Africa LEDS reporting back templates

A) TECHNICAL REPORTING TEMPLATE / FORMAT

1) **Context**:

The immediate development objective of this project is to assist the Democratic Republic of Congo (DRC) in strengthening its vision of a green economy and a sustainable society. It focused on improving the transition to low-emission domestic energy options in pursuit of the Low Carbon Emission Development (LEDS) strategy in agriculture, forestry, and waste management (agriculture and household bio-degradable waste). The main lines of intervention focused in particular on:

(i) demonstration for the promotion and deployment of options for "the transition to low-carbon energy options in the domestic sector;
(ii) analysis of gaps and challenges related to the updating of investment mobilization policies and strategies aimed at contributing to the implementation of NDCs; and
(iii) modelling of the transition strategy towards low-carbon energy options based on improved stove utilization, briquettes and biogas based on biodegradable household waste that will ensure job creation; income improvement in households.

To achieve these objectives, the Sustainable Development Department, in agreement with the Regional Coordination of the Program, initiated field actions to monitor, evaluate and report on progress and write two case studies. Two organizations at the national level (ISTA and CADRI) have been contracted.

Exchange sessions and demonstrations of the efficiency of the use of briquettes and improved cookstoves were organized. The reduction of fuel quantities and expenditures compared with traditional homes has also been proven and a high level of adoption has been observed. However, the cost of acquiring improved stoves is still high to facilitate this transition. Government subsidies would be needed to encourage and secure the conversion to new jobs to be created in connection with this new option in the domestic cooking energy sector.

2) Achievements / accomplishments

Component 1 – ground demonstration pilot actions

This component focused on two approaches, including:

1°. The establishment of two working groups:
   - an Interinstitutional Technical Consultative Platform on Low Carbon Development Policies, Measures and Strategy; and
   - a working group on modelling low-carbon energy options in the domestic sector.

2°. carry out case studies that can contribute to the goal of transitioning to energy-efficient options in the domestic energy sector

3°. A field demonstration on the substitution of wood-energy by the use of low-carbon energy-efficient stoves (promotion of improved use of improved cook stoves, briquettes and biogas based on biodegradable household waste).

Promoting the use of energy efficient cook stoves and biogas is considered as "the transition to low-carbon energy options in the domestic sector. This option is likely to contribute to the consolidation of the REDD + process. There is a national consensus on the drivers of deforestation and forest degradation in the DRC, the main direct causes of which are shifting cultivation on slash, artisanal logging, carbonization, fuelwood.

Thus, two case studies were conducted to support the substitution of wood energy (charcoal and firewood) in the domestic sector.

A. **First case study**

1) **First case study: Production of improved stoves and briquette fuel**

Charcoal and other energy sources of plant origin account for more than 95% of energy consumption for cooking in the DRC. The industrial sector consumes only 1%.

A huge amount of wood is needed for cooking comes from natural forests. However, fuelwood energy is largely ignored in national energy policies. Promotion and extension programs for the use of improved stoves are supported here and there across the country, but there is no incentive for the use of briquettes based on agricultural residues (fruit peels, rice, beans, corn, sugar cane, etc.) and wood processing and sawmill waste (chips) in energy production.

This case study has shown that the promotion of improved stoves rationalizes the consumption of urban households in charcoal and afterwards the reduction of pressures on the exploitation of natural forests. It was found that the average consumption of charcoal per household could go from 16.7 kg/week before adoption of improved stoves to 10.9 kg/week after its adoption, a difference of 5.8 kg/week. A gain estimate can be applied to a number of households in some major urban cities of the DRC compared to a "virtual" situation in which no improved stove program would have been introduced. Improved cooking stoves can improve livelihoods while protecting the planet: this is a good recipe for successful sustainable development.

These companies producing improved charcoal stoves are not intensive in jobs (2 to 6 people, limited employment of women, 1 or 2 in half of the cases).

Biomass briquettes are an interesting alternative to fuelwood. Several organic wastes can be used for briquette production, but some of them have a periodicity during the year and others are available in small quantities at harvesting sites and in the market. They have the advantage of being a source of sustainable, ecological and cheap energy. The cost of production is low. Raw materials are abundant and briquettes provide 70% more energy than traditional charcoal.

It should be noted here that the technological means currently used in the DRC for transforming firewood and charcoal into thermal energy for cooking have a low energy efficiency, exposing their users to pollutant emissions. In addition, there is virtually no effective policy to mitigate the current overexploitation of forest resources and promote the sustainable production of wood energy.

2) **Second Case Study: Methanization and Production of biogas cook stove**

This case study highlights the considerable impact of the use of household waste for the production of biogas and briquettes as a lever in the substitution of the use of wood energy fuel in a region, such as the province of Kinshasa, generating economic benefits for the development of the energy sector. The main problem in the biogas sector remains the lack of recovery of household waste and the development of the biogas supply chain.

A policy of charcoal and fuelwood substitution through the use of biogas and briquettes as biomass fuel (modern biomass) would contribute to forest conservation. The establishment of a biogas production unit in the province of Kinshasa will allow rapid socio-economic development and a clean energy transition for the province in particular and for the country in general. The alternative of the production of biogas and the maintenance of the climatic balance, by the creation of a carbon sink which saves the forest to its degradation, because 6550 tons/year of methanized waste, equal to: 130 MW/year = 277 tons of CO_2 equivalent per year avoided.

The development of such initiatives is likely to:

- Provide an effective response to domestic energy deficiency.
- Substitute charcoal and firewood through the use of biogas as an improved biomass fuel,
- Ensure large-scale production, regular supply of biogas and stabilize the selling price.
- protect the forest against wild and illegal deforestation,
- Train and convert current producers of charcoal into briquette dispensers
- Popularize the production and use of biomass fuel briquettes
- Promote sustainable development by creating local jobs.

The DRC, with its 152 million km^2 of natural forests, is experiencing a relatively rapid rate of deforestation, with an estimated annual rate of between 0.2 and 0.3%. The two main causes are slash-and-burn agriculture and the need of satisfaction in cooking energy (95% of households). It is therefore anticipated that, if nothing is done (business as usual scenario), the DRC would lose 12 to 13 million Km^2 of forests by 2030, with an annual GHG emission of at least 400 MtCO2eq.

To this end, the Ministry of Environment and Sustainable Development (MEDD), through the Directorate of Forest Inventory and landscaping and the Sustainable Development Department, are developing various pillars, including: the Land Monitoring System by satellite, the National Forest Inventory, the Greenhouse Gas Inventory and the Forest Reference Emission Level.

As a result, the DRC has instruments capable of monitoring the implementation of the national climate change policy, particularly with regard to the national REDD + strategy.

Thus, the Forest Reference Emission Level document recently submitted to the UNFCCC indicates, on the basis of a "business-as-usual" scenario, that emissions from deforestation, linked to its indirect causes (population growth, meeting household cooking and infrastructure development) with a multiplier effect on direct causes, are estimated at

	Year				
	2015	2016	2017	2018	2019
Emissions (MtCO2e)	1,042	1,113	1,184	1,255	1,326

The adoption of a strategy and transition measures towards low-carbon energy options in the domestic sector, based on the substitution of fuelwood (wood energy in general) by the use of low-carbon energy efficient stoves (promotion of the use of improved cook stoves, briquettes and biogas based on biodegradable household waste) would be an important lever in the domestic energy sector. Therefore, there is a need for basic rules to coordinate efforts to implement the NDC, in particular, and in general to combat climate change at the national level (progress indicators, comparability, transparency and responsibility, follow-up-notification-verification).

Also, the efforts to achieve the socio-economic development priorities targeted in the National Strategic Development Plan (PNSD) will have to be coupled with those of the implementation of the NDC in order to ensure both: (a) the reduction of GHG emissions and their monitoring; and (b) the creation of co-benefits for the well-being of the Congolese population.

Thus, this project to implement the NDC will seek synergies between ongoing initiatives to fight against poverty, such as the implementation of the National Strategic Development Plan (PNSD) and those of struggle against global warming, which includes to date: (a) various initiatives to mitigate GHG emissions; and (b) various initiatives in the context of adaptation to climate change.

B. Field demonstration on the use of low-carbon energy-efficient stoves

In the context of these case studies, series of demonstration activities on energy transition options was conducted through experiments at five sites in Kinshasa, namely at the Higher Institute of Applied Techniques (ISTA) and in certain neighborhoods of Kinshasa. These demonstrations activities were mainly aimed at stimulating the adoption of transition strategy towards low-carbon domestic energy options based on the use of improved stove, briquettes and biogas based on biodegradable household waste in Kinshasa. It is also intended to have information on the performance of the improved briquette stove.

The overall objective of this approach was to provide peri-urban populations with energy recovery technology for biodegradable household waste and other agricultural or plant residues. Specifically, production of low-pressure of biomass briquettes or solid biofuel, made by using various binders and a manual lever press; and to evaluate the performance of the improved metal stove, biomass briquettes and biogas stoves through the boiling water test.

1°. Experiments on the adoption of transition to low-carbon energy options in the domestic sector: production of biomass briquettes; and the use of improved stoves

The demonstrations, through experiments relating to energy transition options: the biomass briquettes production; and the use of improved stoves.

These experimentations were carried out at the Higher Institute of Applied Techniques ISTA in Quartier Ndolo. It was showed that it is possible to produce biomass briquettes in the peri-urban context of Kinshasa, notably, in the Commune of Barumbu, using a manual lever press and clay as a binder. This requires a low level of technicality and investment. It also reveals that the briquettes have a good behavior and give a good combustion, the availability of the binder and the best price of briquettes are major factors that favor its adoption.

Regarding the improved stoves, the demonstration activity revealed that it is fully accepted and used by the people of Kinshasa, in general and, in particular, in Barumbu commune. The boiling tests of the water showed that its thermal efficiency was less than 20%; with specific consumptions corrected by the temperature varying of 197 g/L and 183.5 g/L respectively for the two prototypes used. Specific boiling times vary between 2.39 min/L and 4 min/L. The experimentation shows that there is a significant loss of heat and fuel when using the fireplace; so a huge loss of energy. Technical deficiencies therefore lie in its design and are major challenges to be met.

2°. Energy recovery of household waste, sawdust and other agro-industrial and agricultural residues in Kingabwa in the municipality of Limete.

The demonstration consisted of the energy recovery of household waste and sawdust and other agro-industrial and agricultural residues for the production of biogas and biomass briquettes in the facilities of a "Green Space Network", NGO. .

Indeed, in Kinshasa, the energy recovery of household waste and sawdust and other agro-industrial and agricultural residues is still in its infancy. Most sawmill residues are used traditionally to supply kitchen fires by housewives in peri-urban areas of Kinshasa. To this is added the use as manure in market gardening. In the case of agro-industrial residues, they are often processed into feeds for livestock or poultry.

In briquette manufacturing, these materials, based on household waste and sawdust and other agro-industrial and agricultural residues, were used as raw materials and clay as an inorganic binder.

Animal manure, such as cow dung and pigs, can be used, but this material is rare in the context of Kinshasa.

A manual press, made to solve the problem of insufficient pressure on the waste was used. The press does not work alone, other accessories are associated; these include:

- the cylindrical mold: we tested two molds during our experiments, one metal and one in wood;
- A compressor piston that slides inside the mold to ensure compression;
- Central tube, which allows to make a hole in the center of the briquette during its making;
- and the bottom disk which plays a dual role by serving both as a support for the central tube and as a closure device for the bottom of the mold;
- water for the dissolution of binders; a pot and a spatula for heating binders ...

Figure 1: Manual press in wood

This experiment made it possible to identify at least six (6) units for 7 projects producing and promoting biogas and biofertilizer. The installed tanks were mostly of family size but there was also a technical landfill as sanitation installation in peri-urban area in Mpasa (in the municipality of N'sele). The beneficiaries were mostly women market gardeners. Of the 6 units surveyed, 4 were no longer functional, this means that the biodigesters had not been filled for at least 3 months and that the beneficiary was not planning to restart the production of biogas in the month to come up. Some plants in operation are used mainly for the treatment of latrine sludge.

As the biogas sector is not yet very developed in Kinshasa, there is very little statistical data. The exchanges with the operators and projects identified made it possible to understand the context of deployment of biodigesters and to highlight the strengths and weaknesses of the biogas sector in the DRC.

ISTA offers balloon biodigesters, partially buried while the Green Space Network offers it in plastic containers of 220 liters and is installing a 25m^3 concrete fixed dome. These biodigesters have a filling tank, a central tank (fermentation chamber and storage of biogas), a digestate outlet tank and an overflow system to evacuate the digestate during the digestion (biogas production).

The 10 m^3 biodigestors have a storage capacity of about 4 m^3 of biogas and 2 m^3 of digestate (outlet tank). The recommended weekly inputs (60 liters of dung per 90 liters of water) make it possible to produce an average of 1.3 m^3 of biogas per day. An area of 7 x 4 = 28 m^2 is necessary for its installation. The start-up of the tank can take a few days to a few weeks depending on the quality and quantity of the dung collected by households.

Figure 2: Biogas production in 220 liter plastic containers (at Green Space Network in Kingabwa, Limete municipality)

Figure 3: Production of biogas in a partially buried balloon (at ISTA Ndolo, Barumbu municipality)

3°. Demonstration of the energy efficiency of different types of stoves (traditional stoves versus improved stoves) and fuels (charcoal versus modern biomass - briquettes).

These experimentations was conducted in the Mboloko and Pigeon districts, located respectively in Commune de Matete and Ngaliema. The purpose of this demonstration was to compare the energy efficiency in the use of different types of stoves (traditional stoves versus improved stoves) and fuels (charcoal versus modern biomass - briquettes).

Indeed, almost all of the population in these neighborhoods uses an open fire or traditional biomass cooking stoves for cooking and/or heating. Traditional cookstoves are highly fuel-hungry and emit large amounts of harmful substances such as carbon monoxide and particulates.

It is estimated that users of these homes burn one kilo of biomass each day, generating an extrapolation of the total population in developing countries to about 6 billion kilograms of carbon dioxide and thus contribute significantly to global warming.

The main obstacle to adopting clean homes is the economic logic of biomass cooking stoves for the poor. Traditional cookstoves are popular because they can be made for almost anything: traditional cookstoves can cost around US $ 1. In addition, in many areas, fuel such as firewood and charcoal are available at lower prices. Designers of clean homes compete with homes that cost virtually nothing. There is a big market, but the risk is high.

The technological challenge is to manufacture an affordable biomass cooking stove for the poor, performing even with very heterogeneous fuels, and sustainable even with combustion that combines high temperatures (up to 1000 °C) with a corrosive environment (presence of sulfuric and hydrofluoric acids in biomass). Most traditional cooking stoves do not allow large volumes of air to penetrate in order to be efficient. Too little air produces thick smoke; too much air cools the flames. Earthen cookstoves absorb a large amount of fire energy (high heat mass), and drive the fire heat outwards (high thermal conductivity). Earthen cookstoves thus steal heat from fire, which increases their fuel consumption. By burning heat to fire, the earthen cookstoves reduce the temperature inside the firebox, which increases the amount of smoke produced there. Traditional cookstoves often do not have a fireplace, and when they have one, the exit is narrow.
In homes, improved stoves compete with alternatives to the three-stone fireplace and the open cookstoves.

Distribution is an additional challenge because households are mostly used by women, while the purchase decision is often made by a man who usually does not know much about the stoves. Cooking techniques are a deeply rooted local cultural heritage that is of great psychosocial importance. A user-centric product design is being used to adapt state-of-the-art technology to the local context, such as the dimensions of the cookware. Rigorous testing has been done with end-users who feed into the research and development process. Although there are many improved stove models available today, few have succeeded in replacing traditional large-scale open cookstoves with much higher performance (over 30 percent savings on fuel and lifetime of several years).

Price is a weight factor for low-income users, but improved stove developers should not seek to produce the cheapest home, if it means sacrificing ease of use, sustainability and the performance. The price of energy-efficient homes will never be a sufficient argument against a traditional home that costs almost nothing. The strategy must be refocused on the design and distribution of households that embody value: it is the only way for these households to become competitive and to convince potential users.

Figure 4: improved stove manufacturing workshop at Green space network, Kingabwa (municipality of Limete)

Figure 5: Comparison of the cooker between traditional cookstoves and improved stoves in quartier Mboloko, Municipality of Matete.

It is also essential to set the selling price so that the targeted population considers the product to be good value. The economic benefit of this energy efficiency allows users to depreciate the purchase of the improved stoves in 5 to 6 months. Improved stoves are sold without warranty and have a lifetime of 3 to 5 years; they generate fuel savings that, in total, equate more than ten times their purchase price. Yet most target users cannot afford to pay for the household at one time. It is necessary for manufacturers and resellers to work in partnership with recognized microfinance institutions to offer their customers microloans or opt-in lease plans that allow users to pay a little bit each month by saving money.

C. Integrating lessons into policies through case studies

With regard to the Energy sector, the objective of the National Strategic Development Plan (PNSD) is "to ensure greater accessibility for all social strata and basic national communities to reliable electricity by increasing the power available ... in a safe and sustainable way, without fearing or threatening their safety, health, well-being and health, by 2050". It is on this vision that the strategic development is aligned the objectives of the implementation of the DRC's NDC.

Given the context of the DRC, the attainment of this object, with regard to social, economic and technical aspects, can also be achieved by the development of large deposits of both household and municipal waste. This valorization could be envisaged in three ways: gasification for thermal and electrical applications, carbonization for the manufacture of coal briquettes and densification for the manufacture of densified briquettes. Some interesting projects could be formulated for implementation in the near future. Overall, the current context in the DRC favors small-scale modernization activities more artisanal than industrialization.

The need to change fuel from the massive use of fuelwood to the use of alternative, sustainable and economically attractive fuel is now established. The existence of biomass waste deposits in urban and rural areas confirms the possibility of creating value chains or recovery processes, thus providing a sustainable and economically interesting response from the point of view of waste management. However, such a fuel, to be adopted by the intended users, needs to meet not only energy needs but also social criteria, especially in the case of domestic cooking.

Efforts have been made to promote the use of biomass briquettes, energy-efficient cooking stoves and alternative energy sources in order to reduce the pressure on natural forests but also to contribute to the management of huge deposits of waste littering our cities. The choice of cookstoves models to be disseminated as part of this strategy depends largely on its acceptability in relation to the culinary habits of the beneficiary households. In the context of the DRC which generates a lot of biodegradable waste, the production of biogas, based on household waste and agricultural residues, appears as the most appropriate alternative and renewable solution. Furthermore:

- cooking energy has been saved by the improved stoves;

- technologies have been developed to manufacture biomass briquettes from household and agricultural residues and other plants;
- biogas fed by latrines and organic waste produced; and
- a strong job creation potential demonstrated.

The price is obviously the first selection criterion and the visual quality of the product is another. The energy released is obviously a major criterion but the fact that a biomass coal does not dirty, that its combustion releases little smoke and that there are few sparks are also determining criteria. An equally important parameter is the high density of this biomass coal; the users prefer it because they have the impression that it is made with big tree trunks, aged, and that it should release a lot of energy.

Replacing diesel generators with solar-based hybrid systems, and possibly biogas and ethanol, can reduce fuel costs in the long run. A review of energy options was done above and allowed us to focus on solutions, tested and approved. Collaboration with local and international technology partners, including academic and research institutions, will help improve the energy technologies selected.

For the implementation of the NDC, the action plan should be updated. it should aim to translate, on the one hand, the willingness of partners and the public power to harmonize sectoral policies and strategies into a national framework for meeting energy needs, associated with the control and sustainable management of natural resources, and 'to the protection of the environment and to socio-economic development

Component 2 – modelling actions

The objective of implementing the DRC NDC is to increase the contribution of renewable energies (wind, solar PV) in the energy mix and promote the use of modern biomass in the residential sector. More specifically, it is:

1°. Provide clean, sufficient and stable energy in the residential sector:
    - Install hydroelectric power plants, rehabilitate existing hydroelectric power plants and their associated networks, and interconnect networks;
    - Promote and popularize photovoltaic solar energy technology or other renewable energy sources;
    - Acquire equipment (anemometers, wind vanes) for the installation of wind technology in favourable sites (eg the coastal zone of Moanda, the Bateke plateau, the Kundelungu plateau);

- Promote the installation of other forms of renewable energy (eg Biogas, geothermal energy, natural gas, etc.).

2°. Improve energy efficiency

- Building energy efficiency capacities in buildings and industries and in the residential sector;
- Promote and popularize the use of improved wood energy stoves.

The objective of this component is to model the transition to low-carbon energy options in the domestic sector. It must also promote an integrated approach to promoting environmental management of energy that is consistent with development needs. It should also, during the next project implementation cycle, seek to raise substantial funds from the private sector with the aim of setting up pilot facilities for the production of modern biomass (biogas and briquettes) for the domestic energy sector.

The project will support the DRC in consolidating sustainable forest management practices as part of the REDD + process and implementing its NDC to improve the management of biodegradable household waste and environmental sanitation.

In order to achieve the modelling objectives for the transition to low-carbon energy options in the domestic sector, the working group has developed four implementation scenarios that focus on:

- Improvement of the penetration of improved stoves, briquettes made from agricultural residues (fruit peel, rice, beans, maize, sugar cane, etc.) and waste from wood processing and sawmills (chips) and biogas from biodegradable household waste;
- Projection of opportunities for income-generating activities and creation of new jobs, environmental sanitation; and
- Contribution to the consolidation of the national REDD + process;

Scenario business as usual. If nothing is done in terms of adopting a transition strategy towards low-carbon energy options in the domestic sector,

Government intervention scenarios. In this scenario, the government encourages and subsidizes the use of improved stoves and clean technologies such as charcoal substitution through the use of improved stoves, briquettes made from agricultural residues, government re-employment papers and sawmill waste as well as the penetration of biogas into the energy balance, mainly for domestic cooking needs.

Additional intervention scenario. The high penetration of improved cook stoves, briquettes based on agricultural residues and biodegradable household waste, as well as biogas is considered to be accentuated from 2020 and not at the beginning of the planning period. Similarly, the Government of the DRC subsidizes the use of improved stoves and clean technologies such as agricultural residue briquettes and biogas from 2020.

Scenario of strong economic growth. Efforts focus on the strong penetration of improved stoves and the intensification of use of agricultural residue briquettes and biogas instead of electric cooktops, with annual growth of 5.3% to 10.2% at the end of the planning period. With consequent reduction in the use of wood energy

The modeling of different scenarios was based on the energy demand analysis and the scenarios analysis of the energy supply options for the future of the DRC by 2030 and 2050 (Model for Assessment of Energy Demand - MAED). This model has made it possible to identify and highlight that the energy transition scenarios in the domestic energy sector constitute a real lever for economic development and ecological transition as well as job creation by 2050 in the DRC. .

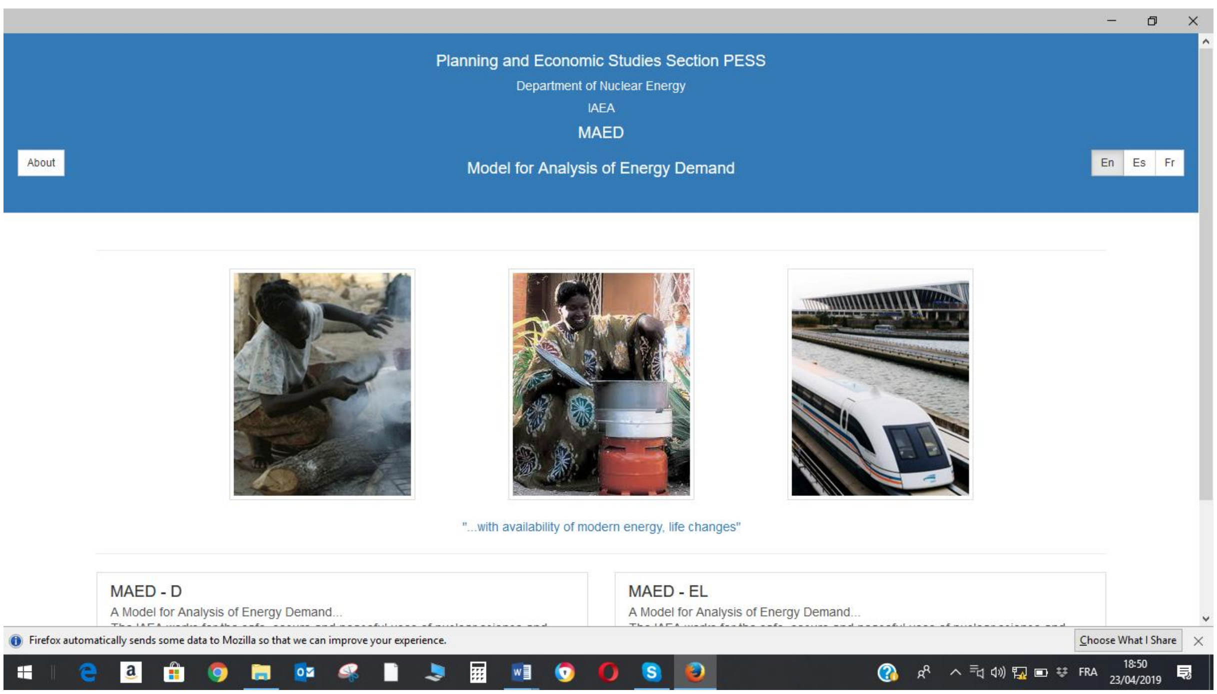
In terms of annual demand for biomass, the analysis showed that the expected consumption of households in charcoal in 2015 would be about 74 million kilos, compared to a "virtual" consumption of 89 million, or 15 million kilograms of charcoal saving (17%) through the use of improved stoves induces in 87.7% of households. Therefore, it is possible to estimate the overall economy of wood energy for a number of cities in the country.

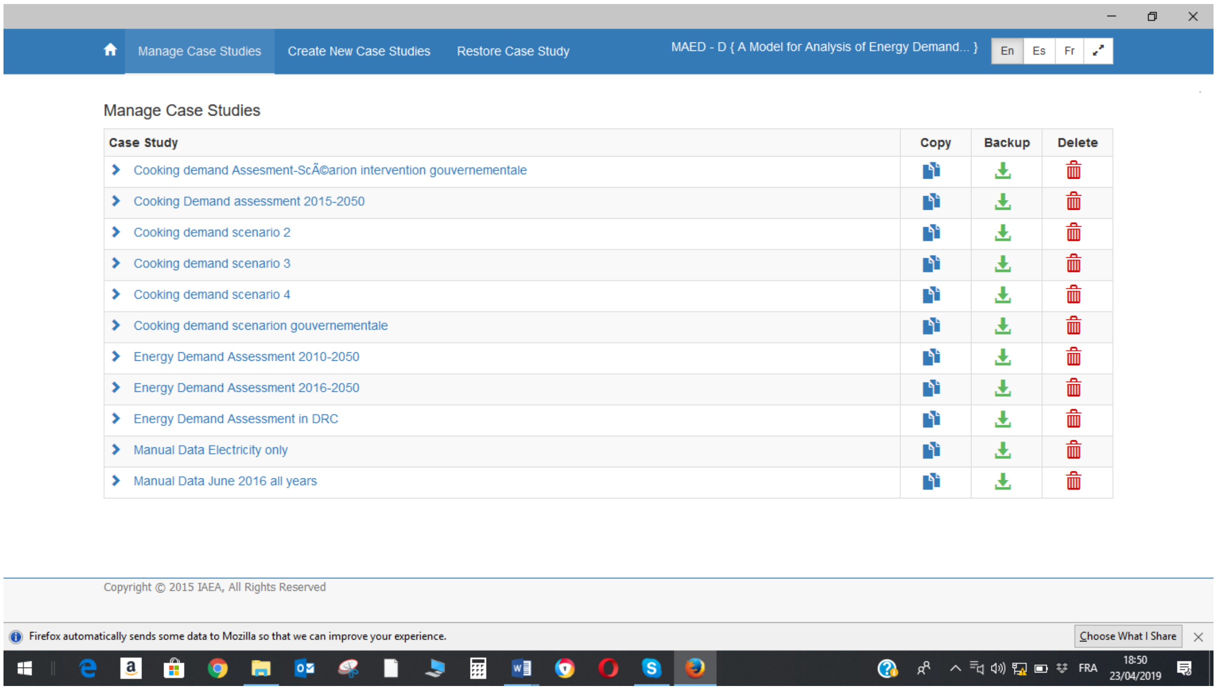
In addition, the amount of wood needed to produce this amount of charcoal (15,000 tons) would have been 75,000 tons, with a carbonization yield of 20%, corresponding to 125,000 m^3 of wood (0.6 t/m^3), or 5,000 hectares of natural forest that will be saved (assuming their productivity of $25m^3$/ha/year and a rotation of 6 years). It is therefore interesting to estimate the extent of natural forest saved knowing that it produces 250 tons of wood per hectare: 300 ha of natural forest not slaughtered if the economy is forest wood as it seems to be often the case if we consider the preference of buyers for hardwood.

The DRC's NDC objective in the energy sector positively influenced the planning of the sector. The potential for success in achieving this goal is high due to the strong commitment of the government. The objective of the NDC includes increasing the contribution of renewable energies (wind, solar PV) in the energy mix, promoting the use of modern biomass and the production and distribution of at least 1 million homes effective cooking. The challenge would be to: (i) ensure universal access to modern energy services; (ii) multiply energy efficiency by two; and (iii) produce and distribute 1 million improved cookstoves, at least 50% of them in urban and semi-urban areas.

With the development of renewable energies, the DRC could reduce its dependence on imported fossil fuels, create sustainable jobs for inhabitants and contribute to the goal of SE4All to provide access to electricity for all in the DRC by 2030. Currently, only 50% of urban populations and 35% of rural populations have access to electricity. Promoting clean energy, mainly energy for cooking, could help improve public health conditions. In fact, existing kerosene lamps and cooking stoves and biomass cookstoves contribute to indoor pollution and increase health risks. Investing in more efficient and affordable alternatives such as improved cooking stoves can have a direct positive impact on the health of citizens.

However, there is still a lack of clear policy and regulatory instruments, which is the main obstacle to the large scale deployment of renewable energies. It seems that the reluctance of financiers to facilitate private sector investment is often attributed to the lack of public policies and regulations. The negotiation of feed-in tariffs by project, and the lack of appropriate instruments and methodologies to design renewable, fair and transparent energy tariffs, constitute significant obstacles to its development.





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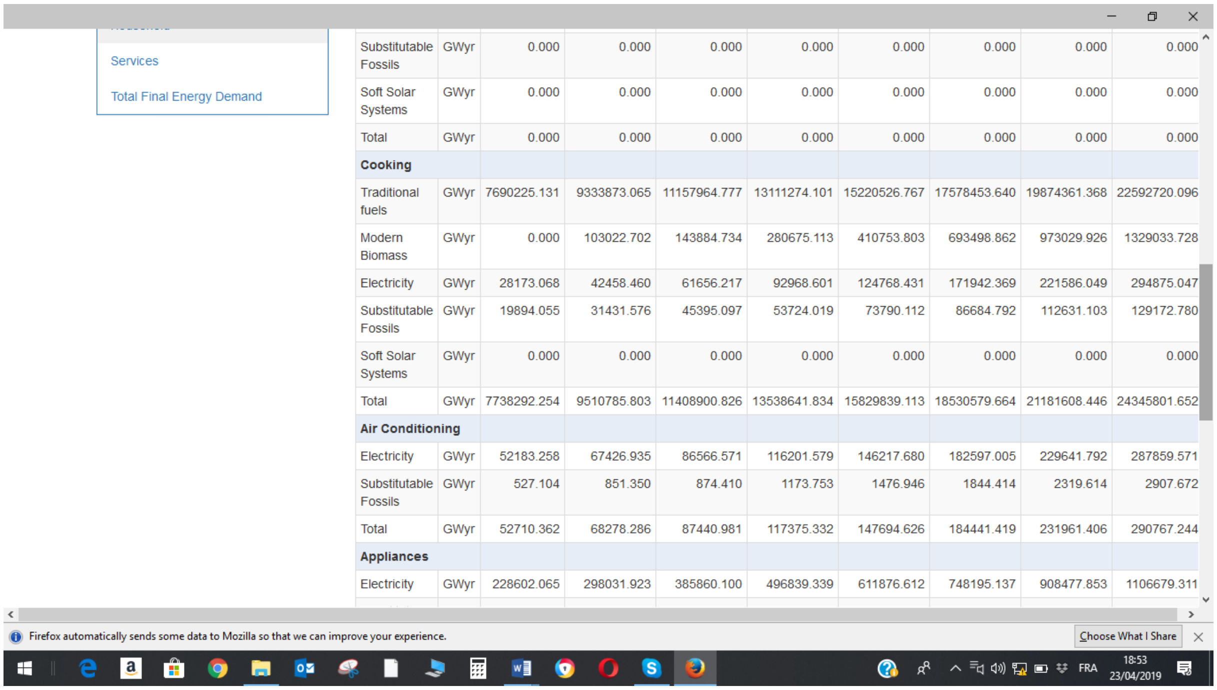
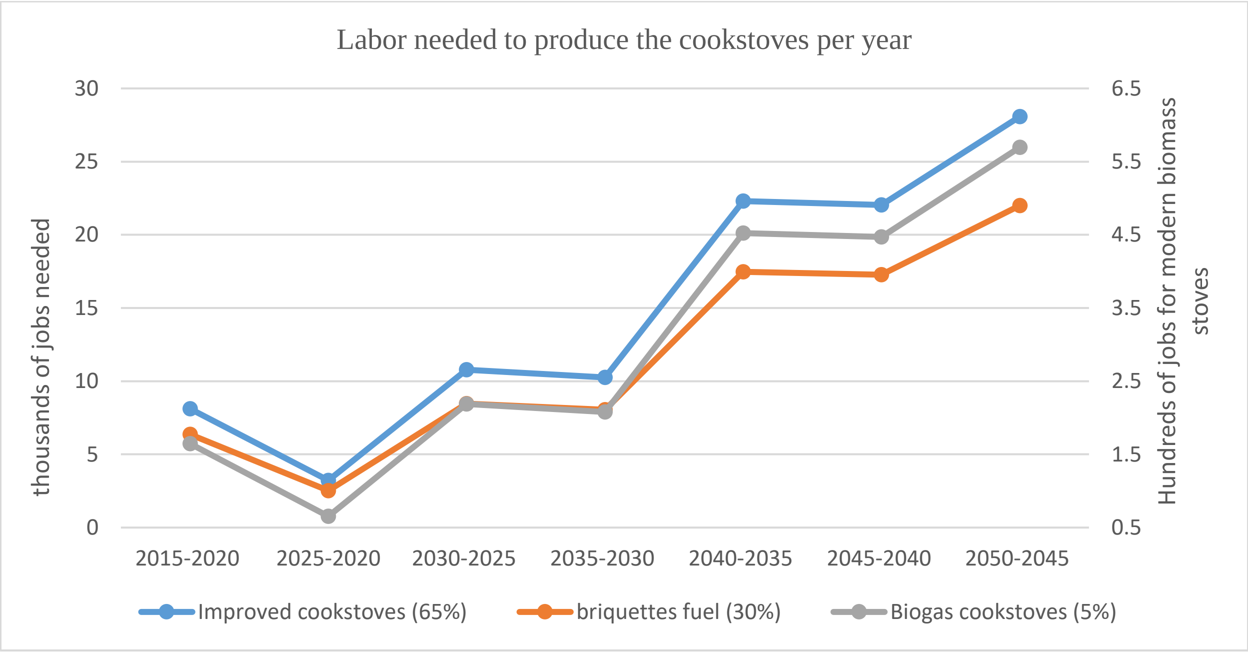
Cooking demand scenarion gouvernementale			
Energy Demand Assessment 2010-2050			
Energy Demand Assessment 2016-2050			
Energy Demand Assessment in DRC			
Manual Data Electricity only			
Manual Data June 2016 all years			

Based on the MAED model, the study made it possible to carry out 5 cases of modelling of the cooking energy demand in the DRC for the period from 2015 to 2050 on which the estimation of job creation opportunities was simulated.



Substitutable Fossils	GWyr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Soft Solar Systems	GWyr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	GWyr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cooking									
Traditional fuels	GWyr	7690225.131	9333873.065	11157964.777	13111274.101	15220526.767	17578453.640	19874361.368	22592720.096
Modern Biomass	GWyr	0.000	103022.702	143884.734	280675.113	410753.803	693498.862	973029.926	1329033.728
Electricity	GWyr	28173.068	42458.460	61656.217	92968.601	124768.431	171942.369	221586.049	294875.047
Substitutable Fossils	GWyr	19894.055	31431.576	45395.097	53724.019	73790.112	86684.792	112631.103	129172.780
Soft Solar Systems	GWyr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	GWyr	7738292.254	9510785.803	11408900.826	13538641.834	15829839.113	18530579.664	21181608.446	24345801.652
Air Conditioning									
Electricity	GWyr	52183.258	67426.935	86566.571	116201.579	146217.680	182597.005	229641.792	287859.571
Substitutable Fossils	GWyr	527.104	851.350	874.410	1173.753	1476.946	1844.414	2319.614	2907.672
Total	GWyr	52710.362	68278.286	87440.981	117375.332	147694.626	184441.419	231961.406	290767.244
Appliances									
Electricity	GWyr	228602.065	298031.923	385860.100	496839.339	611876.612	748195.137	908477.853	1106679.311

Results of cooking energy demand in one of the scenarios after simulation



The number of jobs created is estimated on the basis of the energy demand for each type of fuel or stove taken into account. This simulation shows that the job creation trend remains the same in all cases. New jobs will be created in terms of thousands for the production of improved stoves and by the hundreds for the use of modern biomass (briquettes and biogas stoves)

Interagency policy taskforces

Despite their many benefits, the appropriation of improved foci by populations requires time as any change in habits. It is therefore important to understand these issues, which must include a strong awareness of the problem and the consequences of deforestation. More and more households are using different types of improved stoves, briquettes and biogas.

The popularization of these technologies is a long-term task that requires a change in behavior of both urban and rural populations. To do this a real political will must be affirmed making improved stoves and the use of modern biomass effective tools to fight against deforestation, land degradation, health problems related to indoor air pollution, decline in production, cultural handicaps, etc.).

The government must be able within the framework of the public service to implement regulatory, administrative and not financial conditions in place with a view to widespread popularization and use of improved stoves and the use of modern biomass.

As part of the implementation of the Domestic Energy Strategy and the National Energy Policy, with a view to ensuring the promotion and popularization of high-performance cooking equipment, the establishment of a high-level dialogue framework and a Consultative Technical Inter-ministerial Platform on the domestic energy sector has promoted the Government's adoption of strong orientations in terms of:

- Better management of sources of energy wood supply (firewood and charcoal);
- The promotion of alternative sources such as fuel briquettes and the use of butane gas and
- The promotion of efficient cooking equipment (solar cookers, improved fireplaces / stoves).
- Promoting the purchase or installation of these fireplaces using local materials in public places (canteens, restaurants, etc.)
- Carry out a vast publicity campaign through the media (TV, local radios, etc.) as well as all the meeting and exchange frameworks in view of a strong continuous awareness and constant monitoring for the appropriation of populations
- Encourage institutions and research and training centers to intensify the reflection for the development of ranges of models of fireplaces based on more efficient local materials

To ensure the implementation of the Low Carbon Energy Transition Initiative, the Ministry of Environment and Sustainable Development, through the Consultative Technical Inter-ministerial Platform to implement the policy of harmonization between ministries to support trajectories that maximize climate and socio-economic benefits, as part of the implementation of NDC.

The energy transition in the domestic sector in the DRC, based on the policy of promoting new renewable energies, faces challenges and opportunities intrinsically linked to the national development process. While the issue of access to electricity and security of supply remain central objectives, a new dimension of policies lies in taking into account the climate challenge and CO_2 emissions. The dynamic notion of sustainability implies the search for a balance between these objectives which can thus prove to be both complementary and contradictory.

It is thus a set of technico-economic, social and political processes aiming at the transition to a more sustainable energy system, through the progressive substitution of traditional sources and technologies by new and renewable energies. At the same time, this requires changes in behaviour (energy use), institutional (sector regulation) and organizational (structures and functioning of public and private actors).

Sustainability at the energy level therefore implies taking into account a series of objectives in their environmental, social and economic dimensions:

- security of supply: this implies ensuring a steady (uninterrupted) supply flow of final energy;
- accessibility and economic efficiency: this includes guaranteed access (physical and economic) to a modern minimum energy service for the entire population; and
- cleanliness: this implies the minimization of the environmental impacts at the global level (mainly GHG emissions) and at the local level (pollutant emissions, water or soil contamination, etc.).

It is also important to consider the positive effects of the energy transition sector on community development and employment. The simulations showed that the sector is more labour-intensive because they generate more jobs per MW compared to conventional technologies. In the context of this report, it is not easy enough to say so, as several socio-economic parameters and studies on the number of direct and indirect jobs created are still needed.

3) Conclusion & way forward

It has been shown through this initiative that in the DRC there is real potential and capacity for the transition to low emissions domestic energy options to complement LEDS development in agriculture, forestry, and waste management (agriculture and household bio-degradable waste). This included the construction of improved cooking stoves and the gasification process of biodegradable household waste and agricultural and agro-industrial residues, as briquettes and biogas (biomass). Integrated approaches to mobilize ministries (notably energy, forestry and agriculture) in their sectoral policies have been analyzed in order to reduce pressure on natural forests.

With the support of the Modelling Working Group, under the supervision of the Department of Sustainable Development, the main actors, including the Ministries of Agriculture, Energy, Land, Forests, Environment, Transport, Finance and Planning, were informed and mobilized around the strategic pillars of NDC implementation, based on transition options to low-emission domestic energy sector identified in this study

The socio-economic and environmental impact analysis of the various scenarios showed the positive and substantial job creation impact in coherence with the national policies in terms of sustainable development and energy objectives and thus support the implementation of the CDN of the DRC

Through the closing and information exchange notes of the inter-institutional expert advisory working group on energy policies and strategies and the implementation of the low-carbon development strategy, the government and key stakeholders were encouraged in their commitment to pursue reforms in the energy sector, including:

- meet the energy needs of social development meeting the needs of households, both in quality and quantity;
- ensure the protection of the environment; and
- promote the development of technical and administrative structures promoting a cross-sectoral approach.

To achieve the objectives of this policy, the government has developed an "energy policy and strategy" focused on:

- improving the energy balance and improving the energy mix, which encourages the use of modern biomass and energy efficient kilns;
- the management of the national energy system through a better recovery of organic waste and a reduction of negative effects on the environment;
- Energy consumption in rural areas for income-generating activities and reduction of rural-urban migration;
- Improve the coordination of resources in the energy sector, taking into account the municipal, departmental and national plans;
- promote private investment in the sector ;
- improve access to quality energy services for the population;

The engagement of all state and non-state actors is critical to the success of the transition to energy efficiency and implementation of the NDC. This will include:

- promote investment in low-carbon infrastructure;
- promote passive and active energy transition to reduce final energy consumption at national level; and
- Operationalize renewable energy development plans (hydropower, solar, wind, biomass, etc.) based on the implementation of the NDC in a participatory and inclusive approach.

4) Annex: include list of team members – component 1 team, component 2 (modelling team & policy taskforce team)

	Name	Roles and responsibilities	institution
Component 1 team: Transition to low-carbon energy options in the domestic sector			
1.	Prof. Dr. Bernard NDAYE	Team leader	Higher Institute of Applied Technologies (ISTA)
2.	Augustin LOMENA MULENDA	Research and development of energy efficient furnaces	Centre for Studies and Research in Renewable Energy
3.	André KABWE	Develop in œ implementation of manuals and project operation;	National Centre of Energy (CNE) /Ministry of Energy and Hydraulic Resources
4.	Kuabi BAVUEZA	· Make é study on the socio-economic impact of e Mod e l	Energy Information System (EIS)/ General Secretariat for Energy and Hydraulic Resources
5.	Bertin BAPINGA	Conduct studies on the environmental impact of the Model (gains)	Center for Integrated Rural Development and Adaptation (CADRI)
6.	Dr. Prof. Jean Paul KIBAMBE	Conduct an analysis of the impact of the value chain on the decision chain	University of Kinshasa
7.	Rachel KAYEYE	Conduct a study on the need for cooperation between the actors in the decision chain	Ministry of Petroleum
8.	Samuel MANDRAGUEL		Ministry of Petroleum
9.	Georges KAPONSOLA	Conduct a study on the environmental impact of the Model (gains)	DDD / MECNDD
10.	Gaston ILUNGA	Conduct an analysis of the impact of the chain of values on the chain of decisions d é	Ministry of Industry

	Name	Roles and responsibilities	institution
11.	Perching MALELA	Make é study on the socio-economic impact of Model	Ministry of Scientific Research and Technology
12.	Gloire KABEMBA	Conduct a study on the socio-economic impact of the Model	Green Business
13.	Alphonse BANGILA		BIODEC NGO
component 2: Modelling team & policy taskforce team			
14.	Onèsphore MUTSHAIL KAVUL	Senior national expert	University of Kinshasa (UNIKIN)/Faculty of Sciences/Department of Physics
15.	Theodore KASANDA KALONJI	Development of climate scenarios	University of Kinshasa (UNIKIN)/Faculty of Sciences/Department of Physics
16.	André KABWE BIBOMBE	Expert in energy demand planning	Energy Commission/Ministry of Hydraulic Resources and Electricity
17.	Germain ZASY NGISAKO	Forest Expert	Ministry of Environment and Sustainable Development
18.	NICKY KINGUNIA	Expert in forest carbon accounting	Carbon Map and Model Project
19.	François NSEKA SEDI	Expert in Urban Planning	Urban Design and Planning Office (Ministry of Infrastructure)
20.	Dr. Ruffin NSIELOLO KITOKO	Expert in inventory of greenhouse gases	University of Kwango (Kwilu Province)
21.	MAKOLO MBO	Processing of national data / statistics	Central Bank of Congo

	Name	Roles and responsibilities	institution
22.	BADILA LUWILAMO	Energy statistics	Ministry of Energy and Hydraulic Resources
23.	MUBILAYI KABEYA François	Forestry expert	Sustainable Development Department
24.	MUTEBA Pontien	socio-economic Expert	General Secretariat for Rural Development/Direction of Study and Planning
25.	NSEMBANI Alphonse	Data collection expert	National Institute of Statistics
26.	Bernard NDAYE	Expert in energy demand planning	Higher Institute of Applied Technologies
27.	BAPINGA MUSELU	Development of socio-economic scenarios	Center for Adaptation to climate change and Integrated Rural Development
28.	Jean-Claude KABAMBA	Expert in GHG inventory	Center for Adaptation to climate change and Integrated Rural Development (CADRI)