – IDF, MINAMB, provincial and municipal administrations, local authorities and local communities) to ensure local ownership of forest resources management and perception of the value of forest resources.

The target groups for the interventions are IDF technical staff and community actors, more specifically:

- 50 technicians from IDF and other governmental institutions at provincial and national level
- 5 beekeepers associations for a total of 200 families and 1,000 people
- 5 forest and charcoal producer groups for a total of 500 families and 2,500 people
- 2 training institutes that gain improved professional capacities

There are great similarities in the approaches used in this initiative and the proposed GEF project and COSPE provided detailed technical comments during the development of the PIF.

**Sub-total: USD 4,000,000 total (2011-2017)**

#### **Baseline #7 – CODESPA (Spanish NGO)**

CODESPA – the Spanish NGO – has recently undertaken a series of studies and pilot programs focused on SFM and improved biomass energy management with communities in the Municipalities of Bailundo and Caala in the Province of Huambo. CODESPA is working with 17 cooperatives, 10 in Huambo and 7 in Bie, which includes 2,600 families (total budget of the project is USD 180K). A proposal was recently submitted from them to the OPEC Fund for improved cook stoves in Angola and JICA has expressed a preliminary interest in providing additional funding for this work.

CODESPA also plans to carry out three (3) value chain studies on biomass energy management in the next 12 months (approved budget of USD 55K) and assign an expert for one year (based in Angola). They worked with UNDP on the development of the PIF (providing detailed comments and recommendations).

**Sub-total: USD 235,000 (2014-2016)**

#### **Baseline # 8 – ADPP**

ADPP is an NGO that is heavily-involved in community capacity-building and micro- enterprise development projects in both Huambo and Kwanza Sul. They operate a series of Farmers’ Clubs, schools and “Projects for Economic Development” in both Huambo and Kwanza Sul. Students from their “Environment Promoter” line at their practical and theoretical school in Huambo (*Escola Polivalente e Profissional*) are trained in the various technologies and assist in community activities throughout Huambo, whilst the “Informação e Comunicação Social” students assist in community mobilization activities. Finally they run the Frontline Institute, a training center for coming project leaders, also in Huambo. They have expressed a strong interest to collaborate in field-level activities under this project.

MINFAM-related projects are currently negotiated on an annual basis, although ADPP and MINFAM have signed a protocol on operating projects until at least 2017. There are currently 1,250 members of the ADPP Project for Economic Development in Huambo, with a total budget of \$250K USD per year (through 2018). The Farmers’ Club Kwanza Sul is entirely financed by the Exxon Mobil Foundation (via ADPP), with an expected budget of USD \$262K up until 2018. ADPP’s schools in Huambo have an estimated budget of \$514K USD until 2018.

**Sub-total: USD 1,779,095 (from all sources) (2014-2018)**

**Total: USD \$ 12,764,095 (excludes UNDP co-finance mentioned in Section B.3)**

***The proposed alternative scenario, with brief description of outcomes and components of the project / Incremental cost reasoning and expected contributions from the baseline, the GEF TF and co-financing***

As noted in Table 2, many stakeholders (including several NGOs) are working with IDF and communities across wide areas of the *Planoalto* on various biomass energy management (improved charcoal production), SFM and rural development pilot projects. Other NGOs such as ADPP have developed unique training and community mobilization structures which could be harnessed for additional technology transfer scale-up while Development Workshop is now focusing its resources on developing activities related to climate change, deforestation and charcoal. New tools such as the “Annual Cutting Index” methodology have been developed and piloted in selected areas and the new national forestry inventory will provide a valuable baseline on the most current biomass stocks and areas of vulnerability. On the SFM side, as already mentioned, two GEF-funded projects are working to promote sustainable agriculture, sustainable grazing management and sustainable forest management both nationally (on a policy level) and in several parts of the *Planoalto* (see Section A.4). The UNDP/GEF SLM Enabling project is already working on national SLM and biomass policies and has as one of its outputs “Sustainable Land Management principles developed and guidance for systematic integration in relevant national policies, strategies and legal and regulatory framework available” (under this output the indicators include: SLM reflected in National Policies, Laws, Development & Investment Plans e.g. sustainable charcoal reflected in energy policy, a CBNRM policy adopted, etc.).

Meanwhile national stakeholders such as INAPEM have platforms and services that could be applied to the biomass energy sector and support charcoal producers and briquetting enterprises on a more commercial, formalized basis if the business models can be proven as viable, proper linkages established and enterprises registered, and awareness raised. Many of the current community-based initiatives are happening in a fragmented and ad-hoc manner with limited resources and scale-up; almost none of the activities are formalized and communities are not being linked to urban charcoal markets or receiving higher prices for their “green” products versus normal BAU charcoal products. A unique opportunity now exists to transform charcoal production in Angola into a more organized and sustainable business, thus enhancing its dual role as a source of livelihood for rural and urban populations and an affordable household energy option for urban households in the short- and medium term.

In light of the barriers mentioned and baseline initiatives, this project proposes a series of integrated interventions **mostly focused on value chains steps 2-4 of the charcoal value chain (charcoal production, transport and retailing)** – see **Figure 4**. Forest management (stage 1) is already being covered via other GEF projects supporting SFM capacity-building and schemes in the *Planoalto* (see Section A.4). An intervention to address charcoal consumption (stage 5) was also considered as part of the development of the PIF but CODESPA is already undertaking a study in this area<sup>41</sup> (and moreover stakeholders consulted felt that other parts of the value chain required more immediate attention in the short term and that the project should not spread its interventions across too many parts of the value chain). There was also the idea of supporting a government policy to promote the national use of agricultural and forestry residues for energy production but this was considered inappropriate at this stage. The issue of additional support for SFM activities and/or demand-side charcoal interventions will be re-visited during the PPG phase as a potential area of GEF support based on the latest status of the CODESPA proposal and stakeholder consultations (these options are listed in Annex B – *Alternative Scenarios Considered in PIF Development*).

Moreover the project’s focus on supporting improved charcoal production technology transfer is based on numerous studies that demonstrate that for areas where charcoal is a primary driver of deforestation (as is the case in Angola) the introduction of improved kilns is the most powerful tool in both reducing emissions and increasing forest cover. The results of a study by the World Bank<sup>42</sup> on the impacts of improved kilns in a Miombo woodlands context demonstrated that improved kilns were by far the most effective instruments in

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<sup>41</sup> Based on discussions with JICA, there is the possibility of an eventual small grant from JICA for improved cook stove activities (USD 100k).

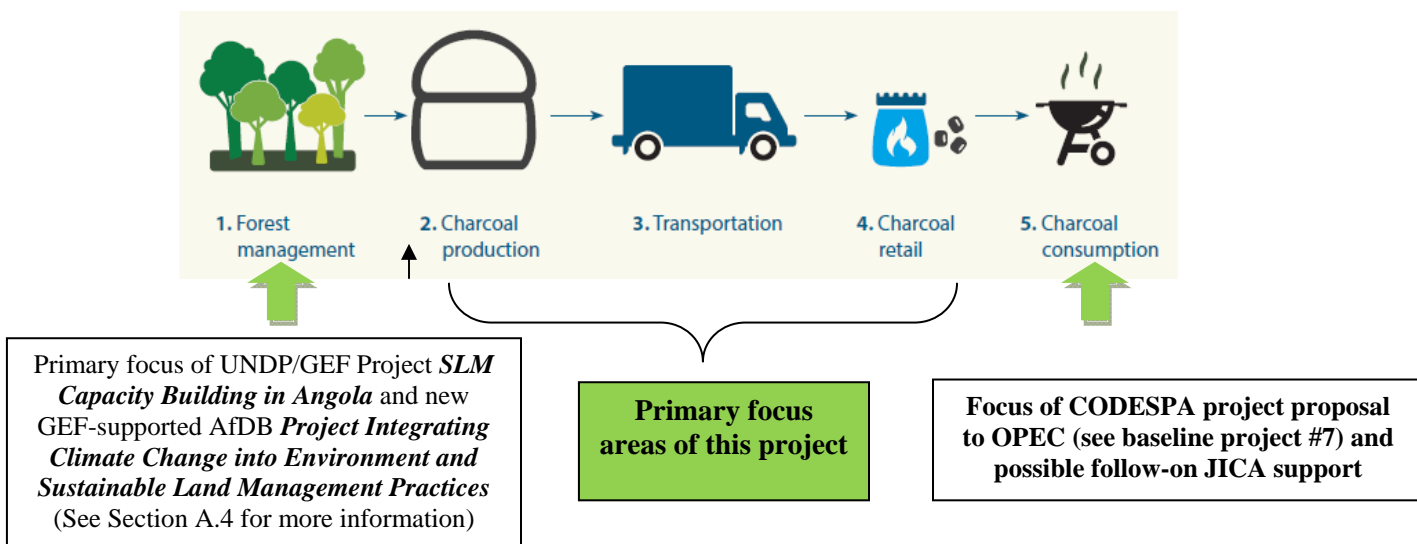
<sup>42</sup> *Environmental Crisis or Sustainable Development Opportunity? Transforming the charcoal sector in Tanzania* - A Policy Note, World Bank, 2009

improving forest cover compared to a business-as-usual scenario (see Annex E - *Emissions reduction impacts of improved kilns on forest cover*). The relatively larger impact of improved kiln technology and waste utilization technologies on avoided emissions from deforestation, compared to policy interventions on the consumption side, can be explained by the fact that production-side measures are not offset by population growth and, thus, have a more profound impact.

Finally as regards project design it is important to emphasize that the interrelationship between the different components of the project – and the inter-linkages between the different interventions/phases of the charcoal value chain (whether funded by GEF or other stakeholders) – must be considered in a holistic manner and seen in their entirety to understand why it’s essential to approach the problem via a comprehensive value chain approach to maximize mitigation benefits. Numerous studies have confirmed that the optimization of emission reduction benefits can only come from holistically addressing all parts of the charcoal value chain in an integrated manner; as one study notes: **“No single intervention, implemented alone, will have a significant impact on reducing deforestation. Rather, measures must be implemented together and in a mutually supportive manner along the supply-demand chain if tangible results are to be achieved.”**<sup>43</sup>

In this way the project is following established best practices and is integrated with and complementing a series of interventions across the full charcoal value chain. The primary intervention areas for this project (stages 2-4) are noted below:

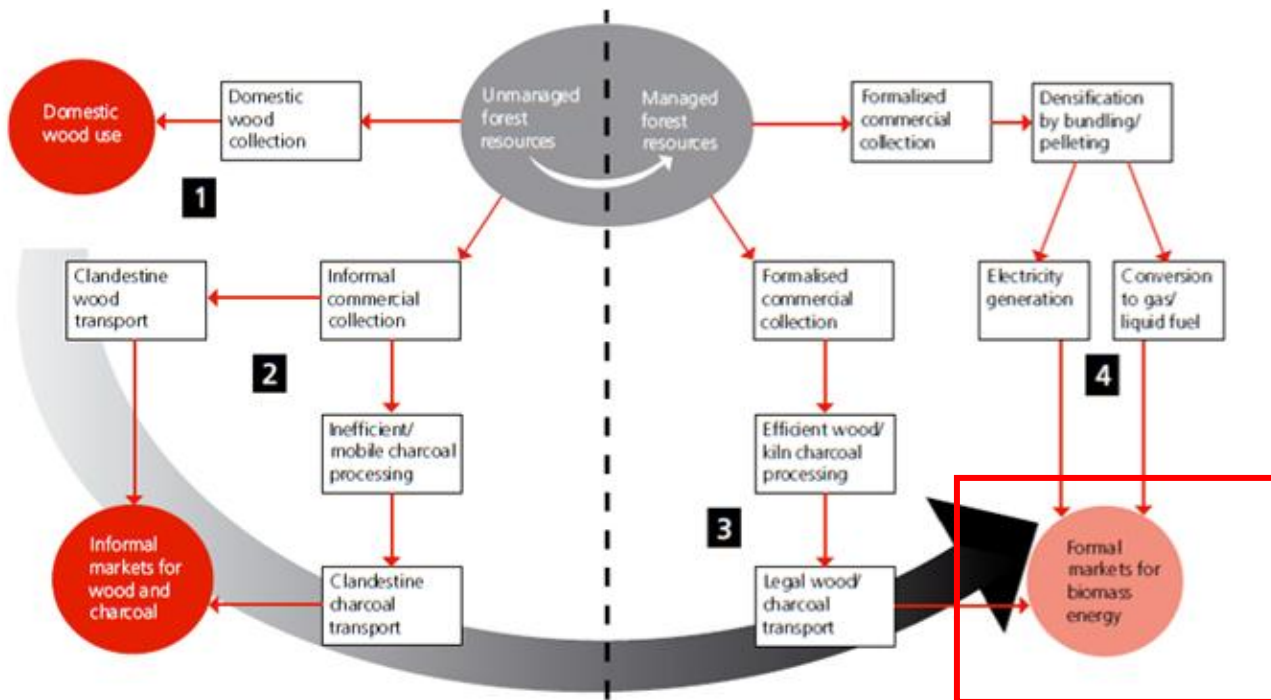
**Figure 4 – Charcoal Value Chain – Interventions by Stage**



The project and its associated baseline co-finance together seeks to transform the Angolan charcoal value chain from a version of the scenario described in the left side of Figure 5 (unmanaged and informal) to a version of the scenario described on the right side (managed, sustainable and formalized).

<sup>43</sup> Ibid

Figure 5 – Woody Biomass Energy Production showing desirable transition stages



Source: (2011) *Bundles of energy: The case for renewable biomass energy*, IIED

While this project does not propose the development of a sustainable charcoal NAMA, the design of the interventions and the proposed MRV system draws heavily on the UNDP Nationally Appropriate Mitigation Action Study on Sustainable Charcoal in Uganda (which can be downloaded at <http://www.undp.org/content/undp/en/home/librarypage/environment-energy/mdg-carbon/NAMA/>). That study also focused on stages 2-4 of the charcoal value chain and was a key reference point for the development of this project.

### *Description of Components*

The project has **four inter-related components**:

#### **Component 1: Biomass data collection and institutional strengthening of biomass energy stakeholders**

This component will seek to achieve the following outputs:

- National charcoal survey conducted and standardized baseline report completed, including mapping of areas of production and consumption and organizations involved in charcoal trade (using a value chain approach)
- Biomass data information and statistics (collected under Output 1.2) mainstreamed into annual energy statistics collected by the Ministry of Energy and Water (MINEA) and national energy planning mechanisms
- Biomass energy information hosted in an appropriate IT database with mechanism in place to ensure it is updated and maintained post-project
- Completed assessment study of charcoal production-related environmental, economic and social impacts with recommended action plans for vulnerable areas
- Framework agreement for institutional coordination on biomass energy policies and charcoal regulation developed between MINAMB, IDF and MINEA covering both upstream and downstream biomass energy issues
- Trainings conducted for relevant government and provincial staff on best practices in sustainable biomass

management, policies, incentives and MRV systems

- Exchange visits and stakeholder participation in regional community of practice and knowledge exchange platforms on sustainable charcoal issues in the Miombo Eco-region

This component will be the first set of activities in the project (year 1) and will support key data collection platforms and improved coordination and mainstreaming of biomass energy data into national energy planning mechanisms, as well put in place frameworks for institutional coordination on sustainable charcoal. The component will fund a national charcoal survey and customized standardized baseline (SBL) for Angola, replicating the SBL recently approved by the UNFCCC for Uganda<sup>44</sup>.

As regards GEF support for Output 1.3 on the biomass energy database, at PPG phase negotiations will be held between MINAMB, IDF and MINEA and a specific plan will be agreed upon (with a corresponding commitment of resources) as to who will be responsible for hosting and updating the database post-project. This output will not be included in the final project document submitted for CEO Endorsement unless there is a specific agreement and commitment by the government to regularly update and maintain this database post-project.

The output on “*Framework agreement for institutional coordination on biomass energy policies and charcoal regulation developed between MINAMB, IDF and MINEA covering both upstream and downstream biomass energy*” has been included because although the GEF SLM Enabling Project is focused on planning coordination and knowledge exchange related to SLM stakeholders, coordination on biomass energy is a minor component. Government and energy stakeholders recommended that a specific output on institutional coordination among biomass energy policies and charcoal regulation be included in this project to complement parallel efforts supported by the SLM project but with a more concrete focus on mitigation.

This component will also increase the general national knowledge of best practices in sustainable charcoal production and biomass energy management in the country and put in place the MRV mechanisms that will apply to all project activities as regards tracking GHG emission reductions, but also as applied to all similar interventions across the country. Finally it will allow for Angolan stakeholders to be connected with similar platforms, policies and sustainable charcoal initiatives that are underway in neighboring countries (many of which are being supported by GEF) so they can learn from these other initiatives and be part of a broader network of regional stakeholders committed to changing biomass energy value chains in the Miombo ecosystem (see Section A.4 on other GEF-related initiatives in this area and Section B.3 for UNDP-supported work on sustainable charcoal).

## **Component 2: Dissemination of appropriate technologies for sustainable charcoal production (improved kilns) and efficient combustion**

This component will seek to achieve the following outputs:

- Sensitization campaign conducted with relevant provincial stakeholders and community groups on

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<sup>44</sup> At the 73rd CDM Executive Board meeting, the standardized methodology for sustainable charcoal in Uganda (SSC methodology, AMS-III.BG: Emission reduction through sustainable charcoal production and consumption) was approved and will for the first time provide an opportunity to earn VERs for switching from non-renewable to renewable biomass in improved kilns. The new SSC methodology and recently submitted standardized baseline (SB) pave the way for further carbon market activity for improved charcoal production by providing a strong basis for Measuring, Reporting and Verification (MRV). In particular, the SB provides strong and conservative assumptions with regard to the yield and carbon flows in the baseline production which project activities will build upon. The SBL for Angola can be developed following the Uganda model. The standardized baseline methodology and new SSC charcoal methodology approved – AMS-III.BG: Emission reduction through sustainable charcoal production and consumption – applies to both voluntary and CDM projects. Compliance methodologies are widely employed in the voluntary carbon market creating VERs (Voluntary Emission Reduction Units). These projects use the same methodology and benefit from standardized baseline, but have their projects approved and registered under appropriate voluntary certifying bodies including the Verified Carbon Standard (VCS), Gold Standard (GS), and CarbonFix Standard. This project will support a SB for Angola that can be used to facilitate carbon finance and offsetting via VERs. **No GEF funds will be used to support any compliance-based carbon finance activities.**



importance of sustainable charcoal technologies and practices

- Minimum sixty (60) sustainable charcoal producer associations (CPAs) selected from existing NGO-supported groups across 8 municipalities in targeted Provinces. (TA)
- All CPAs selected will be legally registered as micro-enterprises according to regulations of the Angola Invest Programme (*Programa Angola Investe*)
- Dissemination of approximately 200 Casamance kilns and 80 retort (or other) kilns to target CPAs
- Training of 60 CPAs on sustainable charcoal practices and improved kiln technologies, as well as group reporting, book-keeping and compliance with certification standards (established under Component #4)
- MRV, tracking and licensing system established for all improved kilns piloted and mapping completed of all targeted areas receiving kilns to track decrease in forest cover loss relative to baseline parameters (TA)
- National model scheme for commercial financing for charcoal producing groups (a partnership with INAPEM and local financial institutions) proposed and in place by the end of project (TA)

This component provides GEF seed funding for the roll-out of appropriate technologies (i.e. improved kilns) for sustainable charcoal production in at least eight (8) selected charcoal-producing *municípios* (municipalities) in 1-2 target Provinces (selected from among Huambo, Benguela, Kwanza-Sul and/or Huila). As already noted the selection of the target areas will be done during the PPG phase based on more in-depth consultations with NGO stakeholders and the SLM project team and a more detailed assessment of the most suitable structures available on the ground.

After groups are identified and sensitized they will all be formally registered according to the criteria established by INAPEM's Angola Investment Programme. Thereafter GEF funds will be used to purchase and disseminate the equipment for two hundred (200) Casamance kilns<sup>45</sup> to the relevant producer groups and groups will be trained in their use. In addition, eighty (80) retort kilns<sup>46</sup> will be distributed to more commercially-oriented charcoal producer groups who might have access to transport or be located adjacent to woodlots (the criteria for the kiln selection is adopted from the methodology used in the Uganda charcoal NAMA study – please see Annex A for kiln criteria). Criteria will also be established for the expected in-kind contributions of chosen producer groups who receive the technologies. It is expected that the subsidization of the technologies will start at 100% for the first batch of technologies piloted and slowly decrease over the project period as the proof of concept is demonstrated and CPAs show increased revenue and profits. In line with the sliding subsidy, all CPAs receiving the technologies will be asked to provide a pre-determined financial contribution for a certain percentage of the asset cost (the level of subsidy will be further analyzed and defined at PPG phase).

Customized trainings will be done on proper utilization and maintenance of the retort kilns, as well as group reporting and book-keeping. All groups will need to adhere to the IDF licensing requirements (see footnote 28) and will become part of the certification scheme under component #4, with direct access to specialized urban market retailers. MRV, tracking and licensing system will be established for all improved kilns piloted to ensure they are replacing inefficient practices and to track their emission reduction impacts. It is expected that the profit margin per output unit of charcoal produced by the groups with the new more efficient technologies will increase by a TBD % per group (with new kilns) as compared to baseline scenario for all participating charcoal cooperatives (this will be verified). Financial statements and records of sale will be kept for all groups and monthly aggregate charcoal production and sales by all groups within a municipality will be recorded. Much of the work with the groups will build on and follow the structures and platforms already established by the various NGOs listed in the baseline section and work done by the UNDP/GEF SLM project (see section A.4).

The broader aim of GEF support for these technologies is that sustainable charcoal is recognized as a viable

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<sup>45</sup> A full overview of the different types of kilns is provided in the UNDP NAMA study (already cited).

<sup>46</sup> Or beehive kilns; the type of kiln to be disseminated will be identified during the PPG phase.

MSME in the targeted provinces by end of project and for post-project sustainability. As such the final output of this component will be the establishment of a national model scheme for commercial financing for charcoal producing groups (a partnership with INAPEM and local financial institutions) proposed and in place by the end of project. INAFEM's Angola Investment Programme already has a national structure in place to support informal sectors and formalize them through registration, licensing, training, capital grants for technology transfer and credit provision (matching entrepreneurs with local banks). However what is needed is to create a customized national platform for financial assistance and advisory support (hosted at INAPEM) that is specifically customized to charcoal-based enterprises (such as the types supported by this project) so that post-project other interested groups can access training and commercial finance on a sustainable on-going basis to purchase similar technologies and scale-up the business models on a national level. The details of this output will be further developed during the PPG phase during which local banks will be identified who would be willing to work with the project and INAPEM to establish such a scheme (co-finance from financial partners will be provided at CEO Endorsement).

### **Component 3: Dissemination of charcoal briquetting machines to enterprises in selected peri-urban areas of Luanda and/or Benguela**

This component will seek to achieve the following outputs:

- Feasibility study and mapping of the best locations and production capacity for briquetting from charcoal dust production and/or other base sources in Luanda and Benguela (TA)
- Twenty (20) charcoal briquetting enterprises formally established, incorporated, trained and operational across selected peri-urban areas of Luanda and/or Benguela. Activities under this output will involve:
  - 1) Participatory mapping and consultations to identify, rank and select entrepreneurs for assistance
  - 2) Legal formation of all enterprises as micro-enterprises according to regulations of Angola Invest Programme (Programa Angola Investe)
  - 3) Training of all enterprises on briquetting practices, technologies and business models (including financing options)
- Dissemination of approximately 40-50 briquetting machines to selected enterprises targeted for assistance (INV)
- MRV, tracking and licensing system established for all machines piloted to monitor production and sales, as well as ensure compliance with certification scheme (linked to Component #4)
- Briquetting support platform integrated into Angola Invest Program for replication of support services and provision of commercial finance to enterprises post-project (TA)

This component will include activities that are quite similar to Component #3 as regards technology transfer and capacity-building but for charcoal briquetting enterprises. There are two main types of briquettes –carbonised and uncarbonised – produced by the application of two different processing techniques. Carbonised briquettes are made from biomass sources that have been processed through partial pyrolysis (such as charcoal) whereas uncarbonized briquettes can be used from agricultural waste such as sugarcane, corn cobs and stalks, banana leaves, vetiver, sorghum stalks, coconut husks, cassava flour and millet stalks. Hereafter, they are mixed with a binder (often cassava), cast into appropriate shapes through pressing and finally dried. This project will likely focus on support for carbonised charcoal briquettes made from charcoal fines (found at transport depots and charcoal wholesaler locations in peri-urban and urban markets) that would otherwise be discarded as waste; however the potential for uncarbonized briquettes will also be analyzed at PPG phases.

The first activity in this component will be a detailed feasibility study and mapping of the best locations and production capacity to introduce and promote briquetting from charcoal dust production in Luanda and Benguela (the potential of uncarbonized briquetting will also be considered). This will be followed by a series of related activities to identify, capacitate, formalize and transfer the required briquetting technologies to a selected number of briquetting entrepreneurs in either Luanda or Benguela. The type of briquetting machines to be disseminated will be analyzed as part of the f/s. The four main types of briquetting machines are the low-pressure presses (or

manual presses), piston presses, screw presses and the roller presses (see Annex D). The type that is most likely to be applicable to this project is the screw press. Screw presses use one or more screw devices that force the processed briquettes through a die and out of the machine as a continuous, often cylindrical briquette. The taper die is commonly heated, releasing briquettes that are carbonised on the exterior and have a hole in the middle for better combustion during final use. A screw press typically has the capacity to produce 150 kg of briquettes per hour and costs between US\$1,000 and US\$2,000. All enterprises receiving the briquetting machines will be monitored and become part of the certification scheme under component #4, with direct access to specialized market outlets. The same type of sliding subsidy model (decreasing over time) as proposed under Component #2 for the kilns will apply to beneficiaries of GEF INV under this Component. In line with the sliding subsidy all enterprises receiving the technologies will be asked to provide a pre-determined financial contribution for a certain percentage of the asset cost (this will be further analyzed at PPG phase). Finally an important output under this Component – mirroring what has already been mentioned for charcoal producers – will be the establishment of a national platform for financial assistance and advisory support to briquetting-based enterprises post-project (to be hosted at INAPEM and working with local financial institutions).

#### **Component 4: Sustainable charcoal and briquetting certification and marketing scheme at selected retailers in Luanda and Benguela**

This component will seek to achieve the following outputs:

- Feasibility study conducted on development of a “green charcoal” certification scheme to source and market charcoal produced under Component #2 to 2-3 selected retail outlets in Luanda and Benguela
- Feasibility study conducted on development of a market outlet for the sale of charcoal briquetting products supported under Component #3
- Based on recommendations from F/S, pilot fair trade “green charcoal” product sourced and available for sale to the public at 2-3 retail outlets in Luanda and/or Benguela with packaging requirements and source tracking system in place (point of origin)
- Market survey conducted at end of project assessing consumer reception and competitiveness of “green charcoal” and briquetting concepts and potential for scale-up
- Sensitization campaign for consumers on “green charcoal” and “green briquetting” products and impacts of unsustainable charcoal production
- Establishment and operationalization of a national certifying entity with funding committed for its operation post-project

As regards the importance of GEF funding for Component #4 as noted in the Uganda NAMA study “None of the actors in the charcoal value chain (at presently) have any incentive to produce or promote the use of ‘green’ charcoal.” Therefore a key step in transforming the current charcoal value chain involves understanding the type of incentive structure that can be created to encourage the various actors to gradually shift towards the use of green charcoal and this includes retailers developing market outlets and product differentiation schemes that will reward charcoal producers from shifting to green charcoal. This is critical to charcoal producers and briquetting enterprises being able to establish themselves as viable MSMEs.

This component will support a variety of activities (beginning with a feasibility study) with the aim of establishing Angola’s first certified green charcoal and briquette retail product at selected supermarkets in Luanda and Benguela. Based on the f/s a pilot fair trade “green charcoal” scheme will be launched whereby the products from the CPAs and briquetting enterprises supported under Component #2 and #3 will be sourced and available for sale to the public at 2-3 retail outlets in Luanda and/or Benguela with packaging requirements and source tracking system in place (point of origin). The exact business and sourcing model will be developed on a preliminary basis during the PPG phase and on a more in-depth basis as part of the f/s. **It is important to emphasize upfront that GEF support for Outputs (4.3-4.6) will be conditional upon positive outcomes from these feasibility studies demonstrating that there is a verified market interest in certified sustainable charcoal and/or briquetting schemes and that customers would be willing to pay a “market premium” for such products on a scale that would make the scheme viable. Moreover stakeholder consultations at the**

**PPG phase should identify retailers that are willing to support and invest in the scheme (which means that they would provide co-financing commitments at CEO Endorsement). Only under these circumstances will this component be included in the project at CEO Endorsement.**

Consumer labeling systems will be developed for both charcoal and briquetting products and a sensitization campaign will be undertaken for consumers. Given that briquettes are a new product segment in the Angolan market, a simple labeling system (based on energy content) will be developed along the lines of the generic grading system schematic mentioned below:

**Figure 6 – Example of a simple briquette grading system<sup>47</sup>**

Type	Definition	Energy Content	Colour Code
Grade A	High-Energy	>20 MJ/Kg	Red
Grade B	Medium-Energy	15-20 MJ/Kg	Orange
Grade C	Low-Energy	<15 MJ/Kg	Yellow

Finally an important output of this component will be the establishment and operationalization of a designated national certifying entity that will continue to monitor and oversee the certification scheme post-project. The certification and retail scheme will closely follow the one proposed in the Uganda NAMA study. As with the case of conditions for GEF support for Output 1.3, this output will not be included in the final project document submitted for CEO Endorsement unless there is a specific agreement and commitment by the government to fund the designated national certifying entity on a recurring basis.

***Incremental cost reasoning and expected contributions from the baseline, the GEFTF and co-financing***

A summary of the business-as-usual (BAU) scenario, incremental activities funded by GEF, and linkages to baseline investments is provided below in Table 3, disaggregated by Component.

**Table 3: Project Activities and Incremental Reasoning**

BAU Scenario	Incremental Activities (GEF Project Outputs)	Incremental Reasoning vis-à-vis Baseline
<b>Component 1: Biomass data collection and institutional strengthening of biomass energy stakeholders</b>		
<ul style="list-style-type: none"> <li>- National emissions from charcoal production have not been quantified and the recently completed forest inventory does not specifically track land change trends driven by charcoal production</li> <li>- No standardized baseline/default values for charcoal in Angola</li> <li>- No biomass energy database exists and biomass energy is not included in national energy statistics and planning</li> </ul>	<ul style="list-style-type: none"> <li>- National charcoal survey conducted and standardized baseline report completed, including mapping of areas of production and consumption and organizations involved in charcoal trade (using a value chain approach)</li> <li>- Biomass data information and statistics (collected under Output 1.2) mainstreamed into annual energy statistics collected by the Ministry of Energy and Water (MINEA) and national energy planning mechanisms</li> </ul>	<p>GEF-funded activities will incrementally build on current data collection and institutional coordination efforts by MINAMB, IDF, Development Workshop, COSPE and UNDP.</p> <p>As regards GEF support for Output 1.3 on the biomass energy database, at PPG phase negotiations will be held between MINAMB, IDF and MINEA and a specific plan will be agreed upon (with a corresponding commitment of resources) as to who will be responsible for hosting and updating the database post-project. This output will not be included in the final project document submitted for CEO Endorsement unless there is a specific</p>

<sup>47</sup> Source: see footnote 38

<ul style="list-style-type: none"> <li>- Knowledge of the role of biomass energy – particularly charcoal – and the importance of sustainable management and regulation of the sector in both protecting the environment and fostering local employment to reduce poverty is extremely low in Angola, both at national and provincial levels</li> <li>- Weak institutional cooperation between the forestry department and energy stakeholders who operate in silos.</li> <li>- Limited engagement of Angolan stakeholders with other neighboring country stakeholders who are facing similar challenges</li> </ul>	<ul style="list-style-type: none"> <li>- Biomass energy information hosted in an appropriate IT database with mechanism in place to ensure it is updated and maintained post-project</li> <li>- Completed assessment study of charcoal production-related environmental, economic and social impacts with recommended action plans for vulnerable areas</li> <li>- Framework agreement for institutional coordination on biomass energy policies and charcoal regulation developed between MINAMB, IDF and MINEA covering both upstream and downstream biomass energy issues</li> <li>- Trainings conducted for relevant government and provincial staff on best practices in sustainable biomass management, policies, incentives and MRV systems</li> <li>- Exchange visits and stakeholder participation in regional community of practice and knowledge exchange platforms on sustainable charcoal issues in the Miombo Eco-region</li> </ul>	<p>agreement and commitment by the government to regularly update and maintain this database post-project</p> <p>As already noted the SLM Enabling project is already mainstreaming SFM management principles into national policies, plans and processes. This project will be integrated with those policies.</p>
<p><b>Component 2: Dissemination of appropriate technologies for sustainable charcoal production (improved kilns) and efficient combustion</b></p>		
<ul style="list-style-type: none"> <li>- Improved kilns have only been piloted on small-scale and ad-hoc basis across <i>Planoalto</i>; most charcoal producers are using traditional technologies (earth mound kilns, pit kilns or equivalent open-end technologies) solely made of branches and soil. They do not incorporate parts made of metal and/or masonry</li> <li>- Value chain approaches are being done in certain areas (e.g. CODESPA) but without national dissemination</li> <li>- Most charcoal producers are</li> </ul>	<ul style="list-style-type: none"> <li>- Sensitization campaign conducted with relevant provincial stakeholders and community groups on importance of sustainable charcoal technologies and practices</li> <li>- Minimum sixty (60) sustainable charcoal producer associations (CPAs) selected from existing NGO-supported groups across 8 municipalities in targeted Provinces.</li> <li>- All CPAs selected will be legally registered as micro-enterprises according to regulations of the Angola Invest</li> </ul>	<p>GEF-funded activities will incrementally build on current field-level activities by MINAMB, IDF, INAPEM, ADPP, COSPE, CODESPA, ADRA and UNDP.</p> <p>This component will build off and scale-up the community-level activities described in Table 1 being done by NGOs such as COSPE, ADRA, CODESPA and ADRA.</p> <p>As mentioned the selection of the two provinces and 8 municipalities for targeting will be done during the PPG phase based on more in-depth consultations with NGO stakeholders and a more detailed assessment of the most suitable structures available on the ground. The areas for targeting will be presented at CEO Endorsement. During the PPG phase</p>

<p>not formally registered as micro- or small enterprises; there is (as yet) no access to commercial finance for CPAs</p> <ul style="list-style-type: none"> <li>- Only a limited number of producers have been trained on compliance with the new law National Policy of Forest, Wildlife and Conservation Areas (Política Nacional de Florestas, Fauna Selvagem e Áreas de Conservação Lei 120</li> <li>- No standardized tracking system in place to monitor communities using improved charcoal technologies and practices</li> <li>- Low knowledge of best practices in sustainable charcoal production</li> </ul>	<p>Programme (Programa Angola Investe)</p> <ul style="list-style-type: none"> <li>- Dissemination of approximately 200 Casamance kilns and 80 retort (or other) kilns to target CPAs</li> <li>- Training of 60 CPAs on sustainable charcoal practices and improved kiln technologies, as well as group reporting, book-keeping and compliance with certification standards (established under Component #4)</li> <li>- MRV, tracking and licensing system established for all improved kilns piloted and mapping completed of all targeted areas receiving kilns to track decrease in forest cover loss relative to baseline parameters</li> <li>- National model scheme for commercial financing for charcoal producing groups (a partnership with INAPEM and local financial institutions) proposed and in place by the end of project</li> </ul>	<p>detailed consultations will be undertaken with the project stakeholders of the UNDP/GEF Angola SLM project to ensure that groups targeted for assistance are in areas where stakeholders have already received training on SLM good practices and norms under the Angola SLM project.</p> <p>Moreover the co-finance of the relevant provincial authorities will be done once the areas are selected during the PPG phase and presented at CEO endorsement. The same will apply to co-finance provided by the communities targeted.</p> <p>As already mentioned the last output will be a partnership between the INAPEM, provincial authorities and local banks; the co-finance of the local financial partners will be provided at CEO ER</p>
<p><b>Component 3: Dissemination of charcoal briquetting machines to enterprises in selected peri-urban areas of Luanda and/or Benguela</b></p>		
<ul style="list-style-type: none"> <li>- From informal site visits during the PIF development stage there is a huge amount of charcoal fines that are lost during production, transport and retail</li> <li>- From informal stakeholder consultations done during PIF development stage charcoal briquetting technologies are not well-known in Angola</li> <li>- INAPEM's PFE program has no focus on support for biomass energy entrepreneurs or enterprises</li> </ul>	<ul style="list-style-type: none"> <li>- Feasibility study and mapping of the best locations and production capacity for briquetting from charcoal dust production in Luanda and Benguela (TA)</li> <li>- Twenty (20) charcoal briquetting enterprises formally established, incorporated, trained and operational across selected peri-urban areas of Luanda and/or Benguela.</li> <li>- Training of all enterprises on briquetting practices, technologies and business models (including financing options)</li> <li>- Dissemination of approximately 40-50</li> </ul>	<p>GEF-funded activities will incrementally build on current field-level activities by MINAMB, INAPEM, COSPE and UNDP.</p> <p>A determination of whether the interventions will be focused on areas of Luanda or Benguela (or both) will be done during the PPG phase (based on more in-depth consultations with stakeholders and a more detailed assessment of the most suitable structures available on the ground) and presented at CEO Endorsement.</p> <p>The PIF development phase did not allow us to conduct an assessment of the possible enterprise-based support platforms in the two cities that could be identified for collaboration with the project (as regards selection of beneficiaries). This will be done during the PPG phase. The co-finance of the enterprises to receive assistance will also come at CEO ER.</p>

	<p>briquetting machines to selected enterprises targeted for assistance</p> <ul style="list-style-type: none"> <li>- MRV, tracking and licensing system established for all machines piloted to monitor production and sales, as well as ensure compliance with certification scheme (linked to Component #4)</li> <li>- Briquetting support platform integrated into Angola Invest Program for replication of support services and provision of commercial finance to enterprises post-project</li> </ul>	<p>As already mentioned the last output will be a partnership between the INAPEM, provincial authorities and local banks; the co-finance of the local financial partners will be provided at CEO ER</p>
<p><b>Component 4: Sustainable charcoal and briquetting certification and marketing scheme at selected retailers in Luanda and Benguela</b></p>		
<ul style="list-style-type: none"> <li>- No differentiation at retail or wholesale level between sustainable charcoal and charcoal produced using inefficient methods</li> <li>- No price incentives or market premium for green charcoal producers or briquetting enterprises</li> <li>- At present almost all of the “formalized” (i.e. formally labeled and taxed) charcoal products sold in Angola (which is approximately 1-2% of the total charcoal sold) is imported and does not come from certified sources; most charcoal is sold informally via informal sellers at open-air markets.</li> <li>- No tracking in place for retailers to trace where the charcoal was produced</li> <li>- No market survey or data as to potential viability or consumer interest in “green charcoal”</li> <li>- No direct relationship between charcoal producers and retail outlets – all charcoal sold to retail outlets is through importers or middlemen</li> <li>- No certification entity in</li> </ul>	<ul style="list-style-type: none"> <li>- Feasibility study conducted on development of a “green charcoal” certification scheme to source and market charcoal produced under Component #2 to 2-3 selected retail outlets in Luanda and Benguela</li> <li>- Feasibility study conducted on development of a market outlet for the sale of charcoal briquetting products supported under Component #3</li> <li>- Based on recommendations from F/S, pilot fair trade “green charcoal” product sourced and available for sale to the public at 2-3 retail outlets in Luanda and/or Benguela with packaging requirements and source tracking system in place (point of origin)</li> <li>- Market survey conducted at end of project assessing consumer reception and competitiveness of “green charcoal” and briquetting concepts and potential for scale-up</li> <li>- Sensitization campaign for consumers on “green charcoal” and “green briquetting” products and impacts of unsustainable charcoal production</li> </ul>	<p>GEF-funded activities will incrementally build on current field-level activities by MINAMB, IDF and UNDP. The involvement and selection of the retailers will be done at PPG phase and presented at CEO endorsement, together with their co-financing contributions.</p> <p>It is important to emphasize upfront that GEF support for Outputs (4.3-4.6) will be conditional upon these feasibility studies demonstrating that there is a verified market interest in certified sustainable charcoal and/or briquetting schemes and that customers would be willing to pay a “market premium” for such products on a scale that would make the scheme viable. Moreover stakeholder consultations at the PPG phase must identify retailers that are willing to support and invest in the scheme (which means that they would provide co-financing commitments at CEO Endorsement). Only under these circumstances will this Component be included in the project at CEO Endorsement.</p> <p>As with the case of conditions for GEF support for Output 1.3, Output 4.6 will not be included in the final project document submitted for CEO Endorsement unless there is a specific agreement and commitment by the government to fund the designated national certifying entity on a recurring basis.</p>

Angola for “green charcoal”	- Establishment and operationalization of a national certifying entity with funding committed for its operation post-project	
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**Global Environmental Benefits**

On a national basis the calculation of CO2 emissions and removals from land use changes and forestry (as per the INC) is primarily based on the following main activities: 1) Forestry conversion; 2) Use of biomass; and 3) Abandonment of harvested land. Total emissions from these activities for the reference year (2005) were 1,907,000 tCO2 eq per annum. As noted in the INC: “Emissions were calculated essentially by the deforested area corresponding to the use of wood by direct burning and for production of vegetal coal, as well as information on planted eucalyptus forests. Due to difficulties to obtain concrete information, emissions derived from deforestation, soil and abandonment of deforested areas were not calculated.”

As previously noted, from an emission perspective (and assuming the fuel stock is non-renewable) the main problem with baseline BAU charcoal production is the low conversion efficiency of the wood used as both fuel and feedstock for the pyrolysis process. The ratio between the mass of charcoal obtained and the mass of biomass used for its production (ideally expressed on an oven-dry basis) is called the charcoal yield. As mentioned previously, the efficiency of traditional kilns is between 8% to 15% percent while efficiency can be increased to as high as 30% to 42%. A second problem associated with the production of charcoal is the production of methane during the pyrolysis gases. Depending on the source, between 0.027 and 0.045 tons of methane are emitted per ton of charcoal produced in a BAU scenario (Müller and Michaelowa 2011). Under the systems boundary of the BAU scenario we assume that no “associated upstream emissions” occur.

Direct emission reductions for this project will primarily come from the introduction of improved kilns and the briquetting machines. For interventions focused on improved yields without fuel/feedstock switch, the wood consumption avoided is the quantity of wood which would have been consumed for the incremental quantity of charcoal produced thanks to the higher achieved yield. The end result is reduced deforestation or forest degradation. As regards the improved kilns to be introduced, the emission reduction targets are therefore based on wood savings (converted to energy savings) and methane capture (as regards the retort kilns) calculated over the lifetime of the assets and compared to a Business-As-Usual (BAU) wood use scenario during the same period.

For the improved production technologies (Component #2) we are assuming for this project that the fuel wood for the kilns comes from non-renewable biomass; therefore ERs are calculated from improved carbonization only. If the kilns are fed with sustainable biomass and improved carbonization is applied then the impact on forest stocks would be zero. A preliminary calculation of the ERs from the improved kilns is based on the following preliminary assumptions:

1)	BAU is the earth mound kiln
2)	<p>BAU parameters; At this point we do not have specific baseline data for Angola (the amount of wood used per batch of charcoal produced, the fraction of non-renewable biomass, the carbon content in the wood used - expressed on an oven-dry wood basis, etc) which would allow us to calculate a net calorific value and ratio of the amount of wood needed to produce a unit of charcoal in the targeted areas under a BAU scenario (yield).</p> <p>As such we have used yield values taken from the Uganda MFA project; using inefficient methods produces charcoal yield of between 80 kg to 150 kg from 1,000 kg wood giving an efficiency ratio of between 8% to 15%. We have used a conservative average efficiency rate of 10% for earth mound kilns on all the BAU calculations.</p>
3)	In the targeted areas with the support of GEF funds traditional charcoal-making facilities are replaced by: 1) 80 high-yield, low-emission retorts each with an average yield of 350 to 400 kg of charcoal from 1000kg of wood



	(dry basis), which is equivalent to 35 – 40 % efficiency; and 2) 200 casamance kilns, each with an average yield of 200kg to 250 kg of charcoal from 1000kg of wood giving an efficiency ratio of 20% to 25%. <b>All preliminary calculations for the mitigation scenario have been based on 35% efficiency for the retort and 25% for the casamance.</b>
4)	Based on field studies, each retort is capable of producing 350 kg to 400 kg of charcoal in each batch process with a 30-hour batch duration. Each retort therefore has an average annual production of 24 tons of charcoal; for Casamance it is about 10 (9.6) tons of charcoal.
5)	Optimized charcoal production from use of retorts can entirely avoid the emissions of CH <sub>4</sub> from pyrolytic gases resulting from traditional processes. Avoiding CH <sub>4</sub> emissions through such a technology represents an emission reduction of roughly 3.5 tCO <sub>2</sub> e per ton of charcoal of produced (Pronatura 2009). These methane-based ERs have been applied to all retorts piloted.
6)	Retorts have an average lifetime of 15 years but can stay longer as they are made of fired bricks and as long as metal plates are replaced; Casamance kilns have an average lifetime of 5 years. These are the assumed lifetimes for the kilns for the direct ER calcs.
7)	For each retort, total losses (i.e., production facility, charcoal transport, and distribution to consumers) do not exceed 5 percent.

Based on these parameters the GEBs from the improved kilns are as follows:

Activity	Global Environmental Benefits
<b>Improved Kilns (Component #2)</b>	<p>The introduction of improved and more energy efficient carbonization technologies will lead to the following GEBs:</p> <ul style="list-style-type: none"> <li>- Wood usage is reduced by 252,000 MT over the asset lifetimes (15 years) from use of improved kilns compared to BAU scenario</li> </ul> <p>Lifetime energy savings of :</p> <ul style="list-style-type: none"> <li>- 737,280,000 MJ for Casamance kilns (avoided emissions of <b>84,326 tCO<sub>2</sub>eq</b>) ; and</li> <li>- 3,291,428,571 MJ for retort kilns (avoided emissions of <b>376,457 tCO<sub>2</sub>eq</b>)</li> <li>- additional lifetime avoided methane emissions for all retort kilns introduced of <b>63,000 tCO<sub>2</sub> eq</b></li> </ul> <p>Total direct lifetime emissions avoided of <b>523,784 tCO<sub>2</sub>eq</b></p> <p>Note: To avoid double counting there is need to account for the fact that not all the GHGs removed from the biomass as part of the charcoal production process is released immediately; some of the carbon is retained in the form of charcoal to be combusted and accounted for at the end user level which is outside the scope of this project. These emission reductions are only for wood savings in the carbonization process and do not account for all net emissions in the charcoal chain or end use combustion.</p>

As regards the introduction of the briquetting machines (Component #3), these will also result in wood savings (and therefore less deforestation). We do not yet have the detailed data as regards the energy content (grade), type and annual production of the briquettes produced from the machines to be piloted but based on some preliminary assumptions we can estimate the emission reductions as follows:

Activity	Global Environmental Benefits
<p><b>Briquetting Machines (Component #3)</b></p>	<p>The introduction of briquetting machines using charcoal fines (wastage) will result in more charcoal being produced (to meet aggregate national demand) in an energy efficient manner with less deforestation.</p> <p>We can estimate the avoided emissions based on the following preliminary assumptions:</p> <ul style="list-style-type: none"> <li>- As noted in Output 3.4 (Dissemination of approximately 40-50 briquetting machines to selected enterprises targeted for assistance) we can assume a lower estimate of 40 machines piloted under the project.</li> <li>- We assume that the machines piloted are screw press machines with a production capacity of 150 kg/hour. Assuming (conservatively) that each machine operates 6 hours per day for 200 days/per year that is an aggregate production of 180,000 kg per machine per year or 7.2 million kg from all presses per year.</li> <li>- We can assume (conservatively) that the briquettes produced from the machines are of low-medium quality and have an energy content value of 15 MJ/kg.</li> <li>- Given that each machine has a lifetime of 15 years, total aggregate production of the 40 machines piloted is estimated at 108,000 tons over 15 years. Applying the energy content factor of 15 MJ/kg results in 1,620,000,000 MJ of energy savings for all machines piloted which translates into total direct avoided emissions of <b>185,288 tCO<sub>2</sub>eq</b>.</li> </ul>

The emission reduction calculations for the briquetting technologies will be further analyzed in detail during the PPG phase depending on the choice of machines and data collection at the targeted sites. These will be presented at CEO Endorsement.

As regards the cost-effectiveness of CCM funds, the direct lifetime GHG emission reductions from the deployment of improved carbonization technologies (kilns and briquetting machines based on a combined total of **709,071 tons CO<sub>2</sub>eq** of avoided deforestation) will result in a cost of avoided CO<sub>2</sub> emissions for the GEF grant of USD \$6.5 per ton CO<sub>2</sub> avoided or reduced. **The emission reduction calculations will be further refined during the PPG phase.**

***Innovativeness, sustainability and potential for scaling up***

*Social Sustainability:* The project’s main target beneficiaries are charcoal producers, rural communities, briquetting enterprises, retailers, financial institutions, land owners and government stakeholders. For the project to be successful these groups must directly experience the benefits of the project in order for them to champion the project strategy and be the primary agents of change at the local level in terms of ensuring a paradigm shift towards sustainable charcoal. The project has dedicated substantial resources to capacity building efforts to overcome barriers to adoption of new technologies and management practices, and has also brought on board many partners with extensive experience working with these stakeholders who will continue to work in these communities post-project.

*Financial Sustainability:* Given the immaturity of improved kiln and briquetting technologies in Angola at this time and the current disorganized nature of most current charcoal production practices, it was decided that these technologies were not yet ready for full commercialization from the project onset and it would be more appropriate for them to be piloted with GEF support with communities and enterprises with a sliding subsidy incorporated over time. However the inclusion of Output 2.7 (National model scheme for commercial financing for charcoal producing groups/partnership with INAPEM and local financial institutions) and Output 3.6 (similar scheme for briquetting enterprises) will ensure that by the end of the project the subsidization models are replaced by commercially-based financing platforms that can be scaled up on a national basis.

The sustainable development benefits of the project are expansive. The organization and improved effectiveness and efficiency of the charcoal value chain will result in a significant decrease in deforestation in the targeted areas and if the interventions prove successful there will be tremendous opportunity for scale-up. Reduced deforestation will result in environmental benefits such as improved soil conditions and improved waterway conditions from decreased runoff. Further benefits are improved forest health and decreased air pollution as improved kilns can significantly reduce air pollution as the smoke produced is partly burned off during the carbonization process (Adam 2009). From the economic point of view, the project will result in fairer payment for charcoal producers and increased tax revenue from license fees for the municipality. From a social point of view, health conditions will improve due to decreased air pollution and due to shorter cooling times in improved kilns, workers will see a decrease in time spent on production (Adam 2009).

Women will be heavily involved in the project across all components, particularly components #2 and #3. Women are often the wholesale buyers of charcoal and also the end-customers, essentially constituting the “face” of consumers. The research and development on briquette sizes, types of machines for piloting and compatibility with cooking appliances must directly engage women. Furthermore, the marketing and promotion of briquettes has to target women and it is likely that many of the briquetting enterprises will be women-owned and operated.

**A.2. Stakeholders. Identify key stakeholders (including civil society organizations, indigenous people, gender groups, and others as relevant) and describe how they will be engaged in project preparation:**

The specific roles and responsibilities of the different stakeholders in the project are described below and will be further elaborated during the PPG phase:

**Table 4. Summary Overview of Stakeholder Roles and Responsibilities**

Stakeholder	Role in Project
Ministry of Environment (MINAMB)	<p>Lead agency responsible for overall coordination and execution of all components. The MINAMB’s Organic Statute (approved by Government Order 201/10) establishes that among the National Environmental Directive’s competencies are: i) Promoting and coordinating the development of policies, programs and actions for the control and reduction of GHG emissions; ii) Adopting and promoting strategies to educate citizens about the environment; and iii) Participating in and conducting studies and programs to collect environmental indicators that would contribute to the equilibrium and quality of the environment.</p> <p>At the national level MINAMB’s CC unit will</p>

	<p>oversee implementation of the project together with the support of the new National Directive of Environmental Technology (DNTA) (the entity within MINAMB responsible for the transfer of technology necessary to deal with climate change). Provincial MINAMB staff will sit on the provincial-level technical coordination committees (see below). Given that MINAMB has limited field-level capacity, it is highly likely that they will use a Responsible Party (RP) modality<sup>48</sup> and delegate either an NGO or another ministry to execute components #2 and/or #3 on their behalf. The implementation structure will be fully elaborated at CEO Endorsement.</p>
<p>Ministry of Agriculture and Rural Development (MINADER) / IDF (Institute for Forest Development – Angola)</p>	<p>IDF is the main government body dealing with woodfuels. Created in 1989 and located within the Ministry of Agriculture and Rural Development, the IDF’s responsibilities are to define, monitor and control the sustainable exploitation of forest and animal resources. IDF will be a key partner of the project in Components #1 and #2 and will sit on the PSC.</p>
<p>Ministry of Economy - The National Institute of Support to Micro, Small and Medium Enterprises (INAPEM)</p>	<p>INAPEM will be a key project stakeholder (particularly as regards Components #2, #3 and #4) and oversee all registration and formalization activities linked to their PFE program. Moreover INAPEM will likely be the host of the sustainable financing and advisory support platforms developed under Outputs 2.7 and Output 3.6. A full elaboration of INAPEM’s role in the project will be done at the PPG phase.</p>
<p>CETAC (Centro de Ecologia Tropical e Alterações Climáticas)</p>	<p>To be determined at PPG phase</p>
<p>Ministry of Energy and Water (MINEA)</p>	<p>MINEA is responsible for policy formulation regarding household energy consumption (with an emphasis on electricity), while MINADER is responsible for charcoal production and fuel wood supply. MINEA is also responsible for collecting and disseminating energy statistics in Angola and serves as a clearing house for energy information sent to international bodies. MINEA will be a key project stakeholder, particularly as regards Component #1. The biomass energy information collected under the project will be hosted by them and they will mainstream this into their national energy statistics going forward. A framework agreement for institutional coordination on biomass energy policies</p>

<sup>48</sup> As per UNDP NIM guidelines, a Responsible Party is defined as an entity that has been selected to act on behalf of the Implementing Partner on the basis of a written agreement or contract to purchase goods or provide services using the project budget. In addition, the Responsible Party may manage the use of these goods and services to carry out project activities and produce outputs. All Responsible Parties are directly accountable to the Implementing Partner in accordance with the terms of their agreement or contract with the Implementing Partner. Implementing Partners use Responsible Parties in order to take advantage of their specialized skills, to mitigate risk and to relieve administrative burdens. The following types of organizations may act as Responsible Parties: UNDP, other UN agencies, Government agencies, IGOs, CSOs and private firms.

	and charcoal regulation will be developed between MINAMB, IDF and MINEA covering both upstream and downstream biomass energy issues.
Ministry of Commerce; Ministry of Industry; Ministry of Family (Ministério da Família e Promoção da Mulher)	The role of these two line ministries will be determined at PPG phase following further stakeholder consultations.
Provincial Governments of Huambo, Huila, Kwanza-Sul and Benguela Provinces	The provincial governments of the two (2) provinces selected for targeting will be key project stakeholders and will oversee the relevant Provincial-level Technical Coordination Committees
ADPP	Key stakeholder; possible RP for component #2 (TBD at PPG phase)
ADRA	Key stakeholder; possible RP for component #2 (TBD at PPG phase)
CODESPA	Key stakeholder; possible RP for component #2 (TBD at PPG phase)
Development Workshop Angola	Key stakeholder for knowledge-sharing and community engagement
COSPE	Key stakeholder; possible RP for components #2 and #3 (Benguela) (TBD at PPG phase)
Retailers in Luanda/Benguela	Beneficiaries and stakeholders for Component #4
Charcoal producers	Charcoal producers are the ones who benefit the least from the current charcoal economy and are the most important actors in shifting production techniques from BAU to green charcoal. The producers can be incentivized to undertake this shift to green charcoal through higher income generation potential. As the charcoal producers constitute the “poorest of the poor”, the incentive of a significantly higher, stable and assured source of income is expected to be a key driver to shift towards green charcoal use. CPAs will be beneficiaries and stakeholders for Components #1, #2 and #4.
Entrepreneurs in Luanda and/or Benguela	Beneficiaries of Component #3
Stakeholders from other GEF-funded projects	Key stakeholders to be consulted during the PPG phase; the integration/linkages between SLM project stakeholders and the stakeholders identified under this project will be analyzed in detail at PPG phase.

The project will be guided in its technical work by a multi-stakeholder Project Technical Committee (PTC), chaired by MINAMB (or a designate). The composition of the PTC will be inclusive of public and private sector representatives, representatives of research institutions, University, NGOs and civil society, as well as interested and collaborating donors; where appropriate members of the National Climate Change Committee (NCCC) will be part of the PTC. As the Project Board oversees the management of the project, the functions of the PTC will be mainly technical.

Provincial-level Technical Coordination Committees will also be formed and will coordinate the provincial level planning, implementation and M&E of the sector/local level activities. The Governor of the relevant Province selected (or his/her delegate) will chair the Committee.

The project will benefit from the experience obtained through implementation of the SLM project, including the involvement of consultants in key base studies, training and capacity building expertise created, and the implementing capacity acquired by the project management team.

**A.3 Risk. Indicate risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the project design (table format acceptable):**

Risk	Rating	Mitigation
The type of kilns proposed could prove to be unsuitable for the designated areas; semi-industrial charcoal kilns may only be a viable option in large-scale, plantation-based production enterprises; and modern, stationary kilns may not be viable if the woodlots are not well-established and managed.	M	This is noted and the kiln selection will follow the criteria described in Annex A and will build on past experiences and lessons learned from IDF and NGOs working in the <i>Planoalto</i> who have already worked with certain kiln types. If retort kilns are not deemed to be suitable for the context they will be replaced with other suitable technologies.
The introduction of improved kilns in charcoal-producing areas with large areas of standing forest could actually create a perverse incentive whereby efficiencies incentivize more production of charcoal rather than replacement of inefficient methods and reduced pressure on forests.	M/H	This risk has been mitigated by the project's close attention to registration, certification and MRV issues that will be rigorously applied to all CPAs who receive assistance. All groups receiving support from the project will be closely monitored not only by the project but also by the participating stakeholders (NGOs, IDF, etc).
As regards the potential of the standardized baseline making it easier to develop carbon finance projects in this area, a project risk is the possible collapse in demand for carbon credits or a drop in the carbon prices. This will reduce the attractiveness of utilizing the SBL.	L	<p>With regards to the carbon finance component, the control of the carbon markets is beyond the scope of this project but every indication is that market demand for VCS VERs from LDCs (and Africa in particular) will continue to grow. Moreover the latest findings from the <i>Forest Trends' Ecosystem Marketplace. State of the Forest Carbon Markets 2013 Report</i> testify as to the attractiveness of any potential VERs issued under this project. That report states that:</p> <ul style="list-style-type: none"> <li>- The average price of Africa-based forest carbon offsets remained strong in 2012, rising 18% to \$7.2/tCO<sub>2</sub>e, as buyers continued to show interest in projects that can successfully establish their co-benefit credentials. This is expected to continue in the future (post-2013).</li> <li>- The report noted that "Smallholder-led sustainable agriculture and sustainably-managed energy production (e.g., charcoal production) that reduce pressure to forested areas were also priced slightly higher than other activities."</li> <li>- The report noted that Sustainable Energy projects (the type of project to be developed in this case) attracted an Average VER Price (\$/tCO<sub>2</sub>e) <b>of US \$7.6 tons</b>, the third highest price by category among Transacted Forest Carbon Credit Types and Buyers.</li> </ul> <p>Source: Forest Trends' Ecosystem Marketplace. State of the Forest Carbon Markets 2013.</p>
Several NGOs consulted on the design of the PIF noted the challenge of implementing a project with intervention areas scattered over a very wide territory	H/M	This is noted. The selection of the provinces and target areas will be done in such a way that the municipalities are not spread out over too large an area and every effort will be made to ensure they are adjacent to each other to streamline implementation. A full analysis of the lessons learned and SWOT of working in the different

<p>It is worth considering either reducing the number of provinces involved or the distance between beneficiary communities inside a province. They advised that it would be more effective to work with adjacent communities in order to increase the impact and ease the management of the intervention.</p>		<p>provinces mentioned will be done with all local stakeholders (NGOs) at the PPG phase. Moreover the modalities for how the project will work with the different communities and areas will be a key consideration in the project design and will be fully elaborated at CEO Endorsement.</p>
<p>Various factors have to come together simultaneously to support technology transfer. The technology has to be adaptable to the local communities' preferences, affordable and accessible. The financing options for the uptake of the technology transfer component post-project will have to be carefully assessed, as will maintenance issues.</p>	<p>M</p>	<p>This is noted and that is why in the case of the improved kilns so much effort has been placed on building off existing structures and platforms already in place via the work of IDF and NGO partners. INAPEM is a key stakeholder as regards providing financing options post-project and ensuring that mechanisms are in place to support the enterprises established. As regards briquetting, for this reason the first step will be detailed f/s and mapping that will examine how best to establish the enterprises and transfer the technologies in line with market conditions and consumer preferences; the same measured approach applies to the retail scheme.</p> <p>Finally this is one of a host of projects focused on improved charcoal and technology transfer that UNDP is supporting in the region and best practices and lessons learned from other countries and projects will be shared with this project to ensure that there is continual learning and incorporation of best practices. The Uganda MFA project in particular will serve as an important test case for these technologies and feedback from that project will be incorporated into the final project design of this project.</p>

The Project's Overall Risk Level is High/Medium. A full assessment and mitigation strategy of all project risks will be done at the PPG phase.

#### **A.4. Coordination. Outline the coordination with other relevant GEF financed and other initiatives:**

The proposed project will avoid duplication and seek to find synergies with the various other GEF-supported projects and programs in the country, particularly the initiatives mentioned below which are not included as baseline activities but nonetheless have strong linkages with the proposed project activities. There is a donor coordination framework in the natural resource and environmental sector in Angola and meetings are held periodically where donors share knowledge and experience on their respective interventions in the sector. As regards the FAO and AfDB LDCF projects mentioned below, UNDP Angola is in regular contact with their multilateral and UN counterparts in the country as regards planning complementary activities between the different projects and documenting lessons learned and knowledge management. As regards national projects, collaboration will be done via communications with the responsible entities mentioned below and the entities will be invited to participate in stakeholder consultation meetings and be consulted as regards project design during the PPG phase.

In Angola UNDP has been the Implementing Agency of the **UNDP/GEF Project SLM Capacity Building in Angola** whose objective is to develop local capacity for SLM for key stakeholders, and mainstream SLM principles into national policies, plans and processes. That project recognizes deforestation as a growing problem, driven by a number of factors including the demand for charcoal for energy both in rural and urban areas; forest clearing for expanding agriculture to compensate for the infertile soils; forest fires (partly for clearing land for cultivation, and partly for creating grazing lands to compensate for the overgrazing in pasturelands); and logging for timber. The project acknowledges that the forest production system is intimately interlinked with the unsustainable use of biomass based energies in Angola, and thus energy provision is a key issue and challenge to post-war Angola.

Although the SLM project has been promoting sustainable agriculture, sustainable grazing management and sustainable forest management – particularly with sensitization and capacity development in SLM issues in the project area (including Huambo and Kwanza Sul Provinces) – the issue of biomass energy is well beyond the scope of the project; hence the rationale for this project as a response to addressing many of the broader challenges identified during that project’s implementation. During the PPG phase detailed consultations will be undertaken with the project stakeholders of the UNDP/GEF Angola SLM project as regards the possibility of downstream project activities supported under this project (such as improved kiln dissemination) being piloted among groups that have already received training on SLM good practices and norms under the Angola SLM project.

Another new national GEF project with strong linkages to this project is FAO’s LDCF Project *Integrating and up-scaling climate resilience through soil fertility management into agricultural and agropastoral production systems for food security in key productive and vulnerable areas through the Farmers Field School approach*. The project location is also Angola’s Central Plateau and the project aims to meet the climate change adaptation needs of the agro-pastoral sectors in the Central Plateau as established in the NAPA and increase the resilience of small farmers to cope with declining ecosystems services (and especially sustainable crop production and diversification) due to increasing climate variability, droughts, and extreme events. During the PPG phase detailed consultations will be held with FAO to ensure harmonization of results and collaboration and determine whether the groups supported under this project can be integrated with FAO’s FFS approach (such a model is being piloted between UNDP and FAO in Uganda where the ranking and formation of charcoal producer associations in targeted sites are building off those community-based groups already formed and supported by FAO’s Agro-Pastoralist & Farmer Field Schools).

Finally the project will seek synergies with new GEF-supported AfDB LDCF Project *Integrating Climate Change into Environment and Sustainable Land Management Practices* which similarly builds off much of the foundational work done under the UNDP/GEF Project *SLM Capacity Building in Angola*. Among other activities, under Component #2 of that project “four (4) pilot sites in Namibe, Kuando-Kubango, Huambo and Cabinda [will be selected] to demonstrate and promote synergy and best practice in sustainable land-use management, biodiversity conservation, conservation adaptation to climate change and the use of environmental clean technologies.” The adaptation practices and technologies to be piloted in the agro-forestry sector include natural regeneration techniques, rangelands and agro systems rehabilitation practices, wind breaks and dune stabilization methods, water efficiency and harvesting techniques. That component will also build a mapping tool that will identify vulnerable areas and potential investments and CC technologies that can be “extrapolated” to those areas. This project will work closely with AfDB to ensure that all project activities in *Planoalto* Provinces realize maximum synergies and that technology dissemination approaches supported by the respective projects use a common approach.

On a regional level, this project is one of a number of sustainable charcoal projects developed by UNDP in Africa (together with related policy initiatives supported by other parts of UNDP) and supported by GEF that are designed to transform the biomass energy sector in various countries and reduce pressure on the region’s *Miombo* woodlands (these initiatives are described under Section B.3). Two UNDP/GEF projects in the region that are part of this strategic portfolio and which are of particular relevance as regards linkages with this project include:

**UNDP/GEF Uganda MFA Project *Addressing barriers to the adoption of improved charcoal production technologies and Sustainable Land Management practices through an integrated approach*** – This project – which was recently approved by GEF – has as its objective “to secure multiple environmental benefits by addressing the twin challenges of unsustainable utilization of biomass for charcoal and poor land management practices common in Uganda’s Woodlands.” Many of the project components and activities proposed for this project are informed by the development of that project which also adopts a value chain approach and includes similar activities (customized for a Uganda context) such as development of a national charcoal survey and standardized baseline; establishment and training of charcoal producer associations in targeted areas; dissemination of Casamance and retort kilns and briquetting machines; and support for green charcoal certification schemes.



**UNDP/GEF Zambia LDCF PIF Promoting climate resilient community-based regeneration of indigenous forests in Zambia's Central Province** – This project is also focused on *Miombo* woodlands and has as its objective “to increase the rate of forest regeneration and promote climate-resilient adaptation practices among forest-dependent communities in Zambia’s Central Province.” Under Component # 3 a variety of energy efficient charcoal production and wood-saving technologies are targeted for piloting, including improved kilns and charcoal or sawdust briquetting machines. That project is now at PPG phase and although an adaptation project has strong synergies with this project.

The UNDP/GEF RTA responsible for development of that project is similarly responsible for these two projects and therefore will ensure linkages are formed and lessons learned are shared during both the design phase and during implementation. One of the reasons for Output 1.7 (*exchange visits and participation in regional community of practice platform on sustainable charcoal issues*) is to ensure structured regional knowledge sharing between stakeholders involved in this project and other GEF-funded initiatives in neighboring countries (such as the two projects above), as well as exposure to platforms such as the new NEPAD (UNDP-sponsored) African Sustainable Charcoal Policy Framework and the regional community of practice on charcoal supported by UNDP’s Regional Bureau for Africa’s Regional Environment Project.

## **B. Description of the consistency of the project with:**

### **B.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NCSAs, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.:**

Angola has made addressing climate change a national priority – acknowledged at the highest levels – as evidenced by the following steps:

- Adopted the UNFCCC in 2000 and Kyoto Protocol in 2007, formally adhering to these two international legal instruments;
- Published in September of 2007 its National Strategy for the effective implementation of UNFCCC and the Kyoto Protocol;
- Regularized in 2004 the Environmental Impact Studies;
- Instituted in November of 2009 the DNA (Designated National Authority);
- Concluded in 2011 the preparation of the initial National Adaptation Program of Action (NAPA);
- Published in 2011 the country’s First National Communication (INC) on Climate Change to the UNFCCC;
- Regularized, during 2011, the legal and institutional framework within MINAMB and associated agencies the roles and responsibilities to formally implement and operationalize the various Angolan strategy, actions, goals and resources related to adaptation and mitigation of climate change.
- In 2014 is now in the process of developing a high-level cabinet level post to assist in cross-ministerial implementation of climate change initiatives nationwide

This particular project is **directly informed by and developed in response to the priorities in the country’s first National Communication on Climate Change (INC) and NAPA**. As regards the former the proposed project is directly in line with the stated objective of that document as regards the government’s intention to support the design of “a sustainable development trajectory pertaining to energy production and consumption, produced via renewable sources and consumed with greater efficiency, that allows the construction of a low emissions scenario that brings to the country more wealth, employment, healthcare and education, i.e. improved quality of life.”<sup>49</sup> More specifically that document presents a matrix of priority GHG mitigation actions in Angola over the next 20 years and “more energy efficient domestic applications” and “reducing deforestation” are both classified as an A (highest importance and practicability) in that matrix.<sup>50</sup> Under the section on Technology Transfer Needs for the Forestry Sector among the technologies prioritized (which are supported by this project) are: 1) Energy production (biomass); 2) Modern use of biomass and electric cogeneration; 3)

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<sup>49</sup> Angola’s Initial National Communication to the UNFCCC (2011), Excerpted from Section “4.1 – Appropriate Measures to Mitigate Climate Change.”

<sup>50</sup> Ibid, Section 4.3 – Mitigation Measures Matrix

Technique for the promotion and carbonization of all forest species; 4) Pyrolysis techniques and increase of stove efficiency; and 5) development of new techniques for reduction of consumption and energy conservation

Moreover as regards the NAPA the project responds to the first priority project: “Promote Alternative Renewable Energies for Avoided Deforestation.”<sup>51</sup> That priority project specifically mentions the critical threats emanating from unsustainable charcoal production in the *Planoalto* and the urgent need to “reduce pressure on forests through the use of alternative energy sources and ensure increased soil cover.”

The project also corresponds to the specific recommendations derived from a survey of the Angolan energy sector and energy policies conducted in 2005 by the International Energy Agency at the request of the Angolan government. That executive summary of that report include specific recommendations such as “Biomass: address biomass within wider framework of household energy needs” and “Statistics: improve capability to collect and disseminate relevant energy statistics and other socio-economic data.” That report specifically notes that:

*“Important demand-side issues for the government to address in order to ensure sustainability of biomass use include the efficiency of the charcoal production process (e.g., more efficient kilns), the efficiency and safety of end-use (e.g., more efficient stoves) and the lack of energy alternatives. On the supply-side, the government can enhance the sustainability of Angola’s biomass resources through increasing the area of the country with plantations and through monitoring and control of charcoal production. The government can also promote the use of agricultural and forestry residues for energy production.”*<sup>52</sup>

This project is also informed by and consistent with the following national plans:

- National Development Plan for the Sustainable Management of the Forestry Sector (2009-2013) – this program is under the Medium-term Development Plan of the Government (2009-2013) and puts in place the key programs and guidelines for the management of the forestry sector.
- New law Política Nacional de Florestas, Fauna Selvagem e Áreas de Conservação Lei 120 under approval since 2007.
- The Land Law (*Leis das Terras* - 9/04 of November 9, 2004) considers all land, and the natural resources on that land, to be the property of the State. This new Land Law contains a number of environmental related aspects which are important to foster sustainable development in Angola as well as better use of the soil and natural resources. It makes references to a number of other pieces of environmental legislation with particular emphasis on the Environmental Framework Law. The other legislation is used to support mechanisms for the implementation and enforcement of certain articles and clauses of the new Land Law. It presents two land classifications, namely urban land (areas for construction of buildings) and rural land (areas for agriculture, livestock raising, forestry and mining).
- The Local Municipalities Act, No. 17 of 1999 (*Lei das Autoridades Locais*) which establishes that local governments are responsible for the promotion of development, basic sanitation, environmental protection and land management.
- National Environmental Management Programme (NEMP) / *Programa Nacional de Gestão Ambiental* (PNGA), which, in conformity with the Lei de Bases do Ambiente, is a key vehicle for achieving environmental protection and sustainable use goals. Among the specific objectives of the PNGA (which the project is in conformity with) are:
  - define priority actions in environmental management, based on the importance of these and the available human, technical and financial resources;
  - promote environmental controls on activities using natural resources or which may cause any damage to the environment, developing the required instruments for environmental policy and management;
  - develop institutional structures and professional capacity necessary for the responsible implementation of environmental management policy, the NEMP and other sectoral strategies; and

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<sup>51</sup> Angola NAPA, 2011, Selected Project ProfilesPg. 66

<sup>52</sup> See Footnote 10

- promote the elaboration and implementation of environmental policies, strategies and plans of action and corresponding environmental investment plans, and their periodic revision.

- The project is consistent with for the National Action Plan for SLM (NAP) to combat desertification (which is currently being developed and validated)

- Finally the project is consistent with the *ANGOLA 2025: Angola um País Com Futuro – Sustentabilidade, Equidade and Modernidade* (Strategy for the Long-Term Development of Angola - 2004) which is the long-term blue print for the country's development. That document has a specific section on environmental issues (Section 10) which testifies as to the critical importance of preserving the country's *Miombo* woodlands and reducing deforestation via more energy efficient technologies and better management:

*“There is a clear process of deforestation in the country, especially near urban centers...Forests are a primary source of food and energy (firewood and charcoal) for 60% of the rural population of the country, and also for construction of houses and huts, and for agricultural purposes.*

*Almost all rural industry, informal services, biomass stakeholders, agricultural producers and the fish smoking industry rely on wood fuel, charcoal or direct solar energy. We must reverse the loss of our country's forest resources.”*<sup>53</sup>

## **B.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities:**

This project has been designed with the express intention of responding to GEF's overall strategic vision under GEF V of helping countries meet their sustainable development needs and achieve multiple environmental benefits through an integrated approach. Within the GEF V Focal Area of climate change (CC) mitigation, the proposed project supports Strategic Objective 2: “Promote investment in energy efficiency technologies”. The project expressly supports an increase in investment in market transformation for energy efficiency applications (in this case biomass applications) and has as its primary output “Energy Savings Achieved.”

## **B.3 The GEF Agency's comparative advantage for implementing this project:**

At a global level, this project fits under the UNDP-GEF EITT (Energy, Infrastructure, Technology and Transport) Signature program number 1 “SP1 – Clean Energy” Promoting access to clean and affordable energy systems and services. UNDP has been a leader in seeking to develop more integrated solutions to the sustainable use of biomass-based electricity and thermal applications in different countries and promoting regional synergies. Under GEF V UNDP's EITT team has developed projects with sustainable biomass components in Uganda, Zambia, Kenya, Sierra Leone and Brazil. This is the fourth project (after Uganda, Zambia and Kenya) that specifically focuses on reducing deforestation and promoting more energy efficient charcoal production and SFM practices in Africa's greater *Miombo* Eco-region. UNDP's approach to market transformation of this sector is to use a value chain approach that develops customized solutions and incentives to induce change in each stage of the value chain and prioritize interventions that maximize emission reductions and deliver developmental co-benefits. All activities proposed are climate resilient. At a policy level the general approach is to assist countries develop and implement national biomass energy strategies and frameworks (cornerstone policy instruments as well as NAMAs, Standardized Baselines (SBLs), inventories, etc) that set out rational and implementable approaches to legally manage the biomass energy sector in a low-carbon, sustainable way. As regards specific types of downstream interventions the approach aims to promote integrated sustainable energy, land and forest management practices that assure security of biomass supply combined with promotion of the best possible technologies available for efficient biomass conversion and end use consumption in targeted landscapes and communities. Improved practices in the transportation and retail sub-sectors of a biomass value chain are also prioritized.

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<sup>53</sup> *ANGOLA 2025: Angola um País Com Futuro – Sustentabilidade, Equidade and Modernidade* (Strategy for the Long-Term Development of Angola - 2004), V.10 *Garantir o Uso Sustentável do Ambiente e dos Recursos Naturais. Combater a Desertificação*, pg. V-144

Several other parallel UNDP initiatives complement the GEF-funded work on sustainable charcoal in Africa. In Uganda UNDP has funded a Biomass Energy Strategy and published a first-of-its kind NAMA study on charcoal (funded by MDG Carbon) and has previously worked on bio-carbon and biomass energy linkages with carbon finance under the UNDP Capacity Development for Carbon Finance Project and more recently under the UNDP Low Emissions Capacity Building (LECB) program. UNDP Kenya and Zambia have also supported various biomass energy strategies and charcoal pilot projects. UNDP has also recently published a new study on the development of standardized baselines in carbon finance projects on off-grid power generation in sub-Saharan Africa. UNDCF's *CleanStart* initiative (jointly developed with UNDP's EITT team) is also piloting biomass briquetting technologies in Uganda and will support improved stove dissemination in Ethiopia.

On regional level the UNDP regional environment project on the "Management of Environmental Services and Financing for Sustainable Development," organized a study tour on Sustainable Charcoal for DNA focal points and Decision Makers in Rwanda in November 2011. The study tour was designed to assist countries in Eastern and Southern Africa in the design of sustainable charcoal projects, examine carbon markets related to sustainable charcoal, bring the regional economic communities (RECs) into focus on the issue of sustainable charcoal, and explore opportunities under the International Year for Sustainable Energy for All in 2012 and the United Nations Conference on Sustainable Development (RIO+20) conference. The study tour was attended by 30 participants from Rwanda, Tanzania, Kenya, Ethiopia, Malawi, Uganda, and three Regional Economic Communities (ECOWAS, EAC, and SADC) and the Ecowas Regional Centre for Renewable Energy and Energy Efficiency (ECREEE), as well as experts from academia, private sector, NGOs and development organizations. Moreover over the last year UNDP has supported approximately 35 countries in Sub-Saharan Africa in undertaking SE4ALL rapid assessments, and through a series of workshops, experts meetings and technical sessions has led the development of a number of key SE4ALL policy and planning documents, including the Africa Strategy for Decentralized Energy Services; the Africa Guidelines for SE4ALL Action Plans; and the **Africa Sustainable Charcoal Policy Framework**. Additionally UNDP is now represented on the AfDB hosted SE4ALL Regional Hub to lead the development and implementation of the Decentralized Energy Services Strategy, which includes a major focus on biomass energy.

As regards national capacity, the UNDP Country Office in Angola, supported by the UNDP/GEF Regional Office, will oversee and provide support to this project, relying on UNDP's country-level coordination experience in integrated policy development, human resources development, institutional strengthening, and non-governmental and community participation. The UNDP Angola country office already supports the largest portfolio of GEF projects in the country (including two LDCF projects and several BD projects) and also has a long track-record of working with provincial governments. The UNDP Angola Country Office counts on at least three full-time professional staff dedicated to the environment portfolio (plus support from operations and senior management). This team is supported by UNDP/GEF Regional Coordination Unit (including a Portuguese speaking Regional Technical Advisor for Climate Change and support staff assisting with M&E and delivery oversight, among other tasks).

It is important to note that the UNDP Angola Environment Programme is positioned within existing frameworks of the UN system, such as its Millennium Development Goals (MDGs), Multilateral Environmental Agreements (MEAs), and the legislative instruments of the Government of Angola. It responds to the priorities identified from analyses undertaken over the past decade in Angola, and in particular, to the UNDP Country Programme Action Plan (CPAP) for 2009 – 2013 and the National Programme for Environmental Management (*Programa Nacional de Gestão Ambiental* - PNGA) of the Ministry of Environment. **UNDP Angola will contribute USD 400K in co-financing to this project.**

Two key strategy documents provide a chapeau for the project's fit within the UN and UNDP's Program in Angola: the United Nations Development Assistance Framework (UNDAF) and the Country Programme Action Plan (CPAP). The UNDP Angola CPAP (2009-2013) is anchored in the UNDAF (2009 – 2013), and underpins the Angolan national vision of "sustainable human and economic development and strengthened national cohesion and democracy". UNDAF Outcome 4 is: "Strengthened pro-poor economic growth and accountable


macroeconomic management and integrated rural development, natural resources and energy management, to promote environmental protection and adaptation to climate change.” This project will make a key contribution to UNDAF’s Outcome #4 under which a concerted UN approach is geared to provide a framework for national and decentralized institutions, strengthened integrated rural development, improved natural resource management and more low-carbon energy management and climate change mitigation.

**PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)**

**A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):**  
 (Please attach the [Operational Focal Point endorsement letter\(s\)](#) with this template. For SGP, use this [OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)
Dr. Carlos Avelino Manuel Cadete	National Director of Statistics Planning and Studies Cabinet,  GEF Operational Focal Point	Ministry of Environment	November 5 <sup>th</sup> , 2013

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

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for project identification and preparation.					
Agency Coordinator, Agency name	Signature	DATE (MM/dd/yyyy)	Project Contact Person	Telephone	Email Address
Adriana Dinu UNDP-GEF Executive Coordinator and Director a.i.		March 18, 2014	Lucas Black UNDP Regional Technical Advisor, EITT	Tel: +27 71 874 4893	<a href="mailto:lucas.black@undp.org">lucas.black@undp.org</a>

## Annex A – Overview of Kiln Selection

(Source: Nationally Appropriate Mitigation Action Study on Sustainable Charcoal in Uganda, UNDP, 2012)

When selecting technology interventions to be deployed, the following criteria should be considered:

**Scale:** The informal charcoal sector is extremely fragmented and consists of thousands of small-scale producers, most of whom make a living by producing less than 50 tonnes of charcoal per year. Improved small-scale production technologies can replace previously employed technologies at the level of charcoal makers and/or communities, thereby keeping most of the same informal charcoal makers employed in the sector. Large-scale charcoal production units, however, have a high productivity and are more complex. As such, informal charcoal makers are unlikely to either get involved with large-scale units or give up their source of income. The potential outcome of this would be an increased competition for wood between informal charcoal makers continuing their small-scale activity parallel to wood being harvested for newly established large-scale charcoal facilities. Nevertheless large-scale facilities are interesting on different accounts: (i) the product quality is high and stable, (ii) yields are very high and steady and (iii) the advanced technology allows the processing of many types of biomass. One disadvantage associated with large-scale facilities is the need to transport wood over increased distances to the sedentary kiln/processing unit. Small-scale facilities should be preferred when community participation is important. Large-scale facilities can be the preferred choices where charcoal production does not compete with local communities for wood harvests, such as: (i) in the use of alternative sources of biomass, (ii) in the production of charcoal from newly established plantation or (iii) in areas where local communities have previously not produced charcoal.

**Quality of the charcoal produced:** Most improved kilns have been observed to produce high quality charcoal from wood. Attention should nevertheless be paid to charcoal production from alternative sources of biomass such as agricultural wastes. Indeed, high ash contents of the inputs might reduce the overall quality of the product, which is mostly determined by the fixed carbon content in the charcoal. It is, therefore, important to establish minimum quality standards and ensure that production complies with that standard, for example, by operating with mix of biomass wastes whose expected charcoal quality is predictable.

**Complexity:** More advanced kilns require trained staff for their operation and maintenance. In some cases, trained staff proves problematic to find. Large-scale kilns or briquetting units also often require a source of electricity to be operated. This can be problematic in countries with low rates of rural electrification like Uganda.

**Local vs. global technology:** Technologies which need to be imported might face administrative hurdles related to their import. Ideally, technologies which can be:

- a. produced locally, or
- b. sourced locally, or
- c. maintained locally or even
- d. produced and maintained locally should be preferred

**Yield:** This criteria is one of the most important as the wood savings per tonne of charcoal are directly proportional to the difference in yields (savings = quantity charcoal/(baseline yield – project yield)). Ideally, yields obtained should be not only high but also steady providing a high degree of confidence for the subsequent calculation of wood savings. Theoretical yields are roughly known for specific technologies. Real yields might need to be measured by sampling, especially in cases where a broad possible range of yields was achieved. Even for alternative sources of biomass, a high yield is important as the quantity of available wastes is limited and it is therefore essential to use the waste in the most efficient manner to displace a maximum of the baseline charcoal which is produced from wood.

**Portability:** In most areas, installing small-scale sedentary kilns is possible. In mountainous or highly hilly landscapes however, transporting the wood to a sedentary kiln instead of building a traditional kiln on-site might prove challenging. For this reason, only very light portable kilns such as the Casamance kiln are likely to be successful in such contexts.

**Cost:** The cost is one of the most important selection criteria for charcoal making equipment. With limited budget available, the cost should be kept as low as possible in relation to the achievements. In turn, the cost indicator should for example be expressed in USD per tonne of wood avoided

- a. for fuel switch projects, the wood consumption avoided is the quantity of wood which would have been consumed for the same production of charcoal on the basis of the unimproved baseline technologies (applying for example the proposed SBL PSB0001)
- b. for projects which improve yields without fuel/feedstock switch, the wood consumption avoided is the quantity of wood which would have been consumed for the incremental quantity of charcoal produced thanks to the higher achieved yield (applying for example the proposed SBL PSB0001)

**Annex B – Alternative Scenarios Considered in PIF Development (not selected for inclusion but which could be reconsidered at PPG phase)**

- I. Possible output to support community woodlots and reforestation schemes in areas where the kilns are piloted (in the case that other initiatives are not implementing SFM activities) – phase 1 of the charcoal value chain:

Possible activities under the output:

- CPAs or land owners in the 8 pilot municipios identified, trained and contracted to make land available for woodlot establishment (minimum hectares set-aside TBD) for reforestation of endemic species. Activities under this output will involve:

- a) Training all communities/woodlot managers on SFM best practices, including “Annual Cutting Index” tool , use of specified endemic tree species and optimal ecological yield from such species.
- b) Technical support provided to all woodlot owners on tree nursery management as an entrepreneurial activity with target to plant a certain number (TBD) of seedlings
- c) Dissemination of selected number of tree seedlings to woodlot owners
- d) Establishment of land use and participatory forest management plans (including zoning and mapping of forest areas) for all targeted woodlot areas
- e) Contracts signed between woodlots owners and CPAs for feedstock supply of renewable biomass

- II. Possible component on dissemination of appropriate technologies for sustainable charcoal consumption (improved cooking stoves) in selected urban and peri-urban areas of targeted provinces (phase 5 of the charcoal value chain)

Possible output: Twenty (20) stove production enterprises trained and operational across selected areas of target provinces. Activities under this output will involve:

- Participatory mapping and consultations to identify rank and select enterprises targeted for assistance. (TA)
- Training of all enterprises on improved cooking stove production and marketing. (TA)

Possible output: Dissemination of approximately 40-50 improved institutional cooking stoves to selected schools, restaurants and commercial establishments (INV)

Possible output: Sensitization campaign for women in targeted provinces on benefits of improved stove usage. (TA)

## Annex C – Importance of Angola’s Miombo Woodlands in terms of supporting indigenous flora and fauna

Huambo’s highland forests (more technically known as Afro-montane forests) are restricted to small patches, usually of less than 20 hectares in valleys above 2,000 meters. The edges of these forest patches are often sharply defined because younger, smaller trees and shrubs are burnt back in the fires that are prevalent in the surrounding dry grasslands. Most of the forest patches are in the higher areas of western Huambo and many of the tree and plant species in these forests are found only in cool and wet highlands elsewhere in Africa; as a result these highland forest ‘islands’ support several bird and plant species that are endemic to Angola<sup>54</sup>.

Although there are considerable areas of planted forest (especially Eucalyptus along the Benguela railway), *Miombo* woodlands cover more of Huambo province than any other vegetation type, and the only areas where the woodlands are often naturally absent are at altitudes above 1,800 meters. Covering all of central Angola and extending into the Democratic Republic of Congo, the extensive Angolan *Miombo* woodlands are part of an even larger *Miombo* ecosystem that covers much of Eastern and Southern Africa. *Miombo* consists of a mixture of broad-leafed, deciduous trees and in the *Planoalto* is characterized by species belonging to the genera *Brachystegia*, *Julbernardia* and *Isoberlinia*. The *Planoalto*’s woodlands are at the heart of the *Miombo* Eco-region, which is listed as a WWF Global 200 Eco-region because of its high species richness. Also referred to as the Zambezian Regional Centre of Endemism, this area is covered by 2.7 million km<sup>2</sup> of *Miombo* woodlands and is a significant part of the larger Zambezian phytocorological region (total of 3.8 million km<sup>2</sup><sup>55</sup>).

*Miombo* is characterized by several unique ecological factors, including its propensity to burn, the importance of termites, and the unusual browsing conditions. Besides its role in supporting livelihoods and managing climate change, *Miombo* woodlands support important populations of fauna and is also floristically diverse, harboring some 8,500 plant species, of which approximately 54% are endemic (WWF-SARPO, 2002).

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<sup>54</sup> A quite large (fragmented) area (>590 ha) of Afro-montane forest has been identified on Mount Namba, Kwanza Sul Province in 2010. Please refer to the following article for more details: Mills, M.S.L., Melo M., Vaz A. (2012) *The Nambamountains: New hope for Afro-montane Forest Birds in Angola*. Bird Conservation International

<sup>55</sup> Campbell B. (1996) *The Miombo in Transition: Woodland and Welfare in Africa*. CIFOR. Bogor, Indonesia.



## Annex D – Overview of Different Briquetting Techniques

Table 5: Summary of advantages and disadvantages of briquette production techniques

TECHNIQUE/ TECHNOLOGY	ADVANTAGES	DISADVANTAGES
MANUAL PRESS (LOW PRESSURE PRESS)	<ul style="list-style-type: none"> <li>• low capital costs US\$150</li> <li>• locally fabricated and enable access to briquetting technology especially in rural areas</li> <li>• does not require electricity</li> </ul>	<ul style="list-style-type: none"> <li>• low capacity 6kg per hour</li> <li>• briquettes easily disintegrate</li> <li>• low maintenance</li> <li>• low-tech requiring little to no technical skills to operate</li> </ul>
PISTON PRESS	<ul style="list-style-type: none"> <li>• high capacity up to 750kg per hour</li> <li>• can be fabricated by local mechanical technicians</li> </ul>	<ul style="list-style-type: none"> <li>• very high capital costs US\$20 000 - 30 000</li> <li>• import required</li> </ul>
SCREW PRESS	<ul style="list-style-type: none"> <li>• low capacity costs US\$1 350</li> <li>• simple mechanism</li> <li>• can be fabricated by local mechanical technicians</li> </ul>	<ul style="list-style-type: none"> <li>• low capacity 150kg per hour</li> </ul>
ROLLER PRESS	<ul style="list-style-type: none"> <li>• high production capacity 1,500 kilogrammes per hour</li> <li>• suited for briquetting of wet powder</li> </ul>	<ul style="list-style-type: none"> <li>• high capital cost US\$14,000 -19 000</li> <li>• import related</li> <li>• low compaction rate</li> </ul>

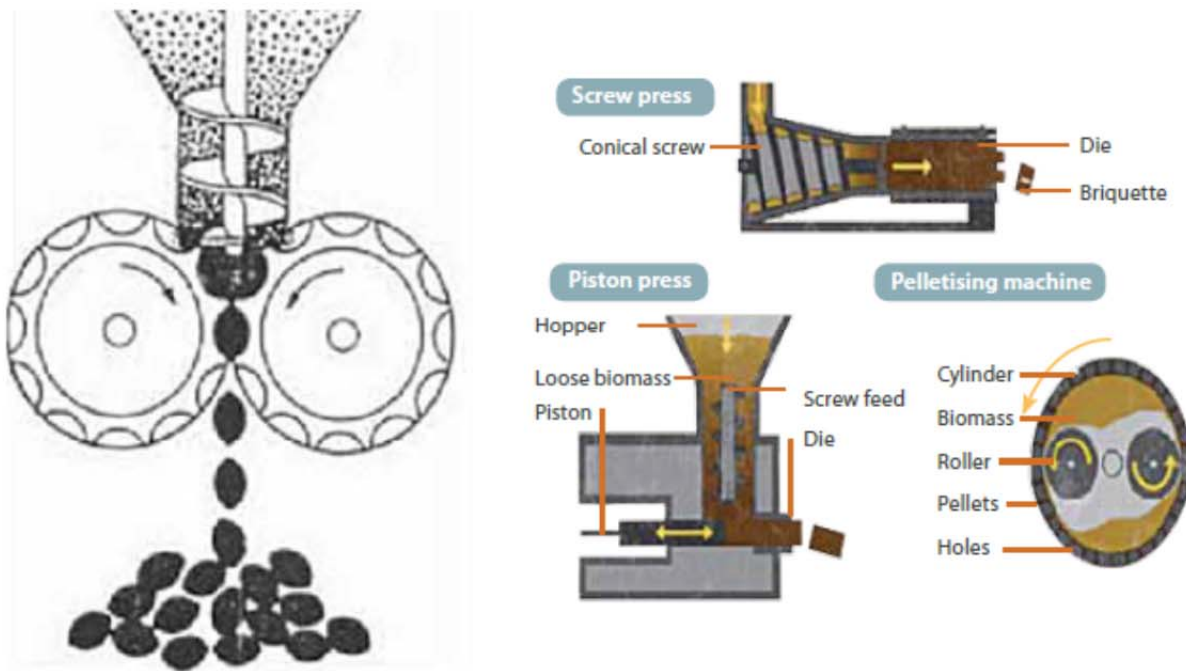


Figure 13 Roller press (left), Screw press (top-right) and Piston press (lower-right)

Sources: [www.alibaba.com](http://www.alibaba.com), Ashen Foundation <http://www.ashden.org/briquettes>

## Annex E – Emissions reduction impacts of improved kilns on forest cover

As regards the cost-effectiveness of the different options, a number of studies have demonstrated that for areas where charcoal is a primary driver of deforestation the introduction of improved kilns is the most powerful tool in both reducing emissions and increasing forest cover. The results of a study by the World Bank (*Environmental Crisis or Sustainable Development Opportunity? Transforming the charcoal sector in Tanzania - A Policy Note*, World Bank, 2009) on the impacts of improved kilns in a Miombo woodlands context demonstrated that improved kilns were by far the most effective instruments in improving forest cover compared to a business-as-usual scenario (see diagram below which illustrates the combined and individual impacts of the three policy options on forest cover).

### IMPACT OF IMPROVED KIN TECHNOLOGY ON FORESTS (Source: World Bank)

	Year				Units
	1	5	10	20	
<i>Forest Area under BAU Scenario</i>					
	1,887,369	607,640	0	0	hectare
<i>Forest Area with Policy Intervention</i>					
<b>A) Traditional Kiln</b>					
Fuel Switch	1,887,369	838,982	0	0	hectare
Fuel Switch + Improved Stoves	1,887,369	886,701	0	0	hectare
<b>B) Improved Kiln*</b>					
Fuel Switch	1,887,369	1,474,745	921,141	0	hectare
Fuel Switch + Improved Stoves	1,887,369	1,508,616	1,215,381	0	hectare
<b>*Applied Conversion Parameters</b>					
Kiln Efficiency (traditional kiln)	10%				
Assumed annual increase in kiln efficiency	20%				
Maximum kiln efficiency assumed for improved kiln	15%				
Conversion factor wood weight => Volume (ton => m3)	0.85				
<b>Assumed Forest Parameters Natural Forests (Miombo Woodland)</b>					
Stock per hectare	10				
Growth per hectare per year	2.5				

The diagram above illustrates that improved kiln technology – although only increasing efficiency – has a significant positive impact on forest area. The relatively larger impact of improved kiln technology on forest management, compared to policy interventions on the consumption side, can be explained by the fact that production-side measures are not offset by population growth and, thus, have a more profound impact. The same logic applies to the cost-effectiveness of briquetting technologies.