GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

Naoko Ishii
CEO and Chairperson

February 16, 2016

Dear LDCF/SCCF Council Member:

UNDP as the Implementing Agency for the project entitled: ***Benin: Strengthening the Resilience of the Energy Sector in Benin to the Impacts of Climate Change***, has submitted the attached proposed project document for CEO endorsement prior to final approval of the project document in accordance with UNDP procedures.

The Secretariat has reviewed the project document. It is consistent with the proposal approved by LDCF/SCCF Council in March 2014 and the proposed project remains consistent with the Instrument and LDCF/SCCF policies and procedures. The attached explanation prepared by UNDP satisfactorily details how Council's comments have been addressed. I am, therefore, endorsing the project document.

We have today posted the proposed project document on the GEF website at www.TheGEF.org. If you do not have access to the Web, you may request the local field office of UNDP or the World Bank to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

Naoko Ishii
Chief Executive Officer and Chairperson

Attachment: GEFSEC Project Review Document
Copy to: Country Operational Focal Point, GEF Agencies, STAP, Trustee

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REQUEST FOR CEO ENDORSEMENT

PROJECT TYPE: FULL-SIZED PROJECT
TYPE OF TRUST FUND: LDCF

PART I: PROJECT INFORMATION

Project Title: Strengthening the resilience of the energy sector in Benin to the impacts of climate change			
Country(ies):	Benin	GEF Project ID:	5431
GEF Agency(ies):	UNDP	GEF Agency Project ID:	4979
Other Executing Partner(s):	Ministère de l'Energie, des Recherches Pétrolières et Minières, de l'Eau et du Développement des Energies Renouvelables (Ministry of Energy, Mining and Petroleum Exploration, Water and Renewable Energy Development)	Submission Date: Resubmission Date:	3 Nov 2015 3 Feb 2016
GEF Focal Area (s):	Climate Change	Project Duration(Months)	60 months
Name of Parent Program (if applicable): ➢ For SFM/REDD+ ☒ ➢ For SGP ☐ ➢ For PPP ☐		Project Agency Fee ($):	760,000

A. FOCAL AREA STRATEGY FRAMEWORK

Focal Area Objectives	Trust Fund	Grant Amount ($)	Co-financing ($)
CCA-2: Increase adaptive capacity to respond to the impacts of climate change, including variability, at local, national, regional and global level	LDCF	850,000	2,000,000
CCA-1 Reduce vulnerability to the adverse impacts of climate change, including variability, at local, national, regional and global level	LDCF	2,400,000	11,000,000
CCA-3 Adaptation Technology Transfer: Promote transfer and adoption of adaptation technology	LDCF	4,370,000	17,000,000
Project management Cost (PMC) including DPC		380,000	1,570,000
Total project costs		8,000,000	31,570,000

B. PROJECT FRAMEWORK

Project Objective: To reduce the impacts of climate change and variability on Benin's energy sector						
Project Component	**Grant Type**	**Expected Outcomes**	**Expected Outputs**	**Trust Fund**	**Grant Amount ($)**	**Confirmed Cofinancing ($)**
1. Mainstreaming adaptation to climate change into energy policies and management and planning strategies and tools	TA	1.1 Capacities of the energy sector's stakeholders are strengthened in order to enable them to integrate climate risks in energy planning and to face climate risks	1.1.1 A multi-stakeholder platform is set up to facilitate dialogue between decision-makers in different sectors related to energy, and decision-making on the competing use of energy sources and on cross-	LDCF	850,000	2,000,000

			cutting issues related to the production, access and energy efficiency in relation to climate change 1.1.2 A training program is implemented for 500 individual stakeholders in the sectors related to energy (including members of the multi-stakeholder platform of the energy sector and members of the National Multi-sectoral Commission on Domestic Fuels) to strengthen their capacity to: i) identify climate risks for the energy sector; ii) design and implement adaptation measures; iii) integrate climate risks and parameters in key policies of the energy sector, in the energy planning tool GEOSIM, and in planning processes of energy supply and demand;			
2. Sustainable land and forest management practices for strengthening the climate resilience of the zones supplying wood for energy	TA	2.1 Energy supply strategies and plans integrate climate change and adaptation measures	2.1.1 The Masterplans for Supply (SDA) of fuelwood in the cities of Parakou, Malanville, Djougou, Natitingou, Bohicon, Abomey, Cotonou, Porto-Novo and Lokossa (including Development Plans (PAF) of forest areas of Nonsinansson for Parakou, Tfougou for Djougou, Dahendé for Natitingou, Fita-Agbado for Bohicon, Zouzounkan and Abomey for Cotonou and Porto-Novo) are revised to incorporate climate risks and	LDCF	2,400,000	11,000,000

			appropriate adaptation measures. 2.1.2 A National Plan for optimal management of supply and demand of electric power in a context of climate change including climate risks (temperature, river flow, evapotranspiration, rain, sunshine, cyclones, floods ...) and adaptation measures are developed and implemented. 2.1.3. The Information System for Permanent Evaluation (SIEP) on domestic fuels and the Ecological and Forest Information System (SIEF) are updated and functional in order to include climate risks and strategic options to address these risks 2.1.4. The Forest Development Plans (PAF) of Middle Ouéme and communal forests of Fita Agbado (towns of Dassa and Savalou), Zounzoukan (towns of Covè and Zangnanado), Détohou (town of Abomey), Kolobi (town of Djidja), Bobe (town of Bantè), Ouogui (town of Savè), Badé (town of Ouessè), Tfougou (town of Djougou), Nonsinansson (towns of Perere and N'Dali) and Dahendé (towns of Natitingou and Toucoutouna) supplying the cities and urban centers of Benin in wood			

			energy are revised to incorporate risks of drought, wildfires, and other climate risks as well as adaptation measures			
	INV/TA	2.2. The climate resilience of watersheds of rivers Ouémé, Niger (Sota), Volta (Pendjari) housing the hydroelectric installations of Yéripao (existing) on one hand, and of Sosso waterfall, Gbassè, Koutakroukrou, Kota fall, Wabou and Kouporgou (considered in the medium term) on the other hand, is enhanced through the implementation of restoration and preservation of watershed ecosystems activities	2.2.1 Riverbanks of rivers Ouémé, Sota, Pendjari, Zou, Mono (likely to harbor hydroelectric facilities of Yéripao (existing) on one hand, and of Sosso waterfall, Gbassè, Koutakroukrou, Kota fall, Wabou and Kouporgou (considered in the medium term) on the other hand, , are protected against erosion through the reforestation of twenty acres of multipurpose herbaceous species tolerant to drought and flooding 2.2.2. Low cost community infrastructures are built and supported to protect the riverbanks of rivers Ouémé, Zou, Sota, Mono, Niger against erosion. 2.2.3. A training program on good practices of sustainable land management integrating climate risks is implemented in communities of Djidja, Abomey, Zangnanado, Dassa, Savè, Perere, N'dali, Toukoutouna, Djougou, Bantè, Bassila, in order to fight against the erosion of land in the watersheds of rivers Ouémé, Zou, Sota, Mono,			

			Niger 2.2.4. Climate resilient and environmentally sound remunerative activities such as beekeeping, small livestock farming, production and marketing of improved cooking stoves are supported through the implementation of a framework for their development (training program on good practices for business and management, support for access to needed products and components, support for access to micro-financing to start these activities).			
	INV/TA	2.3. Climate resilience of fuelwood supply areas identified by revised SDAs is enhanced through reforestation and conservation of woody areas.	2.3.1. Community parks of firewood resilient to climate change are set up in areas identified as most vulnerable by the revised SDAs, in the communal forests of Fita Agbado (towns of Dassa and Savalou), Zounzoukan (towns of Covè and Zangnanado), Détohou (town of Abomey), Kolobi (town of Djidja), Bobe (town of Bantè), Ouogui (town of Savè) , Badé (town of Ouessè), Tfougou (town of Djougou), Nonsinansson (towns of Perere and N'Dali) and Dahendé (towns of Natitingou and Toucoutouna) 2.3.2. The fuelwood supply areas (Zouzounkan			

			for Parakou, Tfougou for Djougou, Dahendé for Natitingou, Fita-Agbado for Bohicon, Zouzounkan and Abomey for Porto-Novo and Cotonou) are protected against bushfires induced and / or enhanced by climate through: i) the development of management protocols against risks of increase of the frequency and intensity of wildfires linked to climate; ii) demonstration bushfire fight methods resilient to climate around ha of forests.			
3. Energy use and production Technology transfers to strengthen the resilience of livelihoods and living conditions of the vulnerable communities	INV	3.1. Electricity production and distribution facilities are protected against disasters and other climate risks	3.1.1. Protective measures for the thermal power plants of Cotonou (Akpakpa), Porto-Novo, Kandi, Natitingou, against the increase in intensity and frequency of droughts and other climate risks and natural disasters are in place. 3.1.2. Protective measures for the distribution network (cables), against winds and raising temperatures are developed.	LDCF	4,370,000	17,000,000
	TA	3.2. Development of alternative energy production sources for vulnerable localities	3.2.1. Elaboration of a feasibility study for the development of the solar sector (installation of mini-grids in villages for cooking and lighting). 3.2.2 Awareness raising and training of men, women and children to solar technology.			

			3.2.3. Ten thousand (10,000) improved stoves and a thousand (1,000) pressure cookers are distributed through micro-financing and loan guarantee schemes in the most vulnerable rural communities of Djidja, Zangnanado, Dassa, Savè, N'dali Perere, Toukoutouna, Djougou and Bassila and urban centers of Cotonou, Porto Novo, Bohicon, Abomey, Parakou, Natitingou, Djougou, Malanville, Lokossa, Kandi, to reduce household demand for fuelwood. 3.2.4. Three improved carbonization technologies applied to 100 energy efficient kilns are spread in communities producing charcoal through the training of 500 coal operators. Technologies will be based on rotor kilns and improved casamance kilns.			
	INV	3.3. Increased investment in clean energy technologies and low-carbon practices in the agro-forestry waste sector, and in adaptive measures to increase the resilience of the energy sector to climate change.	3.3.1. Financial Support Mechanism established with a policy framework and capitalized to support private investment in adaptive measures to increase the resilience of the energy sector to climate change. MOU signed with the Central Bank of West African States (or with commercial bank selected on the basis of competitive bidding) setting out the objective,			

			funding mechanism and administration rules regarding its participation as fiduciary agent of the FSM. Financial and other incentives to be provided to project developers/Independent Power Producers (IPPs) towards low-carbon climate resilient investments in the energy sector.			
				Subtotal	7,620,000	30,000,000
				Project management Cost (PMC) including DPC	LDCF	380,000	1,570,000
				Total project costs	8,000,000	31,570,000

C. SOURCES OF CONFIRMED COFINANCING FOR THE PROJECT BY SOURCE AND BY NAME ($)

Please include letters confirming cofinancing for the projeSct with this form

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount ($)
National Government	MERPMEDER through Directorate of Energy	In kind	**7,000,000**
National Government	MERPMEDER through Directorate of Energy	Grant	**1,000,000**
National Government	MERPMEDER through PAGEFCOM	Grant	**8,000,000**
National Power Utility	CEB (Electricity Community of Benin)	In kind	**15,000,000**
GEF Agency	UNDP	Grant	**500,000**
NGO	GoodPlanet	In kind	**70,000**
Total Co-financing			**31,570,000**

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in $)		
				Grant Amount (a)	Agency Fee (b)	Total c=a+b
UNDP	LDCF	Climate Change	Benin	8,000,000	760,000	8,760,000
Total Grant Resources				8,000,000	760,000	8,760,000

E. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? no ☒

PART II: PROJECT JUSTIFICATION

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

There were only a few main changes made during the project design, from the original PIF:

- Two expected outcomes have been added namely 3.2 and 3.3.

Those outcomes have been added following a thorough full consultative process with stakeholders, via face-to-face meetings and stakeholders workshops in September and November 2014, respectively in Bohicon and Cotonou.

Based on the inputs from this consultative process, a first outcome was added compared to the original PIF on the development of alternative energy production sources for vulnerable localities (new outcome 3.2.).

The second new expected outcome focuses on the increase in investment in clean energy technologies and low-carbon practices in the agro-forestry waste sector and in adaptive measures to increase the resilience of the energy sector to climate change (new outcome 3.3.).

- There are some outputs and activities, initially located in the 3rd Component have been moved to the 2nd component, to keep consistency and alignment in the project activities.

- The financial mechanism proposed has a common administrative structure (Project Management Unit) with the one proposed under the MFA project 5752 (GEF ID) focusing on biomass. Thus the proposed mechanism should be capitalized by both projects with funds possible co-management with the fiduciary support of the Central Bank in order to reduce structural and management fees and leverage on the benefits from having a common administrative structure. Both projects will have the same project team. Clear and specific management rules and criteria for disbursement will be elaborated.

A.1 National strategies and plans

The following paragraphs only present summaries and key points. For additional details, please refer to the Project Document.

National context:

Benin (Republic of Benin) is a small Sub-Saharan African country of 116,622 km² and around 10 million inhabitants in 20131. Poverty is widespread in Benin, with more than 36% of the population living below the poverty line. The country's economy relies mainly on agriculture, in particular cotton exports, which represents one third of the Gross Domestic Product (GDP). 70% of the population is dependent on agriculture for its livelihood. Benin's economy is also highly dependent on exports and trade, especially with Nigeria, on climatic conditions for the agricultural production, and on foreign investments. As a consequence, growth rates can vary significantly from one year to another. They are currently comprised between 5 and 6%.

[1] http://data.worldbank.org/country/benin

The Government of Benin (GoB) adopted in 2011 a Growth and Poverty Reduction Strategy (Stratégie de Croissance pour la Réduction de la Pauvreté/SCRP 2011-2015)2, which aims to make Benin an emerging economy by 2025, with a sustainable growth and the achievement of the Millennium Development Goals (MDG).

Focusing on climate change, on June 30, 1994, the Republic of Benin ratified the United Nations Framework Convention on Climate Change (UNFCCC) following this commitment, and the first implementation strategies elaborated in collaboration with the Global Environment Facility (GEF), the Republic of Benin launched in January 2008 the process of the National Adaptation Plan of Action (NAPA)3..

The current project is one of the five project profiles elaborated in 2008. In the NAPA 2008 document, it was entitled « P.2 – Secteur Energie : Adaptation des ménages aux changements climatiques par la promotion des énergies renouvelables et des foyers économiques performants et autocuiseurs dans les zones vulnérables aux changements climatiques et dont les terres sont fortement dégradées ».

Benin faces important climate risks and adaptation has become an increasing priority. A first step towards adaptation to future climate change is to reduce vulnerability and exposure to present climate variability. Integration of adaptation into the energy sector, including the energy policy design, planning and decision making can promote synergies with the increasing demand for energy in Benin and disaster risk reduction. Building adaptive capacity is also crucial for the effective implementation of adaptation options in the energy sector.

The energy sector in Benin is characterized by a predominance of traditional uses of biomass energy, low access of population to modern energy (fuel and electricity). Benin is 100% dependent on outside supplies for petroleum products and over 80% for electricity (mainly from the Akosombo dam in Ghana).

The analysis of the energy balance from 2000 to 2010 clearly shows the dominance of biomass energy consumption over other types of energy. In 2010, the consumption structure shows a predominance of biomass energy and petroleum products.

The electrical energy consumption has shown during the 2000-2010 period an average annual growth of 7.1%. The very low share of electricity in the total energy consumption clearly demonstrates, if it was necessary, that the industry is embryonic and household access to electricity is still very low.

Benin has significant energy resources for power supply. However, the country faces more than two decades a recurring energy crisis, which will amplify with climate change. Benin has experienced four major electricity supply crisis between 1984 and 2007 because of:

a. Decreased water level in the Akosombo dam in the Volta river in Ghana due to the modification of the rainy seasons. This was Benin's main source of power supply until 2007;
b. At the regional level, energy deficit in the three power supply countries of Ghana, Nigeria and the Ivory Coast;
c. The sub-optimal exploitation of the energy potential of the country. The project targets this latest weakness by strengthening the resilience of the energy sector in Benin to the impacts of climate change.

Moreover, the poor quality of the energy services has negative impacts on businesses, households and Government revenue4.

Vulnerability to climate change has been assessed for each type of risk for power production and transportation,

[2] http://www.bj.undp.org/content/dam/benin/docs/pauvrete/SCRP%203-version9dec2010.pdf
[3] http://unfccc.int/resource/docs/napa/ben01f.pdf
[4] Source : Evaluation du coût socio-économique de la mauvaise qualité des services énergétiques du Bénin (Bureau d'Etudes CETRA, 2008)

considering, in the supply chain, the vulnerability is different for each type of energy source (biomass, hydropower, other renewable energies, thermal power and electricity imports). Among those sources, the most vulnerable are biomass, hydroelectricity and electricity imports. Indirectly, the economic sectors with important energy needs will be affected by extreme climate events and by climate change.

With regards to change in rainy seasons, the main risk is posed by flooding to power stations and electricity transmission and primary distribution substations. Substations are at greater risk of river flooding, while power stations are at greater risk of tidal flooding. There may be opportunities to increase resilience to flooding when existing energy infrastructures reach the end of their lifetime and are replaced, but this will depend strongly on the design and location of the new infrastructure.

High temperatures will also impact the power network: ambient temperature can be expected to result in future derating of the overhead power lines, up to 5% for the transmission network and even higher for the distribution network. Derating means an increase in line losses due to heat waves. The electrical energy available for distribution will then undergo a significant reduction in transport. These losses will become more significant during the hottest days of the year, during which energy demands are usually higher because of an increase in energy demand for cooling.

Finally, solar energy potential would increase but, in the long term, risks of negative impacts on the equipments' performance will increase as well. Sectors requiring continuous electric supply for refrigeration and freezing, typically food industry, are also very exposed. The lack of woody biomass will impact the small catering services.

A.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities.

This project has been designed in compliance with LDCF guidelines and is in line with the updated Results-Based Management Framework for the LDCF and SCCF (GEF/LDCF.SCCF.9/Inf.4, October 20, 2010).

The project is also in line with Objective 1 of LDCF/SCCF focal area aiming at "*reducing vulnerability to the adverse impacts of climate change, including variability, at local, national, regional and global levels*" and with Objective 2 aiming at *" increasing adaptive capacities to respond to the impacts of climate change, including variability at local, national, regional and global levels*".

The links to related expected outcomes in the LDCF/SCCF Result Based Management Framework include outcome 2.1 " Mainstreamed adaptation in broader development frameworks at country level and in targeted vulnerable areas", outcome 1.2 "reducing vulnerability in development sectors" and outcome 2.2 "Strengthened adaptive capacity to reduce risks to climate-induced economic losses".

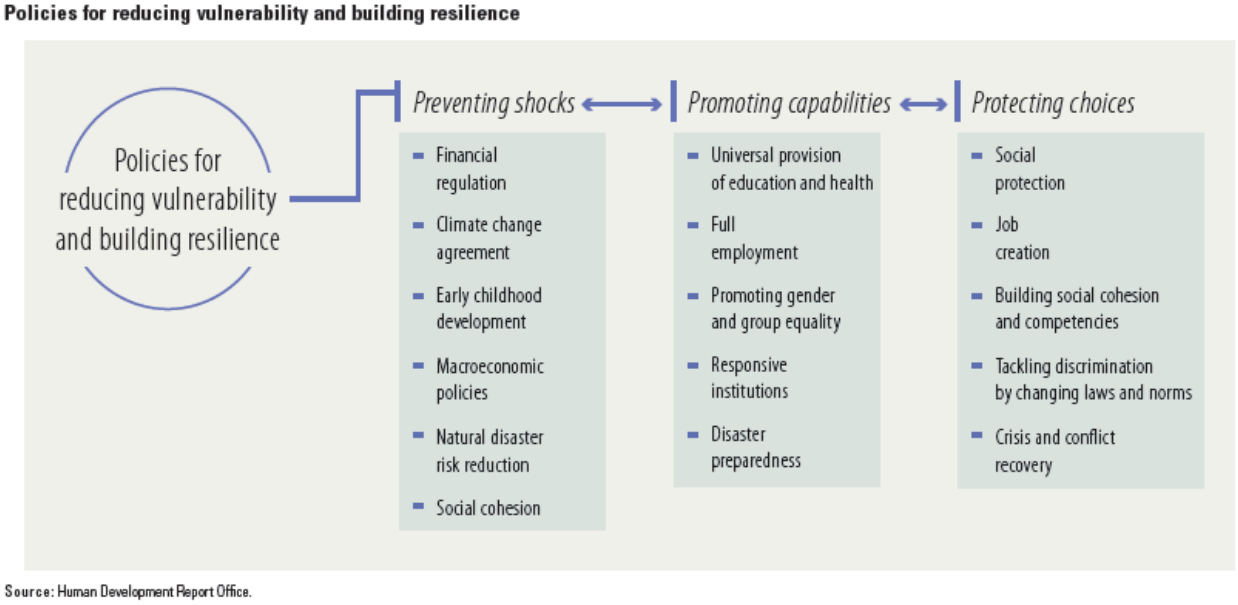
A.3 The GEF Agency's comparative advantage:

UNDP support strategy on climate change adaptation in Benin

As it is highlighted in UNDP's 2014 Human Development Report[5], vulnerability and resilience represent a major challenge today for human development. UNDP aims at strengthening resilience of communities as a whole, while focusing on people instead of a specific sector. Because energy, in the form of electricity, fuel, heat…, is essential to human development, assessing its vulnerability and providing solutions to adapt to future changes is essential too. This is why this project is particularly in line with UNDP's development objectives. The 2014 HDR underlines, moreover, the necessity to target more vulnerable groups (women, youth, senior, poor communities, minority groups, etc.). Strengthening resilience and preparedness to crisis, be they nature or human-induced, will be part of UN's post-2015 agenda priorities. It should be reached through collective action and better international governance.

[5] http://www.undp.org/content/dam/undp/library/corporate/HDR/2014HDR/HDR-2014-English.pdf

Figure 1: Policies for reducing vulnerability and building resilience[6]



Addressing risks, including natural disaster risks, will allow Benin to progress towards better human development indicators, contributing to its becoming an emerging country. Benin currently (2013 assessment) presents a low human development according to the UN criteria, with an HDI of 0.476 (on 1) that places it at the 165th rank among UN states (on 187). Climate change does not create vulnerability, but it increases it where it already exists. Thus, by rapidly increasing the rate of extreme events in the years to come, climate change will trigger more violent natural disasters and conflicts.

A.4. The baseline project and the problem that it seeks to address:

The following paragraphs only present summaries and key points. For additional details, please refer to the Project Document.

Energy is central to Benin's strategy to accelerate economic growth and poverty reduction. However, the country has little experience dealing with adaptation to climate change in the energy sector. With its global perspective, GEF is the leading body in the very new area of adaptation to climate change and well positioned to provide knowledge and institutional experience gained from its various programs on adaptation. It is essential for Benin to introduce adaptation into its development decision making process, and it is timely for power companies, energy suppliers, energy consumers, local authorities and the GoB to understand that climate change is impacting the energy sector and adapt the energy system and policy accordingly.

UNDP would be the implementing agency for the proposed project. UNDP can bring its expertise and know-how in a wide range of aspects related to project management, energy management, adaptation, etc. At the same time, the project is consistent with the goals of the United Nations Development Assistance Framework (UNDAF) in Benin for the 2014-2018 period. The proposed project will contribute to the successful implementation of this partnership strategy.

One of the solutions to the climate vulnerability of Benin's energy sector is to implement adaptation measures combining technical measures to strengthen energy sources and infrastructure, to integrate climate risks in sector planning process and to encourage behavior change to promote a climate-rational and diverse use of energy potential.

[6] Source: UNDP, 214

These measures should be underpinned by promoting alternative income generating activities to unsustainable practices of exploitation of forest resources and adoption / implementation by the Benin of institutional, regulatory and policy measures to remove barriers to the adoption of such adaptation.

Baseline scenario

The energy sector is vulnerable to projected climate changes. For example, it is expected that climate change will impact the power sector in numerous ways[7]. Increases in water temperature are likely to reduce generation efficiency, especially where water availability is also affected. Increases in air temperature will reduce generation efficiency and output as well as increase customers' cooling demands, stressing the capacity of generation and grid networks. Changes in precipitation patterns and surface water discharges, as well as an increasing frequency and/or intensity of droughts, may adversely impact hydropower generation and reduce water availability for cooling purposes to thermal and nuclear power plants. Extreme weather events, such as stronger and/ or more frequent storms, can reduce the supply and potentially the quality of fuel (coal, oil, gas), reduce the input of energy (e.g., water, wind, sun, biomass), damage generation and grid infrastructure, reduce output, and affect security of supply. Rapid changes in cloud cover or wind speed (which may occur even in the absence of climate change) can affect the stability of those grids with a sizeable input of renewable energy, and longer term changes in these and precipitation patterns can affect the viability of a range of renewable energy systems. Sea level rise can affect energy infrastructure in general and limit areas appropriate for the location of power plants and grids. The thermal power plant of Cotonou is under such threats.

Table 1: Indicative Impacts of Climate Change on Electricity Generation, Transmission and End Use[8]

Technology	Δ Air Temp	Δ Water Temp	Δ Water Availability	Δ Wind Speed	Δ Sea Level	Floods	Heat Waves	Storms
Coal	1	2	1-3	-	-	3	1	-
Oil	1	2	1-3	-	-	3	1	1
Natural gas	1	2	1-3	-	-	3	1	1
Nuclear	1	2	1-3	-	2a	3	1	-
Hydropower	-	-	1-3	-	-	3	-	1
Wind	-	-	-	1-3	3a	1	-	1-3
Photovoltaic	1	-	-	1	-	1	1	1
CSP/Solar tracking	-	-	2	2	-	1	1	2
Biomass/Biofuel	1	2	2	-	3a	3	1	-
Geothermal	-	1	-	-	-	1	-	-
Ocean	-	1	-	-	1	N/A	-	3
T&D grids	3	-	-	1	3a	1-2	1	2-3
End use	2	-	-	-	-	-	3	-

CSP = concentrating solar power, Δ = change in, T&D = transmission and distribution

[a] Higher severity in coastal or low-lying areas.

Notes: 3 = severe impact, 2 = medium impact, 1 = limited impact – = no significant impact, N/A = not applicable

Hence, in the baseline scenario, the Beninese energy sector does not take into account the consequences of climate change and energy access in the country remains vulnerable to drought and floods. The power sector for instance is subject to blackouts due to climate change: there are some scientific evidences that rainfall in the Volta basin and intake

[7] http://www10.iadb.org/intal/intalcdi/PE/2012/12152.pdf

[8] ADB, 2012. Climate Risk and Adaptation in the Electric Power Sector. Modified and expanded from European Commission. 2010. Investment needs for future adaptation measures in EU nuclear power plants and other electricity generation technologies due to effects of climate change. Final report. European Commission Directorate General for Energy Report EUR 24769.

water levels on the Volta lake impact hydropower generation[9]. This partly explains the difficulties for the Volta River Authority (VRA) [10] in Ghana to supply Benin in power.

Today, adaptation is not present in any energy policy document nor in the national energy management system. As far as sustainable and resilient land and management practices are concerned, various masterplans and development plans (SDAs and PAFs) do exist, but they need to be revised by strengthening the climate resilience of the areas supplying wood for energy. The same applies for the Information System for Permanent Evaluation (SIEP) on domestic fuels and the Ecological and Forest Information System (SIEF). In the baseline scenario, the watersheds of rivers in Benin are vulnerable to climate change. The project will therefore set-up adaptation measures to secure the energy sector of Benin.

Adaptation measures

Changes in climate, e.g. higher temperatures and sea level rise, may result in consequences for the energy sector of Benin, urging to take actions by adopting adaptation measures.

- Adaptation Measures for Thermal Power Generation
- Adaptation Measures for Renewable Energy
- Adaptation Measures for Biomass Energy and Biofuels
- Adaptation Measures for Transmission and Distribution
- Adaptation Measures for Electricity End Use

Proposed alternatives through the project:

Objective

The project aims to reduce the impacts of climate change and variability on Benin's energy sector.

It will contribute to the removal of the main institutional, political and financial barriers and those relative to individual capacities and knowledge that hinder effective climate risk management for the energy sector in Benin. It will introduce adaptation measures to strengthen the resilience of the national energy sector.

The advanced degradation of fuel wood supply areas, in a context of predominance of energy from wood in the energy balance of Benin, the narrowness of the energy mix and the difficulties in the supply of electrical energy are obstacles to meeting households energy needs, and may worsen Benin's energy deficit. The GoB is aware of this and has taken a number of initiatives to address these shortcomings in the energy sector.

Outcomes

At the end of the project, Beninese stakeholders and beneficiaries of the energy sector will have achieved strengthened capacities, allowing them to better adapt to climate change and variability, and thus reducing their vulnerability to energy shortfalls. Benin will have further integrated and implemented adaptation strategies and measures both at the national scale and locally, in identified vulnerable areas. Finally, stakeholders and beneficiaries of the energy sector will benefit from strengthened energy supply sources throughout the Beninese territory, against the current and future impacts of climate change.

[9] Obeng Bekoe E., and Yaw Logah F., 2013. « The Impact of Droughts and Climate Change on Electricity Generation in Ghana », Environmental Sciences, Vol. 1, 2013, no. 1, 13 – 24. http://m-hikari.com/es/es2013/es1-4-2013/bekoeES1-4-2013.pdf

[10] Benin and Togo relies on power coming from Ghana. In 2013, the power supply arrangement of 50MW on week days (off peak) and weekends as well as 35MW during peak periods on weekdays was no longer adequate for their countries' needs, while at the same time these countries were experiencing unscheduled blackouts due to lack of power. The power is generated by the Volta River Authority, which main generation facility is the Akosombo hydropower plant (1,020 MW of installed capacity accounting for 35.83% of the total installed capacity of VRA). Drought is one of the main causes of the power rationing due to low water levels in the Akosombo dam. More information can be ffound on the VRA website : http://www.vra.com/

The project will consequently strengthen the Government's initiatives through additional measures to strengthen human resources and institutional capacities in the energy sector (**Outcome 1**), to integrate climate risks into planning policies and tools of the energy sector (**Outcome 2**), and through investing in physical adaptation measures to strengthen climate resilience of energy sources and to improve energy services for the most vulnerable households (**Outcome 3**).

To address the project's objectives and achieve the expected results, the project framework is structured along 3 components.

Project Outcomes, Outputs and Activities

Component 1: Mainstreaming adaptation to climate change into energy policies and management and planning strategies and tools

The baseline is a growing demand in energy access in the country, with existing energy planning to increase the supply from renewable sources such as hydropower (with a target set at 259,9 MW). Rural electrification is also a priority set by the GoB for around 1,000 rural communities[11]. Under this scenario, the national energy management system does not include any module on climate-related risks.

The outcome focuses on strengthening climate change adaptation capacities of stakeholders of the energy sector to better identify and address the climate risks for the sector.

The project will bring additional resources to the existing policies and strategies of the energy sector in Benin, to the PDDC and to the PNDGRN, in order to strengthen the capacities of state and non-state stakeholders involved in managing the energy sector, to enable them to integrate climate risks and adaptation measures in planning processes for the management of supply and demand of energy in Benin, the coordination of decision-making and of initiatives in the sector.

The first output consists in setting up a multi-stakeholder platform to facilitate dialogue between decision-makers in different sectors related to energy, and decision-making on the competing use of energy sources and on cross-cutting issues related to the production, access and energy efficiency in relation to climate change. Through this output, the project will support the creation and functioning of a multi-stakeholder platform with the goals stated above. The output will also support the integration of the platform, as a technical or sector work group, into the national committee on sustainable development and the national committee on climate change. This will strengthen the institutional legitimacy of the platform and its sustainability after the end of the project (Output 1.1.1.).

Activities will be dedicated to a gender sensitive evaluation of the project and of the positioning of the actors in the platform, setting the criteria to appoint the members of the multi-platform, and develop the work plan of the members of the multi-stakeholder platform.

A training program will be implemented for 500 individual stakeholders in the sectors related to energy (including members of the multi-stakeholder platform of the energy sector and members of the National Multisectoral Commission on Domestic Fuels) to strengthen their capacity to: i) identify climate risks for the energy sector; ii) design and implement adaptation measures; iii) integrate climate risks and parameters in key policies of the energy sector, in the energy planning tool GEOSIM, and in planning processes of energy supply and demand (Output 1.1.2.). The training program planned in this output will be supervised (development and implementation) by the Direction of Energy. The training program will increase the stakeholders' knowledge of interrelations between the energy sector and climate

[11] http://www4.unfccc.int/submissions/INDC/Published%20Documents/Benin/1/INDC%20BENIN%20%20Version%20finale%20revue%20septembre%202015.pdf

change, so that they can later on provide sensible opinions and advice in the decision-making of the sector. The program should also target forestry officers from every category, technical managers from the Ministry of Energy, and beneficiaries from local authorities, NGOs and communal forestry associations.

The program will especially rely on existing structures of technical, professional and higher education and training, such as CFPP, CEB, SBEE, FSA, EPAC, and the water and forestry training center of Toffo. The program will begin by a training of these trainers, which will then be in charge of the training of stakeholders defined above. Experiences and lessons learned from this training will allow the creation of a training module on integrating climate risks into the energy sector, to be provided to CFPP and spread in their centers. Activities will focus on the capacity building of 500 stakeholders (as for 2020) in sectors related to energy with a yearly quota of at least 50 women and 50 men. At least 80% of those trainees should, during the year, apply the experience acquired in training. Also, the trained stakeholders from sectors related to energy will be assisted, by providing them with regular training reports and annual project reports. A list of parameters and indicators for energy sector risks to climate change will be defined and methodologies and tools elaborated for evaluating and prioritizing the adaptation options for advancing a climate resilient energy sector.

Component 2: Sustainable land and forest management practices for strengthening the climate resilience of the zones supplying wood for energy

Sustainable land and forest management, and biomass production are highly susceptible to climate change. The energy density of biomass can vary due to variations in photosynthetic/plant physiological interactions, often driven by CO_2 concentration changes. However, in the baseline scenario, adaptation is absent from any national biomass-based energy policy or program document.

The outcome of this component will be that energy supply strategies and plans at all scales integrate as much as possible climate change issues and adaptation measures.

Stakeholders in charge of managing the energy sector do not only need to integrate into energy planning the parameters affecting energy production, distribution and demand, but also hydro-meteorological and climatic parameters. Even though climate is not the only determining factor of energy demand, it is a key factor. Future energy demands will depend on factors such as development policies, the industrial sector's dynamism, population growth, the evolution of modes of transportation, the improvement of energy efficiency, and future climate evolutions. All of these non-climatic factors will be affected by climate and climate change, independently of any problem of the energy sector. Satisfying the energy demand will require taking into account these climate-related factors. Moreover, the energy sector will need to assess potential direct impacts of climate and climate change on energy sources, energy production and distribution, and to develop strategies to prevent these risks, in order to minimize the potential impacts of climate change on the energy balance.

In order to use wood energy resources of Benin in a rational and sustainable way, the project will support, based on future climatic projections, an assessment of risks and vulnerabilities of the communal forests identified as supply areas for fuelwood to temporal and climatic phenomena such as storms, floods, increase in frequency and intensity of droughts, intensification of wild fires, in order to adopt a proactive strategy for the management of these risks and to integrate them into the new design of SDAs. This means that these SDA, which will be looking at fuelwood in the cities of Parakou, Malanville, Djougou, Natitingou, Bohicon, Abomey, Cotonou, Porto-Novo and Lokossa, will be revised (Output 2.1.1.).

In addition, a National Plan for the optimal management of supply and demand of electric power will be developed and implemented, by considering climate risks (temperature, river flow, evapotranspiration, rain, sunshine, cyclones, floods

...) and adaptation measures. This will be based on projections of the evolution of energy demand according to economic development and demographic evolution scenarios, to elaborate a climate-resilient electricity supply masterplan and to allow minimizing imbalances between energy supply and demand due to climate change and variability as well as natural disasters (Output 2.1.2.).

In the same parallel, the Information System for Permanent Evaluation (SIEP) on domestic fuels and the Ecological and Forest Information System (SIEF) will be updated and functional in order to include climate risks and strategic options to address these risks. The revision of the SIEP and SIEF tools will enable the General Directorate of Energy (DGE) and the National Remote Sensing Center (CENATEL) to respectively integrate climate risks identified above in the monitoring, planning and management of the sub-sector of biomass energy (Output 2.1.3.).

The Forest Development Plans (PAF) of Middle Ouéme and communal forests of Fita Agbado, Zounzoukan, Détohou, Kolobi, Bobe, Ouogui, Badé, Tfougou, Nonsinansson and Dahendé will be revised to incorporate risks of drought, wildfires, and other climate risks as well as adaptation measures. These forests supply the cities and urban centers of Benin in wood energy. This output will promote climate-resilient and ecologically sustainable energy from wood. It will support the revision of Forest Development Plans corresponding to 600,000 ha in Middle Ouémé and communal forests supply energy wood to the eight big cities of Benin. These plans will integrate climate risks such as the increase in frequency and intensity of droughts, floods, rainfall perturbations, and climate factors which can favor the increase in intensity and frequency of wild fires. It will also support the development of community measures and rules enabling the concerned communities to ensure that resources and land use directives set by the revised plans are respected (Output 2.1.4.).

The second outcome under this component is the enhancement, through the implementation of restoration and preservation of watershed ecosystems activities, of climate resilience of watersheds of rivers Ouémé, Niger (Sota), Volta (Pendjari) housing the hydroelectric installations of Yéripao (existing) on one hand, and of Sosso waterfall, Gbassè, Koutakroukrou, Kota fall, Wabou and Kouporgou (considered in the medium term) on the other hand.

With the project, riverbanks of these rivers will be protected against erosion through the reforestation of 10,000 hectares of multipurpose herbaceous species tolerant to drought and flooding. Erosion on the riverbanks will be facilitated by the combined phenomena of land drying and heavy rains. This output (2.2.1.) will plan and implement the reforestation of 10,000 ha of multipurpose herbaceous species tolerant to drought and floods. These species should be palatable species for cattle, also allowing the development of beekeeping and fruit growing, in order to help strengthen the climate resilience of livelihoods of communities living in these areas.

The project will also finance the building and maintenance of low cost community infrastructures to protect riverbanks against erosion. The preparatory phase of the project will develop, with the participation of local communities, a mechanism for the operationalization and funding for maintenance of these infrastructures (Output 2.2.2.). It will support the spreading of good practices for sustainable land management (fertility management, anti-erosion practices…) through the implementation of a training program benefitting 1,000 members (with gender parity) from local communities of the rivers Ouémé, Zou, Sota, Mono and Niger, in order to lessen the erosion phenomena that contribute to the destruction and silting of the riverbanks, threatening the hydroelectric potential of these (Output 2.2.3.).

The promotion of alternative, climate-resilient income generating activities (IGAs) such as beekeeping, horticulture, small livestock, production and maintenance of improved stoves and pressure cookers will also be promoted. Indeed, the communities living in these areas derive all their income from agriculture and especially cotton production. Due to the increase in the cost of living, rural populations in these regions are forced to intensify cotton production and forestry. This is usually done at the expense of natural resources and ecosystems protecting Ouémé, Zou, Sota, Mono, Niger against drying and sanding. To do this, the output will finance training of 1,000 individuals (with gender parity)

for a dozen of the most vulnerable communities in efficient production techniques of the IGAs and financial management of businesses. In addition, the project will also support in each of the communities, the development of business plans and access to finance for 100 individuals or groups of individuals. By supporting alternative income generating activities, the project will reduce pressures on ecosystems Ouémé, Zou, Sota, Mono, Niger... and the phenomena of erosion that threaten the hydroelectric potential of these rivers. From an operational point of view, those activities should be based on the following methodology: first, an information campaign should be run on the project, its objectives and the financing mechanism of sub-projects. The partner structures are invited to see by themselves in the various concerned communities what can be done and how. The NGOs or firms form the private sector that are to work on the project are then identified and sign a cooperation agreement. The second step consists of identifying the communities' precise needs and financing means, relying for instance on an interview guide or a ZOPP method. The needs are then prioritized and the means are discussed with the Micro-Finance cell of the Ministry of Finance. Once the financing scheme is elaborated, it is submitted to the relevant party (Output 2.2.4.). Various business models can therefore be discussed and implemented, depending on the community specificities. Some will be micro-credit-based while other will rely on equity for those who can afford it. Also, subsidies can be discussed, in the form of capacity reinforcement or technical financial advice or even to provide for a certain percentage of the activity. Note that any retained business model is to be sustainable beyond project completion in order to outlive it and not rely only on external help.

The third outcome of Component 2 will be the enhancement of climate resilience of fuelwood supply areas by revised SDAs and through reforestation and conservation of woody areas. Investments from the project will include the development of climate-resilient community wood for energy parks in wood for energy supply areas as most vulnerable by the revised SDAs, to increase their climate resilience. These community parks have the dual objective of sustainably secure wood for energy supply and contribute to strengthening the resilience of livelihoods of communities living in and around these areas. These woods for energy parks will be managed by the communities themselves and according to the resilient development plans that will be developed or revised. Memoranda of agreement based on the rules and forms of local social organization will ensure compliance with these management plans by all beneficiary communities (Output 2.3.1.).

This project will finance the protection of identified supply areas for fuelwood against wild fires induced or aggravated by climate phenomena through: the development of risk management protocols for the increase in intensity and frequency of climate-related wild fires and the demonstration of fight methods against wildfires resilient to climate around 300 000 ha of forests (Output 2.3.2.).

The project will support the promotion of alternative climate-resilient income generating activities (IGAs) such as beekeeping, horticulture, small livestock, production and maintenance of improved stoves and pressure cookers, sustainable production of charcoal. Indeed, the communities living in these areas derive all their income from agriculture and especially cotton production. Due to the increase in the cost of living, rural populations in these regions are forced to intensify cotton production and forestry. This is usually done at the expense of natural resources and forest areas. To do this, the output will finance training programs for the benefit of the most vulnerable 1,500 individuals in the city communities of Djidja, Zangnanado, Dassa, Savè, Toukoutounan, Pèrèrè, N'dali and Malanville and other areas vulnerable in the technical production of these alternative IGAs and financial management businesses. The project also will accompany them in the development of business plans and access to finance for 10 individuals or groups of individuals in each of the communities (Output 2.3.3.).

Component 3: Energy use and production - Technology transfers to strengthen the resilience of livelihoods and living conditions of the vulnerable communities

Under the baseline scenario, no practical measures are taken to protect the existing power generation, transmission and distribution facilities in the country. There is no real technology transfer plan nor financial mechanism to cover the risks in the energy sector in case a climate-related extreme event hits the country.

The outcome of this component is to set the practical, technology- and financial-based, measures to strengthen the resilience of the vulnerable communities and to better protect the strategic assets in the energy sector against climate risks.

In order to strengthen climate resilience of sources of energy supply of Benin, the project will support investments for the physical protection of the most vulnerable existing electrical infrastructure, the protection of the hydropower potential of rivers destined to house hydroelectric plants, and the conservation and strengthening of forests identified by the revised SDAs (via the second component) as sources of energy wood supply. Measures will be implemented to protect thermal power plants of Cotonou (Akpakpa), Porto-Novo, Kandi, Natitingou against the increase in the intensity and frequency of droughts and other climate risks and natural disasters such as floods, cyclones and hurricanes. The goal of this output is first to conduct a vulnerability assessment of the most important electrical installations and then to support securing these infrastructure investments. The selection criteria for infrastructure for which it will assess vulnerabilities will be defined during the project preparation phase and will include the size of the concerned population, the economic activities concerned and also the common capability to cope with disruptions of electrical distribution such as acquiring generating sets (Output 3.1.1.). Measures will also be implemented to the distribution networks against winds and raising temperatures. The goal of this output is first to conduct a vulnerability assessment of the network, to analyze what technological or strategic solutions are feasible and then to support securing these infrastructure investments (Output 3.1.2.).

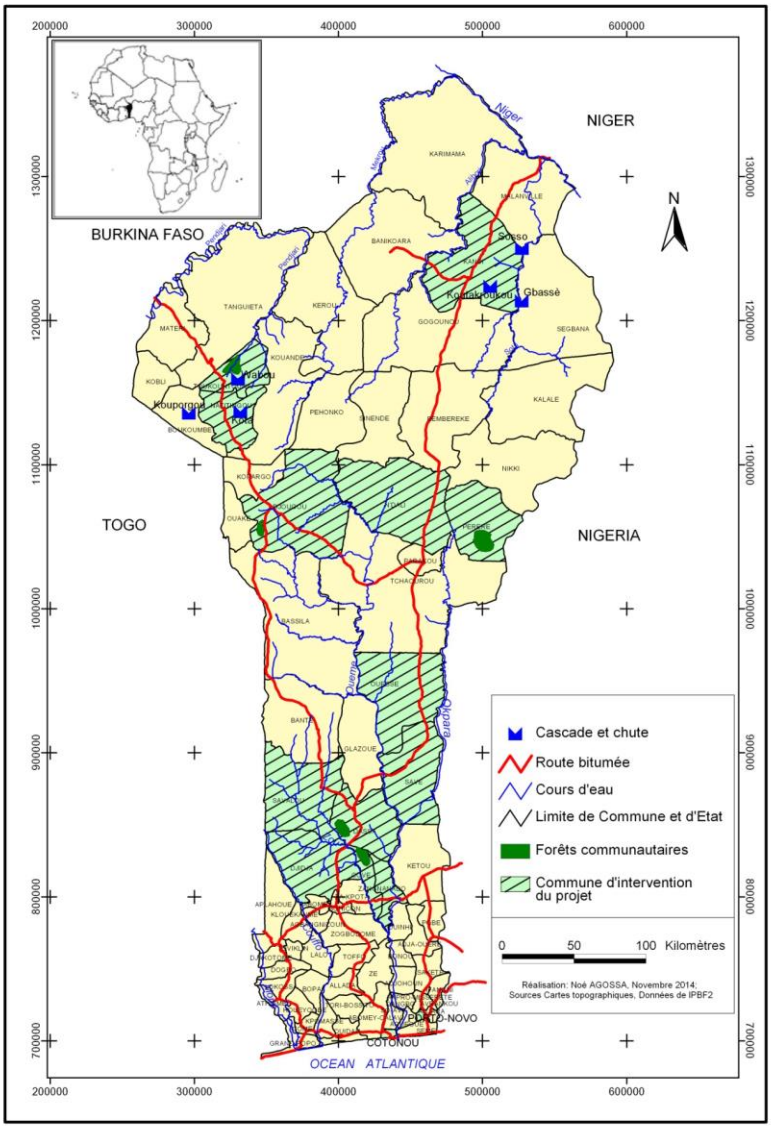
The project will also promote Benin's renewable energy generation capacity by raising the evidence to support hydro, solar or biomass-based energy generation in rural areas (one selected vulnerable locality). This is in line with the biomass project as one of the objectives mentioned in the PIF was to issue an "RFP for installed capacity of 4 MW of both on-grid and off-grid (mini-grid) generation from biomass IPPs will be launched". A cross subsidy model to fund utility scale renewable energy may not be politically possible in Benin as the country may not afford to promulgate renewable energy feed in tariffs in the way that Europe or South Africa have (residential customers are struggling to pay bills at current levels, hence innovative financing mechanisms will be needed to reduce the cost from current unaffordable levels. The study should consider incentives such as voluntary carbon market, eco-labelling, etc...). Just about 25% of the country is electrified and more than half of the households cannot pay for it at current prices (Output 3.2.1.). Communication and raising awareness to the targeted rural population will be ensured, focusing on the benefits of being organized in renewable energy user groups and of promoting hybrid diesel-PV based mini-grids (Output 3.2.2.). Ten thousand (10,000) improved stoves and a thousand (1,000) pressure cookers will be distributed through micro-financing and loan guarantee schemes in the most vulnerable rural communities of Djidja, Zangnanado, Dassa, Savè, N'dali Perere, Toukoutouna, Djougou and Bassila and urban centers of Cotonou, Porto Novo, Bohicon, Abomey, Parakou, Natitingou, Djougou, Malanville, Lokossa, Kandi, to reduce household demand for fuelwood (Output 3.2.3.). Three improved carbonization technologies will also spread in communities producing charcoal through the training of 500 coal operators (Output 3.2.4.).

Finally, a Financial Support Mechanism (FSM) will be established and capitalized to support private investment in adaptive measures to increase the resilience of the energy sector to climate change. The FSM will be in line with the UNDP micro grant Policy. The mechanism will be able to provide micro-capital grants for non-credit purposes as inputs to the project activities. A policy framework will be established, with a adaptation compartment to cover climate related extreme events such as floods and/or droughts. The compartment of the FSM related to the current project is a national insurance fund for the GoB. It is an energy sector insurance instrument which is not similar to indemnity type products which are usually offered by the traditional insurance companies. It will operate at a different level from insurance companies because it is a national mechanism for the GoB targeting the vulnerable communities. It will be the first-of-

its-kind instrument in the country, and even in the region. The CCA compartment of the FSM will be able to meet the claims-paying requirements in the energy sector in case a climate-related extreme event (floods, droughts, etc.) is harming the population of the country in terms of energy access. Hazards that are considered in computing the loss are wind, floods, droughts and storm surge in coastal areas where assets can be at risk. The FSM payout is based on the loss assessment from the climate-related extreme event as it happens. Losses calculated will primarily focus on the assets in the energy sector in rural areas. However, the FSM will develop a policy framework for the purpose. The framework will be designed to help the most vulnerable communities in terms of access to energy, especially after a disaster. So a loss estimate will be designed to give an estimate of what the charge to the GoB accounts can be. The payout is designed to help the communities in that short period between the disaster and 3-6 months later when they can get other resources to reconstruct what has been damaged. The CCA FSM will enable the GoB to learn how to deal with such critical climate-related extreme events. In the future, the FSM and its policy framework is expected to help the GoB to have its own process. The recognition of an extreme event or a climate-related hazard, by a decree for instance, should lead to the coverage of the damages directly by the GoB, once the FSM will be depleted.

The FSM will have a common administrative structure (Project Management Unit) with the one proposed under the MFA project focusing on biomass (GEF ID 5752). A MOU will be signed with the Central Bank of West African States (or with commercial bank selected on the basis of competitive bidding) setting out the objective, funding mechanism and administration rules regarding its participation as fiduciary agent of the FSM (Output 3.3.2.). Financial and other incentives will be provided to project developers/Independent Power Producers (IPPs) towards low-carbon climate resilient investments in the energy sector (Output 3.3.3.).

Figure 2: Intervention areas of the project



A. 5. Incremental /Additional cost reasoning:

The principle of financing the additional costs necessary to respond to the adverse impacts of climate change for purposes of the LDCF[12] applies for the current project. Moreover, addressing the adverse impacts of climate change imposes an additional cost on vulnerable countries in their effort to achieve national sustainable development goals and Benin is no exception.

Practically, activities that would be implemented in the absence of climate change constitute a project baseline, and the costs of achieving this scenario without the project are referred to as baseline costs or baseline financing. In this case and with a view to improving the energy supply system (infrastructure), the quantity and the quality of energy sources and enhancing the efficiency of energy supply and demand, the Government of Benin has developed and adopted in 2009 a national development strategy for the energy sector. The main axis of this strategy is to: i) enhance the human, institutional and regulatory capacity for a better planning and management of the energy resources; ii) increase the production, transport and distribution of the different forms of energy; iii) improve poor rural access to energy. To achieve these ambitious objectives, the GoB, with the technical and financial support of its partners, including UNDP, has initiated several programs and projects. Among baseline projects, the following are relevant for the proposed LDCF project:

- Programme in support to decentralization and communal development (PDDC)
- Support for the sustainable management of Benin Communal Forests
- Program for the enhancement of the management of the Energy supply and demand - 2013-2015
- Support to the implementation of Millennium Villages in Benin

Therefore, it is undeniable that the GoB has undertaken an ambitious program for improving energy access based mainly, on improving the management capacity of the energy sector, developing new tools and strategies for managing the energy demand and supply and increasing energy production. However, the climate variability and change are likely to worsen Benin's energy deficit if appropriate adaptation measures are not adopted.

The proposed LDCF financed project will contribute in overcoming the political, institutional, financial barriers and those relating to individual capacities and to knowledge impeding to prevent and reduce the impacts in vulnerable communities of climate-related risks on the energy sector of Benin. These barriers to adaptation measures are the following:

- Low technical and institutional capacities
- Limited access of decision makers from the energy sector to climate information
- Limited access of producers of charcoal to efficient carbonization technologies
- Difficult access of households to efficient equipment for fuel wood use
- Limited knowledge of the evolution of renewable energy potential

Overcoming these barriers will involve the development of a strategy for strengthening resilience of the key energy sources, the integration of climate risks in the planning and budgeting processes of the energy sector and the promotion of behavioral change on the part of both consumers and producers of energy. Both climate resilient energy use and the development of alternative energy sources (portfolio approach) will be necessary to reduce vulnerability. Given the importance of biomass in the context of Benin's current energy supply, these measures will also need to be backed up by the practice of sustainable land management options especially in areas that are more vulnerable and the promotion of income-generating activities, alternatives to non-sustainable forest and land uses practices in riparian communities of wood energy supplying landscapes and the adoption and implementation by Benin, of institutional, political and regulatory measures aiming at removing any obstacles to such adoption of adaptation measures.

[12] https://www.thegef.org/gef/sites/thegef.org/files/documents/GEF.C.28.18.pdf

To achieve these results, it will first be necessary to improve climate change capacity of the decision makers and technical staffs in charge of the energy and forests resources sectors. Through the Programme to support decentralization and communal development (PDCC), the government of Benin is implementing capacity building program for national and local authorities for the management of the energy sector. Also, the project for the sustainable management of Benin Communal Forests is carrying out capacity development for communal forest association members in the development and management of wood energy communal forests. Through this outcome, the LDCF resources will support the design and implementation by the Energy Directorate of a training program to create within the country capacity able to support the integration of climate change concerns (climate risks, including the ones for the energy sector in the importing countries and adaptation options) in the planning tools and processes of the energy sector, the management of hydroelectric and thermal power plants, the policy, strategies, and development programmes of the sector. This capacity building program will include the strengthening of the capacities of the communal forest association members, the land and forest managers to develop and implement climate resilient sustainable land and forest management strategies and measures for preventing and managing bushfires and other climate resilient strategies (under the outcomes 2 et 3).

Additionally, the outcome 1 will support the creation and the functioning of a multi-stakeholders climate change and energy platform (from energy, forest, land and water resources, agriculture, private sector, …) to facilitate dialogue and coordination of the decision-making processes about the cross-cutting climate changes related issues of the energy sector including the energy production, the access, the efficiency and the competing use of energy sources.

On top of contributing to reduce the pressure on the wood energy sources (baseline scenario), the initiatives supported by this project are expected to have 2 additional adaptation benefits: i) to reduce the impacts on households energy budget of the price increase that could stem from the reduction of the wood energy availability induced by the projected impacts of climate changes in the ligneous resources, and ii) to prevent the increase of time and effort dedicated for collecting wood energy in rural communities, above all, for women and girls, due to the climate induced degradation of wood resources. This will allow Beninese households of which 80% depends on wood energy for cooking, to dedicate more resource, time and energy to the other households activities such as IGAs, education, health, participation in communities affairs, necessary for increasing their livelihoods and life conditions. Finally, the improved cook stoves will also contribute to reduce the indoor pollution and related health problems from the use of traditional wood stoves.

While the investment of the project amounts for 8 million USD, with an important the co-financing in grant, for 9 million USD, and the involvement also of the power utility company, the *Compagnie d'Electricité du Bénin* (CEB), the return is high. The project will enable i) to enhance the adaptive capacities of the rural population in accessing biomass for energy purposes, and ii) to better protect the entire supply chain in the power sector, i.e. the assets related to generation, transmission and distribution of power. Inadequate attention to the impacts of climate change can increase the long-term costs of electric power sector investments, the likelihood that they will not deliver intended benefits, and the probability of failure under climate stress. In certain cases, existing high-risk infrastructure may be retrofitted for protection against storms, flooding, and increased salinity and temperature, and relocated where necessary. Transmission and distribution lines may require relocation and revised design codes for protection against wind, high temperatures, corrosion, and flooding. Besides, the project will enable to better estimate specific areas related to the energy sector, such as the costs and benefits of retrofitting cooling systems where the economic efficiency of such climate-proofing investments is often proven. Relocation or refitting of extremely vulnerable infrastructure may also need to be considered. A broader mix and balance in generation option can improve energy security and stability of supply. Options may include decentralized renewable energy, decentralized planning and generation, integration of adaptation and mitigation planning, forecasting demand changes with warming and improving supply-side management, integrating power planning with that of other sectors, and rezoning land use so future energy infrastructure is in less vulnerable areas. In some cases, small additional costs at the development and design stages of power plants,

transmission lines or the distribution network are expected to result in substantial net benefits[13]. These aspects will be considered under Component 3.

In conclusion, the costs of inaction, or poorly considered and badly executed actions, are expected to be far higher than well-planned and implemented efforts to improve energy sector resilience to climate change. Inadequate attention to these impacts can increase the long-term costs of energy sector investments, the likelihood that they will not deliver intended benefits, and the probability of eventual failure under climate stress.

A.6 Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks:

The proposed implementation of the project aims to allow multiple consistent results, with a replicable and sustainable approach. This does not go without risks. It is necessary to make an assessment of the elements that could prevent the proposed project from leading to the expected results, and also to anticipate a strategy for managing these risks in order to maximize benefits from the project.

Obstacles can be of different kinds: political (delays in decision-making or in providing information), institutional (management structures proposed in the project document inefficient), technical (low potential for partnerships, complexity of project themes), environmental (potential deforestation in the future micro plants areas) and financial (high costs, lack of attracted financial partners).

They can also meet various phases of the project: inception and recruitment phase at the beginning of the project, implementation of the activities, involvement of stakeholders, monitoring and adaptive management during the project, or sustainability and impacts of the project actions after the end of the project period.

While identification and assessment of risks is addressed at an early stage of project design, the overall risk management should be considered an iterative process given that potential impact of anticipated risks may change, and new risks can emerge throughout the project lifecycle. At this stage all identified risks and associated information have been documented in a risk assessment table. They are analyzed from an environmental, economic, technical, social perspective and from the perspective of the overall governance of the sector. Based on the risk analysis and management responses identified, the initial Risk Log has been created to keep track of the identified risks.

Table 2: Initial risk framework

#	Risk Description	Category	Impact severity	Likelihood	Risk Management strategy and safeguards	By when / whom?
1	Strong winds	Environmental	High	Medium	Strengthening prevention mechanisms, Establishment of infrastructure maintenance program Awareness raising of populations impacted	Government (DGE, CEB, SBEE, DGCC, WAPP), Civil Society, Beneficiaries
2	Rising temperatures	Environmental	High	Medium	Strengthening prevention mechanisms, Establishment of infrastructure	Government (DGE, CEB, SBEE,

[13] ADB, 2013

#	Risk Description	Category	Impact severity	Likelihood	Risk Management strategy and safeguards	By when / whom?
					maintenance program Awareness raising of populations impacted	DGCC, WAPP), Civil Society, Beneficiaries
3	Influence of rainfall: late and heavy rain (risk for supply) or flooding (flooding of power plants).	Environmental	High	Medium	Strengthening prevention mechanisms, Establishment of infrastructure maintenance program Awareness raising of populations impacted	Government (DGE, CEB, SBEE, DGCC, WAPP), Civil Society, Beneficiaries
4	Inconsistence between institutional arrangements due to lack of coordination and synergy among the stakeholders.	Organizational	High	Medium	Strengthening dialogue among partners Upstream awareness raising of partners and strong involvement in the process	Government, Financial and Technical partners
5	Implementation capacities / capabilities of stakeholders (Appointment of unqualified persons).	Organizational	High	Medium	Capacity building (training, access to technical resources) Establishment of a knowledge transfer system	Government, Research and development institutions, Financial and Technical partners, Civil Society, Private sector, Land chiefs, Beneficiaries
6	Management and implementation arrangements must be specified beforehand and respected (delay in mobilizing and recruiting people).	Organizational	Medium	Medium	Designation of a Ministry "Champion" for steering the process	Government
7	Problem of energy sector management (governance and management) (delay in the development of protocols).	Organizational	Medium	High	Improving good governance Establishment of procedures for monitoring and progress monitoring Definition of participatory management systems and an independent framework to implement the agreed measures.	Government
8	External economic factors of price	Financial	Medium	Medium	Awareness raising of stakeholders	Government, Financial and

#	Risk Description	Category	Impact severity	Likelihood	Risk Management strategy and safeguards	By when / whom?
	volatility.				on price indexation.	Technical partners, Private sector
9	Access to financial services.	Financial	Medium	Medium	Financial Support Mechanism is up and running. Strengthen applied research to reduce the cost of new technologies in the African context (energy products fitted to the context of Benin and other African countries such as prepaid energy access).	Research and development institutions, Financial and Technical partners, Private sector
10	Lack of ambitious incentives for private sector (implementation costs of activities are greater than expected revenue)	Financial	Medium	Medium	Identify and mobilize key stakeholders to support the development of a favorable framework (investors, artisans, entrepreneurs, micro-finance, associations).	Financial and Technical partners, Private sector
11	Payback: the question of the attractively and profitability of renewable technologies	Financial	High	Medium	Identify and mobilize key stakeholders to support the development of a favorable framework (investors, artisans, entrepreneurs, micro-finance, associations).	Financial and Technical partners, Private sector
12	Period of political instability	Political	Medium	Medium	Anticipate election periods.	Government, Civil Society
13	Change within government structures: monitoring and skills (no appointment of proper profiles)	Political	High	Medium	Focal point appointment. Knowledge transfer to ensure monitoring.	Government, Civil Society
14	Geopolitical: Regional interdependence	Political	High	Medium	Strengthening of the coordination of regional policies. Strengthening dialogue.	Government, Financial and Technical partners
15	Complexity and innovative nature of the project (Project Management: Cumbersome administrative process, Breach profile nominees, Ignoring gender in the selection of	Operational	Medium	Medium	Lobbying governments Defining objective criteria for appropriate persons designation.	Government, Financial and Technical partners

#	Risk Description	Category	Impact severity	Likelihood	Risk Management strategy and safeguards	By when / whom?
	nominees)					
16	Probable reluctance to appropriation of technologies (Opposition landowners , poorly applied reforestation techniques Lack of knowledge and henceforth possible negative perception (lack of or limited social and cultural acceptance) on the use of new technologies for cooking	Operational	High	Medium	Strategies taking into consideration the social context Awareness targeted to experienced actors key within communities to frame reforestation	Research and development institutions, Civil Society Private sector Land chiefs Beneficiaries
17	Strategic vision, planning and communication.	Strategic	Medium	Medium	Definition of participatory management systems and an independent framework to implement the agreed measures	Government, Civil Society
18	Relationships between stakeholders: lack of dialogue with the beneficiaries and involvement of all stakeholders	Strategic	Medium	Medium	Strengthening of participatory dialogue	Government, Civil Society Private sector Land chiefs Beneficiaries
19	New unexpected regulations or policies: Finance Act 2015	Regulatory	High	High	Anticipation of deadlines for implementing new regulations	Government, Private sector

As identified in the NAPA and Second National Communication of Togo and Benin under the United Nations Framework Convention on Climate Change, the major climatic risks that impact the energy sector are:

- Strong winds: the effects of high winds cause disruption on the distribution network;
- Rising temperatures cause expansion of cables;
- The influence of rainfall and heavy rains (lack of precipitation leading to drought and flooding) is that heavy rainfall lead to atmospheric discharges that often cut the transportation cables;

About organizational risks some institutional arrangements are inconsistent due to lack of coordination and synergy between stakeholders (states), which can induce random decisions. Also often implementing stakeholder capacity is

weak because the designated focal points, often lack recent data that do not allow certain representations abroad to be technically competent. Also the terms of the project management and implementation should be identified before and respected so that stakeholders can meet their commitments towards proper implementation. Finally strongly related to the previous point strengthening of good governance is essential. The lack of good governance for the energy sector is a problem.

Pertaining to financial risks climate change phenomena affect the energy sector. However, innovative solutions specific to the African context such as prepaid access to energy should offset the increase in financial risk due to the great impact of climate change. It nevertheless becomes necessary to put in place incentives to involve closer financial partners and the private sector.

First, the major external economic factor is price volatility due to economic fluctuations and related market elements. Second internal factors to consider are:

- Access to financial services for certain actors or households is still difficult.
- Lack of ambitious incentives for private sector.
- The introduction of new technologies in particular involves a major risk for cost recovery.

Regarding political risks a period of political instability is to anticipate with the presidential elections to be held in 2016. The changes in the structures of government (High turnover in government structures) may result in disruption of resources for monitoring and competent skills. On the geopolitical arena Benin is highly dependent on importation of energy from neighboring countries. It is therefore vulnerable to political instability within ECOWAS. The types of instability that can be anticipated are mainly civil wars, political crisis in a member country or demographic / socio-economic growth that would increase national demand for energy. Additionally future parliamentary and presidential elections in Nigeria, Burkina Faso, Cote d'Ivoire, Ghana and Togo in 2015 and 2016 need to be carefully anticipated, as those political changes may impact bilateral or regional processes as well as agreements.

Looking at operational risks now the programmatic aspect of project induces a factor of complexity and an innovative nature for the management arrangement to design. Regarding project beneficiaries' possible reluctance to the appropriation of technologies may arise during training or awareness raising campaigns

At the strategic level it has been stressed several times during the interviews with stakeholders that political discourse does not fit the reality of the energy sector needs. Strategic vision, planning and communication are not in synchrony. The involvement of all stakeholders is needed to foster productive dialogue towards acceptable and useful solutions to all beneficiaries.

Finally regarding the possible regulatory risks unexpected new regulations or policies be need to be anticipates. This is the case for instance with the Finance Act 2015 that will offer a tariff exemption for the importation of generators. This regulation is at odds with the efforts already made towards sustainable energetic transition (the country is not an oil producer).

In summary and based on discussions with stakeholders, it is expected that the overall project risk will be moderate. The potential risks, which could hinder the successful project implementation and/or reduce project effectiveness, are itemized in details the table below. To address these anticipated risks, the project will be designed to include an effective means to monitor, and to the extent possible, mitigate these risks. A project monitoring and evaluation plan has been prepared to track not only the project milestones, but also the indicators that will show that the identified risks are, if not eliminated – at least mitigated. Stakeholders were engaged during the project design stage. The measures that have been taken during the preparation and design of the Project and/or will be taken during the implementation phase so that these potential risks will be mitigated are also outlined in the table.

Table3: Risks, Rating and Mitigation Approach

Risks	Rating	Mitigation Approach
Policy and Regulatory: Reluctance in some quarters of the Government to introduce the necessary supporting policies and regulations.	Moderate	The Government of Benin is strongly motivated to provide access to modernized energy services to the large rural and peri-urban population that utilizes fuel wood/charcoal for cooking and is driven by its plans to reduce the massive deforestation that accompanies the use of forestry resources. Hence, it will ensure that all Government Institutions (Ministries/Departments/Directorates, etc.) get on board to put in place a conducive policy and an enabling regulatory framework for biomass gasifier promotion and development. This will also be in line with its December 2003 "Energy Policy and Strategy" and the updated October 2009 "Strategic Plan for Energy Sector Development".
Economic/Financial: Non-availability of credit to promoters of biomass gasifiers.	Moderate	The project will work with local lending institutions to develop their capacity to understand and appraise gasifier projects for lending. In addition, the Financial Support Mechanism will contribute towards minimizing risk exposure on the part of lenders.
Financial: The poor investment climate may impact the project.	High	Benin ranks 135 out of 189 economies on protecting investors and 169 out of 189 on enforcing contracts, as per the WB/IFC "Doing Business 2015" publication. With this in mind, the project will put in place a Financial Support Mechanism that will be directed at minimizing the financial risks that both project developers and lenders may face in doing business targeting biomass gasifiers.
Technology: Likelihood of gasifiers of inappropriate design and/or of poor quality introduced in the country.	High	The project will establish network arrangements with other countries that have several years of experience with biomass gasifiers, like Brazil, Cambodia, China, India, etc. This will ensure that only successful models of gasifiers will be introduced and mistakes made elsewhere are not repeated. In addition, the project will bring in trainers from these countries to train Beninese technical personnel in high-quality installation, operation and maintenance of gasifiers. Moreover the project will identify a fall back plan with the identification of a list of alternative suppliers for the technology.
Strategy: Village level commitment to change and adopt new agricultural methods is not sufficient for the widespread adoption.	Moderate	Project success will depend on the participation and commitment of all the relevant stakeholders at the local level including traditional authorities, municipal and national agencies, NGOs and research centers. Participatory planning and decision-making processes as well as capacity building and organizational support will mitigate the risk of certain stakeholders restraining from participating in project implementation at least temporarily. To convince people to change long-held habits, the project will demonstrate the effectiveness (social, financial and environmental) of alternatives in the short and long-term. Most rural villages operate at extreme levels of poverty and people may be unwilling to try new approaches when their basic livelihood needs are not being met. Hence, pedagogic plots, trainings and visits to experimental farms are key activities to promote changes in rural areas.
Political: Land conflict and conflict among traditional / religious groups	Moderate	The recently adopted land tenure law reduces significantly the potential land conflicts as it improves the Rural Land tenure Plan, recognizing the customary rights ("Rural certificate"). The project will be implemented through participatory processes, consensus building and conflict resolution and capacity building, with the underlying agenda of pre-empting conflict that could otherwise undermine project success.
Environmental/ Climate Change.	High	There are multiple environmental risks (e.g. decrease in the availability of agricultural biomass due to land degradation, reduced rainfall/water flows, drying up of watershed areas due to a change in climatic conditions) that can affect agricultural output and result in a reduction in crop residues, thus negatively impacting on the biomass supply chain. This risk will be mitigated by introducing appropriate water management techniques in agricultural production, like drip irrigation and boreholes.
Overall	Moderate to High	

A.7. Coordination with other relevant GEF financed initiatives

Past initiatives

Benin and UNDP, with the collaboration of GEF and MEPN, implemented in 2008 Benin's first National Adaptation Programme of Action (NAPA), which set the framework for future adaptation actions in Benin.

The NAPA already pointed out the vulnerability of the energy sector to climate change, with less regular functioning of hydroelectric installations and slowed growth of forest resulting from the rise in temperature, as well as the growing anthropogenic pressure for fire wood and charcoal.

Priorities options were set for the energy sector:

- Promoting economically efficient stoves;
- Spreading new and renewable energies (biogas, solar energy, biofuel, micro hydroelectricity);
- Reforestation with fast growing species;
- Promoting agroforestry;
- Promoting income generating activities.

Finally, the NAPA drew five project profiles with matching objectives as follow:

- Providing to agricultural stakeholders and communities climatic and meteorological information and warnings in case of forecast extreme events likely to harm production systems;
- Reducing populations' vulnerability to climate change impacts by providing a better access to sustainable energy sources and protecting forest resources;
- Strengthening water availability during droughts in order to adapt communities to climate change;
- Contributing to the reduction of morbidity and mortality due to malaria;
- Correcting sedimentary unsteadiness, coastal erosion and retreat, restoring mangroves and promoting improved salt extraction technologies combining solar and wind power.

Another significant partnership between UNDP and Benin led to the publication of the First[14] and the Second[15] National Communications to the UNFCCC, respectively in 2002 and in 2011. In the same vein, UNDP CO supported the development of the National Strategy for the Implementation of the UNFCCC[16] in 2003. This assistance from UNDP related to climate change includes capacity building to enable the participation of Beninese negotiators to the various climate-related Conferences of the Parties (COP) and the integration of climate change in public policies.

Other projects have been implemented in Benin by UNDP, before or after the setting of the NAPA.

The integrated climate change adaptation program for agriculture and food safety in Benin (NAPA1 priority)[17] began in 2010. It seeks to enforce rural communities' capacities of resilience to climate change in four vulnerable agro-ecological areas of Benin. Its main results so far were urgent measures to enhance vulnerable populations' resilience to climate change, and the setting of an institutional, legislative and governance framework to integrate climate issues into development.

A project of capacity building for rural communities' adaptation to climate change was led from 2007 to 2011 by the NGO *Initiatives pour un Développement Durable* (*IDID*)[18] to identify and disseminate relevant climate change adaptation strategies.

[14] http://unfccc.int/essential_background/library/items/3599.php?rec=j&priref=3543
[15] http://unfccc.int/essential_background/library/items/3599.php?rec=j&priref=7590
[16] http://unfccc.int/resource/docs/natc/bennc1fa1.pdf
[17] http://www.bj.undp.org/content/benin/fr/home/operations/projects/environment_and_energy/project_sample1/
[18] http://www.ididong.org/

The same NGO led a second project, from 2011 to 2014, aimed at strengthening economic knowledge and adaptation abilities in Benin (the French acronym being *PRECAB* for *Projet de renforcement des connaissances économiques et de la capacité d'adaptation face aux changements climatiques au Bénin*)[19]. It strengthened local stakeholders' capacities on adaptation strategies and disaster management, and implemented a sectoral approach to integrate climate change adaptation into development strategies and policies.

The CCDARE (Climate Change Adaptation and Development Initiative) project[20] sought to integrate climate change adaptation in local development planning and strengthening of stakeholders, more specifically in communal development plans and annual investment plans.

Finally, an Adaptation GEF Project was submitted in 2012 and is currently under implementation. This project ("Strengthening climate information and early warning systems in Western and Central Africa for climate resilient development and adaptation to climate change – Benin") aims at strengthening the climate monitoring capabilities, implementing early warning systems and collecting available information for responding to climate shocks and planning adaptation to climate change in Benin.

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

B.1 Describe how the stakeholders will be engaged in project implementation.

The following paragraphs only present summaries and key points. For additional details, please refer to the Project Document.

The project will be managed by an organizational structure as follows: the project will be implemented by the MERPMEDER and UNDP, with other responsible organizations (including the ministries related to agriculture, environment and finance), and in close consultation with other stakeholders.

A common management organization will be established with the biomass project in order to coordinate their activities.

The project will be implemented according to the guidelines of the UNDP projects executed nationwide. The project meets the objectives of the UNDAF framework, and as such, the responsibility of the execution returns to the Government.

Instances and governing bodies of the project:

Following a reform of the UNDP country's Program, the project NAPA Energy will be managed within the Directorate General of Energy (DGE). However, neither of the two projects (NAPA Energy and Biomass) will have a dedicated Steering Committee. There will be a unique Steering Committee for all the projects managed under the Environment Unit. The DGE will coordinate and oversee the delivery and execution of the projects.

In other words, the Steering Committee of the sub-program Environment, Climate Change and Sustainable Development will be hosted by the Secretariat General of the Ministry of Environment and serve as a common committee for both projects (NAPA Energy and Biomass).

This Steering Committee will provide strategic direction and approve the annual budget of the project. It will also examine the various project activities, through inputs provided by the project management team (PMT). The Steering Committee will be the organ of key project decision. It is co-chaired by the Ministries of Environment and Energy, and consists of representatives of UNDP, the GoB (including SBEE, other ministries, etc.), the

[19] http://www.ididong.org/?Le-Projet-PRECAB
[20] http://www.unep.org/climatechange/adaptation/KnowledgeandPolicy/CCDARE/tabid/29582/Default.aspx

private sector, the civil society and eventually other donors contributing to the financing of the project.

Resources of the project:

Another element of the country's reform program is that the projects will not have dedicated coordinators. In order to ensure national ownership, the Government administrations, in which the projects are hosted, will ensure the Technical and Operational Coordination of projects. Technical or General Directors will designate a National Focal Point for the coordination of each project. The Focal Point who will be a state official (civil servant) shall not be paid by the project grant since he would already receive a salary as a civil servant. However he will be granted a bonus or incentive paid from the National co-financing that the Government will allocate to the project.

The National Focal Point will have the following tasks:

- Coordinate project activities with activities of other government bodies;
- Supervise project expenditures in accordance with the work plans and approved by the Steering Committee budgets;
- Assist, monitor and report on the markets and the implementation of activities within the deadlines;
- Accept the terms of reference for consultants and tendering documents for the inputs resulting in a subcontracting;
- Make reports to UNDP on the implementation and impacts of the project.

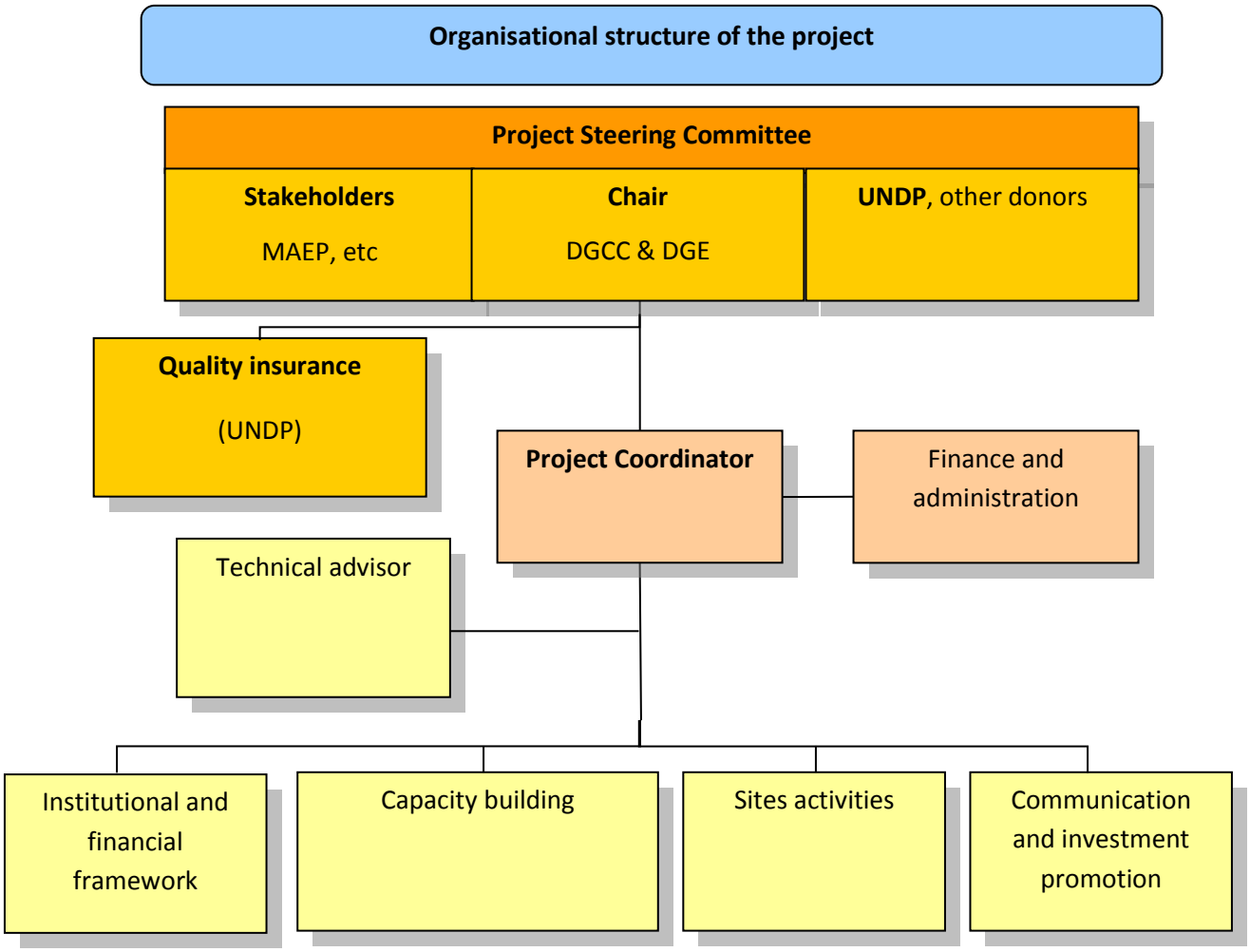
For technical requirements, experts and specialist will assist the National Focal Point. They will be recruited to lead the implementation of specific technical activities of the project components. In the present case, this means that for both projects (NAPA Energy and biomass), it is expected that technical experts will be recruited (e.g. an adaptation specialist in the area of energy or a mitigation specialist in the energy sector). Other specific expertise will be called upon in order to cover specificities of each project to be implemented for which the country has no capacity. Contacts should be established with experts and institutions of other countries that have already implemented similar projects to strengthen energy resilience to climate change and with useful experience.

An Administrative and Financial Manager is scheduled and budgeted for a year of implementation for the two projects.

Organization of the project management:

The Steering Committee will make management decisions consensus when the National Focal Point will seek his advice. It reviews and approves quarterly work plans where required, based on the Annual Work Plans (AWP) approved in advance, and gives permission for any major modification work plans quarterly or annual. In addition, it approves the appointment and defining the responsibilities of the National Focal Point and any delegation of responsibilities to the Project Manager in terms of quality and assurance.

Figure 3: Organization of the project management



B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits

The project approach is to establish the institutional capacity, the financing, the technological know-how and the potential for increasing the resilience of the energy sector sin Benin that will allow sustainability in the development of the energy sector and in responding to the growing energy needs of the country while mitigating the risks related to climate change. The adaptive measures will avoid putting at risks the current and future revenue streams through diversification and innovation, introducing private partnerships, and a fund mechanism acting as an insurance mechanism, that are so far untried in Benin in the energy sector. A high-level of support for innovation is expected in view of the commitment of the GoB towards adapting to climate change and mitigating the risks.

The project is designed to test means of reducing risks that contribute to a better resilience of the energy sector vis-à-vis climate change and climatic extreme events. By doing so, the project will improve the overall financial sustainability of the energy sector. The institutional sustainability will be assured by focusing on capacity building, on energy assets

coverage and technological aspects. Benin will be able to offer useful lessons on the best way to strengthening the energy sector against growing climatic risks.

The participation of women in many field activities of the project will enable to mainstream gender in the issues related to the climate change and to access to energy. The mechanism for gender mainstreaming in the project will be i) ensuring gender balance in all the project activities, especially those benefiting to the field activities, ii) optimizing entrepreneurial and direct employment opportunities for women, and iii) assessing financial impacts of the project for men and for women. Hence, if there would be a difference, it will be important to find out why and try to address it if possible.

B.3. Explain how cost-effectiveness is reflected in the project design:

The proposed project targets the realization of a substantial increase in the sustainable, resilient and efficient production and use of energy through affordable technology transfers. It includes improved land and forest management practices, especially in the zones supplying wood for energy. It will be facilitated through the barrier removal activities focusing on institutional strengthening, regulatory framework, capacity building, market development and other technical assistance activities that will be implemented. During the NAPA process, the actions proposed have been compared against a large array of adaptation alternatives and selected through a multi-criteria analysis that used cost-benefit ratio as one of the decision criteria. The proposed interventions clearly came out of this prioritization process as the cheapest and most effective means to achieve the desired adaptation outcomes in the energy sector. In addition, the project will promote affordable technology transfers and low carbon and resilient approaches that are predicated on preventive management practices, rather than on costly engineering and high-investment related responses to climate hazards which have proven very costly and unsustainable in most instances. Also, the programmatic approach taken by the project (linked to the biomass project) and its embedding into existing national programmes will ensure lower transactions costs, higher impacts and greater profitability over the long run. During the PPG implementation phase, these considerations were further elaborated and cost-effectiveness of the outputs proposed in this PIF thoroughly assessed. The project will hence lead to a catalytic investment in securing the long-term institutional and financial sustainability of the energy sector against increased climate change impacts and severe climatic events.

Costs incurred in project implementation will focus only on those additional actions required to provide key incremental assistance to the GoB in undertaking strategic interventions to increase the resilience of the energy sector of the country vis-à-vis climate change. To accomplish this, the project will complement and build upon the extensive baseline activities already underway in the energy sector. Wherever possible, the project will use the competencies and technical skills within the mandated Government and public institutions such as SBEE to implement project activities. Where applicable, project resources will also be deployed to strengthen and expand existing initiatives and programmes to avoid duplication of effort. Increased co-financing commitments will continue to be targeted by the project during the project implementation (e.g. co-financing of the private sector, co-financing of the NGOs, etc.). Also, the project is considered cost-effective for the following primary reasons: i) project support to strengthening the adaptive capacities and the resilience of the energy sector to the impacts of climate change is expected to improve the overall cost-effectiveness of the energy sector, especially in rural areas where the access to energy is difficult, by introducing affordable and resilient technologies and approaches to energy production and use. It is anticipated that a modest investment of GEF resources will result in: (a) significant improvements in the preparedness of the energy sector, especially power production, transmission and distribution to face extreme climatic events and long-term variability in temperature and water flows affecting the power sector, (b) more efficient energy access in rural areas with the development of alternative sources of energy; and (c)

improvements in the individual skills of adapting to climate change and access to energy. Project support to introducing innovative mechanisms such as the financial mechanism to cover damages in the energy sector due to climatic events should ensure a better resilience of the industry and the people.

Finally, cost-effectiveness has been reflected in the project design on several levels: i) throughout the project, LDCF funding is aligned with project Outputs that have competitive procurement components to ensure best value for money; ii) The project has made a successful effort to secure cash co-financing of the project, which diversifies financial risks and increases financial flexibility. iii) Additional due diligence will be conducted by the project team during project implementation, as per established UNDP practices.

C. DESCRIBE THE BUDGETED M &E PLAN:

The following presents only the M&E budget. For additional details, please refer to the Project Document.

Type of M&E activity	Responsible Parties	Budget USD Excluding project team staff time	Time frame
Inception Workshop and Report	Project Manager PMT (Project Management Team – GoB-UNDP) UNDP CO, UNDP GEF	Indicative cost: $50,000	Within first two months of project start up with the full team on board
Measurement of Means of Verification of project results.	UNDP GEF RTA/Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members. PMT, esp. M&E expert	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on output and implementation	Oversight by Project Manager PMT, esp. M&E expert Implementation teams	To be determined as part of the Annual Work Plan's preparation. Indicative cost is $100,000	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	Project manager PMT UNDP CO UNDP RTA UNDP GEF	None	Annually
Periodic status/ progress reports	Project manager and team	None	Quarterly
Mid-term Review	Project manager PMT UNDP CO UNDP RCU External Consultants (i.e. evaluation team)	Indicative cost: $100,000	At the mid-point of project implementation.
Terminal Evaluation	Project manager PMT UNDP CO UNDP RCU External Consultants (i.e. evaluation team)	Indicative cost : $100,000	At least three months before the end of project implementation
Audit	UNDP CO Project manager PMT	Indicative cost per year: $8,000 ($40,000 total)	Yearly

Type of M&E activity	Responsible Parties	Budget USD Excluding project team staff time	Time frame
Visits to field sites	UNDP CO UNDP RCU (as appropriate) Government representatives	For GEF supported projects, paid from IA fees and operational budget	Yearly for UNDP CO, as required by UNDP RCU
Total indicative cost **Excluding project team staff time and UNDP staff and travel expenses**		**US$ 450,000**	

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:

NAME	POSITION	MINISTRY	DATE *(MM/dd/yyyy)*
Delphin Aidji	Secretaire General Adjoint du Ministere	MINISTERE DE L'ENVIRONNEMENT DE L'HABITAT ET DE L'URBANISME	**05/02/2013**

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for CEO endorsement/approval of project.

Agency Coordinator, Agency Name	Signature	Date *(Month, day, year)*	Project Contact Person	Telephone	Email Address
Adriana Dinu Executive Coordinator, UNDP-GEF		Feb 03, 2016	Saliou Toure Regional Technical Advisor, EITT	+251 912 503 320	saliou.toure@undp.org

ANNEX A: PROJECT RESULTS FRAMEWORK

An abridged version of the logframe is provided below. However, a complete version can be found in the GEF-UNDP project document.

Component objectives	Outcomes	PERFORMANCE INDICATORS			Sources of Verification	Assumptions
		Indicators	**Baseline** (2015)	**Target** (2020)		
Outcome 1: Strengthen capacities in order to reduce risks of economic losses due to climate changes	1.1. Capacities of the energy sector's stakeholders are strengthened in order to enable them to integrate climate risks in energy planning and to face climate risks	- Gender sensitive multi-stakeholder platform installed and functional - Integration and implementation by stakeholders of climate resilient energy access approaches in their business activities - A training plan is developed and approved by the Steering Committee; - Each year, at least 50 women and 50 men from the energy sector are trained; - Each year, at least 80% of the women and men trained apply the experience acquired in training	0 0	1 1 At least 500 managers/executives (men and women)	- Decree - Installment report - Training plan - Training reports - Project annual reports	- No cumbersome administrative - Profile of nominees are compliant - Gender is well considered in the selection of nominees - Appointment of persons is appropriate - No delays in issuing the no-objection notice by donors

Outcome 2: Integrate adaptation in enlarged frameworks at the national scale and in vulnerable areas	2.1. Energy supply strategies and plans integrate climate change and adaptation measures	- The gender-sensitive Masterplans for Supply (SDA) of fuelwood in the selected cities are developed and validated.	8	8 SDA revised	- SDA revised - PAF revised	- No delays in updating the SDA and PAF - No delays in the adoption by the Government of revised SDA and PAF
		- The development plans of selected forest areas (PAF) are adopted and validated. (revised to incorporate climate risks, gender and appropriate adaptation measures)	5	5 PAF revised	- Execution reports from the DGFRN	
		National Plan for optimal management of supply and demand of electric power in a context of climate change including climate risks and gender-specific needs is available, leading to a decrease in power shortages due to climatic events	0	1 National gender-sensitive plan	- National Management Plan - Project execution reports	- No delay in the process of recruitment of a qualified Consultant
		The SIEP on domestic fuels and the SIEF updated and including climate risks, gender-sensitive issues and strategic options are functional.	1 SIEF 1 SIEP	1 SIEF updated, gender sensitive 1 SIEP updated, gender sensitive	Reports on the publication of data on domestic fuels, ecology and forests.	- Qualified resources available
		PAF of the relevant areas supplying the cities and urban centers of Benin in biomass are revised to incorporate risks of droughts, wildfires, and other climate risks, as well as adaptation measures and gender-specific needs.	1 PAF 10 simple management plans non gender-sensitive	01 PAF 10 simple management plans	Project annual execution reports	- Good cooperation from the landowners

	2.2. The climate resilience of watersheds of rivers Ouémé, Niger (Sota), Volta (Pendjari) housing the hydroelectric installations of Yéripao (existing) on one hand, and of Sosso waterfall, Gbassè, Koutakroukrou, Kota fall, Wabou and Kouporgou (considered in the medium term) on the other hand, is enhanced through the implementation of restoration and preservation of watershed ecosystems activities	Riverbanks likely to harbor selected hydroelectric facilities are effectively protected against erosion through reforestation (involving men, women and youth) with multipurpose species tolerant of drought and flooding.	0 ha of riverbanks converted	At least 20 hectares of riverbanks reforested - Proportion/ role of women, men and youth involved in the reforestation process	- Reforestation report - Reforestation monitoring reports of each site. - Project annual execution reports - Execution reports	- Reforestation techniques well applied - No Land conflicts
		Community infrastructures built, by type (reforestation, dikes, gabions, riprap, etc.)	0	At least 100 infrastructures/works	- Infrastructure monitoring reports - Project annual execution report	
		Increase in the amount of people mastering good practices of sustainable land management, both men and women	0	1 training program involving each year 20% women, 30% men and 30% youth trained on good practices for sustainable land management integrating climate risks	- Training program. - Training evaluation report	- Proper understanding of the practices taught during training
		Climate resilient and environmentally sound remunerative activities (beekeeping, small livestock farming, and marketing of improved cooking stoves), involving men, women and youth, and ecologically rational exist.	0	At least 200 resilient remunerative activities involving each year at least 50% women, 30% youth and 20% men are supported	- Training program - Project execution reports	- Proper balance between implementation costs of activities and projected income (i.e. revenues recover the costs)

	2.3. Climate resilience of fuelwood supply areas identified by revised SDAs is **enhanced** through **reforestation and conservation of woody areas**	Existing community parks of firewood resilient to climate change in areas identified as the most vulnerable	0	10 community parks (adding to 600,000 ha) in the concerned communal forests, involving men, women and youth, are set up	- Project execution report - Annual management reports of the community parks in the concerned areas	-Good mobilization of local leaders for the setting up of the parks
		- Bushfire management protocols developed and signed	0	At least 4 protocols signed	- Protocols - Protocol signature statement	- No delay in protocol development
		- Demonstration sessions for resilient bushfire fight methods around fuelwood supply forest areas carried out	0	40 sessions	- Session reports - Project execution reports	
		Number of existing remunerative activities alternative to forest resources use (beekeeping, horticulture, small livestock breeding, production and maintenance of improved stoves, pressure cookers etc.)	0	At least 200 activities generating income, involving each year at least 50% women and girls and 50% men and boys achieving activities alternative to forest resources exploitation	- Project annual execution reports - Project monitoring reports	- Proper balance between implementation costs of activities and projected income (i.e. revenues recover the costs)
Outcome 3: Reduce vulnerability in the Benin energy sector	3.1. Electricity production and distribution facilities are protected against disasters and other climate risks	Thermal power plants protective measures are implemented, lowering the risk of breakdowns of the installed capacity during extreme climatic events.	0	At least 2 measures for each station	- Project annual execution reports	- Protective measures are effective
		Protective measures for the distribution network implemented.	0	At least 2 measures by area exposed to a risk within the network	- Project annual execution reports	- Protective measures are effective

	3.2. Development of alternative energy production sources for vulnerable localities	Existing feasibility study (for each locality)	0 0	1 study for a vulnerable locality	- Project execution report - Awareness campaign	-Baseline data are available to develop the study - No delay in the process of recruitment of a qualified Consultant
		Existing training plan and awareness campaign		1 training program 1 awareness campaign	- Training sessions - Training report	- Proper understanding of the new technologies taught during training
		- Technical capacity building program to make improved stoves and pressure cookers, integrating women's specificities - Improved stoves and pressure cookers distributed in the most vulnerable rural communities of the selected areas.	0	1 capacity building program At least 10.000 improved stoves At least 1.000 pressure cookers	- Project annual execution reports	- Improved stoves appropriate given the social context of populations
		- Improved carbonization technologies spread in charcoal production communities, integrating gender needs and specificities. - Number of improved kilns built and functioning among charcoal production communities	0 0	At least 3 technologies At least 500 operators (50% men / 50% women), adult and youth, trained 100 kilns	- Training sessions - Training reports - Training monitoring reports	-Technologies appropriate given the social context of populations

	3.3. (in common with the biomass project): Increased investment in clean energy technologies and low-carbon practices in the agro-forestry waste sector, and in adaptive measures to increase the resilience of the energy sector to CC.	FSM operationalized with a policy framework and an investment manual with fiduciary principles, ESS and risk coverage criteria, MOU drafted, finalised, signed and enforced with Central Bank, paving the way for a financial climate protection mechanism in the energy sector	0	1		
		Incentives to be provided by Government to project developers/Independent Power Producers (IPPs) approved and operationalised with climate risks reduction coverage mechanisms (eg weather risk insurance-related solutions such as LPC and LPP).	0	1	- Project documentation.	Good cooperation of Government entities and staff

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

RESPONSES TO COUNCIL RECOMMENDATIONS

Comment	Response	Reference
Germany's Comments: Germany approves the PIF in the work program but asks that the following comments are taken into account: Regarding other relevant projects, we are pleased to see that the proposed project plans to build on various on-going initiatives. The PIF lists the Program for Decentralisation and Local Development (PDDC), the implementation of which is assisted by GIZ on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ), as one the planned baseline projects. The program's "Rural Area Electrification" component is an EU Energy Facility co-financing with contributions by the Federal Ministry for Economic Cooperation and Development (BMZ), the French Agency for Development (AFD) and the Energising Development (EnDev) programme. The main objective of this component is to connect 105 rural villages to the power grid. In this context, the program also supports the Beninese Society for Electric Energy (SBEE) and the Beninese Agency for Rural Electrification and Prime Contracting (ABERME) in optimizing the planning processes, particularly in terms of cost-benefit optimization and low-cost technologies. In general, adding a climate-sensitive component to the GEOSIM tool seems reasonable and worth promoting. It would however be desirable that the initiative be embedded into the ongoing sector dialogue as well as the sector strategy which is currently being elaborated by the Ministry of Energy. We therefore recommend initiating inclusion into these processes as soon as possible, in order to ensure that the initiative can be anchored into the SBEE and ABERME proceedings in a sustainable manner.	Germany's comments are very relevant and the present document has been elaborated in collaboration with provided recommendations. During all the consultative process, the Ministry of Energy was involved with strong interactions with the Director General for Energy. In addition, the formulation team included former high-ranking officials from the Ministry of Energy that are still involved in the on-going sector dialogue and strategic issues.	

RESPONSES TO STAP RECOMMENDATIONS

No STAP recommendations

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS[21]

[21] If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

C1. EXPLAIN IF THE PPG OBJECTIVE HAS BEEN ACHIEVED THROUGH THE PPG ACTIVITIES UNDERTAKEN.

The PPG objective of formulating detailed Project Document has been achieved. The project formulation was done through consultations involving a range of stakeholders. Consultative activities were taken up through individual interviews with stakeholders and workshop (Problem/solution analysis and Log frame Workshop).

C2. DESCRIBE FINDINGS THAT MIGHT AFFECT THE PROJECT DESIGN OR ANY CONCERNS ON PROJECT IMPLEMENTATION, IF ANY:

N/A

C3. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES AND THEIR IMPLEMENTATION STATUS IN THE TABLE BELOW:

The activities achieved during PPG are shown in the table below:

Project Preparation Activities	***Implementation Status***	***GEF Amount ($)***				***Co-financing ($)***
		Amount Approved	***Amount Spent to date***	***Amount Committed***	***Uncommitted Amount****	
Collection and analysis of baseline data including comparative review of other countries under similar conditions and circumstances	Completed	80,000	80,000			40,000
Review of experiences in Benin and other countries of the following: - Vulnerability of the energy sector to climate change	Completed	30,000	30,000			15,000
Conduct a Logical Framework Analysis (LFA) to define project goal, objectives, outcomes, outputs and activities, including success indicators as well as delineation of responsibilities and coordination mechanisms	Completed	30,000	30,000			15,000
Stakeholder engagement, capacity needs assessment of key local implementing partners and co-financing	Completed	40,000	40,000			20,000
Detailed design of project implementation plan	Completed	20,000	20,000			10,000
Preparation and finalization of the full-sized Project Document	Completed	0	0			20,000
Total		**200,000**	**200,000**			**120,000**

*Any uncommitted amounts should be returned to the GEF Trust Fund. This is not a physical transfer of money, but achieved through reporting and netting out from disbursement request to Trustee. Please indicate expected date of refund transaction to Trustee. N/A

Empowered lives.
Resilient nations.

Project Document

United Nations Development Programme
Republic of Benin

Project Title	**Strengthening the resilience of the energy sector in Benin to the impacts of climate change**
UNDP Strategic Plan (2014-2017):	**Outcome SP1**: Growth and development are inclusive and sustainable, incorporating productive capacities that create employment and livelihoods for the poor and excluded **Output 5.1:** Inclusive and sustainable solutions adopted to achieve increased energy efficiency and universal modern energy access (especially off-grid sources of renewable energy
UNDAF Outcome	Outcome 6: By 2018, institutions and populations of the intervention areas achieve better management of their environment, of energy and natural resources, of the consequences of climate change, and of natural disasters and crisis.
Expected Project Outcomes	Outcome 1. Strengthening adaptation capacities of the energy sector to climate change Outcome 2. Taking climate change into consideration in energy policies and strategies Outcome 3. Reducing the climate vulnerability of energy supply sources in Benin
Implementing partners	*Ministère de l'Energie, des Recherches Pétrolières et Minières, de l'Eau et du Développement des Energies Renouvelables* (Ministry of Energy, Mining and Petroleum Exploration, Water and Renewable Energy Development)
Responsible Parties	*Société Béninoise d'Energie Electrique* (Benin Electrical Energy Company), *Ministère de l'Environnement et de la Protection de la Nature* (Ministry of Environment and Nature Protection), *Ministère de l'Economie et des Finances* (Ministry of Economy and Finance)

Brief Description of the Project

The project “Strengthening the resilience of the energy sector in Benin to the impacts of climate change” (Adaptation Project) – also called in short “NAPA Energy”, aims to support the Government of Benin’s strategy to adapt to climate change in the energy sector and to reduce the vulnerability of rural and urban communities to climate change and variability, through increasing the resilience of energy production, transport and distribution on the territory.

The project addresses the second priority intervention identified by the 2008 NAPA of Benin: “Reducing populations’ vulnerability to climate change impacts by providing a better access to sustainable energy sources and protecting forest resources”.

The first intervention concerns the adaptation capacities of the energy sector to climate change. It will strengthen these capacities in order to enable stakeholders to integrate climate risks in energy planning and to face climate risks, so that risks of economic losses due to climate change are reduced.

The goal of the second intervention is to support the development of new frameworks for energy policies and strategies that will take climate change into consideration. Climate change issues and adaptation measures should be integrated into policies and strategies both at the national scale, and in vulnerable areas identified by the NAPA.

The third intervention will take action to reduce climate vulnerability of energy supply sources in Benin. It will focus on the resilience of watersheds, of forest areas supplying wood for energy, and of electricity production and distribution facilities. It will assess the vulnerability of these areas and take protective measures, involving all stakeholders, to protect these energy sources. Moreover, it will support the development of alternative energy production sources for vulnerable communities.

UNDAF Program Period:	2014-2018	Total resources:	USD 39,570,000
		Regular (managed resources:	
Atlas Award ID:	00090819		
Atlas Project ID:	00096410	GEF :	USD 8 million
PIMS#	4979	UNDP (TRAC) :	USD 500,000
Start date:	July 2016	Other :	
End date:	June 2021	*Government (MERPMEDER)	USD 8 million
PAC Meeting Date:	tbd	*Government (MEPN)	USD 8 million
		*NGO (Good planet):	USD 70.000
Management arrangements	NIM	*Private sector (CEB):	USD 15 million

Agreement of MERPMEDER: **Date:**

Agreement of UNDP: **Date:**

Table of content

List of Acronyms

ABE	*Agence Béninoise pour l'Environnement* (Benin Environment Agency)
ABERME	*Agence béninoise de l'électrification rurale et la maîtrise d'énergie* (Benin rural electrification and energy management agency)
AfDB	African Development Bank
AISER	*Association Interprofessionnelle des Sociétés d'Energies Renouvelables*
ALCRER	*Association de Lutte Contre le Racisme l'Ethnocentrisme et le Régionalisme*
ANADER	*Agence National pour le Développement des Energies Renouvelables*
AR5	Fifth Assessment Report of the IPCC
AWP	Annual Work Plan
BCEAO	*Banque Centrale des États de l'Afrique de l'Ouest*
BIDC	*Banque d'investissement et de développement de la CEDEAO*
BMZ	German Federal Ministry for Economic Cooperation and Development
CCDARE	Climate Change Adaptation and Development Initiative
CCIB	*Chambre de Commerce et d'Industrie du Bénin*
CDM	Clean Development Mechanism
CENATEL	*Centre National de Télédétection et de Suivi Ecologique*
CFAF	CFA franc
CEB	*Communauté Electrique du Bénin*
CePEB	*Centre de partenariats et d'expertise pour le développement durable*
CMEICB	*Commission de Modélisation Economique des Impacts et de l'Intégration de Changements Climatiques dans le Budget Général de l'Etat*
CNDD	*Commission Nationale de Développement Durable*
CNP	*Conseil national de patronat*
CO	Country Office
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CONTROLEC	*Agence de Contrôle des Installations Electriques Intérieures*
COP	Conference of the Parties
DFID	Department for International Development (United Kingdom)
DGA	*Direction générale de l'agriculture*
DGCC	*Direction Générale des Changements Climatiques*
DGE	*Direction Générale de l'Environnement*
DGFRN	*Direction Générale des Forêts et Ressources Naturelles*
DNM	*Direction National de la Météo*
DOI	*Direction de l'organisation internationale*
DPP	*Direction de la programmation et de la prospective*
EIB	European Investment Bank
EPAC	*Ecole Polytechnique d'Abomey-Calavi*
EU	European Union
FAGACE	*Fonds Africain de Garantie et de Coopération Economique*
FNLD	*Fonds National de Lutte contre la Désertification*
FSA	*Faculté des Sciences Agronomiques*
FTP	Financial and Technical Partners
GCF	Green Climate Fund

GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIS	Global Irradiation on Surface
GIZ	*Deutsche Gesellschaft für Internationale Zusammenarbeit*
GoB	Government of Benin
ha	hectare
IDID	*Initiatives pour un Développement Durable*
IFC	International Finance Corporation
IMF	International Monetary Fund
INRAB	*Institut National des Recherches Agricoles du Bénin*
INSAE	*Institut National de la statistique et d'analyse économique du Bénin*
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
JICA	Japan International Cooperation Agency
LDC	Least Developed Countries
LDCF	Least Developed Countries Fund
M&E	Monitoring and Evaluation
MAEP	*Ministère de l'Agriculture, de l'Elevage et de la Pêche*
MDG	Millennium Development Goals
MEF	*Ministère de l'Economie et des Finances*
MEPN	*Ministère de l'Environnement et de la Protection de la Nature* (Ministry of Environment and Nature Protection)
MERPMEDER	*Ministère de l'Energie, des Recherches Pétrolières et Minières, de l'Eau et du Développement des Energies Renouvelables* (Ministry of Energy, Mining and Petroleum Exploration, Water and Renewable Energy Development)
MRV	Measuring, Reporting, and Verification
Mt CO_2e	Million metric tons of carbon dioxide equivalent
Mt	Million metric tons
MW	Megawatt
NAMA	Nationally Appropriate Mitigation Action
NAPA	National Adaptation Programme of Action
NGO	Non-Governmental Organisation
NIM	National Implementation Modality
OFEDI	*Organisation des femmes pour la gestion de l'énergie, de l'environnement et la promotion du développement intégré*
ONAB	*Office National du Bois*
PDDC	*Programme d'appui à la Décentralisation et au Développement Communal (*Support Program for Decentralisation and Municipal Development*)*
PIF	Project Identification File
PIR	Project Implementation Review
PFR	*Plan Foncier Rural*
PMU	Project Management Unit
PNGDRN	*Programme National de Gestion Durable des Ressources Naturelles* (National Program for Sustainable Management of Natural Resources)
PPP	Public Private Partnership

PRECAB	*Projet de Renforcement des connaissances économiques et de la capacité d'adaptation face aux changements climatiques au Bénin*
QPR	Quarterly Progress Report
RCU	Regional Coordination Unit
SBAA	Standard Basic Assistance Agreement
SBEE	*Société Béninoise d'Energie Electrique*
SCRP	*Stratégie de Croissance pour la Réduction de la Pauvreté*
SDA	*Schéma Directeur d'Approvisionnement en bois-énergie*
SDERB	*Schéma Directeur de l'Electrification Rurale du Bénin*
SE4All	« Sustainable Energy for All » by 2030 initiative
SME	Small and middle-sized enterprises
SNV	*Stechting Nederlandse Vrijwilligers*
SONAPRA	*Société Nationale pour la Promotion Agricole*
toe	tonne of oil equivalent
UEMOA	Union Economique et Monétaire Ouest Africaine
UNCCD	United Nations Convention to Combat Desertification
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	US dollar
WAPP	West African Power Pool

I. Situation Analysis

1.1. National context[1]

Benin (Republic of Benin) is a small Sub-Saharan African country of 116.622 km² and around 10 million inhabitants in 2013[2]. Poverty is widespread in Benin, with more than 36% of the population living below the poverty line. The country's economy relies mainly on agriculture, in particular cotton exports, which represents one third of the Gross Domestic Product (GDP). 70% of the population is dependent on agriculture for its livelihood.

Benin's economy is highly dependent on exports and trade, especially with Nigeria, on climatic conditions for the agricultural production, and on foreign investments. As a consequence, growth rates can vary significantly from one year to another. They are currently comprised between 5 and 6%.

The political context of the country has been stable since 1989. The last elections reelected democratically President Yayi Boni in 2011, for a five-year term. The Government of Benin (GoB) adopted in 2011 a Growth and Poverty Reduction Strategy (*Stratégie de Croissance pour la Réduction de la Pauvreté*/SCRP 2011-2015)[3], which aims to make Benin an emerging economy by 2025, with a sustainable growth and the achievement of the Millenium Development Goals (MDG). This last objective represents a major challenge, and not all the goals will be achieved (in particular regarding child and maternal mortality, sanitation, and parity in primary and secondary education)[4].

Regarding climate change, on June 30, 1994, the Republic of Benin ratified the United Nations Framework Convention on Climate Change (UNFCCC)[5], thus committing to bear its responsibility in the mitigation of climate change and the development of adaptation strategies for its population. Following this commitment, and the first implementation strategies elaborated in collaboration with the Global Environment Facility (GEF), the Republic of Benin launched in January 2008 the process of the National Adaptation Plan of Action (NAPA)[6]. The purpose was to assess the vulnerability of livelihoods and of socio-economic stakeholders, and to determine the priority adaptation needs for the nation, with regard to its resources and to the capacities of the various social groups concerned.

[1] With inputs from the reports of consultant Olola Vieyra on risks and vulnerability
[2] http://data.worldbank.org/country/benin
[3] http://www.bj.undp.org/content/dam/benin/docs/pauvrete/SCRP%203-version9dec2010.pdf
[4] http://www.worldbank.org/en/country/benin/overview
[5] http://unfccc.int/essential_background/convention/status_of_ratification/items/2631.php
[6] http://unfccc.int/resource/docs/napa/ben01f.pdf

The conclusions of the NAPA process were the following:

- Droughts, floods and late violent rains are three major climatic risks on Benin's territory;
- Violent winds and extreme heat are two climatic risks likely to increase in certain localities and situations;
- Some local risks such as sea level rise have a limited geographic imprint but a large social and economic impact;
- In center and northern agro-ecological areas, (i) watersheds, subsistence agriculture and resources, and (ii) small farmers, market gardeners, emerging farmers and fishermen are particularly exposed to these risks;
- In southern agro-ecological areas, (i) subsistence agriculture, lands, water resources, human health and biodiversity and (ii) small farmers, fishermen and livestock farmers are particularly exposed to these risks.

Considering these findings, five draft projects were elaborated. The overall amount needed to implement the NAPA was estimated at 15,580,100 USD, while the environmental degradation costs, between 3 and 5% of Benin's GDP per year. The current project document corresponds to the second project profile elaborated in 2008. In the NAPA 2008 document, it is entitled « *P.2 – Secteur Energie : Adaptation des ménages aux changements climatiques par la promotion des énergies renouvelables et des foyers économiques performants et autocuiseurs dans les zones vulnérables aux changements climatiques et dont les terres sont fortement dégradées* ».

1.1.1. Geographic and climatic situation[7]

Benin is surrounded by Togo (west), Burkina Faso (northwest), Niger (northeast) and Nigeria (east), with 125 km of coast in the south. The country is relatively flat, with five main geomorphologic features: a sandy coastal plain in the south, sedimentary plateaus, a crystalline peneplain, the Atacora chain and the Gourma plain. Benin's climate is characterized by the annual succession of a dry season and a rainy season. The average annual rainfall ranges from 700 mm (in the extreme north) to 1,500 mm (in the extreme southeast), while temperatures vary around an average of 27.2°C, with absolute maxima exceeding 45°C in the north.

Water resources in Benin include surface water and groundwater. The surface water resources are distributed over six watersheds grouped into four major river sets that are Niger, Ouémé — Yeoua, Volta and Mono-Couffo. The annual surface water potential of

[7] One of the key sources of information for this section is provided by the 2011 Second National Communication of Benin to the UNFCCC (http://www.undp-alm.org/projects/trust-benin-second-national-communication)

Benin is estimated at 13 billion m^3. Groundwater water resources include discontinuous aquifers in the bedrock region, and continuous aquifers in the sedimentary regions, covering respectively 80% and 20% of the total area of Benin. The total annual recharge of the various aquifers is estimated at 1.87 billion m^3 of water.

There are five main types of soil in the country: ferralitic soils, tropical ferruginous soils (82% of the country surface), gross mineral soils, hydromorphic soils near rivers, and vertisols or black lands, generally found in the Lama depression[8]. The major part of these soils are degrading due to physical (erosion) and anthropogenic (destruction of the vegetation, unsuitable agricultural practices) factors.

In terms of biological resources, major forest formations encountered in Benin are mostly clear forests and wooded grassland (center and north), and dense forests semi-deciduous and deciduous (in the south). The forest area is divided into protected areas and classified areas that include two reserves (869,867 ha), three hunting zones (443,679 ha), forty six classified forests (1,302,863 ha), seven reforestation perimeters. The fauna is quite diverse and includes several species of mammals, reptiles, birds and invertebrates.

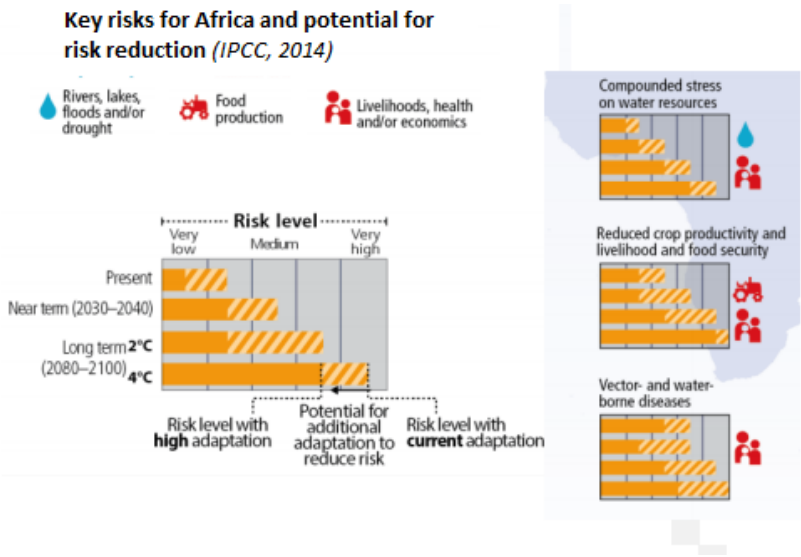
In the south of the country, one of the main climate hazards is the rise in sea level. This is especially the case in Cotonou, which has some areas that are at, or below, sea level. A rise in sea level could trigger a number of climatic phenomena such as coastal and riverbank erosion, flooding and salt water intrusion into Lake Nokoué.

The most recent findings of the Intergovernmental Panel on Climate Change (IPCC), compiled in the Fifth Assessment Report (AR5) published in 2014[9] are unanimous in recognizing the challenges of climate change. It states that “climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development”.

[8] The Lama protected forest is in a depression of an average altitude of 60 m. Soil is clay, more than 2 meters in depth. The hydrographic network is made up of ponds and seasonal backwaters. The climate is a dry Guinean type. The mean annual rainfall is 1,112 mm. The annual average temperature varies between 25°C and 29°C. Air humidity remains high even in the dry season. The so-called “Noyau Central” contains nearly 173 plant species belonging to 67 families (FAO, 2003 ; http://www.fao.org/docrep/article/wfc/xii/0198-c1.htm).

[9] http://www.ipcc.ch/report/ar5/

Figure 1: Key climatic risks for Africa (IPCC, 2014)



Hence, Benin faces important risks and adaptation is an increasing priority. A first step towards adaptation to future climate change is reducing vulnerability and exposure to present climate variability. Integration of adaptation into the energy sector, including the energy policy design, planning and decision making can promote synergies with the increasing demand for energy in Benin and disaster risk reduction. Building adaptive capacity is also crucial for the effective implementation of adaptation options in the energy sector.

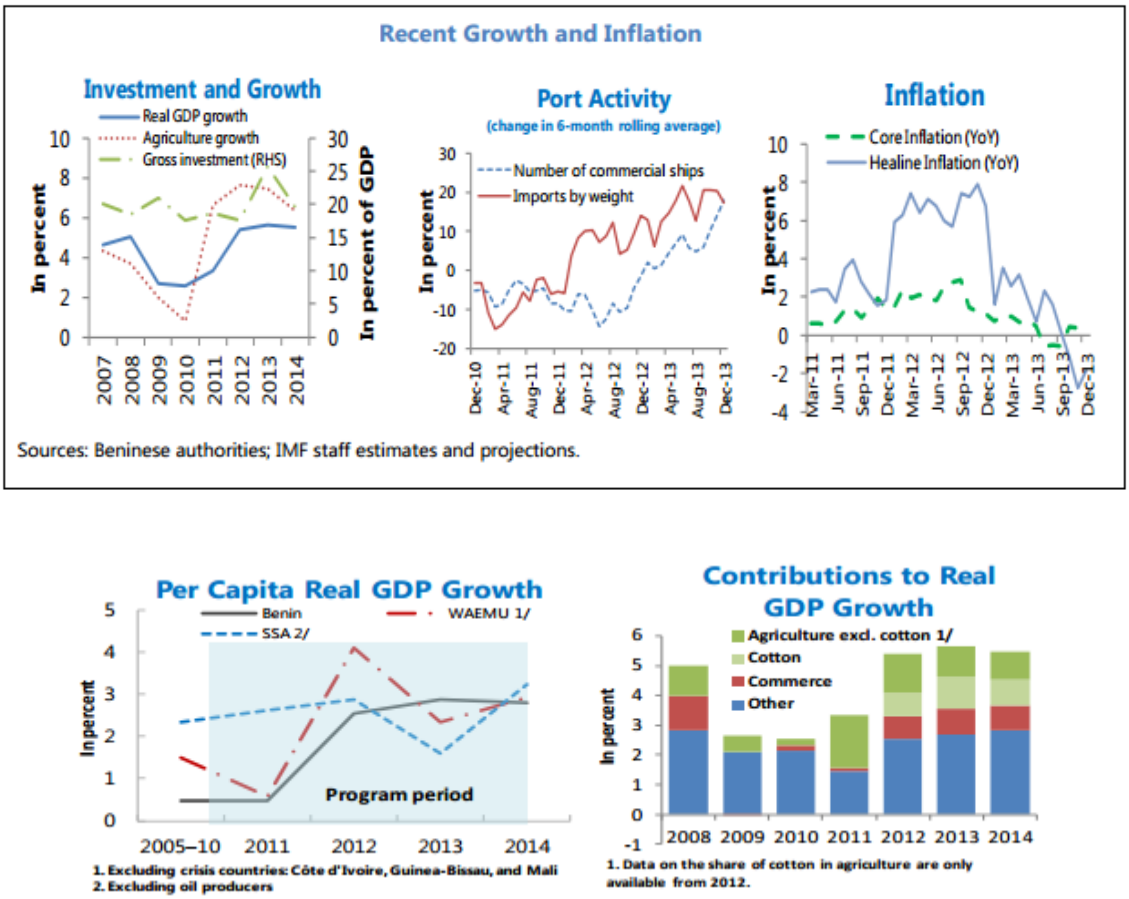
1.1.2. Socio-economic situation

Regarding the socio-economic and demographic situation, Benin is a least developed country[10] whose economy, mainly based on both primary and tertiary sectors, is marked by a change in the GDP ranging from 2 to 6% over the period 1990 to 2014. However, with the economic recovery efforts initiated since 2006, GDP experienced a gradual positive evolution but remains below the minimum rate of 7% required to achieve the Millennium Development Goals (MDGs) despite these efforts.

Real GDP growth in 2013 is at about 5.5%, supported by strong agriculture and commerce activities, the agricultural sector contributing to one third of the GDP. Private investment has increased by about 6% of GDP, most of which directed to oil exploration. Cotton production, managed by the GoB since the 2012/13 campaign, rose by 28% (IMF, 2014)[11].

[10] http://www.un.org/en/development/desa/policy/cdp/ldc/ldc_list.pdf
[11] http://www.imf.org/external/pubs/ft/scr/2014/cr14150.pdf

Figure 2: Growth and inflation (Source: IMF, 2014)



The share of rural population is gradually decreasing, from 61.9% of the total population in 1999 to 53.1% in 2014 (FAO, 2014)[12]. The agricultural sector is dominated by cotton, the main cash crop, besides which emerge other cash crops such as pineapple and cashew nuts. The most important food crops are maize, cassava and sorghum. Livestock breeding, still marked by traditional practices, focuses on cattle, goats, pigs and poultry. In terms of forestry production, the annual production reached, in volume, 6.9 million m^3 in 2013.

[12] http://faostat3.fao.org/

Table 1: Evolution of roundwood production and trade (Source: FAOSTAT[13])

Evolution of roundwood production and trade							
	Volume [1000 CUM]				Annual growth rate [%]		
	1998	2003	2008	2013	1998-2003	2003-2008	2008-2013
Production	6208.34	6383.13	6611.20	6931.02	0.56	0.7	0.95
Imports	5.80	66.00	0.04	0.47	62.64	-77.28	63.68
Exports	0.70	28.30	50.52	300.56	109.57	12.29	42.85

The industrial sector of Benin, dominated by the food industry, the textile industry and the cement industry, is still low and only occupies 10% of the active population. Agribusiness, including cotton ginning, is the most developed branch of the sector (60% of industries). Trade (especially with Nigeria) and transportation to neighboring countries are by far the main activities of the tertiary sector.

The population of Benin increased from 4,915,555 in 1992 to 9,983,884 inhabitants in 2013 with an average density jumping respectively from 43 to 87 inhabitants/m^2 according to the *Institut National de la Statistique et de l'Analyse Economique* (INSAE)[14]. The average annual population growth rate is of 3.25%. According to projections by INSAE, about 60% of Beninese will be living in cities by 2025 and, for the majority, in the coastal area, which represents less than 10% of the territory. This high concentration of people in coastal urban centers will emphasize structural imbalances already very pronounced and malfunctions unfavorable to the harmonious development of the territory. It will impact energy access and provision with more pressure on the supply side, and could become a problem considering the vulnerability of Cotonou to sea level rise.

Table 2: Economic and demographic indicators for Benin (Source: INSAE and World Bank, 2014)

GDP growth (%)	**4.5**
Population (million inhabitants)	9,983,884
Population living below the poverty line (%)	36.20
GDP (billion USD)	8.307
GDP per capita (USD)	804.7

[13] http://faostat3.fao.org/

[14] The key source on demographic information is the Recensement Général de la Population et de l'Habitation (RGPH4) from May 2013. More information at http://www.insae-bj.org/

1.2. National energy context[15]

The energy sector in Benin is characterized by a predominance of traditional uses of biomass energy, low access of population to modern energy (fuel and electricity). Benin is 100% dependent on outside supplies for petroleum products and over 80% for electricity.

Energy indicators for the country are as follows (the most recent available data are for 2010): energy consumption per capita is relatively low (0.392 toe / capita)[16] with a specific annual electricity consumption of 101.9 kWh / capita, while the electricity bill increased from 15.986 billion CFAF in 2005 to 25.310 billion CFAF in 2010 (constant 1985 franc), representing 2.14% of the GDP in 2010.

The analysis of the energy balance from 2000 to 2010 clearly shows the dominance of biomass energy consumption over other types of energy. In 2010, the consumption structure shows a predominance of biomass energy and petroleum products. The consumption share by type of energy appears respectively as follows: biomass energy 49.5%, petroleum 48.3%, electricity 2.2%. There has been a major increase in the proportional consumption of petroleum products, while the share of electricity remains at around 2%.

The electrical energy consumption has shown during the 2000-2010 period an average annual growth of 7.1%. The very low share of electricity in the total energy consumption clearly demonstrates, if it was necessary, that the industry is embryonic and household access to electricity is still very rare. The table below summarizes these figures.

Table 3: Distribution of total energy consumption in 2010

	Biomass energy	**Petroleum products**	**Electricity**
Relative share in %	49.5	48.3	2.2
Consumption in toe	1,654,268	1,614,881	74,661

[15] With inputs from reports of consultant Badarou Moutairou Raoufou on energy
[16] Source : Rapport du Système d'Information Energétique (SIE), Bénin 2010 (le dernier disponible).

Figure 3: Distribution of total energy consumption in 2010

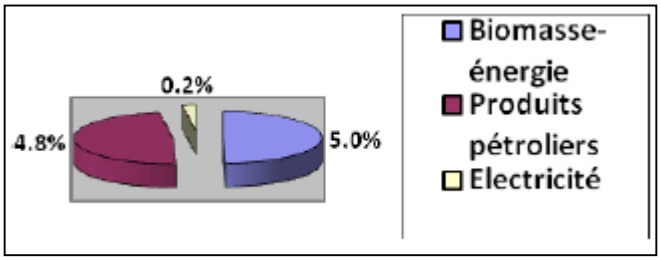
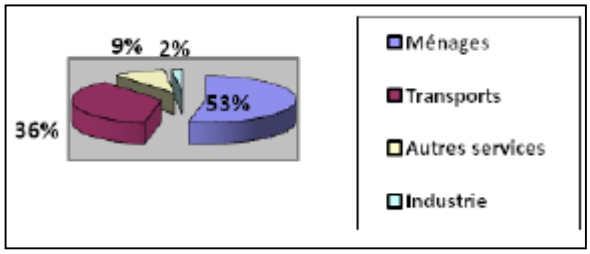


Table 4: Distribution of energy consumption by economy sector in 2010

	Household	Transports	Other services	Industry
Relative share in %	53.1	35.8	9.2	1.9
Consumption in toe	1,776	1,198	307	63

Figure 4: Distribution of energy consumption by economic sector in 2010



The sub-sections below focus on electricity and biomass for energy, as it is intended to target the strengthening of the resilience of the energy sector for these two types of energy, and not for petroleum.

1.2.1. Electricity

a) Power generation: a potential in solar and hydropower to diversify power supply

Benin is characterized by a watershed system containing a number of rivers with some favorable sites for the installation of small to large scale hydropower plants. The hydrological map of Benin shows that the country has a relatively large potential in terms of sites for hydropower, being reservoirs or run-of-the river sites. The estimated hydropower potential in Benin is estimated to be at 624 MW. However, to date, there is only one site under operation, called Yéripao in the northwest part of Benin. This micro-hydropower plant, with an installed capacity of 0.5 MW for an average annual energy production of 1.25 GWh, is in operation since January 1997. It is managed by SBEE. Due to mechanical problems, the plant ceased its operations in April 2008 and is being repaired.

Several potential hydropower sites have been identified, which could mitigate the dependence of Benin on foreign power supply. Among these sites, a split shows that a total of 9 of them have a potential installed capacity comprised between 2 and 9 MW (mainly in the north and in Alibori Atacora), 15 sites between 10 and 99 MW (mainly on the Ouémé River), and 3 sites between 100 and 200 MW (Plateau and Couffo). In addition,

according to the "Master Plan for Rural Electrification in Benin", 85 sites for mini- and micro-hydropower plants have been identified, the total installed capacity being 64 MW. Hydropower is therefore one of the most promising technology for power supply.

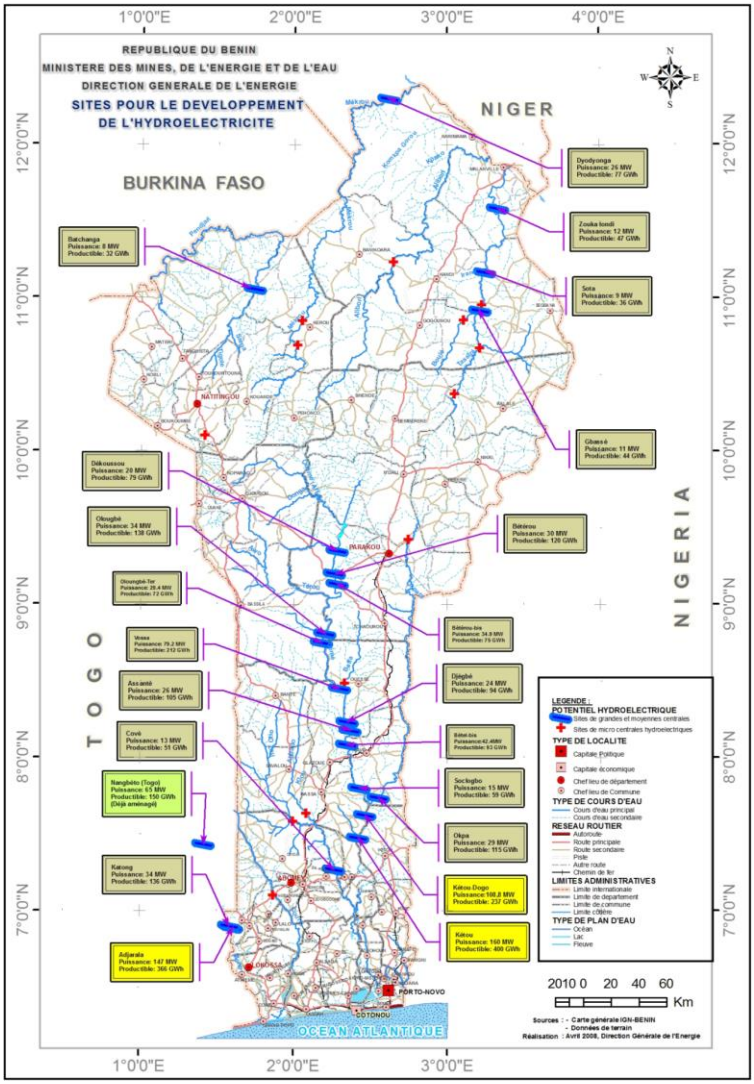
Table 5: Potential hydropower sites[17]

Name of the site	Capacity (MW)	Expected power supply (GWh)	Estimated costs (in CFA '000 000 000)
Adjarala	147	366	107.41
Kétou-Dogo	108.8	237	100
Olougbé	34	138	34.1
Bétérou	30	120	57
Assanté	26	105	32.5

The map of Benin below presents these most important potential hydropower sites.

[17] Source: Direction Générale de l'Energie, Rapport SIE-Bénin 2006

Figure 5: Map of the main potential hydropower sites with a capacity above 2 kW



In terms of solar power, the existing meteorological stations in Benin do not allow to have a detailed mapping of the solar irradiation (measured by a pyranometer enabling to calculate the global irradiation on surface or GIS). As of today, the available data is limited to empirical measures of daily sunshine hours (measured by heliograph). The monthly average data of daily sunshine measured in Natitingou and Kandi stations are shown in the table below, with the maximum being observed in February and the minimum in August.

Table 6: Daily sunshine in hours

Station	J	F	M	A	M	J	J	A	S	O	N	D	Yearly
Natitingou	8,9	9,08	8,21	8,38	7,87	7,36	5,45	4,61	5,73	7,22	8,80	8,51	7,50
Kandi	9,32	9,64	8,98	9,07	8,97	9,05	7,59	6,54	7,68	8,95	9,58	9,32	8,71

Energy data are often extrapolated from these hourly data but with some uncertainty. Official data generally used in the strategy documents show a daily irradiation of 3.9 kWh/m²/d on average over the year in the south, and 6.2 kWh/m²/d in the north.

Still, the potential for developing solar power in Benin is considered to be significant even though more data are needed. This explains why several projects have been developed but are not yet implemented.

Benin has a huge potential of renewable biomass, especially from agriculture residues, as highlighted in the “Promotion of sustainable biomass based electricity generation in Benin” GEF project[18]. It has been estimated through national statistics that biomass could potentially support the installation of more than 700 MW power generation capacity, using simple pyrolysis techniques such as gasification from agriculture residues. 27% of agriculture residues can be realistically exploited, leading to the generation of 300 MW energy capacity, and saving 300 million USD per year from electricity and fossil fuel importation. Regarding hydroelectric potential, the aforementioned study "Master Plan for Rural Electrification in Benin" has identified throughout the country 27 sites with a hydroelectric capacity potential higher than 2 MW. Total hydro capacity was estimated at 882 MW for an annual potential production of 2587 GWh, i.e., more than twice as much as the electricity imports in Benin in 2009. Mini, micro and small hydro systems appear also widely feasible across the country for rural electrification, in particular in the northwest for capacities lower than 1,000 kW, in the center of the country for capacities between 1,000 and 2000 kW and in the south for larger installations. Turning to solar energy, reported minimal sun irradiation of 3.5 to 5.0 kWh/m2/day provides Benin with an annual potential of 1800 to 2200 kWh/m²/day solar energy. Wind velocity fluctuates between 3 and 5 m/s at 10m altitudes but a detailed study is still missing to estimate with more accuracy the country’s potential for wind energy, which seems particularly promising along the Bight of Benin.

Table 7: Strengths and weaknesses of renewable energy

	Strengths	Weaknesses
Small scale hydropower	Available and proven technology, possibility of irrigation of agricultural land	High cost, not available all year round
Solar power	Available and proven technology, positive impact on poverty, the economy and the trade balance	High cost, not available at night, mobilizing large spaces
Biomass power plant	Available and proven technology, positive impact on agriculture, poverty, the economy and the trade balance	Uncertainty about the evolution of supply of biomass due to climate changes
Wind farm	Available and proven technology	Low wind speed

[18] http://www.thegef.org/gef/project_detail?projID=5752

In conclusion, Benin has significant energy resources for power supply. However, the country faces more than two decades of recurring energy crisis, which will amplify with climate change. Benin has experienced four major electricity supply crisis between 1984 and 2007. Three causes explain this situation, which are:

1. Decreased water level in the Akosombo dam in the Volta river in Ghana due to the modification of the rainy seasons. This was Benin's main source of power supply until 2007;
2. At the regional level, energy deficit in the three power supply countries of Benin, Ghana, Nigeria and the Ivory Coast;
3. The non-recovery of energy potential of the country. The project targets this latest weakness by strengthening the resilience of the energy sector in Benin to the impacts of climate change.

Indeed, the poor quality of the energy services has negative impacts on businesses, households and Government revenue[19]. A market analysis shows the importance of these impacts.

b) Market analysis

Electricity offer and demand has been analyzed for Benin from today to 2025, following two main scenarios: a “business-as-usual” scenario and a scenario where Benin experiences rapid growth.

In the business-as-usual scenario, electricity demand in Benin in the next years increases in parallel with the GDP growth, at around 5%. The overall demand for electricity is projected to rise from 964 GWh in 2010 to 2,883 in 2025. This evolution would not allow the population to fulfill its basic needs, nor would it permit to achieve the MDGs.

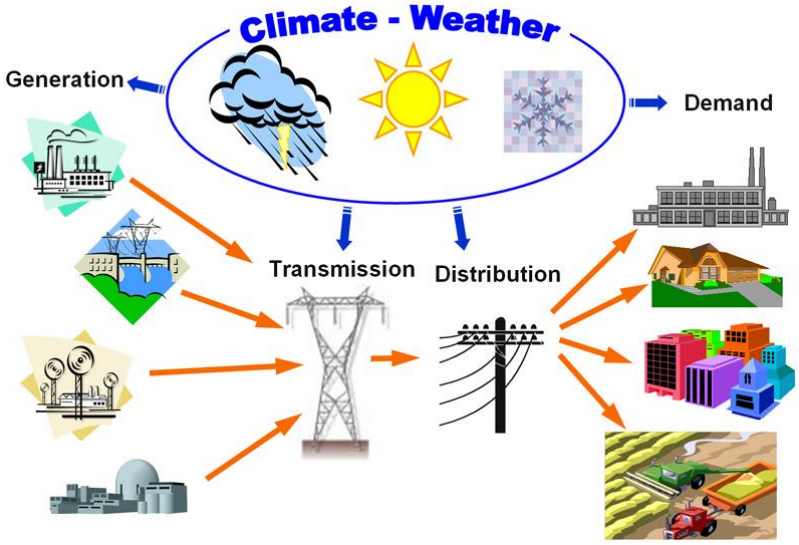
In the rapid growth scenario, the industrial sector’s activity increases and the agricultural sector gets more diversified. This boosts Benin’s GDP growth (reaching 11% in 2025) and the national economy. The electrification rate in this scenario would reach 95% in urban areas and 65% in rural areas, instead of respectively 51.6% and 1.7% in 2005, resulting in a major increase of electricity demand in the country. If Benin was to develop an energy policy designed to conquer external markets, the overall demand for electricity could reach 4,116 GWh by 2025. In the meantime, GDP/capita would almost triple, from 361,000 CFAF in 2010 to 993,000 CFAF in 2025.

[19] Source: Evaluation du coût socio-économique de la mauvaise qualité des services énergétiques du Bénin (Bureau d’Etudes CETRA, 2008)

c) Vulnerability assessment of the power sector

Vulnerability to climate change has been assessed for each type of risks for power production and transportation, considering that, in the supply chain, the vulnerability is different for each type of energy source (biomass, hydropower, other renewable energies, thermal power and electricity imports). Among those sources, the most vulnerable are biomass, hydroelectricity and electricity imports. Indirectly, the economic sectors with important energy needs will be affected by extreme climate events and by climate change. In the case of hydroelectricity for instance, increases in temperature will significantly modify the hydrologic cycle of Benin's rivers, and thus the hydroelectric potential of the country's main rivers. Hazards such as extreme droughts will affect the potential hydropower of the main basins.

Figure 6: Map Impacts of climate change on the electrical power system (Source: DIS, Argonne National Laboratory[20]



With regards to change in rainy seasons, the main risk is posed by flooding to power stations, electricity transmission facilities and primary distribution substations. Substations are at greater risk of river flooding, while power stations are at greater risk of tidal flooding. There may be opportunities to increase resilience to flooding when existing energy infrastructures reach the end of their lifetime and are replaced, but this will depend strongly on the design and location of the new infrastructure.

[20] http://www.dis.anl.gov/news/WECC_ClimateChange.html

Table 8: Examples of threats for the power sector in Benin[21]

Type of threats	Level of consequence
Sub-stations at significant risk of flooding	High
Energy demand for cooling	Medium
Power stations at significant risk of flooding	High
Energy transmission efficiency capacity losses due to heat (over ground)	High
Risks of restriction in water abstraction for energy generation	Low
Heat related damage/disruption to energy infrastructure	Medium

Table 9: Examples of climate change impacts on the electricity networks (Source: SP Energy Networks, 2011[22])

Climate Change Risks		Network Component/Function at Risk													
Risk Type	Specific Risk	Substations	Transformers	Circuit Breakers	Overhead Lines	Cables	Protection	Earthing	Logistics	Vegetation Management	Spares	Resources	Communications	Operations Centres	Customer Service
Extreme Events	Flooding (Fluvial)	H	M	M	L	NE	H	NE	M	NE	M	H	M	M	H
	Flooding (Pluvial)/ Heavy Rain	M	M	M	L	NE	M	NE	L	NE	L	M	L	L	M
	Flooding (Sea Breach including erosion risks)	H	M	M	L	NE	H	NE	M	NE	M	H	M	L	H
	Dam Inundation	H	H	H	H	NE	H	NE	M	NE	NE	L	L	L	L
	Wind	L	L	L	H	NE	NE	NE	H	H	NE	H	H	L	H
	Hurricane and other high wind events	L	L	L	H	NE	NE	NE	H	H	NE	H	H	M	H
	Extreme prolonged temperature periods	L	M	L	M	M	NE	NE	L	L	NE	H	H	M	H
	Lightning	M	M	L	H	NE	NE	NE	NE	L	NE	NE	NE	NE	NE
Gradual Warming	Temperature Increase	NE	L	L	L	L	NE	NE	NE	M	NE	M	M	NE	NE
	Drought (Soil Drying and Movement)	M	L	L	M	L	L	M	NE	M	NE	NE	L	NE	NE
	Demand increase due to Mitigation and HVAC	NE	H	NE	H	H	NE	NE	NE	NE	NE	L	NE	NE	NE

H = High Impact, M = Medium Impact, L = Low Impact, NE = None Expected

High	Network component/function temporarily disabled. Function severely disrupted.
Medium	Network component/function substantially reduced in capacity or damaged. Function disrupted.
Low	Network component/function reduced in capacity or suffers minor damage. Function suffers minor disruption.

High temperatures will also impact the power network: ambient temperature can be expected to result in future derating of the overhead power lines, up to 5% for the transmission network and even higher for the distribution network. Derating means an increase in line losses due to heat waves. The electrical energy available for distribution

[21] Source: adapted from DEFRA, 2012
[22] Climate Change Adaptation Report, Env-05-015, SP Energy Networks, 2011

will then undergo a significant reduction in transport. This reduction would be very detrimental to the energy availability. These losses will become more significant during the hottest days of the year, during which energy demands are usually higher because of an increase in energy demand for cooling.

On the other hand, the basin of potential sites could experience an increase in high rainfall by 2025. This increase, although small, could help to partially compensate for the evaporation losses. The potential hydropower sites would then remain very sensitive to climate variations. That said, increased rainfall may cause flooding of a relatively large extent in the case of an extreme scenario. Increasingly recurrent floods in recent years around the Oueme River are indicative of this trend to increased precipitations.

Finally, solar energy potential would increase but, on the long term, risks of negative impacts on the equipments' performance will increase as well. Sectors requiring continuous electric supply for refrigeration and freezing, typically food industry, are also very exposed, while the lack of wood biomass will impact catering services.

1.2.2. Biomass for energy

a) Market analysis

A study on biomass consumption in Benin in 2010 showed that the national consumption was of 4,297,522 tons of fire wood and 245,197 tons of charcoal. Charcoal production is currently located near forest areas, and follows a traditional carbonization process, with a low output of approximately 15-18% (6 kg of wood for 1 kg of charcoal), which could be improved at least and in a conservative approach, to 20% by an optimized process. Improving the carbonization process yield from 15% to 20% is expected to allow a reduction of the pressure on forest resources by 25%.

Charcoal is mainly consumed in urban areas, resulting in potential long journeys to bring it to consumers. Moreover, while the center and north regions of Benin are self-sufficient, the increasing demand of southern cities conduces to an important pressure on center and north forest resources.

In the future, the demand in biomass energy is expected to increase, while the offer in sustainable biomass will slightly decrease.

b) Vulnerability assessment of biomass for energy

Biomass is one of the most vulnerable energy sub-sectors with regards to climate change. Indeed, increases in temperature are expected to slow down forests' growth by exposing to hydric and thermic stresses, while the demand for wood will increase.

Households with low revenues in rural and urban areas are particularly vulnerable, because they essentially rely on biomass for their energy consumption (cooking, etc.).

Moreover, these populations and more particularly women often get income from collecting firewood and charcoal[23].

Figure 7: Key Climate Change Impacts and Adaptation related to biomass for energy[24]

Climate Variable →	Physical Components →	Key Impacts →	Adaptation Options
Floods/ precipitation	• Biomass supply • Turbine/ generator	• Land degradation/erosion with possibly lower fuel supply and less electricity output	• Soil and nutrient management • Improved water harvesting and use • Resilient ecosystems • Use of trees and shrubs in agricultural systems to improve soil fertility and soil moisture through increasing soil organic matter.
Precipitation or temperature changes	• Biomass supply • Turbine/ generator • Boiler and boiler water treatment system • Fuel feed system • Ash handling and air pollution control systems • Cooling tower	• Temperature and rainfall changes could increase or decrease electricity output depending on feedstock productivity. • Higher rainfall can increase moisture content of feedstock, lowering energy content. • Changing precipitation patterns could affect availability of freshwater for cooling.	• Expansion of rainwater harvesting, water storage and conservation techniques, water reuse, desalination, water use and irrigation efficiency, adjustment of planting dates and crop varieties, crop relocation, and improved land management • Use of salt-tolerant plants (halophytes) or robust crops with high biological heat tolerance and water stress tolerance • Flood protection improvement • Expansion of irrigation systems or improvement of the efficiency of irrigation
Extreme events	• Feedstock and infrastructure	• Possible damage to fuel supplies and generation infrastructure	• Increase the robustness of biomass power plants • Behavioral adaptation measures including early warning systems for rainfall and temperature anomalies, support for emergency harvesting for an imminent extreme event, and provision of crop insurance systems

More precisely, vulnerability assessments show that floods, violent rainfall and drought are the climatic risks with the most impact on forest ecosystems and local communities. The most exposed livelihoods are small foresters and small farmers. Agricultural productions and ecosystem services such as land protection and water resources conservation are particularly threatened by climate change.

In the particular case of biomass residues, quantity or availability of resources remains relatively sensitive to common climate risks. Furthermore the risk of using agricultural

[23] Kowsari R, and H. Zerriffi, 2008. Biomass dependency and vulnerability to climate change, University of British Columbia. http://www.saee.ethz.ch/events/pastevents/cleancooking

[24] ADB, 2012

products directly instead of using the waste could lead to a reduction in food resources availability for households. It is therefore important to find a proper balance.

c) Biomass and the issue of deforestation in Benin

Forest cover has been degrading in Benin for the past thirty years, in particular in protected forests. Between 1990 and 2005, it is estimated that the forest area in Benin decreased by 130,000 ha. At the same time, the forest area per habitant decreased, from 1.63 ha in 1980 to 0.87 ha in 1995, and is estimated to reach 0.29 ha in 2025.

This phenomenon is due to intensive forestry and agriculture activities. Wood and charcoal production are dramatically increasing. Farmers are looking for new fertile lands in forests as the population is increasing, commercial crops such as cotton are extending, and cultivated lands are degrading. On top of this, every year, around 2 million ha of forests burn due to wildfires. This phenomenon, however, decreased in the past years.

d) Wood for energy

As mentioned, the forest area keeps on decreasing at an alarming rate in Benin. The following table shows estimates of the evolution of forest superficies and potential for wood production.

Table 10: Estimates of the evolution of forest superficies and potential for wood production (Source: SIE Benin, 2010[25])

Années	Superficie du couvert forestier (en milliers d'ha)	Production soutenable (en milliers de tonne)
1980	7830(*)	6 342
1995	6573	5 324
1996	6497	5 262
1997	6421	5 201
1998	6342(**)	5 137
1999	6268	5 077
2000	6196	5 019
2001	6124	4 960
2002	6053	4 903
2003	5983	4 846
2004	5913	4 790
2005	5845	4 734
2006	5777	4679
2007	5710	4625
2008	5643	4571
2009	5578	4518
2010	5513	4 466
2015	5201	4 213

Moreover, an estimate of the wood demand has been compiled by the General Directorate for Energy (*Direction Générale de l'Energie*) leading to the following table.

Table 11: Estimates of wood demand, by sector, in tons per year (Source: SIE Benin, 2010[25])

Combustible→	bois de feu	charbon de bois
Consommation des ménages en 2010 (tonnes/an)	3581269	204331
Consommation des services en 2010 (tonnes/an)	716254	40866
Consommation nationale en 2010 (tonnes/an)	4297522	245197

Charcoal is produced through a rudimentary carbonization method using mills and/or pits. Its production is concentrated in various areas, more or less far away from main cities that are the biggest consumers. The distance between production area and sales market can vary from a few kilometers to more than 200 kilometers, for two reasons:

- The availability and accessibility of forest resources located close to the main cities
- The market size, rendering the activity profitable or not

[25] http://www.ecowrex.org/fr/node/12618

The carbonization method being used has a low yield estimated at 15% and if not banned, getting a higher yield could be a very beneficial measure. It is estimated that raising the yield from 15% to 20% would allow saving around 25% of the consumption of wood to produce the current charcoal level. In 2005, it would have represented more than 300,000 tons of wood[25].

1.3. Barriers and adaptation measures

One of the solutions to the climate vulnerability of Benin's energy sector is to implement adaptation measures combining technical measures to strengthen energy sources and infrastructure, the integration of climate risks in sector planning processes and to encourage behavior change by promoting a climate-rational and diverse uses of energy potential. These measures should be underpinned by promoting alternative income generating activities to unsustainable practices of exploitation of forest resources. Also, the adoption / implementation by the Benin of institutional, regulatory and policy measures to remove barriers to the adoption of such measures would facilitate the process.

1.3.1. Barriers

Among the barriers to adaptation measures, the main are the following:

- Low technical and institutional capacities of the authorities and officials of key ministries — particularly in charge of energy and forestry resources — regional and local governments. This limits the integration of climate risks and adaptation measures in the politic, institutional and regulatory frameworks and planning and management strategies for energy demand and supply. Furthermore, the effectiveness of adaptation measures also depends on the existence of climate and weather scientists who can ensure that decisions about the planning of maintenance, networking, inventory and stock management, demand forecasts, projections of energy production from renewable energy sources and other factors incorporate climate and weather information.

- Limited access of decision makers from the energy sector to climate information does not allow planning of energy supply and demand integrating climate risks. Even if the climate-resilient energy planning capacities were available in the country, climate information that Benin can now access does not allow for this planning. Benin is currently implementing a project[26] with GEF to set up an early warning system. This should contribute to providing the energy sector the raw climate information it requires to develop the specific knowledge it will need to successfully plan the energy supply and demand integrating climate risks. Measures to adapt to climate change in the energy sector will inevitably depend on the

[26] http://www.thegef.org/gef/project_detail?projID=5002

reliable hydro-meteorological and weather information, obtained in time and combined with predictive models (e.g. predictive models of digital time) and assessment tools of specific vulnerabilities in the energy sector.

- The master plans for supply *(Schéma Directeur d'Approvisionnement en bois-énergie/SDA*) in fuelwood of major urban centers do not integrate climate risks. Benin has developed master plans for supply in wood for energy in its eight major cities, which allowed the prospective delineation of fuelwood supply basins of the different urban centers, the prospective evaluation of the demand and the evolution of sustainable supply of fuelwood. However, for better planning and sustainability of fuelwood supply in large urban centers, it is essential to consider the climatic and weather factors that may influence the evolution of wood potential and also the fuelwood demand.

- Limited access of producers of charcoal to efficient carbonization technologies do not favor a reduction in pressure on forest resources of the country and thus contributes to increase the vulnerability of the fuelwood sub-sector to climate change and variability.

- Difficult access of households to efficient equipment for fuelwood use (improved stoves, pressure cookers) does not play in favor of reducing the pressure on the forest areas and therefore contributes to increasing the vulnerability of the energy sector. Some extension programs of improved stoves have been implemented in Benin, but these programs have failed to implement strategies of sustainable availability after their closure. Furthermore, Benin lacks an efficient system of inclusive finance to overcome the weakness of the financial capacities of craftsmen making improved stoves and allow them to make the investments necessary for large-scale low cost and cost-effective production of improved stoves. Consequently, rural households as well as low and middle income urban centers do not have the purchasing power that would allow them to invest in those improved stoves.

- Limited knowledge of the evolution of renewable energy potential based on different scenarios of climate variability and change for Benin do not allow efficient use of these potentials. For example, it is necessary to have a better understanding of changes in the flow of rivers, sunlight, winds during the year and the hydraulic potential, solar and wind energy in the coming years for operating efficient renewable energy in Benin to reduce the energy deficit.

1.3.2. Adaptation measures

Changes in climate, e.g. higher temperatures and sea level rise, may result in harsh consequences for the energy sector of Benin, urging to take actions by adopting adaptation measures. While all of the measures proposed below are relevant to the Benin situation, the Beninese NAPA plan of 2008 highlights that the key points to focus on are the fight against deforestation and the urge to make a better use of agricultural residues and waste.

- Adaptation Measures for Thermal Power Generation: Where climate change results in reduced availability of cooling water, power stations can be designed to withdraw less

water from the source and consume less water internally. Cooling water is either used once (open-loop or once-through) or recovered and returned to its source (closed-loop or recirculating). Recirculating systems can use water in cooling ponds or towers or use dry air instead of water. Other adaptation measures include increasing the volume of water treatment works or developing alternative sources of water. The choice of appropriate techniques to adapt to higher temperatures with water shortages can be very site specific. This concerns among others the Maria-Gléta, Akpakpa and Cotonou thermal power plants. As power stations and related infrastructure can operate for 50 years or more, adaption measures should consider a range of projections including gradual change, more rapid changes, and possible changes in extremes over this period. Designing decentralized generation systems reduces the need for large facilities located in areas of high risk while also mutualizing the risk, and requires less cooling power at each station, though perhaps not in aggregate. Other adaptation measures[27] include:

- adaptation of structures, including higher standards for new or renovated buildings, drainage improvements, rerouting of service water pipes, and construction of concrete-sided buildings instead of metal-sided (as they are more resistant to wind and corrosion);
- protection of coal stockpiles through optimized shape and orientation to wind, and protection of coal stockpiles against high temperature and low water content to avoid self-ignition;
- adaption of sites including flood control (embankments, dams, dikes, reservoirs, polders, ponds, relocation of flood defense barriers, and higher channel capacity), construction of improved coastal defenses (seawalls and bulkheads), relocation to less exposed places, land restoration and afforestation to reduce floods and landslides;
- concentrating thermal investment in locations where temperatures are projected to be cooler, if the costs of additional transmission capacity and higher transmission losses are not so high as to offset gains; and
- adaptation of cooling facilities (such as water recovery from condenser and heat exchangers, reduction of evaporative losses, secondary or wastewater usage, construction of dry cooling towers).

- Adaptation Measures for Renewable Energy: Adaptation measures vary depending of the renewable energy technology concerned. However, it should be noted that any climate change that increases variability or lowers predictability is likely to require higher levels of investment to safely integrate renewable energy into the grid or improve grid load capacity.

[27] Sieber 2010 and URS 2010

Higher levels of investment in more intermittent forms of renewable energy (solar, wind) are also likely to require network expansion and/or protection[28]. A complementary approach to adaptation of renewable energy systems under increased climate variability consists of storing electrical energy to allow a greater percentage of renewable energy into the grid. It also improves grid stability and baseload generation units can operate more efficiently. Finally, storage can also reduce transmission congestion and may reduce or delay the need for transmission upgrades[29], but cost-effective applications are site specific.

- Regarding hydropower, considering that it is a long-term investment with typical lifetimes of 50 to 100 years, assessing changes that might affect output and operation is important. Since hydropower plants are normally very robust, an increase in the strength and/or frequency of storms and/or cyclones only marginally increasing the risk of destruction. Nonetheless, there are various measures to better adapt hydropower systems to climate change[30] such as:
    - i) increasing dam height and/or build smaller dams upstream (where flow is expected to increase);
    - ii) design more robust dams and infrastructure for heavier flooding and extreme events;
    - iii) construct or augment water storage reservoirs;
    - iv) modify spillway capacities and install controllable spillway gates to flush silted reservoirs;
    - v) modify the number and type of turbines that are more resilient to performance reductions and have better lifetime due to higher suspended sediment loads;
    - vi) modify canals or tunnels to better handle changes in water flows;
    - vii) develop improved hydrological forecasting techniques and adaptive management operating rules;
    - viii) develop basin-wide management strategies that take into account the full range of downstream environmental and human water uses; and
    - ix) restore and better manage upstream land including afforestation to reduce floods, erosion, silting, and mudslides.
- The main climate impacts on solar photovoltaic systems are likely to be due to temperature increases, increased cloud cover, and extreme events. Adaptation measures[31] in this case are purely of the technological type and include the following:
    - i) assure structures are strong enough to withstand higher winds;

[28] IPCC, 2012
[29] ibidem
[30] Michaelowa et al. 2010
[31] Michaelowa et al. 2010 and Patt et al. 2010

- ii) use designs that improve passive airflow beneath photovoltaic mounting structures, reducing panel temperature and increasing power output;
- iii) for locations where significant occasional or persistent temperature rises are expected, choose modules with more heat-resistant photovoltaic cells and materials designed to withstand peaks of very high temperature;
- iv) consider distributed systems (rather than feeding power into a single part of the grid), which can improve grid stability (although mobile repair teams may be needed to repair damage from extreme events);
- v) use solar photovoltaic systems where expected changes in cloud cover are relatively low, although this is difficult to accurately predict;
- vi) where solar energy is likely to become more diffuse with changes in cloud cover, rough surfaced photovoltaic modules are more efficient and output can be improved under overcast conditions by selecting an appropriate tilt angle;
- vii) where clouds are likely to pass over modules more quickly, consider micro-inverters for each panel (instead of small numbers of large centralized inverters) to improve stability and increase power output.

- Adaptation Measures for Biomass Energy and Biofuels: Adaptation measures for bioenergy systems are similar to those of other high-intensity agriculture. The Food and Agriculture Organization (FAO) has carried out numerous studies on improving climate change resilience in agriculture[32]. These are equally applicable to bioenergy and mixed energy/food production systems. Biomass availability for energy during climate change can be increased if the selected crops are robust, with high biological heat tolerance and water stress tolerance. Expansion of irrigation systems or improvement of the efficiency of irrigation can counteract drought impacts if sufficient water is made available from sources outside drought-hit areas. This might require unconventional sources such as desalinated seawater or fossil water resources[33]. Flood protection can be improved by building dikes and improving drainage. The use of salt-tolerant plants (halophytes) — including varieties of sugarcane, millet, and corn that grow in brackish water on saline land — can provide biomass for energy without competing with conventional agriculture[34]. If they cannot be constructed in less flood- and storm- prone areas, the robustness of biomass power plants should be increased. Behavioral adaptation measures include early warning systems for seasonal rainfall and temperature anomalies, support for emergency harvesting for an imminent extreme event, and provision of crop insurance systems.

[32] Food and Agricultural Organization of the United Nations (FAO). 2010. Climate-Smart Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation; Glantz et al. 2009. Coping with a Changing Climate: Considerations for Adaptation and Mitigation in Agriculture. Food and Agricultural Organization of the United Nations (FAO); and Bogdanski, A. et al. 2011. Making Integrated Food-Energy Systems Work for People and Climate: An Overview. Food and Agricultural Organization of the United Nations, Rome.
[33] Michaelowa et al. 2010
[34] Abideen et al. 2011

Table 12: List of power plants in Benin (Source: carma.org)

Name	Output in MWh[35]	Owner
Akpakpa Powerplant	50,951	SBEE
Cotonou Védoko Powerplant	15,773	CBE
Parakou Powerplant	13,339	SBEE
Natiningou Powerplant	10,678	SBEE
Porto Novo Benin Powerplant	10,678	SBEE
Maria Gleta Terminal Powerplant	0.0	CBE

- Adaptation Measures for Transmission and Distribution: Improving the resiliency of electricity infrastructure involves preparing T&D systems to continue operating even when damaged. Adaptation efforts should also increase the system's ability to return to normal operations rapidly if outages do occur. Specific measures include the following:
    - Invest additional resources into building a resilient, high-capacity transmission system – necessary step to handle more renewable energy.
    - Reinforce existing T&D structures and build underground distribution systems[36].
    - Require higher design standards for distribution poles (usually wood) and towers (steel).
    - Protect masts, antennae, switch boxes, aerials, overhead wires, and cables from precipitation (water ingress, snow melt); wind; unstable ground conditions (flooding, subsidence); and changes in humidity[37].
    - Change routes of overhead lines along roads away from trees, rigorously prune trees, and use covered and/or insulated conductors and more underground cables, especially in wooded areas.
    - Forbid the construction of power lines near dikes and ban "permanent" trees such as eucalyptus and melaleuca next to existing dikes.
    - Where higher temperatures may occur, specify more effective cooling for substations and transformers, including retrofitting measures, improved shading, and choice of cooler locations where possible.
    - Where lightning strikes occurrence may increase, include lightning protection (earth wires, spark gaps) in the distribution network.

[35] As of 2009
[36] Neumann and Price 2009
[37] Horrocks et al. 2010

- Design improved flood protection measures for equipment currently mounted at ground level in substations.
- Where stronger winds are expected, strengthen distribution poles with guy wires[38].
- Increased pressure on the grid, whether or not it is climate-induced, can also be reduced through distributed, decentralized energy generation, although particular care must be taken to maintain grid stability as increasing percentages of wind or solar energy are to be relayed into the grid.
- Design more flexibility into T&D networks, allowing for increased rerouting during times of disruption.
- Use "smart transformers", which control the flow of electricity to stabilize existing, aging power grids[39]. Modern transformer designs can also reduce losses by up to 80% and handle a wider range of ambient conditions. In Benin, network losses are around 22%, of which a third typically occur in transformers and 70% in the distribution system[40].
- Consider improved system management through investing in "smart grids" — the use of smart meters and other digital technology meant to allow better consumer and utility management of energy. These have been overhyped but might nevertheless improve reliability, power quality, efficiency, information flow, and improved support for renewable and other generation technologies over time[41].
- Specify ICT components that are certified resilient to higher temperatures and humidity as well as design-improved redundancy into ICT systems, including wireless transmission better suited to handle high temperatures. More resilient ICT systems will become even more important as smart grids are implemented widely.

- Adaptation Measures for Electricity End Use: Adaptation measures to cope with increased energy demand following temperature rises are of three types:
    - (i) simply increasing generation (MWh) and capacity (MW) to meet increased demand (business as usual approach);
    - (ii) improving the efficiency of energy supply (generation, transmission, distribution system improvements); and
    - (iii) improving end-use efficiency.

- There has been a fairly steady improvement in energy efficiency since the 1980s, and this can be expected to improve further, even without policy interventions[42], although energy consumption is likely to keep on increasing considerably. However, adaptation measures

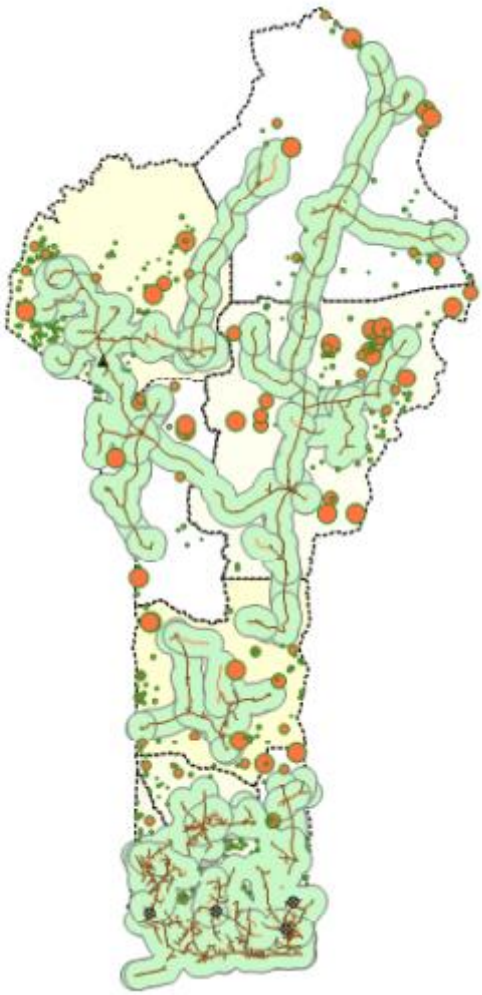
[38] USDOE 2010
[39] Freedman 2011
[40] Targosz 2005
[41] Makovich 2011
[42] Warde 2007

specifically for climate change induced demand can have substantial impacts. There is also a large range of technical and policy demand-side energy efficiency measures available that can reduce energy demand and the need for investing in new capacity, thus indirectly reducing the impacts of changes in climate or increased variability in weather. These are evolving rapidly and are only briefly touched on. Many may require new regulations to have a discernible impact and may be more effective if power utilities are required to take a proactive role in demand-side management. Policy measures, which can make economic sense even in the absence of climate change, include the following:

- Require minimum energy performance standards for new commercial buildings and a wide range of electricity-using appliances (beginning with air conditioning, lighting, and office equipment), with labeling and certification programs for both buildings and key appliances.
- Require and enforce energy performance standards (including maximum allowable "phantom loads" for chargers, power bricks, set-up boxes, TVs, etc.), whether locally manufactured or imported.
- Develop legislation and access to finance for energy service companies, with remuneration based on energy actually saved through an investment, reducing the risks of undertaking energy efficiency initiatives and measures.
- Set minimum standards for industrial electrical motors.
- For households, consider subsidized programs for mass replacement of incandescent lights with far more efficient compact fluorescent lights (CFL) or, soon, light-emitting diodes (LEDs) and replacing old inefficient refrigerators with newer efficient models.
- Adopt the International Organization for Standardization (ISO 2011) global energy management standard (ISO 50001) released in mid-2011, a transparent framework for integrating energy efficiency into an organization's management practices that can be used to evaluate and implement energy efficiency initiatives, as well as to benchmark and document energy savings for compliance.
- Consider evaporative cooling, which may be effective even in temperate climates as temperatures rise and summers become hotter and drier[43].
- Consider the possible impact of solar photovoltaic systems on cooling. Rooftop panels can reduce summer building cooling loads by nearly 3°C, typically saving 5% of cooling energy[44]. Simply installing highly reflective roofs can reduce summertime air conditioning energy and peak demands of commercial buildings by 10% – 30% in warm weather or mild climates[45].

[43] Smith et al. 2011
[44] Dominguez 2011
[45] Levinson and Akbari 2009

Figure 8: Localization of electricity demand by spatial analysis[46]



1.4. Rationale for GEF and UNDP involvement

Energy is central to Benin's strategy to accelerate economic growth and poverty reduction. However, the country has little experience dealing with adaptation to climate change in the energy sector. With its global perspective, GEF is the leading body in the very new area of adaptation to climate change and well positioned to provide knowledge and institutional experience gained from its various programs on adaptation. It is essential for Benin to introduce adaptation into its development decision making process, and it is timely for power companies, energy suppliers, energy consumers, local authorities and the GoB to understand that climate change is impacting the energy sector and adapt the energy system and policy accordingly.

[46] GiZ,2012

UNDP would be the implementing agency for the proposed project. UNDP can bring its expertise and know-how in a wide range of aspects related to project management, energy management, adaptation, etc. At the same time, the project is consistent with the goals of the United Nations Development Assistance Framework (UNDAF) in Benin for the 2014-2018 period. The proposed project will contribute to the successful implementation of this partnership strategy.

II. Intervention strategy

2.1. Relevance of the project under the United Nations Development Assistance Framework

The United Nations Development Assistance Framework (UNDAF) in Benin for the 2014-2018 period sets out the main areas of cooperation between the Government of Benin and the United Nations Country Team (UNCT). The UNDAF is a strategic tool to promote coherence and effectiveness of United Nations programs in support of national priorities in Benin. As such, it provides an overview of strategic outcomes (effects) and intermediate outcomes (products) that can be individual or joint programs between agencies of the United Nations during the 2014-2018 program cycle. This should be understood as part of a larger UNDP Strategic Plan (2014-17)[47] which vision is to help countries achieve the simultaneous eradication of poverty and significant reduction of inequalities and exclusion. The fifth outcome of the Strategic Plan is – among others – to lower the risk of natural disasters, including risks induced by climate change. It is also consistent with the Regional Programme for Africa for the period 2014-2017, stating that *"to build resilience against global financial and economic shocks, UNDP economic advisers, working with African universities and research institutions, will seek to enhance regional and national institutional capacities for gathering economic intelligence and conducting rigorous analytical work on the potential and real impacts of the boom in the extractive industries and of global shocks. The development of related knowledge products that include appropriate risk mitigation measures will be supported and used to influence and inform country and global programme initiatives"*[48].

The responses proposed by the United Nations are based on an analysis of the challenges, particularly in terms of governance, inclusive economic growth, access to basic social services, protection of the environment, stabilization and peace building. On the basis of its comparative advantage, the United Nations therefore intend to contribute to the achievement of six outputs.

Strengthening the energy sector in Benin against climate change falls under the fifth outcome, spelt as follows: *"By 2018, institutions and populations of the intervention areas achieve better management of their environment, of energy and natural resources, of the consequences of climate change, and of natural disasters and crisis."*

[47] http://www.undp.org/content/undp/en/home/librarypage/corporate/Changing_with_the_World_UNDP_Strategic_Plan_2014_17/

[48] http://www.africa.undp.org/content/dam/rba/docs/Programme%20Documents/regional-programme-2014-2017.pdf

Within this outcome, there are several interventions, three of them being in relation to the project rationale:

- Intervention 6.1. National and local institutions and populations are equipped to better plan and manage natural and energy resources and the environment.
- Intervention 6.2. Local institutions and communities identify and plan more good practices of adaptation to climate change.
- Intervention 6.3. National and local institutions and communities' capacities are strengthened to enhance resilience to climate change,natural disasters and crisis.

The project will therefore contribute to the development and the implementation of strategies and environmental policies to adapt to climate change and is consistent with its axis on "Environment, crisis and disaster management, climate change". The project will contribute to the programmatic assistance in the area of climate change. It will also foster strategic partnerships and participate in the promotion of governmental action in the transformation of the energy sector.

Hence, through the UNDAF, UNDP assists the country in achieving its ambitions, namely to increase the resilience of energy sources in rural and urban areas, to slow down the rate of forest degradation and to provide alternative income generative activities for communities.

Besides, in terms of climate change adaptation, UNDP has supported the GoB for many years. This must be understood in the transversal NAPA program.

2.2. UNDP support strategy on climate change adaptation in Benin

2.2.1. A challenge for human development

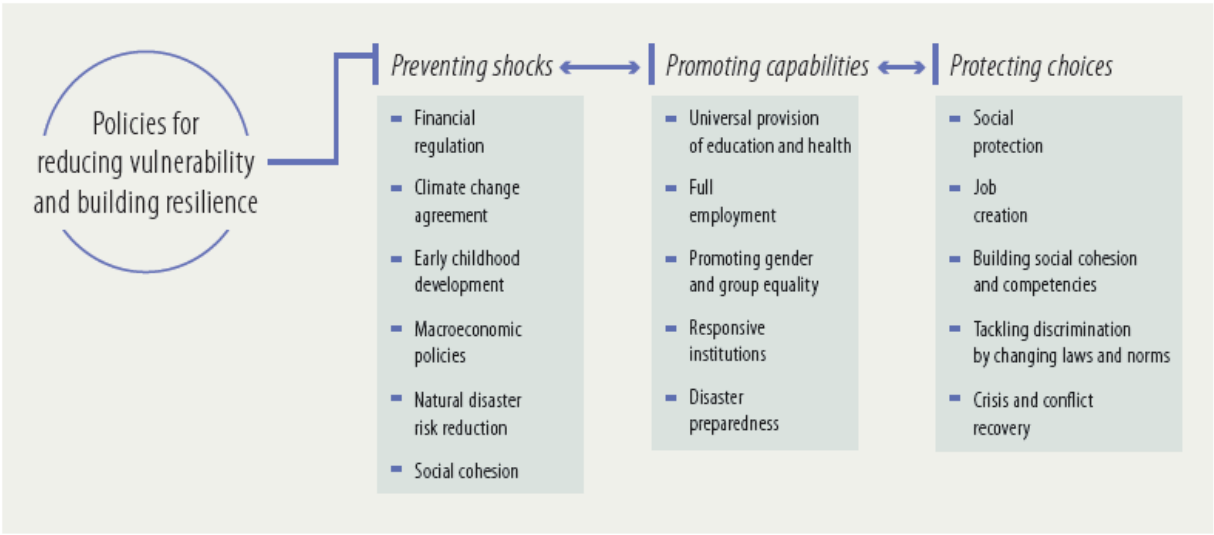
As highlighted in the UNDP's 2014 Human Development Report[49] (HDR), vulnerability and resilience represent a major challenge today for human development. UNDP aims at strengthening resilience of communities as a whole, while focusing on people instead of a specific sector. Because energy, in the form of electricity, fuel, heat…, is essential to human development, assessing its vulnerability and providing solutions to adapt to future changes is essential too. This is why this project is particularly in line with UNDP's development objectives.

The 2014 HDR underlines the necessity to target the most vulnerable groups (women, youth, senior, poor communities, minority groups, etc.). Strengthening resilience and

[49] http://www.undp.org/content/dam/undp/library/corporate/HDR/2014HDR/HDR-2014-English.pdf

preparedness to crisis, be they nature or human-induced, will be part of UN's post-2015 agenda priorities. It should be reached through collective action and better international governance.

Policies for reducing vulnerability and building resilience



Source: Human Development Report Office.

Addressing risks, including natural disaster risks, will allow Benin to progress towards better human development indicators, contributing to its becoming an emerging country. Benin (2013 assessment) presents a low human development according to the UN criteria, with an HDI of 0.476 (on 1) that places it at the 165th rank among UN states (on 187).

Climate change does not create vulnerability, but it increases it where it already exists. Thus, by rapidly increasing the rate of extreme events in the years to come, climate change will trigger more violent natural disasters and conflicts.

Rajendra Pachauri, IPCC expert and contributor to UNDP's 2014 HDR, states that:

> *"Actions that range from incremental steps to transformational changes are essential for reducing risks from climate extremes. Social, economic and environmental sustainability can be enhanced by disaster risk management and adaptation approaches. A prerequisite for sustainability in the context of climate change is addressing the underlying causes of vulnerability, including the structural inequalities that create and sustain poverty and constrain access to resources.*
>
> *The most effective adaptation and disaster risk reduction actions are those that offer development benefits in the relative near term as well as reductions in vulnerability over the longer term. There are many approaches and pathways to a sustainable and resilient future."*

2.2.2. Past initiatives

Benin and UNDP, with the collaboration of GEF and MEPN, implemented in 2008 Benin's first National Adaptation Programme of Action (NAPA), which set the framework for future adaptation actions in Benin.

The NAPA already pointed out the vulnerability of the energy sector to climate change, with less regular functioning of hydroelectric installations and slowed growth of forest resulting from the rise in temperature, as well as the growing anthropogenic pressure for fire wood and charcoal.

Priorities options were set for the energy sector:

- Promoting economically efficient stoves;
- Spreading new and renewable energies (biogas, LPG, solar energy, biofuel, micro-hydroelectricity);
- Reforestation with fast growing species;
- Promoting agroforestry;
- Promoting income generating activities.

Finally, the NAPA drew five project profiles with matching objectives as follows:

- Providing agricultural stakeholders and communities with climatic and meteorological information and warnings in case of extreme forecast events likely to harm production systems;
- Reducing populations' vulnerability to climate change impacts by providing a better access to sustainable energy sources and protecting forest resources;
- Strengthening water availability during droughts in order to adapt communities to climate change;
- Contributing to the reduction of morbidity and mortality due to malaria;
- Correcting sedimentary unsteadiness, coastal erosion and retreat, restoring mangroves, promoting improved salt extraction technologies and combining solar and wind power.

Another significant partnership between UNDP and Benin led to the publication of the First[50] and the Second[51] National Communications to the UNFCCC, respectively in 2002 and in 2011. In the same vein, UNDP co-supported the development of the National Strategy for the Implementation of the UNFCCC[52] in 2003. This assistance from UNDP related to climate change allowed the participation of Beninese negotiators to the various climate-

[50] http://unfccc.int/essential_background/library/items/3599.php?rec=j&priref=3543
[51] http://unfccc.int/essential_background/library/items/3599.php?rec=j&priref=7590
[52] http://unfccc.int/resource/docs/natc/bennc1fa1.pdf

related Conferences of the Parties (COP) and the integration of climate change in public policies.

Other projects have been implemented in Benin by UNDP, before or after the setting of the NAPA.

The integrated climate change adaptation program for agriculture and food safety in Benin (NAPA1 priority)[53] began in 2010. It seeks to reinforce rural communities' capacities of resilience to climate change in four vulnerable agro-ecological areas of Benin. Its main preliminary conclusions were the need for urgent measures to enhance vulnerable populations' resilience to climate change, and the setting of an institutional, legislative and governance framework to integrate climate issues into development.

A capacity building project for rural communities' adaptation to climate change was led from 2007 to 2011 by the *Initiatives pour un Développement Durable* (IDID)[54] NGO to identify and communicate on relevant climate change adaptation strategies.

The same NGO led a second project, from 2011 to 2014, aimed at strengthening economic knowledge and adaptation abilities in Benin (the French acronym being PRECAB for *Projet de renforcement des connaissances économiques et de la capacité d'adaptation face aux changements climatiques au Bénin*)[55]. It strengthened local stakeholders' capacities on adaptation strategies and disaster management, and implemented a sectoral approach to integrate climate change adaptation into development strategies and policies.

The CCDARE (Climate Change Adaptation and Development Initiative) project[56] sought to integrate climate change adaptation in local development planning and strengthening of stakeholders, more specifically in communal development plans and annual investment plans.

2.3. Synergies

Both GEF funded biomass project and NAPA Energy project share the same legal and policy context, and their objectives are converging. In terms of institutional management, they will also share a common team of experts, to facilitate the overall coordination of actions, many of which are complementary. Cross-support between agents, resources or activities will be required. This interactivity will be strengthened by hosting informal

[53] http://www.bj.undp.org/content/benin/fr/home/operations/projects/environment_and_energy/project_sample1/
[54] http://www.ididong.org/
[55] http://www.ididong.org/?Le-Projet-PRECAB
[56] http://www.unep.org/climatechange/adaptation/KnowledgeandPolicy/CCDARE/tabid/29582/Default.aspx

meetings between the project experts. Organizational and policy synergies will be emphasized to build assets and skills to influence each other and achieve greater than expected impact by combining policy positions and influencing strategies in an interactive way.

This coordination between both projects will imply sharing information about their respective resources, goals, and agendas in order to not only avoid duplication, but also strengthen coherence. Further synergy on the ground will be increased for instance by sharing the intervention sites in the field.

III. Project objectives, results and activities

3.1. Objective

The project aims at reducing the impacts of climate change and variability on Benin's energy sector. It will contribute to the removal of the main institutional, political and financial barriers and those relative to individual capacities and knowledge that hinder effective climate risk management for the energy sector in Benin. It will finally introduce adaptation measures to strengthen the resilience of the national energy sector.

The advanced degradation of fuelwood supply areas, in a context of predominance of energy from wood in the energy balance of Benin, the narrowness of the energy mix and the difficulties in the supply of electrical energy are obstacles to meeting households' energy needs, and may worsen Benin's energy deficit. The GoB is aware of this and has taken a number of initiatives to address these shortcomings in the energy sector.

3.2. Outcomes

The project will strengthen the Government's initiatives through additional measures to strengthen human resources and institutional capacities in the energy sector (**Outcome 1**), to integrate climate risks into planning policies and tools of the energy sector (**Outcome 2**), and through investing in physical adaptation measures to strengthen climate resilience of energy sources and to improve energy services for the most vulnerable households (**Outcome 3**).

3.3 Expected results

At the end of the project, Beninese stakeholders and beneficiaries of the energy sector will have achieved strengthened capacities, allowing them to better adapt to climate change and variability, and thus reducing their vulnerability to energy shortfalls.

Benin will have further integrated and implemented adaptation strategies and measures both at the national scale and locally, in identified vulnerable areas.

Finally, stakeholders and beneficiaries of the energy sector will benefit from strengthened energy supply sources throughout the Beninese territory, against the current and future impacts of climate change.

To address the project's objectives and achieve the expected results, the project framework is structured along three main outcomes or components.

3.4. Project Outcomes, Outputs and Activities

The project has been designed to implement three components that will realize the project's objective and outcomes.

The intervention areas chosen for the project correspond to priority vulnerable areas defined in the 2008 NAPA. The choice of project intervention areas are based on the objectives which are:

- The capacity of the various stakeholders in the energy sector are strengthened to enable them to integrate climate risks in energy planning and to address climate risks;
- Strategies and energy supply schemes integrate climate change and adaptation measures;
- To analyze the watersheds of Ouémé, Niger (Sotah), Volta (Pendjari) where potential hydropower projects resilient to climate change are considered as well as their negative impacts such as soil erosion and siltation risks. Existing sites such as Yéripao, and potential new sites such as the Sosso cascade, Gbassè, Koutakroukrou, Kota, and Wabou Kouporgou will be better protected through the implementation of adaptation and restoration activities and ecosystem conservation of watersheds;
- Climate resilience of fuelwood supply areas, identified by the revised SDAs, to be enhanced through reforestation activities and preservation of forested areas;
- Power generation and power distribution infrastructure are to be protected against disasters and other climate risks due to the identification and first implementation of adaptation measures.

The selection of the project interventions sites is the result of a large consultative process with project stakeholders and partners. The compilation and analysis of this information was done using multi-criteria analysis. Those 10 selection criteria were:

- The existence of community forest fuel supply of large cities with development and management plans;
- The availability of land with sustainable land management problems;
- The presence of existing rural wood markets;
- The existence of management schemes (SDA) for the supply of fuelwood to urban areas;
- The presence of cascades and waterfalls having an economic value but where the surrounding area is deforested and eroded;
- The existence of classified forest with a management plan;
- The existence of hydropower plants;
- The presence of community parks for firewood around the community forests;

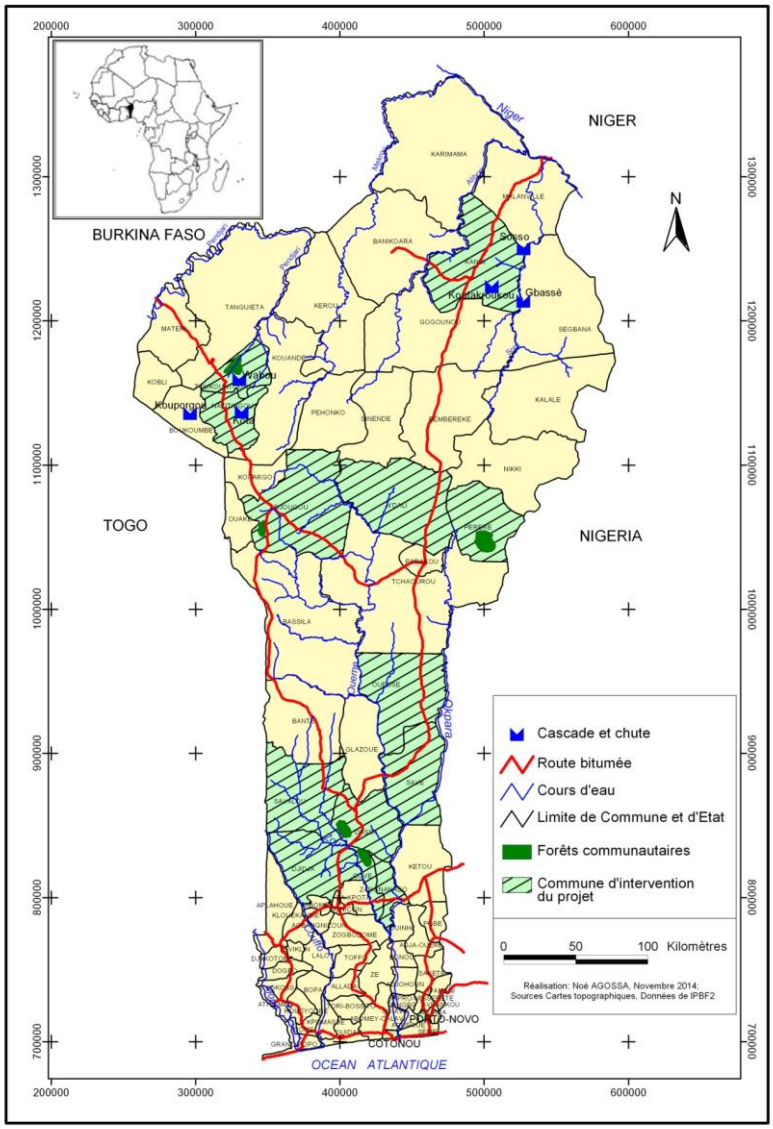
- Synergies with the intervention areas of the NAPA project on agriculture of 2011[57] and the biomass project of 2014[58];
- The existence of thermal power generation plants.

The multi-criteria analysis (see annex C) resulted in the selection of the following sites:

- 14 intervention sites: Djougou Savè, Ouèssè, Savalou Dassa-Zoumé, Toukoutouna, Natitingou Zangnanado, Covè, Perere, N'dali, Djidja Tanguiéta and Kandi, three of which are in common with the biomass project Djougou, Dassa-Zoumé, and Savalou. Savalou is also an intervention area of the first NAPA project on agriculture and food security.
- The watersheds of Ouémé, Sota, Pendjari, Zou, Mono, considering especially the sites of Yéripao, the cascades of Sosso, Gbassè, Koutakroukrou, Kota waterfall, Wabou and Kouporgou.
- The cities with thermal power plants, ie Cotonou (Akpakpa), Porto-Novo, Kandi, Natitingou.

[57] http://www.thegef.org/gef/project_detail?projID=3704
[58] http://www.thegef.org/gef/project_detail?projID=5752

Figure 9: Map of the intervention area



Component 1: Mainstreaming adaptation to climate change into energy policies and management and planning strategies and tools

Outcome 1.1. Capacities of the energy sector's stakeholders are strengthened in order to enable them to integrate climate risks in energy planning and to face climate risks

The baseline is a growing demand in energy access in the country, with existing energy planning to increase the supply from renewable sources such as hydropower (with a target set at 259,9 MW). Rural electrification is also a priority set by the GoB for around 1,000

rural communities[59]. Under this scenario, the national energy management system does not include any module on climate-related risks.

The outcome focuses on strengthening climate change adaptation capacities of stakeholders of the energy sector to better identify and address the climate risks for the sector.

The project will bring additional resources to the existing policies and strategies of the energy sector in Benin, to the PDDC and to the PNDGRN, in order to strengthen the capacities of state and non-state stakeholders involved in managing the energy sector, to enable them to integrate climate risks and adaptation measures in planning processes for the management of supply and demand of energy in Benin, the coordination of decision-making and of initiatives in the sector.

The first output consists in setting up a multi-stakeholder platform to facilitate dialogue between decision-makers in different sectors related to energy, and decision-making on the competing use of energy sources and on cross-cutting issues related to the production, access and energy efficiency in relation to climate change. Through this output, the project will support the creation and functioning of a multi-stakeholder platform with the goals stated above. The output will also support the integration of the platform, as a technical or sector work group, into the national committee on sustainable development and the national committee on climate change. This will strengthen the institutional legitimacy of the platform and its sustainability after the end of the project (Output 1.1.1.).

Activities will be dedicated to a gender sensitive evaluation of the project and of the positioning of the actors in the platform, setting the criteria to appoint the members of the multi-platform, and develop the work plan of the members of the multi-stakeholder platform.

A training program will be implemented for 500 individual stakeholders in the sectors related to energy (including members of the multi-stakeholder platform of the energy sector and members of the National Multisectoral Commission on Domestic Fuels) to strengthen their capacity to: i) identify climate risks for the energy sector; ii) design and implement adaptation measures; iii) integrate climate risks and parameters in key policies of the energy sector, in the energy planning tool GEOSIM, and in planning processes of energy supply and demand (Output 1.1.2.). The training program planned in this output will be supervised (development and implementation) by the Direction of Energy. The training program will increase the stakeholders' knowledge of interrelations between the energy sector and climate change, so that they can later on provide sensible opinions and advice

[59] http://www4.unfccc.int/submissions/INDC/Published%20Documents/Benin/1/INDC%20BENIN%20%20Version%20finale%20revue%20septembre%202015.pdf

in the decision-making of the sector. The program should also target forestry officers from every category, technical managers from the Ministry of Energy, and beneficiaries from local authorities, NGOs and communal forestry associations.

The program will especially rely on existing structures of technical, professional and higher education and training, such as CFPP, CEB, SBEE, FSA, EPAC, and the water and forestry training center of Toffo. The program will begin by a training of these trainers, which will then be in charge of the training of stakeholders defined above. Experiences and lessons learned from this training will allow the creation of a training module on integrating climate risks into the energy sector, to be provided to CFPP and spread in their centers. Activities will focus on the capacity building of 500 stakeholders (as for 2020) in sectors related to energy with a yearly quota of at least 50 women and 50 men. At least 80% of those trainees should, during the year, apply the experience acquired in training. Also, the trained stakeholders from sectors related to energy will be assisted, by providing them with regular training reports and annual project reports. A list of parameters and indicators for energy sector risks to climate change will be defined and methodologies and tools elaborated for evaluating and prioritizing the adaptation options for advancing a climate resilient energy sector.

Output 1.1.1. A multi-stakeholder platform is set up to facilitate dialogue between decision-makers in different sectors related to energy, and decision-making on the competing use of energy sources and on cross-cutting issues related to the production, access and energy efficiency in relation to climate change.

Through this output, the project will support the creation and functioning of a multi-stakeholder platform with the goals stated above. The output will also support the integration of the platform, as a technical or sector work group, into the national committee on sustainable development and the national committee on climate change. This will strengthen the institutional legitimacy of the platform and its sustainability after the end of the project.

Activity 1.1.1.1. Gender sensitive evaluation of the project and of the positioning of the actors in the platform

Activity 1.1.1.2. Setting the criteria to appoint the members of the multi-platform

Activity 1.1.1.3. Develop the work plan of the members of the multi-stakeholder platform

Output 1.1.2. A training program is implemented for 500 players in the sectors related to energy (including members of the multi-stakeholder platform of the energy sector and members of the National Multisectoral Commission on Domestic Fuels) to strengthen their capacity to: i) identify climate risks for the energy sector; ii) design and implement adaptation measures; iii) integrate climate risks and parameters in key policies of the energy sector, in the energy planning tool GEOSIM, and in planning processes of energy supply and demand.

The training program planned in this output will be supervised (development and implementation) by the Direction of Energy. The training program will increase the stakeholders' knowledge of interrelations between the energy sector and climate change, so that they can later on provide sensible opinions and advice in the decision-making of the sector. The program should also target forestry officers from every category, technical managers from the Ministry of Energy, and beneficiaries from local authorities, NGOs and communal forestry associations.

The program will especially rely on existing structures of technical, professional and higher education and training, such as CFPP, CEB, SBEE, FSA, EPAC, and the water and forestry training center of Toffo. The program will begin by a training of these trainers, which will then be in charge of the training of stakeholders defined above.

Experiences and lessons learned from this training will allow the creation of a training module on integrating climate risks into the energy sector, to be provided to CFPP and spread in their centers.

Activity 1.1.2.1. Capacity building of 500 stakeholders (as for 2020) in sectors related to energy with a yearly quota of at least 50 women and 50 men. At least 80% of those trainees should, during the year, apply the experience acquired in training

Activity 1.1.2.2. Accompanying and support to the trained stakeholders from sectors related to energy, providing them with regular training reports and annual project reports

Activity 1.1.2.3. Drawing a list of parameters and indicators for energy sector risks to climate change and elaborating methodologies and tools for evaluating and prioritizing the adaptation options for advancing a climate resilient energy sector

Component 2: Sustainable land and forest management practices for strengthening the climate resilience of the zones supplying wood for energy

Sustainable land and forest management, and biomass production are highly susceptible to climate change. The energy density of biomass can vary due to variations in photosynthetic/plant physiological interactions, often driven by CO_2 concentration changes. However, in the baseline scenario, adaptation is absent from any national biomass-based energy policy or program document.

The outcome of this component will be that energy supply strategies and plans at all scales integrate as much as possible climate change issues and adaptation measures.

Stakeholders in charge of managing the energy sector do not only need to integrate into energy planning the parameters affecting energy production, distribution and demand, but also hydro-meteorological and climatic parameters. Even though climate is not the only

determining factor of energy demand, it is a key factor. Future energy demands will depend on factors such as development policies, the industrial sector's dynamism, population growth, the evolution of modes of transportation, the improvement of energy efficiency, and future climate evolutions. All of these non-climatic factors will be affected by climate and climate change, independently of any problem of the energy sector. Satisfying the energy demand will require taking into account these climate-related factors. Moreover, the energy sector will need to assess potential direct impacts of climate and climate change on energy sources, energy production and distribution, and to develop strategies to prevent these risks, in order to minimize the potential impacts of climate change on the energy balance.

In order to use wood energy resources of Benin in a rational and sustainable way, the project will support, based on future climatic projections, an assessment of risks and vulnerabilities of the communal forests identified as supply areas for fuelwood to temporal and climatic phenomena such as storms, floods, increase in frequency and intensity of droughts, intensification of wild fires, in order to adopt a proactive strategy for the management of these risks and to integrate them into the new design of SDAs. This means that these SDA, which will be looking at fuelwood in the cities of Parakou, Malanville, Djougou, Natitingou, Bohicon, Abomey, Cotonou, Porto-Novo and Lokossa, will be revised (Output 2.1.1.).

In addition, a National Plan for the optimal management of supply and demand of electric power will be developed and implemented, by considering climate risks (temperature, river flow, evapotranspiration, rain, sunshine, cyclones, floods ...) and adaptation measures. This will be based on projections of the evolution of energy demand according to economic development and demographic evolution scenarios, to elaborate a climate-resilient electricity supply masterplan and to allow minimizing imbalances between energy supply and demand due to climate change and variability as well as natural disasters (Output 2.1.2.).

In the same parallel, the Information System for Permanent Evaluation (SIEP) on domestic fuels and the Ecological and Forest Information System (SIEF) will be updated and functional in order to include climate risks and strategic options to address these risks. The revision of the SIEP and SIEF tools will enable the General Directorate of Energy (DGE) and the National Remote Sensing Center (CENATEL) to respectively integrate climate risks identified above in the monitoring, planning and management of the sub-sector of biomass energy (Output 2.1.3.).

The Forest Development Plans (PAF) of Middle Ouéme and communal forests of Fita Agbado, Zounzoukan, Détohou, Kolobi, Bobe, Ouogui, Badé, Tfougou, Nonsinansson and Dahendé will be revised to incorporate risks of drought, wildfires, and other climate risks as well as adaptation measures. These forests supply the cities and urban centers of Benin in wood energy. This output will promote climate-resilient and ecologically sustainable energy from wood. It will support the revision of Forest Development Plans corresponding to 600,000 ha in Middle Ouémé and communal forests supply energy wood to the eight big cities of Benin. These plans will integrate climate risks such as the increase in frequency and intensity of droughts, floods, rainfall perturbations, and climate factors which can favor the increase in intensity and frequency of wild fires. It will also support the development of

community measures and rules enabling the concerned communities to ensure that resources and land use directives set by the revised plans are respected (Output 2.1.4.).

The second outcome under this component is the enhancement, through the implementation of restoration and preservation of watershed ecosystems activities, of climate resilience of watersheds of rivers Ouémé, Niger (Sota), Volta (Pendjari) housing the hydroelectric installations of Yéripao (existing) on one hand, and of Sosso waterfall, Gbassè, Koutakroukrou, Kota fall, Wabou and Kouporgou (considered in the medium term) on the other hand.

With the project, riverbanks of these rivers will be protected against erosion through the reforestation of 10,000 hectares of multipurpose herbaceous species tolerant to drought and flooding. Erosion on the riverbanks will be facilitated by the combined phenomena of land drying and heavy rains. This output (2.2.1.) will plan and implement the reforestation of 10,000 ha of multipurpose herbaceous species tolerant to drought and floods. These species should be palatable species for cattle, also allowing the development of beekeeping and fruit growing, in order to help strengthen the climate resilience of livelihoods of communities living in these areas.

The project will also finance the building and maintenance of low cost community infrastructures to protect riverbanks against erosion. The preparatory phase of the project will develop, with the participation of local communities, a mechanism for the operationalization and funding for maintenance of these infrastructures (Output 2.2.2.). It will support the spreading of good practices for sustainable land management (fertility management, anti-erosion practices…) through the implementation of a training program benefitting 1,000 members (with gender parity) from local communities of the rivers Ouémé, Zou, Sota, Mono and Niger, in order to lessen the erosion phenomena that contribute to the destruction and silting of the riverbanks, threatening the hydroelectric potential of these (Output 2.2.3.).

The promotion of alternative, climate-resilient income generating activities (IGAs) such as beekeeping, horticulture, small livestock, production and maintenance of improved stoves and pressure cookers will also be promoted. Indeed, the communities living in these areas derive all their income from agriculture and especially cotton production. Due to the increase in the cost of living, rural populations in these regions are forced to intensify cotton production and forestry. This is usually done at the expense of natural resources and ecosystems protecting Ouémé, Zou, Sota, Mono, Niger against drying and sanding. To do this, the output will finance training of 1,000 individuals (with gender parity) for a dozen of the most vulnerable communities in efficient production techniques of the IGAs and financial management of businesses. In addition, the project will also support in each of the communities, the development of business plans and access to finance for 100 individuals or groups of individuals. By supporting alternative income generating activities, the project will reduce pressures on ecosystems Ouémé, Zou, Sota, Mono, Niger... and the phenomena of erosion that threaten the hydroelectric potential of these rivers. From an operational point of view, those activities should be based on the following methodology: first, an information campaign should be run on the project, its objectives and the financing mechanism of sub-projects. The partner structures are invited to see by themselves in the

various concerned communities what can be done and how. The NGOs or firms form the private sector that are to work on the project are then identified and sign a cooperation agreement. The second step consists of identifying the communities' precise needs and financing means, relying for instance on an interview guide or a ZOPP method. The needs are then prioritized and the means are discussed with the Micro-Finance cell of the Ministry of Finance. Once the financing scheme is elaborated, it is submitted to the relevant party (Output 2.2.4.). Various business models can therefore be discussed and implemented, depending on the community specificities. Some will be micro-credit-based while other will rely on equity for those who can afford it. Also, subsidies can be discussed, in the form of capacity reinforcement or technical financial advice or even to provide for a certain percentage of the activity. Note that any retained business model is to be sustainable beyond project completion in order to outlive it and not rely only on external help.

The third outcome of Component 2 will be the enhancement of climate resilience of fuelwood supply areas by revised SDAs and through reforestation and conservation of woody areas. Investments from the project will include the development of climate-resilient community wood for energy parks in wood for energy supply areas as most vulnerable by the revised SDAs, to increase their climate resilience. These community parks have the dual objective of sustainably secure wood for energy supply and contribute to strengthening the resilience of livelihoods of communities living in and around these areas. These woods for energy parks will be managed by the communities themselves and according to the resilient development plans that will be developed or revised. Memoranda of agreement based on the rules and forms of local social organization will ensure compliance with these management plans by all beneficiary communities (Output 2.3.1.).

This project will finance the protection of identified supply areas for fuelwood against wild fires induced or aggravated by climate phenomena through: the development of risk management protocols for the increase in intensity and frequency of climate-related wild fires and the demonstration of fight methods against wildfires resilient to climate around 300 000 ha of forests (Output 2.3.2.).

The project will support the promotion of alternative climate-resilient income generating activities (IGAs) such as beekeeping, horticulture, small livestock, production and maintenance of improved stoves and pressure cookers, sustainable production of charcoal. Indeed, the communities living in these areas derive all their income from agriculture and especially cotton production. Due to the increase in the cost of living, rural populations in these regions are forced to intensify cotton production and forestry. This is usually done at the expense of natural resources and forest areas. To do this, the output will finance training programs for the benefit of the most vulnerable 1,500 individuals in the city communities of Djidja, Zangnanado, Dassa, Savè, Toukoutounan, Pèrèrè, N'dali and Malanville and other areas vulnerable in the technical production of these alternative IGAs and financial management businesses. The project also will accompany them in the development of business plans and access to finance for 10 individuals or groups of individuals in each of the communities (Output 2.3.3.).

Outcome 2.1. Energy supply strategies and plans integrate climate change and adaptation measures

Stakeholders in charge of managing the energy sector do not only need to integrate into energy planning the parameters affecting energy production, distribution and demand, but also hydro-meteorological and climatic parameters. Even though climate is not the only determining factor of energy demand, it is a key factor. Future energy demands will depend on factors such as development policies, the industrial sector's dynamism, population growth, the evolution of modes of transportation, the improvement of energy efficiency, and future climate evolutions. All of these non-climatic factors will be affected by climate and climate change, independently of any problem of the energy sector. Satisfying the energy demand will require taking into account these climate-related factors. Moreover, the energy sector will need to assess potential direct impacts of climate and climate change on energy sources, energy production and distribution, and to develop strategies to prevent these risks, in order to minimize the potential impacts of climate change on the energy balance.

Output: 2.1.1: The Masterplans for Supply (SDA) of fuelwood in the cities of Parakou, Malanville, Djougou, Natitingou, Bohicon, Abomey, Cotonou, Porto-Novo and Lokossa (including Development Plans (PAF) of forest areas of Nonsinansson for Parakou, Tfougou for Djougou, Dahendé for Natitingou, Fita-Agbado for Bohicon, Zouzounkan and Abomey for Cotonou and Porto-Novo) are revised to incorporate climate risks and appropriate adaptation measures.

In order to use wood energy resources of Benin in a rational and sustainable way, the project will support, based on future climatic projections, an assessment of risks and vulnerabilities of the communal forests identified as supply areas for fuelwood to temporal and climatic phenomena such as storms, floods, increase in frequency and intensity of droughts, intensification of wild fires, in order to adopt a proactive strategy for the management of these risks and to integrate them into the new design of SDAs.

This output will also support the transcription of future climate projections on temperature, rainfall, relative humidity, into growth and degradation rates of wood resources of the fuelwood supply areas, in order to get a projection of the potential of the different sources of energy wood supply and to confront it to evolution scenarios for the demand of consumption areas, in order to improve the SDAs.

Activity 2.1.1.1. Updating / revision of master plans of fuelwood supply and of Forest Development Plans of the selected areas, including aspects related to climate risks, needs and specifics of vulnerable groups

Activity 2.1.1.2. Development of a population-wide communication on the provisions related to the revised SDA and PAF

Activity 2.1.1.3. Support for the implementation of the revised SDA and PAF

Output 2.1.2: A National Plan for optimal management of supply and demand of electric power in a context of climate change including climate risks (temperature,

river flow, evapotranspiration, rain, sunshine, cyclones, floods ...) and adaptation measures are developed and implemented.

The goal of this output will be, based on projections of the evolution of energy demand according to economic development and demographic evolution scenarios, to elaborate a climate-resilient electricity supply masterplan and to allow minimizing imbalances between energy supply and demand due to climate change and variability as well as natural disasters.

Activity 2.1.2.1. Development of a National Plan for optimized management of supply and demand of electric power including aspects related to climate risk / adaptation, needs and specifics of vulnerable social strata

Activity 2.1.2.2. Support to the implementation of the National Plan for optimized management

Activity 2.1.2.3. Support to the population-wide communication on the National Plan for optimized management

Output 2.1.3: The Information System for Permanent Evaluation (SIEP) on domestic fuels and the Ecological and Forest Information System (SIEF) are updated and functional in order to include climate risks and strategic options to address these risks

The revision of the SIEP and SIEF tools will enable the General Directorate of Energy (DGE) and the National Remote Sensing Center (CENATEL)[60] to respectively integrate climate risks identified above in the monitoring, planning and management of the sub-sector of biomass energy.

Activity 2.1.3.1. Updating / revision of SIEP and SIEF incorporating aspects related to climate risks, strategic options to help address the risks and needs and specifics of vulnerable groups as established in the Masterplans for Supply

Activity 2.1.3.2. Support the operation and the data publication of the updated SIEP and SIEF

Output 2.1.4. The Forest Development Plans (PAF) of Middle Ouéme and communal forests of Fita Agbado (towns of Dassa and Savalou), Zounzoukan (towns of Covè and Zangnanado), Détohou (town of Abomey), Kolobi (town of Djidja), Bobe (town of Bantè), Ouogui (town of Savè), Badé (town of Ouessè), Tfougou (town of

[60] http://cenatelbenin.org/

Djougou), Nonsinansson (towns of Perere and N'Dali) and Dahendé (towns of Natitingou and Toucoutouna) supplying the cities and urban centers of Benin in wood energy are revised to incorporate risks of drought, wildfires, and other climate risks as well as adaptation measures

This output will promote climate-resilient and ecologically sustainable energy from wood. It will support the revision of Forest Development Plans corresponding to 600,000 ha in Middle Ouémé and communal forests supply energy wood to the eight big cities of Benin. These plans will integrate climate risks such as the increase in frequency and intensity of droughts, floods, rainfall perturbations, and climate factors which can favor the increase in intensity and frequency of wild fires.

This output will also support the development of community measures and rules enabling the concerned communities to ensure that resources and land use directives set by the revised plans are respected.

Activity 2.1.4.1. Updating / revision of forest management plans (PAF) supplying fuelwood to the towns and cities of Benin by incorporating issues related to risks of drought, wildfires and other climate risks and adaptation measures and needs / specifics of vulnerable social strata

Activity 2.1.4.2. Support to the implementation of the Forest Management Plans

Activity 2.1.4.3. Support to the population-wide communication on the Forest Management Plans

In order to strengthen climate resilience of sources of energy supply of Benin, the project will support investments for the physical protection of the most vulnerable existing electrical infrastructure, the protection of the hydropower potential of rivers destined to house hydroelectric plants, and the conservation and strengthening of forests identified by the revised SDAs as sources of energy wood supply.

Outcome 2.2. The climate resilience of watersheds of rivers Ouémé, Niger (Sota), Volta (Pendjari) housing the hydroelectric installations of Yéripao (existing) on one hand, and of Sosso waterfall, Gbassè, Koutakroukrou, Kota fall, Wabou and Kouporgou (considered in the medium term) on the other hand, is enhanced through the implementation of restoration and preservation of watershed ecosystems activities

Output 2.2.1: Riverbanks of rivers Ouémé, Sota, Pendjari, Zou, Mono (likely to harbor hydroelectric facilities) of Yéripao (existing) on the one hand and of Sosso waterfall, Gbassè, Koutakroukrou, Kota fall, Wabou and Kouporgou (considered in the medium term) on the other hand, are protected against erosion through the reforestation of 10,000 hectares of multipurpose herbaceous species tolerant to drought and flooding

Erosion on the riverbanks of the rivers listed above is facilitated by the combined phenomena of land drying and heavy rains. This output will plan and implement the reforestation of 10,000 ha of multipurpose herbaceous species tolerant to drought and floods. These species should be palatable species for cattle, also allowing the development of beekeeping and fruit growing, in order to help strengthen the climate resilience of livelihoods of communities living in these areas.

Activity 2.2.1.1. Development and implementation of a plan for reforestation of river banks against erosion.

Activity 2.2.1.2. Capacity building of stakeholders (men/women) on climate resilience of watersheds of rivers housing the hydroelectric facilities.

Activity 2.2.1.3. Development of a communication program in the direction of all stakeholders (men/women) (population, civil society organizations (CSOs), men, women and youth, etc.)

Output 2.2.2: Low cost community infrastructures are built and supported to protect the riverbanks of rivers Ouémé, Zou, Sota, Mono, Niger against erosion.

Through this output, the project will finance the building and maintenance of low cost community infrastructures to protect riverbanks against erosion. The preparatory phase of the project will develop, with the participation of local communities, a mechanism for the operationalization and funding for maintenance of these infrastructures.

Activity 2.2.2.1. Construction of community facilities for the protection of the riverbanks

Activity 2.2.2.2. Developing an information awareness and communication (IEC) program for communities on good management practices of community facilities for the protection of the riverbanks.

Output 2.2.3: A training program on good practices of sustainable land management integrating climate risks is implemented in communities of Djidja, Abomey, Zangnanado, Dassa, Savè, Perere, N'dali, Toukoutouna, Djougou, Bantè, Bassila, in order to fight against the erosion of land in the watersheds of rivers Ouémé, Zou, Sota, Mono, Niger.

This output will support the spreading of good practices for sustainable land management (fertility management, anti-erosion practices…) through the implementation of a training program benefitting 1,000 members (with gender parity) from local communities of the rivers Ouémé, Zou, Sota, Mono and Niger, in order to lessen the erosion phenomena that contribute to the destruction and silting of the riverbanks, threatening the hydroelectric potential of these.

Activity 2.2.3.1. Development of a training program on good practices in sustainable land management and the fight against erosion by incorporating aspects related to climate risks, needs and specifics of vulnerable social strata

Activity 2.2.3.2. Support to the implementation and dissemination of the training program on good practices

Output 2.2.4: Climate resilient and environmentally sound remunerative activities such as beekeeping, small livestock farming, production and marketing of improved cooking stoves are supported through the implementation of a framework for their development (training program on good practices for business and management, support for access to needed products and components, support for access to microfinancing to start these activities).

With this output, the project will support the promotion of alternative, climate-resilient income generating activities (IGAs) such as beekeeping, horticulture, small livestock, production and maintenance of improved stoves and pressure cookers. Indeed, the communities living in these areas derive all their income from agriculture and especially cotton production. Due to the increase in the cost of living, rural populations in these regions are forced to intensify cotton production and forestry. This is usually done at the expense of natural resources and ecosystems protecting Ouémé, Zou, Sota, Mono, Niger against drying and sanding. To do this, the output will finance training of 1,000 individuals (with gender parity) for a dozen of the most vulnerable communities in efficient production techniques of the IGAs and financial management of businesses. In addition, the project will also support in each of the communities, the development of business plans and access to finance for 100 individuals or groups of individuals. By supporting alternative income generating activities, the project will reduce pressures on ecosystems Ouémé, Zou, Sota, Mono, Niger ... and the phenomena of erosion that threaten the hydroelectric potential of these rivers.

From an operational point of view, those activities should be based on the following methodology: first, an information campaign should be run on the project, its objectives and the financing mechanism of sub-projects. The partner structures are invited to see by themselves in the various concerned communities what can be done and how. The NGOs or firms form the private sector that are to work on the project are then identified and sign a cooperation agreement. The second step consists of identifying the communities' precise needs and financing means, relying for instance on an interview guide or a ZOPP method. The needs are then prioritized and the means are discussed with the Micro-Finance cell of the Ministry of Finance. Once the financing scheme is elaborated, it is submitted to the relevant party.

Various business models can therefore be discussed and implemented, depending on the community specificities. Some will be micro-credit-based while other will rely on equity for those who can afford it. Also, subsidies can be discussed, in the form of capacity reinforcement or technical financial advice or even to provide for a certain percentage of the activity. Note that any retained business model is to be sustainable beyond project completion in order to outlive it and not rely only on external help.

Activity 2.2.4.1. Development and design of a pack of climate-resilient income generating activities and environmentally sound. Analysis of relevant possible business plans for these activities (community business model, private business model or a combination of both) based on other natural experiences

Activity 2.2.4.2. Training of developers (maintaining gender parity) of climate-resilient income generating activities and environmentally sound

Activity 2.2.4.3. Accompanying with technical and financial (access to financing) support of developers to the application of their training outcomes

Outcome 2.3. Climate resilience of fuelwood supply areas identified by revised SDAs is enhanced through reforestation and conservation of woody areas

Output 2.3.1: Community parks of firewood resilient to climate change are set up in areas identified as most vulnerable by the revised SDAs, in the communal forests of Fita Agbado (towns of Dassa and Savalou), Zounzoukan (towns of Covè and Zangnanado), Détohou (town of Abomey), Kolobi (town of Djidja), Bobe (town of Bantè), Ouogui (town of Savè) , Badé (town of Ouessè), Tfougou (town of Djougou), Nonsinansson (towns of Perere and N'Dali) and Dahendé (towns of Natitingou and Toucoutouna)

As part of this output, the project will support the development of climate-resilient community wood for energy parks in wood for energy supply areas identified as most vulnerable by the revised SDAs, to increase their climate resilience. These community parks have the dual objective of sustainably secure wood for energy supply and contribute to strengthening the resilience of livelihoods of communities living in and around these areas. These woods for energy parks will be managed by the communities themselves and according to the resilient development plans that will be developed or revised thanks to the component 2. Memoranda of agreement based on the rules and forms of local social organization developed in the component 2 will ensure compliance with these management plans by all beneficiary communities.

Activity 2.3.1.1. Capacity building of stakeholders (men/women) for the setting up of community fuelwood plantations resilient to climate change

Activity 2.3.1.2. Support to the implementation of resilient community fuelwood plantations in the areas identified as most vulnerable in the revised SDAs and in communal forests

Output 2.3.2. The fuelwood supply areas (Zouzounkan for Parakou, Tfougou for Djougou, Dahendé for Natitingou, Fita-Agbado for Bohicon, Zouzounkan and Abomey for Porto-Novo and Cotonou) are protected against bushfires induced and / or enhanced by climate through: i) the development of management protocols

against risks of increase of the frequency and intensity of wildfires linked to climate; ii) demonstration bushfire fight methods resilient to climate around ha of forests.

This output will finance the protection of identified supply areas for fuelwood against wild fires induced or aggravated by climate phenomena through: the development of risk management protocols for the increase in intensity and frequency of climate-related wild fires and the demonstration of fight methods against wildfires resilient to climate around 300 000 ha of forests.

Activity 2.3.2.1. Development of a pack of training tools for managing climate risks

Activity 2.3.2.2. Capacity building of stakeholders (men/women) on the tools, techniques and control and protection measures of fuel wood supply zones against bushfires

Activity 2.3.2.3. Support to the implementation of tools, techniques and control and protection measures of fuel wood supply areas.

Output 2.3.3: Remunerative activities alternative to forest resources use (beekeeping, horticulture, small livestock breeding, production and maintenance of improved stoves, pressure cookers etc.) in communities of Djidja, Zangnanado, Dassa, Savè, Perere, N'dali, Toukoutouna, are supported to strengthen the resilience of woody formations supplying fuelwood for Cotonou, Porto-Novo, Lokassa, Abomey, Bohicon, Parakou, Malanville.

Thanks to this output, the project will support the promotion of alternative climate-resilient income generating activities (IGAs) such as beekeeping, horticulture, small livestock, production and maintenance of improved stoves and pressure cookers, sustainable production of charcoal ... Indeed, the communities living in these areas derive all their income from agriculture and especially cotton production. Due to the increase in the cost of living, rural populations in these regions are forced to intensify cotton production and forestry. This is usually done at the expense of natural resources and forest areas. To do this, the output will finance training programs for the benefit of the most vulnerable 1,500 individuals in the city communities of Djidja, Zangnanado, Dassa, Savè, Toukoutounan, Pèrèrè, N'dali and Malanville and other areas vulnerable in the technical production of these alternative IGAs and financial management businesses. The project also will accompany them in the development of business plans and access to finance for 10 individuals or groups of individuals in each of the communities.

Activity 2.3.3.1. Development and design of a pack of income generating resilient activities alternative to forest resources use

Activity 2.3.3.2. Capacity building of developers (men/women) of income generating resilient activities identified.

Activity 2.3.3.3. Accompanying and support of developers (men/women) to the development of the income generating resilient activities alternative to forest resources use.

Component 3: Energy use and production - Technology transfers to strengthen the resilience of livelihoods and living conditions of the vulnerable communities

Under the baseline scenario, no practical measures are taken to protect the existing power generation, transmission and distribution facilities in the country. There is no real technology transfer plan nor financial mechanism to cover the risks in the energy sector in case a climate-related extreme event hits the country.

The outcome of this component is to set the practical, technology- and financial-based, measures to strengthen the resilience of the vulnerable communities and to better protect the strategic assets in the energy sector against climate risks.

In order to strengthen climate resilience of sources of energy supply of Benin, the project will support investments for the physical protection of the most vulnerable existing electrical infrastructure, the protection of the hydropower potential of rivers destined to house hydroelectric plants, and the conservation and strengthening of forests identified by the revised SDAs (via the second component) as sources of energy wood supply. Measures will be implemented to protect thermal power plants of Cotonou (Akpakpa), Porto-Novo, Kandi, Natitingou against the increase in the intensity and frequency of droughts and other climate risks and natural disasters such as floods, cyclones and hurricanes. The goal of this output is first to conduct a vulnerability assessment of the most important electrical installations and then to support securing these infrastructure investments. The selection criteria for infrastructure for which it will assess vulnerabilities will be defined during the project preparation phase and will include the size of the concerned population, the economic activities concerned and also the common capability to cope with disruptions of electrical distribution such as acquiring generating sets (Output 3.1.1.). Measures will also be implemented to the distribution networks against winds and raising temperatures. The goal of this output is first to conduct a vulnerability assessment of the network, to analyze what technological or strategic solutions are feasible and then to support securing these infrastructure investments (Output 3.1.2.).

The project will also promote Benin's renewable energy generation capacity by raising the evidence to support hydro, solar or biomass-based energy generation in rural areas (one selected vulnerable locality). This is in line with the biomass project as one of the objectives mentioned in the PIF was to issue an "RFP for installed capacity of 4 MW of both on-grid and off-grid (mini-grid) generation from biomass IPPs will be launched". A cross subsidy model to fund utility scale renewable energy may not be politically possible in Benin as the country may not afford to promulgate renewable energy feed in tariffs in the way that Europe or South Africa have (residential customers are struggling to pay bills at current levels, hence innovative financing mechanisms will be needed to reduce the cost from

current unaffordable levels. The study should consider incentives such as voluntary carbon market, eco-labelling, etc...). Just about 25% of the country is electrified and more than half of the households cannot pay for it at current prices (Output 3.2.1.). Communication and raising awareness to the targeted rural population will be ensured, focusing on the benefits of being organized in renewable energy user groups and of promoting hybrid diesel-PV based mini-grids (Output 3.2.2.). Ten thousand (10,000) improved stoves and a thousand (1,000) pressure cookers will be distributed through micro-financing and loan guarantee schemes in the most vulnerable rural communities of Djidja, Zangnanado, Dassa, Savè, N'dali Perere, Toukoutouna, Djougou and Bassila and urban centers of Cotonou, Porto Novo, Bohicon, Abomey, Parakou, Natitingou, Djougou, Malanville, Lokossa, Kandi, to reduce household demand for fuelwood (Output 3.2.3.). Three improved carbonization technologies will also spread in communities producing charcoal through the training of 500 coal operators (Output 3.2.4.).

Finally, a Financial Support Mechanism (FSM) will be established and capitalized to support private investment in adaptive measures to increase the resilience of the energy sector to climate change. The FSM will be in line with the UNDP micro grant Policy. The mechanism will be able to provide micro-capital grants for non-credit purposes as inputs to the project activities. A policy framework will be established, with a adaptation compartment to cover climate related extreme events such as floods and/or droughts. The compartment of the FSM related to the current project is a national insurance fund for the GoB. It is an energy sector insurance instrument which is not similar to indemnity type products which are usually offered by the traditional insurance companies. It will operate at a different level from insurance companies because it is a national mechanism for the GoB targeting the vulnerable communities. It will be the first-of-its-kind instrument in the country, and even in the region. The CCA compartment of the FSM will be able to meet the claims-paying requirements in the energy sector in case a climate-related extreme event (floods, droughts, etc.) is harming the population of the country in terms of energy access. Hazards that are considered in computing the loss are wind, floods, droughts and storm surge in coastal areas where assets can be at risk. The FSM payout is based on the loss assessment from the climate-related extreme event as it happens. Losses calculated will primarily focus on the assets in the energy sector in rural areas. However, the FSM will develop a policy framework for the purpose. The framework will be designed to help the most vulnerable communities in terms of access to energy, especially after a disaster. So a loss estimate will be designed to give an estimate of what the charge to the GoB accounts can be. The payout is designed to help the communities in that short period between the disaster and 3-6 months later when they can get other resources to reconstruct what has been damaged. The CCA FSM will enable the GoB to learn how to deal with such critical climate-related extreme events. In the future, the FSM and its policy framework is expected to help the GoB to have its own process. The recognition of an extreme event or a climate-related hazard, by a decree for instance, should lead to the coverage of the damages directly by the GoB, once the FSM will be depleted.

The FSM will have a common administrative structure (Project Management Unit) with the one proposed under the MFA project focusing on biomass (GEF ID 5752). A MOU will be signed with the Central Bank of West African States (or with commercial bank selected on

the basis of competitive bidding) setting out the objective, funding mechanism and administration rules regarding its participation as fiduciary agent of the FSM (Output 3.3.2.). Financial and other incentives will be provided to project developers/Independent Power Producers (IPPs) towards low-carbon climate resilient investments in the energy sector (Output 3.3.3.).

Outcome 3.1. Electricity production and distribution facilities are protected against disasters and other climate risks

Output 3.1.1: Protective measures for the thermal power plants of Cotonou (Akpakpa), Porto-Novo, Kandi, Natitingou, against the increase in intensity and frequency of droughts and other climate risks and natural disasters are in place.

As part of this output, measures will be implemented to protect thermal power plants of Cotonou (Akpakpa), Porto-Novo, Kandi, Natitingou against the increase in the intensity and frequency of droughts and other climate risks and natural disasters such as floods, cyclones and hurricanes. The goal of this output is first to conduct a vulnerability assessment of the most important electrical installations and then to support securing these infrastructure investments. The selection criteria for infrastructure for which it will assess vulnerabilities will be defined during the project preparation phase and will include the size of the concerned population, the economic activities concerned and also the common capability to cope with disruptions of electrical distribution such as acquiring generating sets.

Activity 3.1.1.1. Support the installation of lightning conductors and green bands around thermal power plants against the increase in the intensity and frequency of droughts and other climate risks and disasters

Activity 3.1.1.2. Developing an information-awareness and communication program (IEC) of populations on measures to protect power plants

Output 3.1.2: Protective measures for the distribution network (cables), against winds and raising temperatures are developed.

As part of this output, measures will be implemented to the distribution networks against winds and raising temperatures. The goal of this output is first to conduct a vulnerability assessment of the network, to analyze what technological or strategic solutions are feasible and then to support securing these infrastructure investments.

Activity 3.1.2.1. Assessment of the vulnerability of the distribution network as well as the various technological and strategic solutions that are feasible[61]

Activity 3.1.2.2. Developing an information-awareness and communication program (IEC) of populations on measures to protect the network as well as annual project execution reports

Outcome 3.2. Development of alternative energy production sources for vulnerable localities

Output 3.2.1: Elaboration of a feasibility study for the development of the renewable energy sector (eg installation of mini solar grids in villages for cooking and lighting)

This output aims to promote Benin's renewable energy generation capacity by raising the evidence to support hydro, solar or biomass-based energy generation in rural areas (one selected vulnerable locality). This is in line with the biomass project as one of the objectives mentioned in the PIF was to issue an "RFP for installed capacity of 4 MW of both on-grid and off-grid (mini-grid) generation from biomass IPPs will be launched". A cross subsidy model to fund utility scale renewable energy may not be politically possible in Benin as the country may not afford to promulgate renewable energy feed in tariffs in the way that Europe or South Africa have (residential customers are struggling to pay bills at current levels, hence innovative financing mechanisms will be needed to reduce the cost from current unaffordable levels. The study should consider incentives such as voluntary carbon market, eco-labelling, etc...). Just about 25% of the country is electrified and more than half of the households cannot pay for it at current prices. Off grid renewable energy will become increasing financially attractive – especially if a low-cost storage solution can be found. There is an urgent need to use low-carbon interventions to support the energy needs of informal settlements and the rural poor. The population subsisting in rural areas lives under precarious conditions. Renewable energies can play an important role in providing source of income, energy for cooking and lighting.

Activity 3.2.1.1 Assessment of off-grid households that have gained sustainable access to basic energy

Activity 3.2.1.2 Study on the key private stakeholders' constraints to sustainably supply the households with affordable and good-quality mini solar solutions

Activity 3.2.1.3 Feasibility study of mobilizing carbon funding for renewable energy implementation;

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[61] As developed in section 1.3.2. "Adaptation measures"

Activity 3.2.1.4 Assessment of relevant policies and frameworks adopted to facilitate penetration of hydro, solar and biomass-based technology transfer

Output 3.2.2: Awareness raising and training of men, women and children on solar technology

This output will support communication and raising awareness to the targeted rural population on the benefits of being organized in renewable energy user groups and of promoting hybrid diesel-PV based mini-grids (with professional trainings to energy management related skills and entrepreneurship, targeting disadvantaged young people, training of trainers, setting up a training center with materials and educational kits for practical work). It will look to increase the skills for relevant individuals in transfer of technology with targeted population groups participating in awareness activities

Activity 3.2.2.1 Strengthen capacity building and research to support the new and renewable energy development

Activity 3.2.2.2 Education and communication on enhanced techniques (solar) to adopt to reduce vulnerability of the energy sector to Climate change impacts

Activity 3.2.2.3 Capacity building modules institutionalized for upscaling — for technicians to gain product knowledge to inform the households adequately and to service them properly

Activity 3.2.2.4 Provide relevant adaptation technology transferred to targeted groups through micro-financing and loan guarantee schemes.

Output 3.2.3: Ten thousand (10,000) improved stoves and a thousand (1,000) pressure cookers are distributed in the most vulnerable rural communities of Djidja, Zangnanado, Dassa, Savè, N'dali Perere, Toukoutouna, Djougou and Bassila and urban centers of Cotonou, Porto Novo, Bohicon, Abomey, Parakou, Natitingou, Djougou, Malanville, Lokossa, Kandi, to reduce household demand for fuelwood. This will happen through micro-financing and loan guarantee schemes.

This output will enable the distribution of 10,000 improved stoves and 1,000 cookers in the most vulnerable rural communities of the supply areas listed above and in the urban centers sourcing from areas identified as the most vulnerable by SDAs revised to reduce the household demand for energy from wood and to help restore the ecological balance of these areas and strengthen their resilience to climate. To contribute to the sustainable availability of improved stoves and cookers, the output will support the emergence of craft micro-enterprises for the production and maintenance of this equipment.

Activity 3.2.3.1. Support the identification of craftsmen / craftswomen able to manufacture pressure cookers and improved stoves in the most vulnerable rural communities

Activity 3.2.3.2. Technical capacity building of craftsmen / craftswomen for the spreading of pressure cookers and improved stoves in rural communities. The type of stove chosen by a community depends on its habits and means, as well as the biomass available; for instance, using rice or palm husks

Activity 3.2.3.3. Accompanying support to craftsmen / craftswomen trained in the implementation of learning outcomes

Activity 3.2.3.4. Advice and support for the spreading of improved stoves and pressure cookers in rural communities

Activity 3.2.3.5. Development of a large-scale information program on the benefits of using pressure cookers and improved stoves in communities

Output 3.2.4: Three improved carbonization technologies are spread in communities producing charcoal through the training of 500 coal operators.

This output will support the dissemination of three improved technologies for carbonization (energy efficient kilns) through the training of 500 coalmen (25% of the identified coalmen) on these technologies and support 200 of the trained coalmen (10% of the number of coalmen) in their access to the funds necessary to finance additional investment required for these technologies. The training will include awareness towards deforestation, use of renewable sources and dissemination of techniques through micro-financing and loan guarantee schemes.
Activities under this output will enable the dissemination of 100 improved kilns (technologies will be based on rotor kilns and improved casamance kilns).

Activity 3.2.4.1. Capacity building of coal operators (men/women) in charcoal production communities on three types of improved and tested carbonization technologies.

Activity 3.2.4.2. Accompanying and support to coal operators (men/women) in charcoal production communities, trained in the implementation of learning outcomes

Activity 3.2.4.3. Support, accompanying and advice to the spread of the three types of improved and tested carbonization technologies in coal operators' communities.

Outcome 3.3. (in partnership with the biomass project): Increased investment in clean energy technologies and low-carbon practices in the agro-forestry waste sector, and in adaptive measures to increase the resilience of the energy sector to climate change.

Output 3.3.1: Financial Support Mechanism established and capitalized to support private investment in adaptive measures to increase the resilience of the energy sector to climate change. The FSM will be in line with the UNDP micro grant Policy.

The mechanism will be able to provide grants for non-credit purposes as inputs to the project activities.
The financial mechanism will have a common administrative structure (Project Management Unit) with the one proposed under the MFA project focusing on biomass (GEF ID 5752).

Activity 3.3.1.1. FSM operational with an investment manual including fiduciary principles, ESS and risk coverage criteria, following the "Relevant International Private Sector Best-Practice Fiduciary Principles and Standards and Environmental and Social Safeguards", published by the Green Climate Fund on October 2014[62]

Output 3.3.2: MOU signed with Central Bank Benin (or with commercial bank selected on the basis of competitive bidding — to be discussed during mission) setting out the objective, funding mechanism and administration rules regarding its participation as fiduciary agent of the FSM.

Activity 3.3.2.1. MOU drafted, finalized and signed with Central Bank. This will lead to the availability of resources in the form of guarantees to incentivize the private sector. Also this activity will lead to implementation and operationalization of the funds management mechanisms.

Output 3.3.3: Financial and other incentives to be provided to project developers/Independent Power Producers (IPPs) towards low-carbon climate resilient investments in the energy sector.

Activity 3.3.3.1. Incentives to be provided by Government to project developers/Independent Power Producers (IPPs) approved and operational.

3.5. Project indicators, risks and assumptions

Indicators on impact monitoring

The most direct impact of the project as it relates to GEF adaptation strategy (2010-2014) is the support for Benin to increase its resilience to climate change through both immediate- and long- term adaptation measures in development policies, plans, programs, projects and actions. Associated impacts, such as increased capacity building activities in the energy sector, will contribute to the overall sustainability of the project and thus are critical to the continued strengthening of adaptation activities. The baseline was assessed during the PPG with measurable indicators and is presented in the logframe. The logframe also

[62] http://www.gcfund.org/fileadmin/00_customer/documents/MOB201410-8th/GCF_B.08_05_Private_Sector_Best_Practices_fin_20141007.pdf

includes targets for the project to facilitate the monitoring and evaluation process and assess in the future the impact of the project. In the baseline scenario, the energy sector does not take into account the consequences of climate change. Adaptation is not present in any energy policy document nor in the national energy management system. As far as sustainable and resilient land and management practices are concerned, various masterplans and development plans (SDAs and PAFs) do exist, but they need to be revised by strengthening the climate resilience of the areas supplying wood for energy. The same applies for the Information System for Permanent Evaluation (SIEP) on domestic fuels and the Ecological and Forest Information System (SIEF). In the baseline scenario, the watersheds of rivers in Benin are vulnerable to climate change. The project will therefore help to prevent.

This will need to be done before energy policy framework are established and implemented in the rural sector. The impact monitoring should be done on an annual basis by the project implementation team, and the results will be used by the project team to improve and/or revise the proposed measures.

The project results frameworks will include indicators that are disaggregated by gender as appropriate, in particular those linked to outputs and outcomes related to adaptation assets created in support of individual or community livelihood strategies. The following indicators could be used to measure the impact of the proposed initiatives:

Table 13: Key Indicators for Impact Monitoring

Impact to be monitored	Indicators (See logframe for the baseline and target values)	Verification means
Mainstreamed adaptation in broader energy policies framework at country level **(In relation to Component 1)**	Adaptation actions implemented in national development frameworks (no. and type). For each action listed above, indicate to what extent targets set out in plans have been met. 1 = Not Significantly (<49%) 2 = Significantly (50-79%) 3 = Principally (>80%) Policy environment and regulatory framework for adaptation-related technology transfer established or strengthened (Score) The score ranges from 1 to 5 and below are the explanations of the rankings. No policy/regulatory framework for adaptation-related technology transfer in place Policy/Regulatory framework for adaptation-related technology transfer have been discussed and formally proposed	Annual Reports of the Ministry of Energy, DGE, CBE, SBEEE, ABERME
Strengthened adaptive capacity to reduce risks to climate **(In relation to Component 2)**	No. and type of targeted institutions with increased adaptive capacity to minimize exposure to climate variability (describe number and type). No. of staff trained on technical adaptation themes (per theme) – (disaggregated by gender) % of targeted population awareness of predicted adverse impacts of climate change and appropriate responses (Score) – Disaggregated by gender % of population affirming ownership of adaptation processes (disaggregated by gender)	Survey of government agencies Survey of municipal enforcement agencies
Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas Energy use and production, deployment and transfer of relevant adaptation technology	Households and communities have more secure access to livelihood assets (Score) – Disaggregated by gender % of increase per capita income of households outside of climate change vulnerable sectors due to adaptation measures applied	Survey of Customers Administration Reports, and government agencies Professional Associations Annual Reports

(In relation to Component 3)	% of targeted groups adopting adaptation technologies by technology type (disaggregated by gender)	

3.6. Risk analysis and risk management measures

The proposed implementation of the project aims to allow multiple consistent results, with a replicable and sustainable approach. This does not go without risks. It is necessary to make an assessment of the elements that could prevent the proposed project from leading to the expected results, and also to anticipate a strategy for managing these risks in order to maximize benefits from the project.

Obstacles can be of different kinds: political (delays in decision-making or in providing information), institutional (management structures proposed in the project document inefficient), technical (low potential for partnerships, complexity of project themes), environmental (potential deforestation in the future micro plants areas) and financial (high costs, lack of attracted financial partners)

They can also meet various phases of the project: inception and recruitment phase at the beginning of the project, implementation of the activities, involvement of stakeholders, monitoring and adaptive management during the project, or sustainability and impacts of the project actions after the end of the project period.

While identification and assessment of risks is addressed at an early stage of project design, the overall risk management should be considered an iterative process given that potential impact of anticipated risks may change, and new risks can emerge throughout the project lifecycle. At this stage all identified risks and associated information have been documented in a risk assessment table. They are analyzed from an environmental, economic, technical, social perspective and from the perspective of the overall governance of the sector. Based on the risk analysis and management responses identified, the initial Risk Log has been created to keep track of the identified risks.

As identified in the NAPA and Second National Communication of Togo and Benin under the United Nations Framework Convention on Climate Change, the major climatic risks that impact the energy sector are:

- Strong winds: the effects of high winds cause disruption on the distribution network;
- Rising temperatures cause expansion of cables;
- The influence of rainfall and heavy rains (lack of precipitation leading to drought and flooding) is that heavy rainfall lead to atmospheric discharges that often cut the transportation cables;

About organizational risks some institutional arrangements are inconsistent due to lack of coordination and synergy between stakeholders (states), which can induce random decisions. Also often implementing stakeholder capacity is weak because the designated focal points, often lack recent data that do not allow certain representations abroad to be

technically competent. Also the terms of the project management and implementation should be identified before and respected so that stakeholders can meet their commitments towards proper implementation. Finally strongly related to the previous point strengthening of good governance is essential. The lack of good governance for the energy sector is a problem.

Pertaining to financial risks climate change phenomena affect the energy sector. However, innovative solutions specific to the African context such as prepaid access to energy should offset the increase in financial risk due to the great impact of climate change. It nevertheless becomes necessary to put in place incentives to involve closer financial partners and the private sector.
First, the major external economic factor is price volatility due to economic fluctuations and related market elements. Second internal factors to consider are:

- Access to financial services for certain actors or households is still difficult.
- Lack of ambitious incentives for private sector.
- The introduction of new technologies in particular involves a major risk for cost recovery.

Regarding political risks a period of political instability is to anticipate with parliamentary elections that will be held in 2015 and presidential elections to be held in 2016. The changes in the structures of government (High turnover in government structures) may result in disruption of resources for monitoring and competent skills. On the geopolitical arena Benin is highly dependent on importation of energy from neighboring countries. It is therefore vulnerable to political instability within ECOWAS. The types of instability that can be anticipated are mainly civil wars, political crisis in a member country or demographic / socio-economic growth that would increase national demand for energy. Additionally future parliamentary and presidential elections in Nigeria, Burkina Faso, Cote d'Ivoire, Ghana and Togo in 2015 and 2016 need to be carefully anticipated, as those political changes may impact bilateral or regional processes as well as agreements.

Looking at operational risks now the programmatic aspect of project induces a factor of complexity and an innovative nature for the management arrangement to design. Regarding project beneficiaries' possible reluctance to the appropriation of technologies may arise during training or awareness raising campaigns

At the strategic level it has been stressed several times during the interviews with stakeholders that political discourse does not fit the reality of the energy sector needs. Strategic vision, planning and communication are not in synchrony. The involvement of all stakeholders is needed to foster productive dialogue towards acceptable and useful solutions to all beneficiaries.

Finally regarding the possible regulatory risks unexpected new regulations or policies be need to be anticipates. This is the case for instance with the Finance Act 2015 that will offer a tariff exemption for the importation of generators. This regulation is at odds with the efforts already made towards sustainable energetic transition (the country is not an oil producer).

In summary and based on discussions with stakeholders, it is expected that the overall project risk will be moderate. The potential risks, which could hinder the successful project implementation and/or reduce project effectiveness, are itemized in details the table below. To address these anticipated risks, the project will be designed to include an effective means to monitor, and to the extent possible, mitigate these risks. A project monitoring and evaluation plan has been prepared to track not only the project milestones, but also the indicators that will show that the identified risks are, if not eliminated – at least mitigated. Stakeholders were engaged during the project design stage. The measures that have been taken during the preparation and design of the Project and/or will be taken during the implementation phase so that these potential risks will be mitigated are also outlined in the table.

Table 14: Initial risk framework - Description of Project Risks and Management Strategy

#	Risk Description	Category	Impact severity	Likelihood	Risk Management strategy and safeguards	By when / whom?
1	Strong winds	Environmental	High	Medium	Strengthening prevention mechanisms, Establishment of infrastructure maintenance program Awareness raising of populations impacted	Government (DGE, CEB, SBEE, DGCC, WAPP), Civil Society, Beneficiaries
2	Rising temperatures	Environmental	High	Medium	Strengthening prevention mechanisms, Establishment of infrastructure maintenance program Awareness raising of populations impacted	Government (DGE, CEB, SBEE, DGCC, WAPP), Civil Society, Beneficiaries
3	Influence of rainfall: late and heavy rain (risk for supply) or flooding (flooding of power plants).	Environmental	High	Medium	Strengthening prevention mechanisms, Establishment of infrastructure maintenance program Awareness raising of populations impacted	Government (DGE, CEB, SBEE, DGCC, WAPP), Civil Society, Beneficiaries

#	Risk Description	Category	Impact severity	Likelihood	Risk Management strategy and safeguards	By when / whom?
4	Inconsistence between institutional arrangements due to lack of coordination and synergy among the stakeholders.	Organizational	High	Medium	Strengthening dialogue among partners Upstream awareness raising of partners and strong involvement in the process	Government, Financial and Technical partners
5	Implementation capacities / capabilities of stakeholders (Appointment of unqualified persons).	Organizational	High	Medium	Capacity building (training, access to technical resources) Establishment of a knowledge transfer system	Government, Research and development institutions, Financial and Technical partners, Civil Society, Private sector, Land chiefs, Beneficiaries
6	Management and implementation arrangements must be specified beforehand and respected (delay in mobilizing and recruiting people).	Organizational	Medium	Medium	Designation of a Ministry “Champion” for steering the process	Government
7	Problem of energy sector management (governance and	Organizational	Medium	High	Improving good governance	Government

#	Risk Description	Category	Impact severity	Likelihood	Risk Management strategy and safeguards	By when / whom?
	management) (delay in the development of protocols).				Establishment of procedures for monitoring and progress monitoring Definition of participatory management systems and an independent framework to implement the agreed measures.	
8	External economic factors of price volatility.	Financial	Medium	Medium	Awareness raising of stakeholders on price indexation.	Government, Financial and Technical partners, Private sector
9	Access to financial services.	Financial	Medium	Medium	Financial Support Mechanism is up and running. Strengthen applied research to reduce the cost of new technologies in the African context (energy products fitted to the context of Benin and other African countries such as prepaid energy access).	Research and development institutions, Financial and Technical partners, Private sector
10	Lack of ambitious incentives for private sector (implementation costs of activities are greater than expected revenue)	Financial	Medium	Medium	Identify and mobilize key stakeholders to support the development of a favorable framework (investors, artisans, entrepreneurs, micro-finance, associations).	Financial and Technical partners, Private sector

#	Risk Description	Category	Impact severity	Likelihood	Risk Management strategy and safeguards	By when / whom?
11	Payback: the question of the attractively and profitability of renewable technologies	Financial	High	Medium	Identify and mobilize key stakeholders to support the development of a favorable framework (investors, artisans, entrepreneurs, micro-finance, associations).	Financial and Technical partners, Private sector
12	Period of political instability	Political	Medium	Medium	Anticipate election periods.	Government, Civil Society
13	Change within government structures: monitoring and skills (no appointment of proper profiles)	Political	High	Medium	Focal point appointment. Knowledge transfer to ensure monitoring.	Government, Civil Society
14	Geopolitical: Regional interdependence	Political	High	Medium	Strengthening of the coordination of regional policies. Strengthening dialogue.	Government, Financial and Technical partners
15	Complexity and innovative nature of the project (Project Management: Cumbersome administrative process, Breach profile nominees, Ignoring gender in the selection of nominees)	Operational	Medium	Medium	Lobbying governments Defining objective criteria for appropriate persons designation.	Government, Financial and Technical partners
16	Probable reluctance to appropriation of technologies	Operational	High	Medium	Strategies taking into consideration the social context	Research and development

#	Risk Description	Category	Impact severity	Likelihood	Risk Management strategy and safeguards	By when / whom?
	(Opposition landowners , poorly applied reforestation techniques Lack of knowledge and henceforth possible negative perception (lack of or limited social and cultural acceptance) on the use of new technologies for cooking				Awareness targeted to experienced actors key within communities to frame reforestation	institutions, Civil Society Private sector Land chiefs Beneficiaries
17	Strategic vision, planning and communication.	Strategic	Medium	Medium	Definition of participatory management systems and an independent framework to implement the agreed measures	Government, Civil Society
18	Relationships between stakeholders: lack of dialogue with the beneficiaries and involvement of all stakeholders	Strategic	Medium	Medium	Strengthening of participatory dialogue	Government, Civil Society Private sector Land chiefs Beneficiaries
19	New unexpected regulations or policies: Finance Act 2015	Regulatory	High	High	Anticipation of deadlines for implementing new regulations	Government, Private sector

IV. Logical framework

Project title: Strengthening the resilience of the energy sector in Benin to the impacts of climate change							
Project Objective: To reduce the impacts of climate change and variability on Benin's energy sector							
Sources: Project baseline reports; Project annual execution reports; Project execution monitoring reports; Project final evaluation report.							
Component objectives	**Outcomes**	**Outputs**	**PERFORMANCE INDICATORS**			**Sources of Verification**	**Assumptions**
			Indicators	**Baseline** (2015)	**Target** (2020)		
Component 1: Mainstreaming adaptation to climate change into energy policies and management and planning strategies and tools							
Outcome 1: Strengthen capacities in order to reduce risks of economic losses due to climate changes	1.1. Capacities of the energy sector's stakeholders are strengthened in order to enable them to integrate climate risks in energy planning and to face climate risks	1.1.1. A multi-stakeholder platform is set up to facilitate dialogue between decision-makers in different sectors related to energy, and decision-making on the competing use of energy sources and on cross-cutting issues related to the production, access and energy efficiency in relation to climate change	- Gender sensitive multi-stakeholder platform installed and functional - Integration and implementation by stakeholders of climate resilient energy access approaches in their business activities	0 0	1 1	- Decree - Installment report	- No cumbersome administrative - Profile of nominees are compliant - Gender is well considered in the selection of nominees
		1.1.2. A training program is implemented for 500 players in the sectors related to energy (including members of the multi-stakeholder platform of the energy sector and members of the National Multisectoral Commission on Domestic Fuels)	- A training plan is developed and approved by the Steering Committee; - Each year, at least 50 women and 50 men from	0	At least 500 managers /executives (men and women)	- Training plan - Training reports	- Appointment of persons is appropriate - No delays in issuing the no-objection

		to strengthen their capacity to: i) identify climate risks for the energy sector; ii) design and implement adaptation measures; iii) integrate climate risks and parameters in key policies of the energy sector, in the energy planning tool GEOSIM, and in planning processes of energy supply and demand;	in the energy sector are trained; - Each year, at least 80% of the women and men trained apply the experience acquired in training			- Project annual reports	notice by donors
Component 2: Sustainable land and forest management practices for strengthening the climate resilience of the zones supplying wood for energy							
Outcome 2: Integrate adaptation in enlarged frameworks at the national scale and in vulnerable areas	2.1. Energy supply strategies and plans integrate climate change and adaptation measures	2.1.1. The **Masterplans for Supply** (SDA) of fuelwood in the cities of Parakou, Malanville, Djougou, Natitingou, Bohicon, Abomey, Cotonou, Porto-Novo and Lokossa (including **Development Plans (PAF)** of forest areas of Nonsinansson for Parakou, Tfougou for Djougou, Dahendé for Natitingou, Fita-Agbado for Bohicon, Zouzounkan and Abomey for Cotonou and Porto-Novo) **are revised** to incorporate climate risks and appropriate adaptation measures.	- The gender-sensitive Masterplans for Supply (SDA) of fuelwood in the selected cities are developed and validated. - The development plans of selected forest areas (PAF) are adopted and validated. (revised to incorporate climate risks, gender and appropriate adaptation measures)	8 5	8 SDA revised 5 PAF revised	- SDA revised - PAF revised . - Execution reports from the DGFRN	- No delays in updating the SDA and PAF - No delays in the adoption by the Government of revised SDA and PAF
		2.1.2. A **National Plan for optimal management of supply and demand of electric power in a context of climate change including climate risks** (temperature, river flow, evapotranspiration, rain, sunshine, cyclones, floods ...) **and adaptation measures are developed and implemented**.	National Plan for optimal management of supply and demand of electric power in a context of climate change including climate risks and gender-specific needs is available, leading to a decrease in power	0	1 National gender-sensitive plan	- National Management Plan - Project execution reports	- No delay in the process of recruitment of a qualified Consultant

			shortages due to climatic events				
		2.1.3. The **Information System for Permanent Evaluation (SIEP) on domestic fuels and the Ecological and Forest Information System (SIEF) are updated** and functional in order to include climate risks and strategic options to address these risks	The SIEP on domestic fuels and the SIEF updated and including climate risks, gender-sensitive issues and strategic options are functional.	1 SIEF 1 SIEP	1 SIEF updated, gender sensitive 1 SIEP updated, gender sensitive	Reports on the publication of data on domestic fuels, ecology and forests.	- Qualified resources available
		2.1.4. The Forest Development Plans (PAF) of Middle Ouéme and communal forests of Fita Agbado (towns of Dassa and Savalou), Zounzoukan (towns of Covè and Zangnanado), Détohou (town of Abomey), Kolobi (town of Djidja), Bobe (town of Bantè), Ouogui (town of Savè), Badé (town of Ouessè), Tfougou (town of Djougou), Nonsinansson (towns of Perere and N'Dali) and Dahendé (towns of Natitingou and Toucoutouna) supplying the cities and urban centers of Benin in wood energy are revised to incorporate risks of drought, wildfires, and other climate risks as well as adaptation measures	PAF of the relevant areas supplying the cities and urban centers of Benin in biomass are revised to incorporate risks of droughts, wildfires, and other climate risks, as well as adaptation measures and gender-specific needs.	1 PAF 10 simple management plans non gender-sensitive	01 PAF 10 simple management plans	- Project annual execution reports	- Good cooperation from the landowners
	2.2. The climate resilience of watersheds of rivers Ouémé, Niger (Sota), Volta (Pendjari) housing the hydroelectric	2.2.1. Riverbanks of rivers Ouémé, Sota, Pendjari, Zou, Mono (likely to harbor hydroelectric facilities of Yéripao (existing) on one hand, and of Sosso waterfall, Gbassè, Koutakroukrou, Kota fall, Wabou	Riverbanks likely to harbor selected hydroelectric facilities are effectively protected against erosion through reforestation (involving men, women and youth)	0 ha of riverbanks converted	At least 20 hectares of riverbanks reforested	- Reforestation report - Reforestation monitoring	- Reforestation techniques well applied

	installations of Yéripao (existing) on one hand, and of Sosso waterfall, Gbassè, Koutakroukrou, Kota fall, Wabou and Kouporgou (considered in the medium term) on the other hand, is enhanced through the implementation of restoration and preservation of watershed ecosystems activities	and Kouporgou (considered in the medium term) on the other hand, , are **protected** against erosion through the **reforestation** of twenty thousand acres of multipurpose herbaceous species tolerant to drought and flooding	with multipurpose species tolerant of drought and flooding.		- Proportion/ role of women, men and youth involved in the reforestation process	reports of each site. - Project annual execution reports	
		2.2.2. Low cost community infrastructures are built and supported to protect the riverbanks of rivers Ouémé, Zou, Sota, Mono, Niger against erosion.	Community infrastructures built, by type (reforestation, dikes, gabions, riprap, etc.)	0	At least 100 infrastructures/works	- Execution reports - Infrastructure monitoring reports - Project annual execution report	- No Land conflicts
		2.2.3. A **training** program on good practices of sustainable land management integrating climate risks is implemented in communities of Djidja, Abomey, Zangnanado, Dassa, Savè, Perere, N'dali, Toukoutouna, Djougou, Bantè, Bassila, in order to fight against the erosion of land in the watersheds of rivers Ouémé, Zou, Sota, Mono, Niger	Increase in the amount of people mastering good practices of sustainable land management, both men and women .	0	1 training program involving each year 20% women, 30% men and 30% youth trained on good practices for sustainable land management	- Training program. - Training evaluation report	- Proper understanding of the practices taught during training

					integrating climate risks		
		2.2.4. Climate resilient and environmentally sound **remunerative activities** such as beekeeping, small livestock farming, production and marketing of improved cooking stoves are supported through the implementation of a framework for their development (training program on good practices for business and management, support for access to needed products and components, support for access to microfinancing to start these activities).	Climate resilient and environmentally sound remunerative activities (beekeeping, small livestock farming, and marketing of improved cooking stoves), involving men, women and youth, and ecologically rational exist.	0 0	At least 200 resilient remunerative activities involving each year at least 50% women, 30% youth and 20% men are supported	- Training program - Project execution reports	- Proper balance between implementation costs of activities and projected income (i.e. revenues recover the costs)
	2.3. Climate resilience of fuelwood supply areas identified by revised SDAs is **enhanced** through **reforestation and conservation of woody areas**	2.3.1. Community parks of firewood resilient to climate change are set up in areas identified as most vulnerable by the revised SDAs, in the communal forests of Fita Agbado (towns of Dassa and Savalou), Zounzoukan (towns of Covè and Zangnanado), Détohou (town of Abomey), Kolobi (town of Djidja), Bobe (town of Bantè), Ouogui (town of Savè) , Badé (town of Ouessè), Tfougou (town of Djougou), Nonsinansson (towns of Perere and N'Dali) and Dahendé (towns of Natitingou and Toucoutouna)	Existing community parks of firewood resilient to climate change in areas identified as the most vulnerable	0	10 community parks (adding to 600,000 ha) in the concerned communal forests, involving men, women and youth, are set up	- Project execution report - Annual management reports of the community parks in the concerned areas	-Good mobilization of local leaders for the setting up of the parks

		2.3.2. The fuelwood supply areas (Zouzounkan for Parakou, Tfougou for Djougou, Dahendé for Natitingou, Fita-Agbado for Bohicon, Zouzounkan and Abomey for Porto-Novo and Cotonou) are protected against bushfires induced and / or enhanced by climate through: i) the development of management **protocols against risks of increase of the frequency** and intensity of wildfires linked to climate; ii) **demonstration bushfire fight methods** resilient to climate around ha of forests	- Bushfire management protocols developed and signed - Demonstration sessions for resilient bushfire fight methods around fuelwood supply forest areas carried out	0 0	At least 4 protocols signed 40 sessions	- Protocols - Protocol signature statement - Session reports - Project execution reports	- No delay in protocol development
		2.3.3. Remunerative activities alternative to forest resources use (beekeeping, horticulture, small livestock breeding, production and maintenance of improved stoves, pressure cookers etc.) in communities of Djidja, Zangnanado, Dassa, Savè, Perere, N'dali, Toukoutouna, are supported to strengthen the resilience of woody formations supplying fuelwood for Cotonou, Porto-Novo, Lokassa, Abomey, Bohicon, Parakou, Malanville	Number of existing remunerative activities alternative to forest resources use (beekeeping, horticulture, small livestock breeding, production and maintenance of improved stoves, pressure cookers etc.)	0	At least 200 activities generating income, involving each year at least 50% women and girls and 50% men and boys achieving activities alternative to forest resources exploitation	- Project annual execution reports - Project monitoring reports	- Proper balance between implementation costs of activities and projected income (i.e. revenues recover the costs)
Component 3: Energy use and production technology transfers to strengthen the resilience of livelihoods and living conditions of the vulnerable communities							

Outcome 3: Reduce vulnerability in the Benin energy sector	3.1. Electricity production and distribution facilities are protected against disasters and other climate risks	3.1.1. **Protective measures for the thermal power plants** of Cotonou (Akpakpa), Porto-Novo, Kandi, Natitingou, against the increase in intensity and frequency of **droughts** and other climate risks and natural disasters are in place	Thermal power plants protective measures are implemented, lowering the risk of breakdowns of the installed capacity during extreme climatic events.	0	At least 2 measures for each station	- Project annual execution reports	- Protective measures are effective
		3.1.2. Protective measures for the distribution network (cables), against winds and raising temperatures are developed.	Protective measures for the distribution network implemented.	0	At least 2 measures by area exposed to a risk within the network	- Project annual execution reports	- Protective measures are effective
	3.2. Development of alternative energy production sources for vulnerable localities	3.2.1. Elaboration of a feasibility study for the development of the renewable energy sector (installation of mini-grids in villages for cooking and lighting)	Existing feasibility study (for each locality)	0	1 study for a vulnerable locality	- Project execution report	-Baseline data are available to develop the study - No delay in the process of recruitment of a qualified Consultant
		3.2.2. Awareness raising and training of men, women and children to renewable energy technology	Existing training plan and awareness campaign	0	1 training program 1 awareness campaign	- Awareness campaign - Training sessions - Training report	- Proper understanding of the new technologies taught during training

		3.2.3. Ten thousand (10,000) improved stoves and a thousand (1,000) pressure cookers are distributed in the most vulnerable rural communities of Djidja, Zangnanado, Dassa, Savè, N'dali Perere, Toukoutouna, Djougou and Bassila and urban centers of Cotonou, Porto Novo, Bohicon, Abomey, Parakou, Natitingou, Djougou, Malanville, Lokossa, Kandi, to reduce household demand for fuelwood	- Technical capacity building program to make improved stoves and pressure cookers, integrating women's specificities - Improved stoves and pressure cookers distributed in the most vulnerable rural communities of the selected areas.	0	1 capacity building program At least 10.000 improved stoves At least 1.000 pressure cookers	- Project annual execution reports	- Improved stoves appropriate given the social context of populations
		3.2.4. Three improved carbonization technologies applied to 100 energy efficient kilns are spread in communities producing charcoal through the training of 500 coal operators	- Improved carbonization technologies spread in charcoal production communities, integrating gender needs and specificities. - Number of improved kilns built and functioning among charcoal production communities	0 0	At least 3 technologies At least 500 operators (50% men / 50% women), adult and youth, trained 100 kilns	- Training sessions - Training reports - Training monitoring reports	-Technologies appropriate given the social context of populations
	3.3. (in common with the biomass project): Increased investment in clean energy technologies and	3.3.1 Financial Support Mechanism established and capitalized to support private investment in adaptive measures to increase the resilience of the energy sector to CC.	FSM operationalized with a policy framework and an investment manual with fiduciary principles, ESS and risk coverage criteria	0	1		

	low-carbon practices in the agro-forestry waste sector, and in adaptive measures to increase the resilience of the energy sector to CC.	MOU signed with Central Bank Benin (or with commercial bank selected on the basis of competitive bidding — to be discussed during mission) setting out the objective, funding mechanism and administration rules regarding its participation as fiduciary agent of the FSM.	MOU drafted, finalised, signed and enforced with Central Bank, paving the way for a financial climate protection mechanism in the energy sector	0	1		
		3.3.2. Financial and other incentives to be provided to project developers/Independent Power Producers (IPPs) towards low-carbon climate resilient investments in the energy sector.	Incentives to be provided by Government to project developers/Independent Power Producers (IPPs) approved and operationalised with climate risks reduction coverage mechanisms (eg weather risk insurance-related solutions such as LPC and LPP).	0	1	- Project documentation.	Good cooperation of Government entities and staff.

V. Table budget and Work Plan

Award ID:	00090819	Project ID(s):	00096410
Award Title:	PIMS 4979 GEF LDCF Energy project		
Business Unit:	BEN10		
Project Title:	Reducing vulnerability of the Beninese energy sector to the impacts of climate change		
PIMS no.	4979		
Implementing Partner Executing Agency)	MERPMEDER		

Components	Responsible party	Source of Funds	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount (USD) Year 1	Amount (USD) Year 2	Amount (USD) Year 3	Amount (USD) Year 4	Amount (USD) Year 5	Amount (USD) Total	Notes
1. Strengthening adaptation capacities of the energy sector to climate changes	MERPM EDER	62160	GEF	71200	International Consultants	50,000	50,000	50,000	50,000	50,000	250,000	1
		62160	GEF	71300	Local consultants	40,000	40,000	40,000	40,000	40,000	200,000	2
		62160	GEF	71600	Travel	15,000	15,000	15,000	15,000	15,000	75,000	3
		62160	GEF	72200	Equipment & Furniture	10,000	10,000	10,000	10,000	10,000	50,000	4
		62160	GEF	74200	Audio Visual & Print Prod Costs	10,000	10,000	10,000	10,000	10,000	50,000	5
		62160	GEF	75700	Training, workshop, meetings	40,000	40,000	40,000	40,000	40,000	200,000	6
		62160	GEF	74500	Miscellaneous	5,000	5,000	5,000	5,000	5,000	25,000	7
		Total GEF Outcome 1				170,000	170,000	170,000	170,000	170,000	850,000	
		4000	UNDP	72100	Contractual Services - Companies	15,000	15,000	15,000	15,000	10,000	70,000	8
		4000	UNDP	71400	Contractual Services - Individuals	15,000	15,000	15,000	10,000	10,000	65,000	9
		Total UNDP Outcome 1				30,000	30,000	30,000	25,000	20,000	135,000	
		Total Outcome 1				200,000	200,000	200,000	195,000	190,000	985,000	
2. Energy supply strategies and plans to integrate climate change	MERPM EDER	62160	GEF	71200	International Consultants	60,000	60,000	60,000	60,000	60,000	300,000	10
		62160	GEF	71300	Local consultants	45,000	45,000	45,000	45,000	45,000	225,000	11
		62160	GEF	71600	Travel	20,000	20,000	20,000	20,000	20,000	100,000	12
		62160	GEF	72100	Contractual Services-Companies	300,000	300,000	300,000	300,000	300,000	1,500,000	13
		62160	GEF	75700	Training, workshop, meetings	40,000	40,000	40,000	40,000	40,000	200,000	14

and adaptation measures		62160	GEF	72200	Equipment & Furniture	10,000	10,000	10,000	10,000	10,000	50,000	15
		62160	GEF	74500	Miscellaneous	5,000	5,000	5,000	5,000	5,000	25,000	7
		Total GEF Outcome 2				480,000	480,000	480,000	480,000	480,000	2,400,000	
3. Reducing the climate vulnerability of energy supply sources in Benin	MERPM EDER	62160	GEF	71200	International Consultants	60,000	60,000	60,000	60,000	60,000	300,000	16
		62160	GEF	71300	Local consultants	40,000	40,000	40,000	40,000	40,000	200,000	17
		62160	GEF	71600	Travel	25,000	25,000	25,000	25,000	25,000	125,000	18
		62160	GEF	72100	Contractual Services-Companies	500,000	500,000	500,000	500,000	500,000	2,500,000	19
		62160	GEF	74200	Audio Visual & Print Prod Costs	10,000	10,000	10,000	10,000	10,000	50,000	20
		62160	GEF	75700	Training, workshop, meetings	25,000	25,000	25,000	25,000	20,000	120,000	21
		62160	GEF	72100	Equipment & Furniture	10,000	10,000	10,000	10,000	10,000	50,000	22
		62160	GEF	72600	Grants	500,000	500,000	-	-	-	1,000,000	23
		62160	GEF	74500	Miscellaneous	5,000	5,000	5,000	5,000	5,000	25,000	7
		Total GEF Outcome 3				1,175,000	1,175,000	675,000	675,000	670,000	4,370,000	
Project Management		62160	GEF	71300	Local consultants	36,000	36,000	36,000	36,000	36,000	180,000	24
		62160	GEF	71600	Travel	12,000	12,000	12,000	12,000	12,000	60,000	25
		62160	GEF	72200	Equipment & Furniture	15,000	15,000	15,000	15,000	15,000	75,000	26
		62160	GEF	74599	Direct Project Cost	10,000	10,000	10,000	10,000	10,000	50,000	27
		62160	GEF	74500	Miscellaneous	3,000	3,000	3,000	3,000	3,000	15,000	7
		Total GEF Project Management				76,000	76,000	76,000	76,000	76,000	380,000	
	MERPM EDER	4000	UNDP	72100	Contractual Services - Companies	25,000	25,000	25,000	25,000	25,000	125,000	28
		4000	UNDP	71400	Contractual Services - Individuals	25,000	25,000	25,000	25,000	25,000	125,000	29
		4000	UNDP	74599	Direct Project Cost	20,000	20,000	20,000	20,000	20,000	100,000	30
		4000	UNDP	74500	Miscellaneous	3,000	3,000	3,000	3,000	3,000	15,000	7
		Total UNDP Project Management				73,000	73,000	73,000	73,000	73,000	365,000	
		Total Project Management				163,000	163,000	163,000	163,000	163,000	815,000	
		Total GEF				1,901,000	1,901,000	1,401,000	1,401,000	1,396,000	8,000,000	
		Total UNDP				103,000	103,000	103,000	98,000	93,000	500,000	
		TOTAL Project				2,003,000	2,003,000	1,503,000	1,498,000	1,493,000	8,500,000	

Budget Notes:

1	*International expert will, with assistance of local consultants, set up a multi-stakeholder platform to facilitate dialogue between decision-makers in different sectors related to energy, and decision-making on the competing use of energy sources and on cross-cutting issues related to the production, access and energy efficiency in relation to climate change*
2	*Local consultant will be hired to support the design of the platform*
3	*International/domestic travel to project sites*
4	*Equipment costs cover promotion documents and equipment*
5	*Printing and reproduction of legal and technical documentation*
6	*Training program implemented for 500 players in the sectors related to energy to: i) identify climate risks for the energy sector; ii) design and implement adaptation measures; iii) integrate climate risks and parameters in key policies of the energy sector, in the energy planning tool GEOSIM, and in planning processes of energy supply and demand;*
7	*Miscellaneous costs: insurance, bank charges, security and other blended costs.*
8	*Contractual services companies will help in to set up a multi-stakeholder platform to facilitate dialogue between decision-makers in different sectors related to energy, and decision-making on the competing use of energy sources and on cross-cutting issues related to the production, access and energy efficiency in relation to climate change*
9	*Contractual services individuals will help in to set up a multi-stakeholder platform to facilitate dialogue between decision-makers in different sectors related to energy, and decision-making on the competing use of energy sources and on cross-cutting issues related to the production, access and energy efficiency in relation to climate change*
10	*International experts hired to support design, enactment and enforcement of energy supply strategies and plans to integrate climate change and adaptation measures*
11	*Local consultants hired to support strategy design, enact and enforcement*
12	*International/domestic travel to project sites*
13	*Companies hired to help with reforestation and community infrastructure, restoration and preservation of watershed ecosystems activities*
14	*Training men, women and children to income generating activities*
15	*Equipment costs cover training documents and equipment*
16	*International expert will, with assistance of local consultants, develop adaptive measures to increase the energy sector resilience to climate change and renewable energies*
17	*Local consultant will be hired to support the development of those adaptive measures and renewable energies*
18	*International/domestic travel to project sites*
19	*Companies hired to help with the implementation and diffusion of those adaptive measures and renewable energies*
20	*Printing and reproduction of legal and technical documentation*
21	*Training men, women and children to renewable energy technology*
22	*Equipment costs cover training documents and equipment*
23	*Financial Support Mechanism established and capitalized to support private investment in adaptive measures to increase the resilience of the energy sector to CC.*
24	*Project Personnel/management cost*
25	*International/domestic travel to project sites*
26	*Equipment and furniture for Project Management Unit*
27	*Salary of Project Personnel*
28	*Engagement of a qualified service provider*
29	*Local professional will be hired to manage the project*
30	*Other Project cost*

Co-financing table:

Sources of Cofinancing	Name of Cofinancer	Type of Cofinancing	Amount ($)
National Government	MERPMEDER through Directorate of Energy	In kind	**7,000,000**
National Government	MERPMEDER through Directorate of Energy	Grant	**1,000,000**
National Government	MERPMEDER through PAGEFCOM	Grant	**8,000,000**
National Power Utility	CEB (Electricity Community of Benin)	In kind	**15,000,000**
GEF Agency	UNDP	Grant	**500,000**
NGO	GoodPlanet	In kind	**70,000**
Total Cofinancing			**31,570,000**

VI. Management arrangements

The project will be managed by an organizational structure described in the diagram below. The project will be implemented by the MERPMEDER and UNDP, with other responsible organizations (including the ministries related to agriculture, environment and finance), and in close consultation with other stakeholders.

A common management organization will be established with the biomass project in order to coordinate their activities.

The project will be implemented according to the guidelines of the UNDP projects executed nationwide (NIM modality) the implementing partner for this project will be. The project meets the objectives of the UNDAF framework, and as such, the responsibility of the execution returns to the Government.

Instances and governing bodies of the project:

Following a reform of the UNDP Country Program the project NAPA Energy will be managed within the Directorate General of Energy, however, neither of the two projects (NAPA Energy or Biomass) will have a dedicated Steering Committee. There will be a **unique Steering Committee** for all the projects managed under the Environment Unit.

In other words the Steering Committee of the Sub-programme Environment –Climate Change and Sustainable Development that will be hosted by the Secretariat General of the Ministry of Environment will serve as a common steering committee for both Energy projects (NAPA Energy or Biomass).

The Steering Committee, will provide strategic direction and approve the annual budget of the project. The Steering Committee will also examine the various project activities, through activities provided by the project management team (PMT) reports. The Steering Committee is the organ of key project decision. It is chaired by the Ministry of Environment, and consists of representatives of UNDP, the government, the private sector and other donors contributing to the financing of the project.

The project will be implemented according to the guidelines of the UNDP projects executed nationwide. The project meets the objectives of the UNDAF framework, and as such, the responsibility of the execution returns to the Government.

Therefore the project will have a **Technical Committee**, in common with the Biomass project, hosted by the Directorate General for Energy. The DGE will coordinate and oversee the delivery and execution of the projects.

Resources of the project:

Another element of the country's reform program is that the projects will not have dedicated coordinators. In order to ensure national ownership, the Government

administrations, in which the projects are hosted, will ensure the Technical and Operational Coordination of projects. Technical or General Directors will designate a **National Focal Point** for the coordination of each project. The Focal Point who will be a state official (civil servant) shall not be paid by the project grant since he would already receive a salary as a civil servant. However he will be granted a bonus or incentive paid from the national co-financing that the Government will allocate to the project.

The National Focal Point will have the following tasks:

- Coordinate project activities with activities of other government bodies;
- Supervise project expenditures in accordance with the work plans and approved by the Steering Committee budgets;
- Assist, monitor and report on the markets and the implementation of activities within the deadlines set by the PTA;
- Accept the terms of reference for consultants and tendering documents for the inputs resulting in a subcontracting;
- Make reports to UNDP on the implementation and impacts of the project.

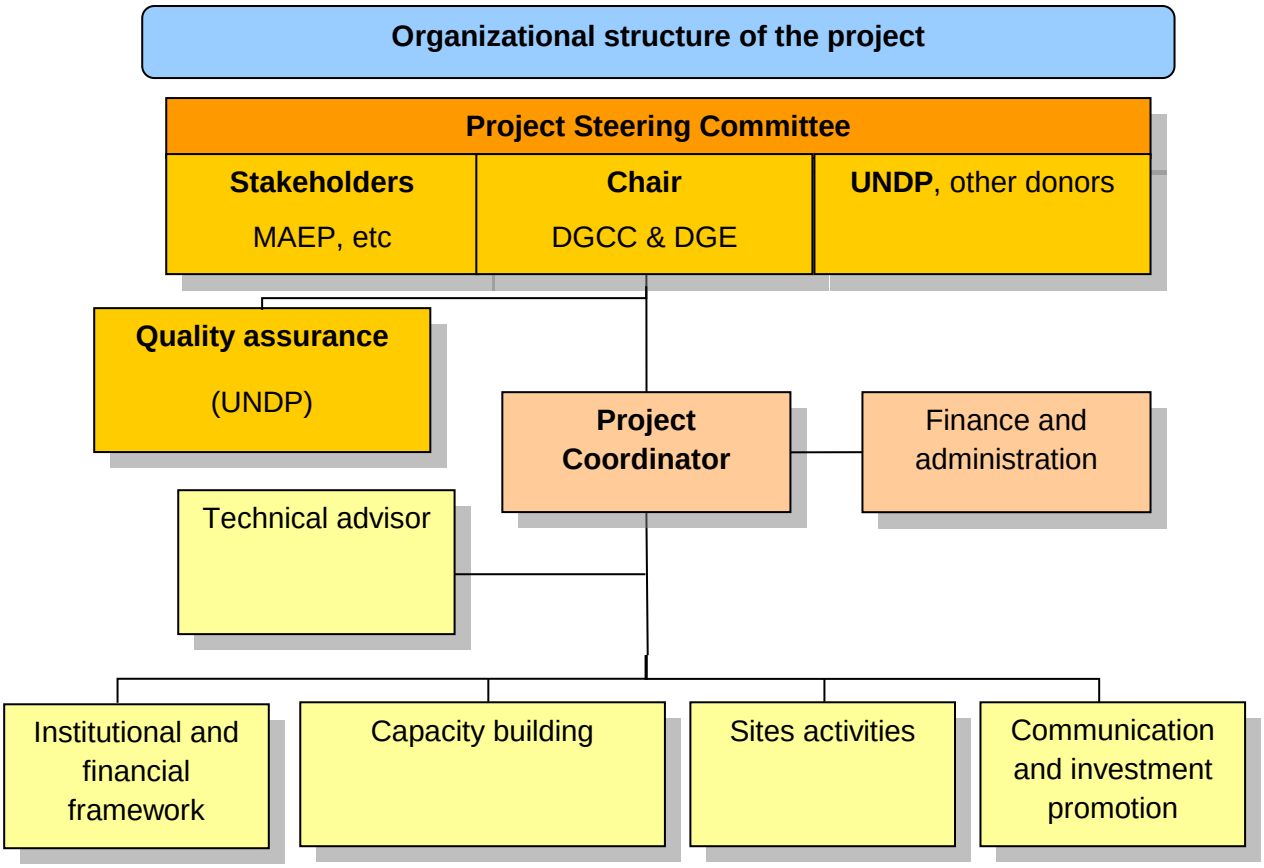
The fact remains that for technical requirements, **Technical experts** will assist the National Focal Point. They will be recruited to lead the implementation of specific technical activities of the project components. In the present case, this means that for both the Biomass and NAPA Energy Projects, it is expected that technical experts will be recruited (e.g. adaptation specialist in the area of energy or mitigation specialist in the energy sector). Other specific expertise will be called upon in order to cover specificities of each project to be implemented for which the country has no capacity. Contacts should be established with experts and institutions of other countries that have already implemented similar projects to strengthen energy resilience to climate change and with useful experience.

An Administrative and Financial Manager is scheduled and budgeted for a year of implementation for the two projects. The person will also be a state official.

Organization of the management of the project:

The Project Steering Committee (PSC) will make management decisions consensus when the National Focal Point will seek his advice. PPC reviews and approves quarterly work plans where required, based on the Annual Work Plans (AWP) approved in advance. He must give his permission for any major modification work plans quarterly or annual. In addition, it approves the appointment and defining the responsibilities of the National Focal Point and any delegation of responsibilities to the Project Manager in terms of quality and assurance.

Figure 10: Organization of the management of the project



The PSC will meet quarterly. Other stakeholders may be invited to meetings on time if circumstances require, by decision of the PSC. However, the PSCwill remain small enough to be fully operational. The final list of members of the PSC will be completed at the start of project activities, and presented in the Inception Report. The Inception Report will include the roles envisaged for different members of the PSC. The National Focal Point will attend meetings of the PSCas a non-voting member, and will be responsible for writing a summary of the discussions and conclusions of each of these meetings.

The daily management of the project is provided by a Project Management Team (PMT), under the overall leadership of the PSC, and in the daily conduct of the Project Manager. The PMT is based in Cotonou, and reports to the UNDP, the executing agency and the PSC. In addition to the National Focal Point, the PMT will consist of a project assistant and an accountant.

The estimated budget of the project integrates fully operational costs related to the Project Team and the Steering Committee of the Project, as well as travel required of the project team on the ground. This will ensure the effectiveness of project management in respect of funds allocated by the GEF and other donors.

UNDP CO will support the monitoring and overall management of the project budget. He will be responsible for monitoring the implementation of the project, the submission of reports within the required timeframe, the Regional Coordination Unit of UNDP and GEF,

and organization journals and mandatory evaluations (and possibly further, if necessary) of the project. It will assist the implementing agency by providing expert services and other project inputs it needs, and administering the various contracts. In addition, UNDP will contribute to the coordination and linking with other initiatives and institutions related to the project in the country.

In order to achieve the objectives and expected outcomes for the project, it is essential to closely monitor the progress of various project components. This monitoring must be done by both stakeholders and local authorities and by international advisers of the project. First, they contribute to the finalization of work plans for each project component and the provisions of the project. They will then follow the project implementation phase. Facilitate the identification of potential risks violating the successful completion of this project organization aims. This will be implemented, if necessary adaptive management of the project early corrective actions to the risks encountered.

In order to give proper recognition to the GEF for funding it provides, the GEF logo will appear on all publications of the GEF project involved, and the equipment purchased with GEF funds. Quotations related to other GEF projects in the publications of the project should also be appropriate mention of the GEF.

VII. Monitoring framework, evaluation, reporting and audit

The project will be monitored through the following M&E activities.

Project start:

A Project Inception Workshop will be held within the first 2 months of project start with those with assigned roles in the project organization structure, UNDP country office and where appropriate/feasible regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

The Inception Workshop should address a number of key issues including:

a) Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP CO and RCU staff vis-à-vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.
b) Based on the project results framework and the relevant GEF Tracking Tool if appropriate, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.
c) Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.
d) Discuss financial reporting procedures and obligations, and arrangements for annual audit.
e) Plan and schedule Project Board meetings. Roles and responsibilities of all project organization structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

Quarterly:

- Progress made shall be monitored in the UNDP Enhanced Results Based Managment Platform.
- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP GEF projects, all financial risks associated with financial instruments such as revolving funds, microfinance schemes, or capitalization of value chain actors are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical).
- Based on the information recorded in ATLAS, a Project Progress Reports (PPR) can be generated in the Executive Snapshot.

- Other ATLAS logs can be used to monitor issues, lessons learned etc... The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

Annually:

- Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared to monitor progress made since project start and in particular for the previous reporting period (1 July to 30 June). The APR/PIR combines both UNDP and GEF reporting requirements.

The APR/PIR includes, but is not limited to, reporting on the following:

- Progress made toward project objective and project outcomes — each with indicators, baseline data and end-of-project targets (cumulative)
- Project outputs delivered per project outcome (annual).
- Lesson learned/good practice.
- AWP and other expenditure reports
- Risk and adaptive management
- ATLAS QPR
- Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

Periodic Monitoring through site visits:

UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

Mid-term of project cycle:

The project will undergo an independent Mid-Term Review at the mid-point of project implementation. The Mid-Term Review will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the Mid-Term Review will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-Term Review will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the UNDP

Evaluation Office Evaluation Resource Center (ERC). The relevant GEF Focal Area Tracking Tools will also be completed during the Mid-Term Review cycle.

End of Project:

An independent Final Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and GEF guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the Mid-Term Review, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

The Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the UNDP Evaluation Office Evaluation Resource Center (ERC).

The relevant GEF Focal Area Tracking Tools will also be completed during the final evaluation.

During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

Learning and knowledge sharing:

Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

Audit Clause:

Audit will be conducted according to UNDP Financial Regulations and Rules and applicable Audit policies.

Table 15: Project Monitoring and Evaluation workplan and budget

Type of M&E activity	Responsible Parties	Budget USD Excluding project team staff time	Time frame
Inception Workshop and Report	Project Manager PMT (Project Management Team – GoB-UNDP) UNDP CO, UNDP GEF	Indicative cost: $50,000	Within first two months of project start up with the full team on board
Measurement of Means of Verification of project results.	UNDP GEF RTA/Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members. PMT, esp. M&E expert	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on output and implementation	Oversight by Project Manager PMT, esp. M&E expert Implementation teams	To be determined as part of the Annual Work Plan's preparation. Indicative cost is $100,000	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	Project manager PMT UNDP CO UNDP RTA UNDP GEF	None	Annually
Periodic status/ progress reports	Project manager and team	None	Quarterly
Mid-term Review	Project manager PMT UNDP CO UNDP RCU External Consultants (i.e. evaluation team)	Indicative cost: $100,000	At the mid-point of project implementation.

Type of M&E activity	Responsible Parties	Budget USD Excluding project team staff time	Time frame
Terminal Evaluation	Project manager PMT UNDP CO UNDP RCU External Consultants (i.e. evaluation team)	Indicative cost : $100,000	At least three months before the end of project implementation
Audit	UNDP CO Project manager PMT	Indicative cost per year: $8,000 ($40,000 total)	Yearly
Visits to field sites	UNDP CO UNDP RCU (as appropriate) Government representatives	For GEF supported projects, paid from IA fees and operational budget	Yearly for UNDP CO, as required by UNDP RCU
Total indicative cost **Excluding project team staff time and UNDP staff and travel expenses**		**US$ 450,000**	

VIII. Legal context

This document together with the CPAP signed by the Government and UNDP which is incorporated by reference constitute together a Project Document as referred to in the Standard Basic Assistance Agreement (SBAA) and all CPAP provisions apply to this document.

Consistent with the Article III of the Standard Basic Assistance Agreement, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

The implementing partner shall:

- put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;
- assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP/GEF hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via http://www.un.org/sc/committees/list_compend.shtml. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

The UNDP Resident Representative in Benin is authorized to effect in writing the following types of revision to this Project Document, provided that he/she has verified the agreement thereto by the UNDP Regional Coordination Unit and is assured that the other signatories to the Project Document have no objection to the proposed changes:

- Revision of, or addition to, any of the annexes to the Project Document;
- Revisions which do not involve significant changes in the immediate objectives, outputs or activities of the project, but are caused by the rearrangement of the inputs already agreed to or by cost increases due to inflation;
- Mandatory annual revisions which re-phase the delivery of agreed project inputs or increased expert or other costs due to inflation or take into account agency expenditure flexibility; and

- Inclusion of additional annexes and attachments only as set out here in this Project Document

Standard text has been inserted in the template. It should be noted that although there is no specific statement on the responsibility for the safety and security of the executing agency in the SBAA and the supplemental provisions, the second paragraph of the inserted text should read in line with the statement as specified in SBAA and the supplemental provision, i.e. “the Parties may agree that an Executing Agency shall assume primary responsibility for execution of a project.”

If the country has signed the *Standard Basic Assistance Agreement (SBAA)*, the following standard text must be quoted:

This document together with the CPAP signed by the Government and UNDP which is incorporated by reference constitute together a Project Document as referred to in the SBAA [or other appropriate governing agreement] and all CPAP provisions apply to this document.
Consistent with the Article III of the Standard Basic Assistance Agreement, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP’s property in the implementing partner’s custody, rests with the implementing partner.
The implementing partner shall:

a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;
b) assume all risks and liabilities related to the implementing partner’s security, and the full implementation of the security plan.

UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.
The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via http://www.un.org/sc/committees/list_compend.shtml. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

If the country has not signed the SBAA, the following standard text must be quoted:

This document together with the CPAP signed by the Government and UNDP which is incorporated by reference constitute together the instrument envisaged in the Supplemental Provisions to the Project Document, attached hereto.

Consistent with the above Supplemental Provisions, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.
The implementing partner shall:

a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;
b) assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via http://www.un.org/sc/committees/list_compend.shtml. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

The following standard text for a global/ multi country and regional projects should be included:

This project forms part of an overall programmatic framework under which several separate associated country level activities will be implemented. When assistance and support services are provided from this Project to the associated country level activities, this document shall be the "Project Document" instrument referred to in: (i) the respective signed SBAAs for the specific countries; or (ii) in the Supplemental Provisions attached to the Project Document in cases where the recipient country has not signed an SBAA with UNDP, attached hereto and forming an integral part hereof.

This project will be implemented by the agency (name of agency) ("Implementing Partner") in accordance with its financial regulations, rules, practices and procedures only to the extent that they do not contravene the principles of the Financial Regulations and Rules of UNDP. Where the financial governance of an Implementing Partner does not provide the required guidance to ensure best value for money, fairness, integrity, transparency, and effective international competition, the financial governance of UNDP shall apply**.**

The responsibility for the safety and security of the Implementing Partner and its personnel and property, and of UNDP's property in the Implementing Partner's custody, rests with the Implementing Partner. The Implementing Partner shall: (a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried; (b) assume all risks and

liabilities related to the Implementing Partner's security, and the full implementation of the security plan. UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

The Implementing Partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via *http://www.un.org/sc/committees/list_compend.shtml*. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

IX. ANNEXES

Annex A: Analysis of stakeholders in Benin

The energy sector covers many issues. As a consequence, it involves a high number of stakeholders. They are listed below, as well as other technical and financial partners of this project.

National and Local Institutions

The **Ministry of Energy, Oil and Mine Research, Water and Renewable Energy Development (MERPMEDER)** is the executing agency of this project.

The **Beninese Electric Community (CEB)**[63] was created in 1968, to launch a common electricity policy between Togo and Benin. CEB is a public international organization, which essential missions are to:

- build and operate, according to the rules applied by industrial and commercial companies, electric power generation facilities for the needs of both States;
- build and operate, according to the rules applied by industrial and commercial companies, transportation facilities of electric power on the territories of the two states as the exclusive carrier. In addition, it receives the single buyer privileges for the needs of both States;
- conclude, if necessary, with the neighboring countries of the two States, agreements on the import of electrical energy, each State undertaking not to conclude any separate agreement of electric power import;
- conclude, if necessary, export agreements for the excess electrical energy with neighboring countries of the two states;
- conclude, if necessary, with the neighboring countries of the two states, agreements on the transit of electrical energy ;
- ensure, through its Centre of Professional Training and Improvement, selection, training and development for enterprises of the two States without exception;
- plan production and transportation of electric power in conjunction with the ministries of electricity for the needs of both States;
- exercise, for the benefit of both states, the assignments of repair and maintenance center, central purchasing of materials and equipment, and engineering, provided that these missions are not binding on CEB.

[63] http://www.cebnet.org/

The **Beninese Society of Electric Energy (SBEE)**[64] is a public company created and designed to transport and distribute electricity on the national territory, buying it from the CEB. It currently furnishes electricity to 400,000 people. It regroups a national headquarter, 8 regional directorates and 22 agencies distributed throughout the country.

The **internal electrical installations control agency (CONTROLEC)** is a structure of the Ministry of Energy, aimed at controlling and protecting installations through awareness raising and support to companies and households. It was launched in May 2013. CONTROLEC is in charge of electrical diagnoses, and of support to those who have power failures, in order to reduce the risks of hazards to people and to reduce energy consumption[65].

The **Beninese Environment Agency (ABE)**[66] is the support institution to the national environmental policy. It is in charge of the implementation of the environmental policy defined by the Government, in partnership with national qualified institutions. It promotes the integration of environmental issues into sector policies and strategies.

The **Beninese Agency for Rural Electrification and Energy Management (ABERME),** is in charge of the implementation of the national policy on rural electrification and energy management (cf. the Decree No. 2004-424 of 4 August 2004 adopting its statutes). More specifically, it is responsible for:

- Strategic studies, national and regional development programs elaboration, supervision and monitoring;
- Demonstration pilot projects;
- Support to projects of various stakeholders through stimulation of local initiative, technical assistance and other services;
- Proposing incentive measures likely to help promote energy management and private investment in rural electrification;
- Conducting investment projects benefitting from incentive measures for the promotion of rural electrification and energy management;

[64] http://www.sbee.bj/
[65] http://www.lapressedujour.net/archives/24955
[66] http://www.abe.bj/

- Contributing to the development and strengthening of the national private sector in the fields of technical services, equipment supply and other needs of rural electrification and energy management;
- Contributing to the research and development of innovative low-cost technologies.

The **National Agency for the Development of Renewable Energy and Energy Efficiency (ANADER)** is a newly created agency (in June 2014 by Decree No. 2014-376 of 25 June 2014) to serve as an interface to the International Renewable Energy Agency (IRENA)[67]. Its overall objective is to encourage the development of renewable energy to meet the energy needs of Benin, and to provide equal access to services.

The **African Guarantee and Economic Cooperation Fund (FAGACE)**[68] is an international public institution of focused on economic and financial aspects for the promotion of public and private investment. It was created in 1978 and counts 14 member States[69]. Based in Cotonou, its purpose is to contribute to the economic and social development of its member States, individually or collectively, by participating in the financing of development projects or facilitating their implementation by accompanying measures or the lengthening loan terms.

The **Ministry of Energy, Mining and Petroleum Exploration, Water and Renewable Energy Development (MERPMEDER)** is mandated to responsibly manage and to sustainably develop Benin's Energy Sector for the benefit of all of its citizens. The key structure in relation to the project is the Directorate General for Energy, created by Decree No. 28 / MMEH / DC / SGM / CTRNE / DGE / SA of 28 May 2004, assigning (Article 1) it "to provide, in conjunction with the competent national structures, the policy in the energy sector and ensure its implementation".

The **Ministry for Environment, climate change management, reforestation and protection of natural and forest resources** is in charge of the development of climate change related policies and strategies, and the focal point to the UNFCCC. It is involved in the management of the power sector through two structures it supervises. This is the General Directorate of Forestry and Natural Resources (DGFRN) and Directorate General of the Office National du Bois (ONAB). Both structures feed the sub-sector of the production of wood energy through (i) natural forests, (ii) semi-natural

[67] http://www.irena.org/
[68] http://www.le-fagace.org/
[69] Benin, Burkina Faso, Cameroon, Central African Republic, Congo Brazzaville, Côte d'Ivoire, Guinea-Bissau, Mali, Mauritania, Niger, Rwanda, Senegal, Chad and Togo

forests and (iii) planted forests (Article 3 of the law 93-009 02 July 1993) and residues from the processing of timber (sawdust, wood chips, etc.).

The **Ministry of Economy, Finance and Denationalization Programs (MEFPD)** is, among others, in charge, through the Directorate General for Economic Affairs, of the supervision of the financial mechanisms and guarantees.

The **Ministry of Agriculture, Livestock and Fisheries (MAEP)** is in charge of the agricultural development.

The **Ministry for the Evaluation of Public Policies, Programs and Denationalization** is involved in the monitoring and evaluation of any project, such as those implemented by UNDP.

The **Ministry at the Presidency of the Republic** is in charge of the coordination of the policies related to the Millennium Development Goals (MDGs) and the Sustainable Development Goals (SDGs). It operates through the Electricity Regulatory Authority established by Decree No. 2009-182 of 13 May 2009 and placed under the authority of the President of the Republic, Article 2. From the Article 3, the Authority's mission is to "ensure compliance with legislation and regulations governing the electricity sector, protect the public interest and ensure continuity and quality of service, the sector financial balance and harmonious development ".

The **Central Bank of West African States (BCEAO)**[70] is the common central bank of the eight West African countries which comprise the West African Economic and Monetary Union (UEMOA)[71], characterized by the recognition of a common monetary unit, the Franc of the African Financial Community or CFA Franc. It was established in Dakar in 1962 with the responsibility of monetary and finance policies. The BCEAO is in charge of centralizing reserves of the Union, monitoring the national accounts of member states, managing the monetary policies of member states, and defining bank legislation for national banks and financial institutions.

Private Structures

[70] http://www.bceao.int/
[71] http://www.uemoa.int/

The **Chambre of Commerce and Industry of Benin (CCIB)**[72] is responsible for the representation, the protection and the promotion of the common interests of economic operators of the Republic of Benin in the areas of Trade, Industry and Services. It was created in 1908, and it is now a public institution under the supervision of the Ministry of Commerce. Its jurisdiction covers the entire national territory. It can administer, on delegation of the relevant authority, public services, public works, and ensure mastery of public works. It may, in compliance with laws and regulations, adopt general or targeted measures of regulation of certain sectors of the economic activity.

The **inter-professional association of renewable energy companies (AISER)** aims to help the Government develop renewable energy throughout national territory, at sustainable costs for the population, and to develop economic activities around the sector. This private initiative was created in 2011 with the support of ABERME, in a context where 300 Benin localities on 3,767 benefited from electric energy[73].

The **partnership and expertise center for sustainable development (CePED)**[74] is a scientific and social center, under the supervision of the plan Ministry. It took over the Beninese Center for Sustainable Development (CBDD), and aims to promote all components of sustainable development: economic development, ecological sustainability, social justice.

The **National Employers Council (CNP)** of Benin is composed of 19 employers groups issued from the CCIB. It was created in 1984 by employers' associations and professional groups who wanted to regroup into a single organization, which has become the main interlocutor for the Government to represent the interests of and promote the private sector. It is also the interface between companies and the labor administration.

The **National Society for Agricultural Promotion (SONAPRA)** is Benin's main Cotton society. It was originally a public structure, but it is now becoming private.

<u>Academic and professional institutions</u>

[72] http://www.ccibenin.org/

[73] http://bj.jolome.com/news/article/creation-de-l-association-interprofessionnelle-de-specialistes-des-energies-renouvelables-au-benin-l/?redirect_from_n

[74] http://www.ceped-benin.org/index.php?option=com_content&view=frontpage&Itemid=1

The **Polytechnical school of Abomey-Calavi (EPAC)** is a higher and professional education institution based in the university center of Abomey-Calavi. It mainly trains engineers for the biology and industrial sectors.

The **Faculty of Agronomic Sciences (FSA)** is also attached to the University of Abomey-Calavi. It was created in 1970, and it is a public institution in charge of professional education, improvement, research and support to development, in the sectors of Agriculture and Rural Development.

The **Laboratory for Applied Ecology (LEA)**[75] was created in 1994 and is part of the Faculty of Agronomic Sciences (FSA) at the University of Abomey-Calavi (UAC-Benin). It is one of the most advanced research institutions on natural resources in West Africa. Activities for the LEA deal with capacity building through training, basic research and applied research for development.

The **National Institute of Agricultural Research in Benin (INRAB)**[76] is the national institution in charge of agricultural research, to address the national and international issues of agriculture and development. It was created in 1992, and is under the supervision of the MAEP. Its mission is to produce technologies for the rural sector that do not harm natural resources, and to contribute to the progress of science.

The **National Institute of Statistics and Economic Analysis (INSAE)**[77] is a public scientific institution, created in 1973 and placed under the supervision of the Ministry of Statistics. Its missions are to present reliable, scientific statistics to the Government; to produce and help produce useful quantitative information for decision-making and management; and to ensure the Secretariat of the National Council on Statistics.

Civil society

The **Organization of Women for energy and environment management, and integrated development promotion (OFEDI)** is a Beninese civil organization which seeks to address development issues related to energy, climate change and environment. It participates in research-action activities, implements projects, and participates in national and international meetings on energy and the environment.

[75] http://leabenin-fsauac.net/en/
[76] http://inrab.org/
[77] http://www.insae-bj.org/

The **Consortium Alafia**[78] is the Professional Association of Decentralized Financial Systems (APSFD) of Benin. It was created in March 2000 as a result of the institutional transformation of the sub-regional network for the development of microfinance, and following the adoption by Benin of the law regulating the decentralized financial system. The Consortium has 39 member institutions and microfinance networks.

Technical and Financial Partners

The **French Development Agency (AFD)** intervenes in Benin since 1960[79]. Its activities aim to support the economic growth of the country and the achievement of the Millennium Development Goals (MDG). Targeted sectors include education, agriculture, infrastructures, environment and health, for a current amount of 52 million EUR. Benin is one of the 17 priority countries set for AFD. AFD is currently setting up a 25 million EUR loan for the energy sector. It also supports the private sector through various financial instruments.

The **German cooperation** in its general appellation encompasses the **GIZ** and **KfW**, the first body being technical while the second is financial. German cooperation in Benin targets the following areas of investment: water supply, rural development, education and the decentralization of administrative structures.

The **Stechting Nederlandse Vrijwilligers (SNV)**[80] is an international not-for-profit development organization from the Netherlands. SNV has been on the ground in Benin since 1970, providing development solutions that have evolved in-line with the changing environment and needs of the country. It initiated for instance a Renewable Energy programme in 2008.

The **European Commission (EC)**[81] is an important technical and financial partner of Benin. Their cooperation is based on the Cotonou Agreement whose general objective is to promote a common strategic approach to poverty reduction that is consistent with the objectives of sustainable development and the gradual integration of ACP countries into the world economy.

[78] http://www.alafianetwork.org/
[79] http://www.afd.fr/home/pays/afrique/geo-afr/benin
[80] http://www.snvworld.org/en/countries/benin
[81] http://www.eeas.europa.eu/delegations/benin/index_fr.htm

Local authorities

The local authorities in the project intervention sites will be involved, especially for income generating activities.

Annex B: Review of national projects, policies, legislations and strategies

The legal framework that organizes the energy sector is made of a set of national and supranational legislation but also regulations. The two major laws specific to the electricity sector are the Benin-Togo Electricity Code and the Law 2006-16 of 27 March 2007 laying the electrical code in Benin. Other texts of more general importance are the Law n°93-009 from July 2nd, 1993 on the regimes of forests, (2002-16) the Law from October 18th, 2004 on fauna and 2013-01 the Law of August 14th, 2013 concerning land and federal code.

2.4.1. Regulatory framework for the energy sector

The Benin-Togo Electricity Code

The electricity sectors in Togo and Benin are governed by one agreement called the International Agreement for the Benin-Togo Code of Electricity. It was signed between the two countries on July 27th, 1968. It provided to the Communauté Electrique du Bénin (CEB)[82] the monopoly for the production, transportation and import & export of electricity over the two countries. Due to new development requirements in the electric sub-sectors in both countries, the International Agreement about the Benin-Togo Electricity Code was revised on December 23rd, 2003. It was ratified by Benin under the Law n° 2005-01 from January 12, 2005 published by the *Journal Officiel de la République du Bénin n° 14 bis*, July 19, 2007[83] and by Togo in 2006.

The major changes in the new Code concern the opening of the production segment to private producers, or Independent Power Producers (IPPs) and the granting of the status of “Unique Buyer” to the CEB for the IPPs’ production in the areas where the CEB has transmission lines. The intervention of the IPPs is organized under the section of the revised article L8 which is sets to two essential aspects: 1) the conclusion of an agreement (concession or other) with the State is specified and 2) the signature with the CEB or, where appropriate, with the SBEE or any third party in the neighboring countries of a purchase and sale agreement on electric energy.

[82] http://www.cebnet.org/
[83] http://www.gouv.bj/sites/default/files/Accord-International-code-benino-togolais-electricite.pdf

Two other provisions in this code create attractive conditions for private investment. The first is a guarantee of judicial security within article L20, paragraph 1, which expressly prohibits the CEB to abuse its monopolistic position. The second provision is that no formalities for authorizations are necessary for the installation of plants below 500 KVA (Article R2).

The Benin Electricity Code and the Law n°2006-16, March 27th, 2007[84]

In order to introduce national provisions for implementing the Benin-Togo Code of Electricity, each country had to adopt its national code. It is within this framework that the Law n°2006-16 of March 27, 2007 was adopted in Benin. It defines the legal framework within which the activities of the electricity sector must be conducted, the modalities of public companies and private companies to participate in the sector, the introduction of rules of competition and formalities which they are subject to.

Among the other provisions in the code, it is important to mention, under Article 8, paragraph 8, the creation of a rural electrification fund exclusively dedicated to contributing to the development of rural electrification. Moreover the institution, in Article 8, of a Regulatory Authority for Electricity as an independent and autonomous body is an additional guarantee for private investors.

The Law n°93-009 from July 2nd, 1993[85]

As far as forest management plans are concerned, the Law n°93-009 applies in Benin, and the related Decree nº96-271[86] about the implementation modalities of the Law. It completes the legal framework, targeting mainly the conservation and rational management of forestry resources following with the empowering of the participatory approach. Indeed, by organizing the protection and exploitation of forestry resources, in particular through Articles 52, 56, 57, 94 and 95, the Law has created favorable conditions for the availability of biomass through reduction of deforestation risks and therefore reducing GHG emissions.

[84] http://www.gouv.bj/sites/default/files/Loi_Num_2006-16_du_27-03-2007.pdf
[85] http://faolex.fao.org/docs/pdf/ben2003.pdf
[86] http://faolex.fao.org/docs/pdf/ben7978.pdf

The Law n°2002-17 of October 18th, 2004[87]

Concerning the protection, management and development of wildlife and its habitats, conservation measures should be implemented under the Law N°2002-16 of October 18th, 2004 (Article 1). This law is about wildlife management in the country. Under this legal framework, a large place is given to the promotion of the energy production from biomass in Benin. Forests are hence clearly concerned.

The Law n°2013-01 of August 14th, 2013

The Law n°2013-01 is about the land use code. It puts an end to the legal dualism that has long characterized the land in Benin, which was a source of insecurity in rural areas. This insecurity has been the main handicap to the valuation of land capital including plantations in general and forest trees with slow growth in particular. This law has established the legal framework creating conditions for the development of Rural Land Plans (*Plan Foncier Rural* or PFR) recognized as a valuable tool for land security, the management of rural areas and to facilitate negotiations between land actors. More than 380 villages have a PFR, clarifying the situation of 60% of the Beninese agricultural land plots. Still, the gender distribution of access to land shows that women lag behind any mode of access to the land in question.

The law contains important innovations for agricultural investment without which neither the biomass energy project nor the project NAPA Energy could succeed. These provisions are the following:

- the prohibition of land hoarding in Article 367, paragraph 1, which states that "the owners of rural land other than the State and local authorities are required to develop them, except where the quality of soil requires a temporary rest period not exceeding five (05) years "..
- the ability for tree plantations that do not have a need to acquire full ownership of rural land to contract a leasehold plantation (Article 68);
- the drastic reduction of delay in obtaining a Certificate of Land Ownership which replaces the former Land certificate since August 14, 2013, date of enactment of the Code. This delay which was at least a year is now legally set to one hundred twenty (120) days in the last paragraph of Article 139 of the Code.

[87] file:///C:/Users/PC%20Acer/Downloads/loi-2002-16.pdf

- the establishment and spread of rural land plans in all villages (Article 193) ; which is the main source of confirmation of land rights in rural areas (Article 192).

These laws are complemented by a set of application documents among which are:

- Decree n°2014-376 of 25 June 2014 on the creation, allocation, organization and functioning of ANADER ;
- Decree n°2009-182 of 13 May 2009 on the creation, allocation organization and functioning of the Electricity Regulatory Authority (ERA) ;
- Decree n° 2004-424 of 4 August 2004 adopting the articles of ABERME ;
- Decree n° 96-271 of 2 July 1996 laying down detailed rules for the application of Law No. 93-009 of July 2nd, 1993 regarding forestry regimes in Benin.

2.4.2. Strategies and policies for the energy sector

The political will of the GoB is not limited to the implementation of a proper legislative and regulatory framework. This should be understood as the legal aspects of a larger strategy and policy. First, there was the creation of a Focus Group on the Vision of the Electric Power Sector in Benin by the Decree n°2007-290 of June 16th, 2007 with the mission to "find appropriate solutions that ensure improved supply system and the efficiency of the energy sector while reducing external dependence into electrical energy and promoting access to the supply of electricity"[88]. Then, it was required to add new skills to ministries of energy and the environment to take into account the concerns respectively renewable energy and climate change.

This finally led to the development of a series of policy and strategic documents for the power sector development taking into account the electricity produced from biomass. A total of three documents were produced between 2003 and 2009.

The first document entitled "Energy policy and strategy of Benin" dates from 2003. The second document entitled "Policy and development strategy for the electricity sector in Benin" dates from 2008. The last document from 2009 is entitled "Strategic plan for the development of the energy sector in Benin". These three documents are part of a

[88] MME, GRVSE, 2008 : Plan stratégique du développement du secteur de l'énergie au Bénin

diagnosis of the sector at large (oil, electricity, biomass energy and renewable energy). The goal is, among others, to provide electricity to the consumers as a public service. While the 2003 plan covers the period 2004-2013, this 2009 plan covers the period from 2009-2017.

The focus is on the need to incentivize the electricity sector and provide a favorable environment for its development. An Inter-ministerial Order of January 12th, 2009[89] decided to set up a strategic committee. This was consistent with the decisions of the Council of Ministers from October 23rd, 2008[90]. The conclusions of this committee are compiled in a 2010 document recommending the establishment of a legislative framework, and regulatory incentives for investing in the electricity sector[91].

2.4.3. Regulatory framework to reduce vulnerability of Benin's energy sector to impacts of climate change

Regarding climate change, a large and riche body of laws does exist in Benin to reduce the vulnerability of the country's energy sector vis-à-vis the impacts of climate change. This section presents this regulatory framework in details.

Laws

The main legal framework is the Constitution of Benin with the Law n°90-32 of December 11th, 1990 [92] . Under the Constitution, the State shall ensure the environmental protection to everyone: any person living on the territory of Benin has the right for a healthy environment. Moreover, in Article 147, it states that "duly ratified treaties or agreements shall, upon publication, have an authority superior to that of laws, subject to each agreement or treaty, to its application by the other party". The Constitution hence recognized international conventions once ratified by the country. This includes the United Nations Framework Convention on Climate Change (UNFCCC) ratified by Benin on 30 June 1994. The UNFCCC has a superior authority to that of a domestic law, including the Constitution.

Besides, the GoB has adopted a series of national laws on climate change:

[89] N°2008 # 002/MECPDEAP/MEE/MEF/DC/SGM/STREM/CTJ/SA
[90] Decision n°37/PR/SGG/REL
[91] The committee benfited from the inputs of Mr. Raoufou Badarou compiled in a document from 2008 entitled "Rational exploitation of biomass — energy for electricity production". This document concludes that electricity from biomass is cheap, based on economic calculations about electricity production from wood and agricultural residues.
[92] http://www.wipo.int/edocs/lexdocs/laws/fr/bj/bj001fr.pdf

- The earlier mentioned Law n°93-009 about forestry plans. It contains a set of favorable dispositions to protect forest resources, related to carbon sequestration.
- The Law n°98-030 of February 12th, 1999 entitled “Framework Law on Environment in Benin”[93]. Several important standards for the environment and requirements for the consideration of the environment in all development projects and programs are detailed in the law, especially the Chapter IV, Title II on air pollution and climate change.

In addition, various regulatory texts do take into account climate change. These include:

- Decree n°2000-610 of December 1st, 2000 approving the statutes of the *Fonds National de Lutte contre la Désertification* (FNLD). The FNLD is "an implementation instrument of the United Nations Convention to Combat Desertification (UNCCD)". This fund, indirectly, helps reducing GHG emissions through afforestation and avoided deforestation actions.
- Decree n°2000-671 of December 29th, 2000 regulating the importation, marketing and distribution of materials and capital goods. One objective of this decree is the limitation on the national territory of the amount of waste that could come from these materials and used capital goods, waste which because of their issuance, accelerates climate change. The decree states in Article 2 the list of these materials and goods. These are "vehicles, accessories and parts, machinery, electronic equipment and sanitary, furniture, building materials that have lost their status as new condition" and are likely to emit GHGs.
- Decree n°2001-110 of April 4th, 2001 lays down the air quality standards in Benin. Based on the Law n°98-030, this decree addresses quality standards for ambient air emission standards for motor vehicles and atmospheric emission standards for stationary sources (Article 1). In practice, this regulation has resulted in the periodic inspection of the emissions but is being abandoned.
- Decree n°2004-710 of December 30th, 2004 on the duty to import motor vehicles equipped with catalytic converters. By this act, it is decreed that "any petrol vehicle, new or used imported into the Republic of Benin must be equipped with catalytic converters in perfect working order" (Article 1).
- The Inter-ministerial Order n°2003 0062/MEHU/MTPT/DC/CTE/SG/DE/SA fixing approval procedures for garages on pollution control and repair of engines for compliance with emission standards of polluting gases.
- Commission for the Economic Modeling of the Impacts et for the Integration of

[93] http://bch-cbd.naturalsciences.be/benin/implementation/legislation/loicadre.pdf

Climate Change in the General Budget (Commission de Modélisation Economique des Impacts et de l'Intégration de Changements Climatiques dans le Budget Général de l'Etat/CMEICB): Article 2 of Decree No 2014-359 of 16 June 2014 creates the CMEICB. Its mandate is to develop tools and assessment methods, modeling and economic prevention of climate change impacts in order to promote and develop adaptation, climate resilient and low carbon development strategies. As such, it is responsible of the development of a national economic model integrating assessment methods on the impact of climate change by sector. The CMEICB is also responsible of the development and analysis of economic cases on resilience, conducting vulnerability assessments and studies of the economic impacts of climate change on the national economy to assist in decision making. It identifies methods for integrating climate resilience in the sectorial activities, programs and projects, as well as new and innovative investment opportunities taking into account the impacts of climate change.

2.4.4. Strategies and policies to reduce the vulnerability of Benin's energy sector to climate change

Initiatives to reduce the vulnerability of Benin's energy sector to climate change have led to the development of an impressive number of documents illustrating the commitment of the country to tackle climate change. Some key documents are:

- The "National Studies about the Long Term Perspectives of Benin 2025" ;
- The Environmental Action Plan adopted in 1993 and revised in 2001 ;
- The National Agenda 21 adopted in January 1997 ;
- The National Action Plan for the Fight against Desertification adopted on November 16th, 2000 ;
- The GHG mitigation strategy from December 2001 ;
- Benin's National Communications on Climate Change. The development of the Third National Communication on Climate Change Benin was launched in October 2014 ;
- The final version of the national UNFCCC implementation strategy in Benin adopted in May 2003 ;
- The National Adaptation Programme of Action to Climate Change in Benin (NAPA Benin) ;
- The National Strategy and the implementation of the Action Plan of the Convention on Biological Diversity from March 2002 ;
- The National Fire Management Strategy from September 2008.

Annex C:

Le choix de la zone d'intervention du projet **Réduction de la vulnérabilité du secteur énergétique béninois aux impacts des changements climatiques** se repose sur la résilience des écosystèmes d'approvisionnement en combustible ligneux et sur les objectifs suivants :

- Les capacités des acteurs du secteur énergétique sont renforcées afin de leur permettre d'intégrer les risques climatiques dans la planification énergétique et de faire face aux risques climatiques
- Les stratégies et schémas d'approvisionnement énergétiques intègrent les changements climatiques et des mesures d'adaptation
- La résilience climatique des bassins versants des fleuves Ouémé, Niger (Sota), Volta (Pendjari) abritant les installations hydroélectriques d'une part de Yéripao (déjà existantes), d'autre part cascade de Sosso, Gbassè, Koutakroukrou, chute de Kota, Wabou et Kouporgou (envisagées à moyen terme), est renforcée a travers la mise en œuvre d'activité de restauration et de préservation des écosystèmes des bassins versants
- La résilience climatique des zones d'approvisionnement en combustible ligneux de identifiés par les SDAs révisés est renforcée à travers des actions de reboisement et de conservation des massifs ligneux
- Les infrastructures de production et de distribution d'énergie électriques sont protégées contre les catastrophes et autres risques climatiques

L'équipe de consultants, dans sa méthodologie de retenir la zone d'intervention du projet, a identifié de façon concertée avec les acteurs et partenaires, 10 critères de choix de la zone d'intervention du projet qui sont :

1. Existence de forêt communautaire d'approvisionnement en combustible des grandes villes et dotée de plan d'aménagement et de gestion.
2. Disponibilité de terre avec problème de gestion durable des terres
3. Présence de marché ruraux de bois précédemment accompagnés par d'autres partenaires
4. Commune appartenant à un Schémas Directeurs d'Approvisionnement (SDA) en combustibles ligneux des villes
5. Présence de zone d'approvisionnement communautaire de bois de feu autour des forêts communautaires retenues;
6. Existence de forêt classée disposant d'un plan d'aménagement ;
7. Présence de cascades et de chutes d'eau d'importance éco touristique déboisés et érodés.
8. Appartenance à un bassins versants des fleuves susceptibles d'abriter les installations hydroélectriques (dont Yéripao) ;

9. Synergie de zone d'intervention avec le projet PANA 1, Projet Biomasse et autres
10. Existence de centrales thermiques de production d'électricité

L'analyse multicritère avec cotation des informations collectées sur chacune des communes cibles, a donc permis de retenir:

1. 10 écosystèmes des bassins d'approvisionnement en combustible ligneux regroupant les communes de : Djougou, Savè, Ouèssè, Savalou, Dassa-zoumé, Toukoutouna, Natitingou, Zangnanado, Covè, Pérèrè, N'dali, Djidja, Tanguiéta et Kandi, et Ségbana dont trois communes d'intervention sont dans la zone de synergie d'intervention avec le projet biomasse : Djougou, Savalou et Dassa-zoumé. La commune de Savalou est également une zone d'intervention du projet PANA 1.
2. Les écosystèmes des berges des fleuves Ouémé, Sota, Pendjari, Zou, Mono susceptibles d'abriter des installations hydroélectriques de Yéripao d'une part (déjà existantes) d'autre part des cascades de Sosso, Gbassè, Koutakroukrou, les chutes de Kota, Wabou et Kouporgou, sont également retenues.
3. Les barrages de Guogbede (arrondissement de Bensékou commune de kandi) de Bobè (arrondissement de Bobè, commune de Bantè) ainsi que la chute aménagée de Tanougou sont retenus
4. Les villes abritant les centrales thermiques de production d'électricité qui sont Cotonou (Akpakpa), Porto-Novo, Kandi, Natitingou.

La carte présentant toute la zone d'intervention est présentée ci-dessous.

Figure 11: Map of the intervention area

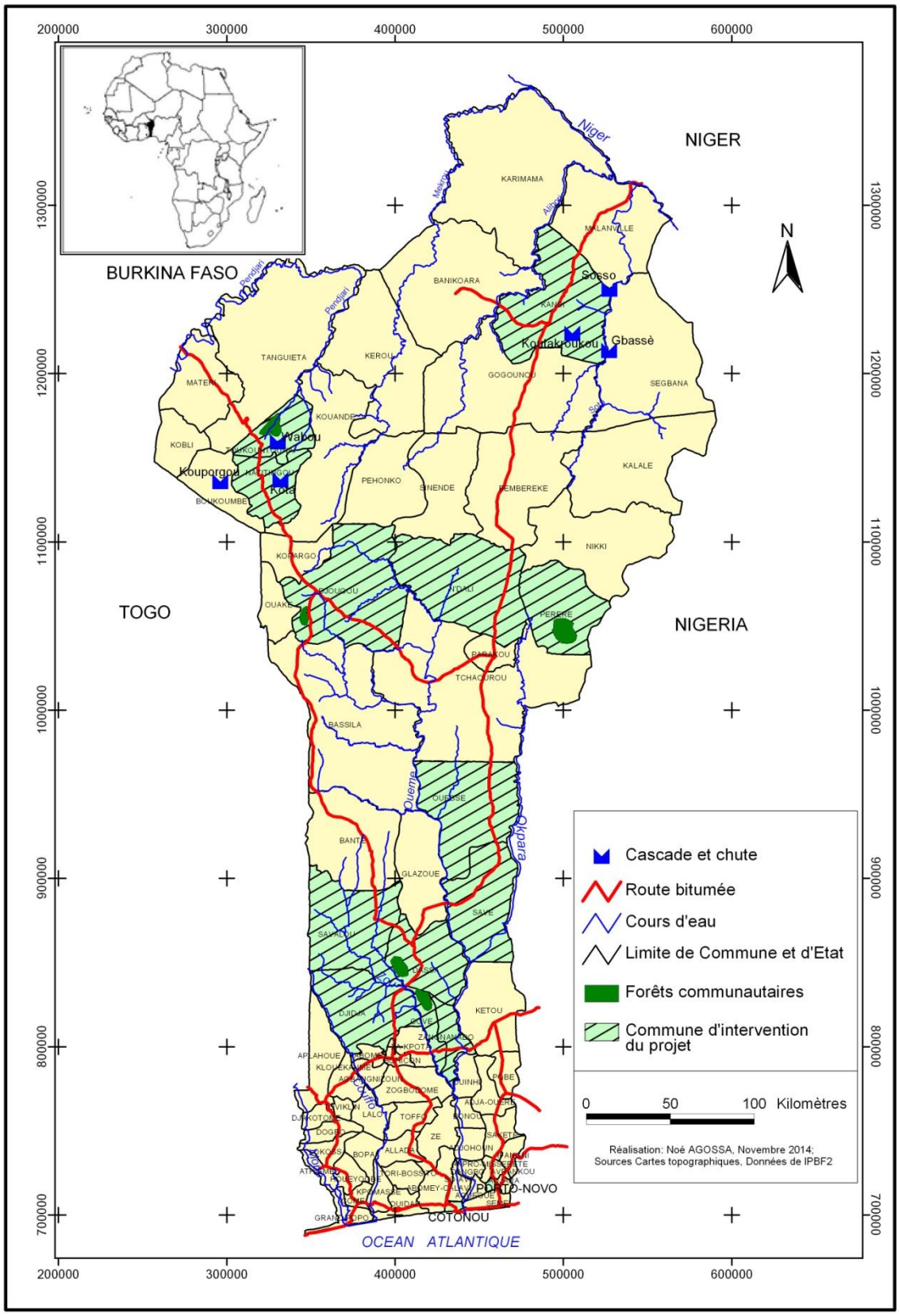


Table 16: Multi-criteria analysis of communes in the intervention area

		COMMUNES ELIGIBLES																				
N°	Critères de choix des sites pouvant abriter la centrale électrique	Cotation	Toucou-touna	Tanguiéta	Bantè	Djogou	Savè	Pèrèrè	Ndali	Ouèssè	Abomey	Savalou	Dassa Zoumé	Djidja	Covè	Zagna-nado	Adja-Ouèrè	Lalo	Apla-houé	Coto-nou	Kandi	Porto Novo	Nati-tingou
1	Existence de forêt communautaire d'approvisionnement en combustible des grandes villes et dotée de plan d'aménagement et de gestion (Forêt communautaire avec PAGS= 10 et Forêt sans plan =0)	10	0	0	10	10	10	10	10	10	10	10	10	10	10	10	0	0	0	0	0	0	10
2	Commune appartenant à un Schémas Directeurs d'Approvisionnement (SDA) en combustibles ligneux des villes ; (inclus dans le SDA =10 Pas inclus SDA= 0)	10	10	0	10	10	10	10	10	10	10	10	10	10	10	10	0	0	0	10	0	10	10
3	Existence de massifs forestiers classés dotés de plan d'aménagement intégré dans le SDA (FC avec PAPF intégré dans le SDA = 10pts et FC sans PAPF=0)	10	0	0	0	0	10	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	10
4	Synergie de zone d'action avec le projet PANA 1, Projet Biomasse et autres (même ZI=10 , ZI différente=0)	10	10	0	0	10	0	0	0	0	0	10	10	0	0	0	0	0	10	0	0	0	0
5	2. Disponibilité de terre avec problème de gestion durable des terres élevé (10) Moyenne (5) faible (2) nul 0)	10	5	5	10	10	10	10	10	10	10	10	10	10	10	10	0	5	0	0	10	0	0
6	Présence de marché ruraux de bois précédemment accompagnés par d'autres partenaires (oui 10 non 0)	10	10	0	10	10	10	10	10	10	10	10	10	10	10	10	10	0	10	10	0	0	10

			COMMUNES ELIGIBLES																				
N°	Critères de choix des sites pouvant abriter la centrale électrique	Cotation	Toucou-touna	Tanguiéta	Bantè	Djogou	Savè	Pèrèrè	Ndali	Ouèssè	Abomey	Savalou	Dassa Zoumé	Djidja	Covè	Zagna-nado	Adja-Ouèrè	Lalo	Apla-houé	Coto-nou	Kandi	Porto Novo	Nati-tingou
7	Appartenance à un bassins versants des fleuves suceptible d'abriter les installations hydroélectriques (dont Yéripao) ; (limitrophe de la berge= 10 Non =0)	10	10	10	0	10	10	10	10	10	0	10	10	0	10	10	0	0	0	0	10	10	0
8	Présence de parcs communautaires de bois de feu autour des forêts communautaires (Très forte 10, Moyennement=5 faible 0)	10	5	0	10	10	10	10	10	10	10	10	10	10	10	10	10	0	0	0	0	0	0

9	**Existence de cascades et de chutes d'eau d'importance éco touristique mais déboisés et érodés(Oui 10, oui mais moyennement deboisé et érodé (cascade de Sosso, Gbassè, Koutakroukrou, chute de Kota, Wabou et Kouporgou) Oui =10 Inexistent =0)**	**10**	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	**Existence de centrales thermiques de production d'électricité (Oui =10, Non =0)**	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10	10
	Total des points par site visité	100	60	25	50	70	70	60	60	70	50	70	70	50	60	60	20	5	20	30	30	30
	Rang obtenu		**6ème Ex**	**18ème**	**12ème Ex**	**1er**	**1ème Ex**	**6ème Ex**	**6ème Ex**	**1er Ex**	**12ème EX**	**1èmEx**	**1ème Ex**	**12ème Ex**	**6ème Ex**	**6ème Ex**	**19ème EX**	**20ème**	**19ème Ex**	**15ème Ex**	**15ème Ex**	**15ème Ex**

Annex D:

STANDARD LETTER OF AGREEMENT BETWEEN UNDP AND THE GOVERNMENT FOR THE PROVISION OF SUPPORT SERVICES

Dear [*name of government official*],

1. Reference is made to consultations between officials of the Government of **the Republic of Benin** (hereinafter referred to as "the Government") and officials of UNDP with respect to the provision of support services by the UNDP country office for nationally managed programmes and projects. UNDP and the Government hereby agree that the UNDP country office may provide such support services at the request of the Government through its institution designated in the relevant programme support document or project document, as described below.

2. The UNDP country office may provide support services for assistance with reporting requirements and direct payment. In providing such support services, the UNDP country office shall ensure that the capacity of the Government-designated institution is strengthened to enable it to carry out such activities directly. The costs incurred by the UNDP country office in providing such support services shall be recovered from the administrative budget of the office.

3. The UNDP country office may provide, at the request of the designated institution, the following support services for the activities of the programme/project:
(a) Identification and/or recruitment of project and programme personnel;
(b) Identification and facilitation of training activities;
(a) Procurement of goods and services;

4. The procurement of goods and services and the recruitment of project and programme personnel by the UNDP country office shall be in accordance with the UNDP regulations, rules, policies and procedures. Support services described in paragraph 3 above shall be detailed in an annex to the programme support document or project document, in the form provided in the Attachment hereto. If the requirements for support services by the country office change during the life of a programme or project, the annex to the programme support document or project document is revised with the mutual agreement of the UNDP resident representative and the designated institution.

5. The relevant provisions of the [*Insert title and date of the UNDP standard basic assistance agreement with the Government*] (the "SBAA"), including the provisions on liability and privileges and immunities, shall apply to the provision of such support services. The Government shall retain overall responsibility for the nationally managed programme or project through its designated institution. The responsibility of the UNDP country office for the provision of the support services described herein shall be limited to the provision of such support services detailed in the annex to the programme support document or project document.

6. Any claim or dispute arising under or in connection with the provision of support services by the UNDP country office in accordance with this letter shall be handled pursuant to the relevant provisions of the SBAA.

7. The manner and method of cost-recovery by the UNDP country office in providing the support services described in paragraph 3 above shall be specified in the annex to the programme support document or project document.

8. The UNDP country office shall submit progress reports on the support services provided and shall report on the costs reimbursed in providing such services, as may be required.

9. Any modification of the present arrangements shall be effected by mutual written agreement of the parties hereto.

10. If you are in agreement with the provisions set forth above, please sign and return to this office two signed copies of this letter. Upon your signature, this letter shall constitute an agreement between your Government and UNDP on the terms and conditions for the provision of support services by the UNDP country office for nationally managed programmes and projects.

Yours sincerely,

_____

Signed on behalf of UNDP
Rosine Sori-Coulibaly
UN Resident Coordinator and
UNDP Resident Representative

_____

For the Government
[*Name/title*]
[*Date*]

Attachment

DESCRIPTION OF UNDP COUNTRY OFFICE SUPPORT SERVICES

1. Reference is made to consultations between **Ministry of Energy, Mining and Petroleum Exploration, Water and Renewable Energy Development** the institution designated by the Government of the Republic of Benin and officials of UNDP with respect to the provision of support services by the UNDP country office for the nationally managed project **number 00096410 on "Strengthening the resilience of the energy sector in Benin to the impacts of climate change"**.

2. In accordance with the provisions of the letter of agreement signed on [*insert date of agreement*] and the programme support document [*or project document*], the UNDP country office shall provide support services for the Programme [*or Project*] as described below.

3. Support services to be provided:

Support services (insert description)	Schedule for the provision of the support services	Cost to UNDP of providing such support services (where appropriate)	Amount and method of reimbursement of UNDP (where appropriate)
1.			
2.			
3.			

4. Description of functions and responsibilities of the parties involved: