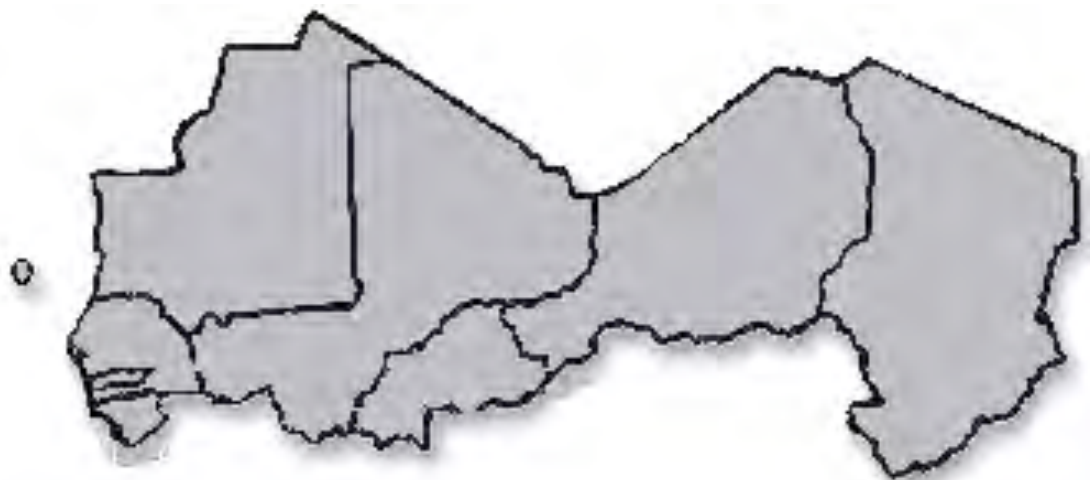


Energy for Poverty Alleviation in Sahel

IE4Sahel



PUBLIC REPORT

Contract N°. EIE/04/131/S07.40673

Participants:

IST – Instituto Superior Técnico - Portugal

ESD – Energy for Sustainable Development Ltd. – UK

CRES – Center for Renewable Energy Sources – Greece

ARC - AGRHYMET Regional Centre – Niger - subcontractor



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FOREWORD

The project "Energy for poverty reduction in Sahel" has been carried on between mid-2005 and mid 2007, as a cooperation and scientific research project, whose principal objective was the formulation of sound energy policies that take into account the energy-poverty component and able to effectively contribute to the poverty reduction efforts. The partners of the project have been Instituto Superior Técnico (Portugal), Energy for Sustainable Development ltd (UK), Centre for Renewable Energy Sources (Greece) and the ARC Aghrymet Centre (Niger). The project has been cofinanced by the European Commission, Intelligent Energy Europe Agency and the Fundação Ciência e Tecnologia (Portugal) that we would like to thank for their support not only financial, but also logistic, scientific and human. A special thank to the CILSS, the Inter – State Committee for Drought Control in Sahel that has been the centre of the policy dialogue performed during the IE4Sahel project, and to its member states and their representatives, that have been the stakeholders of the project. This report is a short summary of the work performed during the project, more detailed data and a complete description of the activities, including the conferences, performed during the project can be found on the website <http://ie4sahel.energyprojects.net>, which will be timely updated with the follow up initiatives.

The maximum effort has been done to assure that the information contained in this report is correct and up to date at the time of the writing, however in some cases the access to first hand data resulted difficult, and laws, regulations and economic factors change quickly, so we apologize for eventual incorrectness or lacks and thank the readers that would like to alert us for successive editions.

This report is dedicated to the memory of Mr. Ibrahim Magagi, former CILSS representative for Niger, whose bright intelligence and warm humanity we all miss.

Luis Manuel Monteiro Alves – IST

Coordinator of the Project.





CHAPTER 1

ENERGY AND POVERTY ALLEVIATION

This introductory section starts with a brief overview of energy in the international agenda followed by the linkage on the ground to issues surrounding poverty and gender. The next section covers specific socio economic conditions, the poverty reduction plans and the role of energy in poverty alleviation in the Sahelian region of West Africa, the focus of this report.

1.1. Energy in the International Agenda

Energy was one of the main themes at the World Summit on Sustainable Development (WSSD) held in South Africa in 2002. The Johannesburg Plan of Implementation highlighted the role of energy services to promote sustainable development and to facilitate the achievement of the Millennium Development Goals (MDG). The Plan also called for maximum efforts from the international community to promote a) Increased energy access to all population, b) Fostering the implementation of modern biomass technologies, c) Management programs for sustainable use of biomass, d) Implementation of actions plans focused on transition to the cleaner use of liquid and gaseous fossil fuels, e) Development of sound national energy policies and regulatory frameworks, f) Enhancement of international and regional cooperation, and g) Development of mechanisms to provide financial and technical assistance for the poor to access these programs. Prior to the Plan, the importance of energy for sustainable development was not always fully recognised. For example, in 1992, ten years before Johannesburg Summit, energy was not mentioned in the Rio declaration and none of the MDGs referred directly to energy being important for poverty reduction.

In the 1992 Rio Earth Summit, energy was principally discussed for its role in climate change and environment starting a process that led to the establishment of the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. After five years, the ninth session of the Commission on Sustainable Development (CSD9) worked extensively on a range of energy issues but no specific quantitative targets, action plans and financing supporting instruments were decided particularly on its relation to poverty. As mentioned earlier, there were no clear energy targets within the MDGs. Some African countries tried to set an MDG target to "provide modern affordable energy services to half of the two billion people who currently do not have access to them by 2015" (Africa Group 2002, WEHAB working Group 2002) with the advocacy of the United Nations Development Program (UNDP). However, the necessary international consensus was not reached.

After the WSSD, energy began to play an increasingly important role in the international debate on poverty and development actions following the development and production of a large number of projects, initiatives, networks, studies and publications. In 2004, the United Nations (UN) created a dedicated inter-agency, named UN-Energy, whose first publication was "The Energy Challenge for Achieving the Millennium Development Goals". The former General Secretary of the UN, Mr. Kofi Annan, emphasising this change in focus, declared in a report to the General Assembly on promoting new and renewable energy sources:

"One of the growing concerns of the international community is the persistent energy poverty that is seriously impeding socio-economic development, particularly in sub-Saharan Africa and in countries of South Asia, but also in many other developing countries, including many of the small island developing States. In the developing countries, some 1.6 billion people still lack access to electricity and about 2.4 billion continue to rely on



traditional biomass for cooking and heating, mainly in the rural areas. Achievement of the Millennium Development Goal of halving, by 2015, the proportion of the world's population whose income is less than \$1 per day will depend on providing these people with access to modern energy services for their basic needs and for income generation. Decentralized renewable energy systems can contribute to poverty eradication efforts, in particular in areas with widely dispersed rural populations". (Kofi Annan, 19 August 2005, UN News service).

1.2. Energy in relation to Poverty and Gender

The low access to modern energy forms is not a question of limited technological options but a reflection of the present socio economic development and the low optimization of potential resources and the environment. Almost all energy and poverty related documents clearly state that the poorest people on the planet live without access to modern energy services. The energy-poverty relationship has several components of which the following three are highlighted:

- i. Access to energy services
- ii. Affordability of the energy vectors
- iii. Empowerment of women and community engagement.

i) Access to energy services: In the past decades, 'access' has been the principal (if not the only) aspect of energy and poverty that national governments have tried to tackle (e.g. electricity grid extension, decentralised renewable energy projects, or initiatives to create market infrastructures for modern energy fuels). Access to modern forms of energy is the primary problem in rural areas, the main reasons being capital intensive transportation costs (fuels etc), and infrastructure access to remote areas. At the same time, the local production of energy and subsequent produce from its usage is similarly constrained by factors such as lack of capital investments, technical skills, and low demand. In fact the level of consumption may be very small and consumers are unable to pay the related capital and generation costs. For isolated areas with the right environmental conditions, the use of local renewable energy resources (wind, biomass, solar, and hydro) is often a good and economically viable alternative but again requires high up-front capital costs which limits its accessibility despite low operating costs. In suggesting tools to overcome these obstacles, the World Bank suggests the opportunity of subsidizing capital costs (but not operating costs) to improve energy access (Saghir 2005).

ii) Affordability of Energy Vectors: The physical availability of modern energy services is irrelevant if the people cannot afford it. This case is very common, for example with the poorer population in urban and peri-urban areas that live relatively close to energy infrastructures and yet do not have access due to high upfront connection costs. The poor end up using more expensive forms of energy (such as kerosene) despite other cheaper options being available due to their low initial capital costs and availability in small quantities. This results in the poor paying high cost for energy not only in relative terms (compared to their incomes) but also in absolute terms as they are obliged to use highly inefficient technologies and can only afford to buy small quantitative of fuels or electrical energy re-sold by someone able to pay the fixed cost of connection. Illegal connections also end up as a solution for their inability to pay for energy which in turn could lead to security problems and threaten the sustainability of the system. Taking into account efficiency and transaction costs, energy for the poor can be more expensive than for the non-poor.

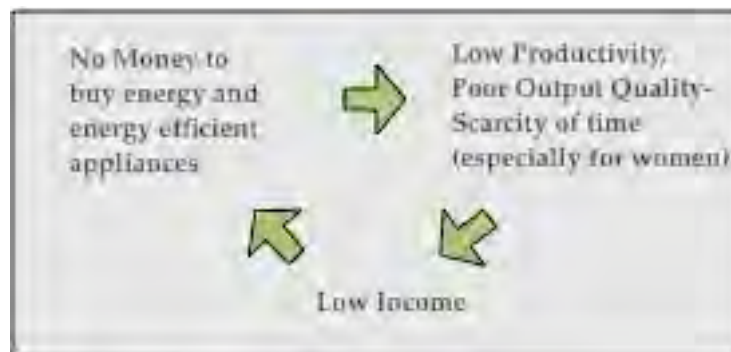
iii) Empowerment of Women: Within the poorest groups of the population, women are often more vulnerable than men and are key to the analysis of poverty status within communities and in households as well as in designing specific effective support policies.



Often, energy projects elude women as primary beneficiaries as it is 'technology oriented' often falling under the realms of men. However, women (including young girls) are the principal users and collectors of energy resources in the poorest regions of the world. Women generally have the burden in domestic energy activities such as cooking, heating and agro-processing, highly dependent on traditional energy resources (fuel, wood/biomass, and labour). This can be an extremely heavy and time-consuming activity (that could be used otherwise for income generating activities or for improving the quality of life) and has serious health impacts.

In poor households, fuel wood is also frequently burned in highly inefficient cook stoves that generate smoke and indoor pollution, which is responsible for numerous respiratory diseases in women and children¹. While fuel wood is collected mostly with no direct monetary costs, its magnitude is not fully addressed in energy statistics, also due to difficulty of measurement, and thus its importance can be under valued by policy makers and this is reflected in national energy plans (Clancy et al., 2002). In regions where there is a huge pressure from the human activities on the environment, or in vulnerable ecosystems like in the Sahel, the destruction of the biomass stock for heating and cooking in a non sustainable way has led to serious impacts on both the environment and the poorer households, resulting in an increase of the desertification process and the necessity to spend even more time and energy to collect wood every day further from home. Women are particularly affected by the lack of modern energies also for security reasons. The activity of collecting wood in isolated areas expose women to higher risk of being harassed or being victim of violence. The use of modern domestic energies reduces this risk and the implementation of public lighting improves the security of the communities. Moreover, villages that have seen the implementation of specific gender-related energy projects have experienced a great improvement in the schooling results of girls, freed from the heavy burden of energy collecting activities.

The vicious circle of energy poverty and gender is well explained by the box 1 (SOURCE: elaboration from Ramani and Heijndermas, 2004)



Box 1: energy poverty trap

It is clear that in order to escape the vicious circle of poverty, energy should be used for productive activities, in a way that enables the generation of additional incomes that enables repayment of the cost of energy systems and create a surplus, establishing a so-called "virtuous circle of energy". There are different opinions between development and energy experts on the possibility that poor rural communities may self-finance the shift to modern energies using the income generated by the productive uses of energy. For example, electricity is often used for lighting, refrigerators or entertainment appliances (radio, TV) and not for uses that have an immediate economic return. Nevertheless some

¹ There are several WHO studies that address this issue, ref. ww.who.int/indoorair/eng/



of these uses are very important to assure a long-term development and an improved quality of life, such as education, health centres, water pumping, street-lights etc. However their financing in low income communities might be problematic. Even if the availability of modern energy services does not assure by itself economic development and poverty reduction, the lack of it is a serious barrier to any policy aimed at improving human conditions.

The under valuation of the poverty-energy link may be responsible for two opposite policy issues creating a double negative impact on the poor. While poverty reduction strategies and policies (or economic development plans) do not sufficiently account the energy component of poverty; on the other side, energy reforms plans also do not fully consider the consequences of reforms on the poor.

1.3: An Overview of Energy and Poverty Alleviation in the Sahel

The 'Sahel' is largely French-speaking and takes its name ("shore") from Arabic. The countries of the Atlantic coast (Cape Verde, Mauritania, Senegal, The Gambia, Guinea Bissau) form a regional market and receive higher aid than others in Western Africa although they do have potential resources and will need to diversify sources of income. The other land locked countries (Mali, Burkina Faso, Niger and Chad) face more constraints because of geographical, spatial and ecological problems. Resources are mostly the agricultural areas and large rivers in the southern parts of some of these countries. This zone has had the biggest drought toll in the 1970s and 1980s but currently is experiencing development of agro pastoral systems. The high demographic growth rate in most of these Sahelian countries has led to the recomposition of settlements, often resulting in high migration. Dakar (Senegal), Ouagadougou (Burkina Faso), Niamey (Niger) and Bamako (Mali) hold about 25 % of the Sahel's population and are growing annually by another five %.

Over the past decades, the Sahelian region has transformed and it is in constant evolution in all social, political and economic levels. There has been macro economic and structural adjustments, changes in the roles of private sector, emergence of civil society, and importantly regional integration processes and strengthening of regional organizations such as the Economic Community of West African States (ECOWAS), the West African Economic and Monetary Union² (UEMOA), the permanent Interstate Committee for drought control in the Sahel (CILSS as per French *Comité permanent inter-État de lutte contre la sécheresse au Sahel*) and others. Below are some basic socio economic indicators of the nine Sahelian countries under review.

² Both ECOWAS and UEMOA (French name *Union économique et monétaire ouest-africaine*) are organisations of states of West Africa established to promote economic integration.



Table 1.1: Basic Socio Economic Indicators of the Sahelian Countries (2005)

Indicators	B'na Faso	Cape Verde	Chad	Gambia	Guinea Bissau	Mali	Mauritania	Niger	Senegal
Surface area (sq. km) in thousands	274	4	1284	11.3	36.1	1240.2	1025.5	1267	196.7
Population, total (millions)	13.2	0.5	9.7	1.5	1.6	13.5	3.1	14	11.7
Population growth (annual %)	3.1	2.3	3	2.6	3	3	2.9	3.3	2
GNI per capita Atlas method (current US\$)	400	1930	400	290	180	380	580	240	700
GDP (current US\$) in billions	5.2	1	5.5	0.5	0.3	5.3	1.9	3.4	8.2
GDP growth (annual %)	5	6	6	5	4	6	5	4	5
Exports of goods and services (% of GDP)	9	..	59	45	38	26	36	15	27
Life expectancy at birth, total (years)	48	71	44	57	45	49	54	45	56
Mortality rate, infant (per 1,000 live births)	96	26	124	97	124	120	78	150	61
Fertility rate, total (births per woman)	6	4	6	4	7	7	6	8	5
Agriculture, value added (% of GDP)	31	..	23	33	60	37	24	..	18
School enrollment primary (% net)	45.2	90.1	61	..	..	50.9	72.2	39.9	76.2
Ratio of girls to boys in primary/secondary education (%)	77	100	60	..	..	75	96	72	90
Time required to start a business (days)	45	..	75	..	..	42	82	35	58
Official development assistance/official aid (current US\$) in billions	65.9	16	38	5.82	7.91	69.2	19	51.5	68.9

Source: World Development Indicators database, World Bank, April 2007

Amongst all the Sahelian countries, Cape Verdeans have a relatively better socio economic position in comparison to the other countries not only in terms of GDP but also infant mortality, life expectancy, and literacy. After Cape Verde, Senegal also has higher GDP, better GNI per capita and education indicators than the other countries. The lowest ranked HDI countries of the region are Niger, Mali and Burkina that present low indicators for GNI, education and health. Oil exports in some of these countries such as Chad and Mauritania would help strengthen the dependence of the region on global markets while at the same time increase the financial flows to the West African Sahelian region.

Basic energy indicators for the nine countries show extremely low electricity consumption per capita as seen from Table 1.2. Traditional fuel consumption is high in almost all countries, especially high in those that have low HDI ranking (Burkina Faso, Mali and Niger).



Table 1.2: Basic Energy Indicators

HDI Rank ³	Country	Tradition fuel consumption (% total energy requirements)	Electricity consumption per capita (kWh)		CO2 Emissions Per capita (mt)		Ratification of international treaties	
		2003	1980	2003	1980	2003	Framework Convention on Climate Change	Kyoto Protocol to Framework Convention on Climate Change
106	Cape Verde	0.0 ^d	55	100 ^d	0.4	0.3	✓	✓
153	Mauritania	35.8 ^d	60	60 ^d	0.4	0.9	✓	✓
155	Gambia	66.7	70	101 ^d	0.2	0.2	✓	✓
156	Senegal	70.9	115	192 ^d	0.6	0.4	✓	✓
171	Chad	98.6	10	11 ^d	-	-	✓	X
173	Guinea Bissau	50	18	45 ^d	0.2	0.2	✓	✓
174	Burkina Faso	83.3	16	32 ^d	0.1	0.1	✓	✓
175	Mali	86.7	15	38 ^d	0.1	-	✓	✓
177	Niger	85.6	-	40 ^d	0.1	0.1	✓	✓

^d Data are estimated produced by the United Nations Department of Economic and Social Affairs, Statistics Division

✓ ratification, acceptance, approval, accession or succession

(Source: Human Development Report UNDP 2006)

In 2003, the Economic Report on Africa⁴ recorded that the Continent's economies need to grow on an average of about 7 % to achieve the Millennium Development Goals (MDG). In 2005, the nine Sahelian countries' average annual GDP growth rate was only 5.1 %. In 2007, the Economic Report stated the need for a growth rate of 5.8 % if the world economy remains stable. However, there are substantial disparities across Africa's five subregions with a deceleration in growth in West Africa. Unreliable energy supply at the national level and weak energy networks at the regional level was noted as the main factors to undermine productiveness and international competitiveness.

Like many other regions in Africa, these nine Sahelian countries are faced with rising energy needs and demands. This is increasingly due to the escalation in convention fuel prices, rapid urbanization, increased occurrence of environmental problems, particularly droughts and the internationally renewed commitment to sustainable energy production. Since the Rio Conference on Sustainable Development in 1992, African policymakers are increasingly realizing the importance of energy interventions in meeting these needs. However, these energy policies and plans are prepared in isolation to other development efforts taking a highly 'technocratic' approach. The changing economic and political environment expects a change to this approach as markets and poverty alleviation are high on the agenda of global development.

In the past decade, the move towards forming comprehensive 'poverty' focused, goal enhanced policies and planning has been initiated by the international donor and financing institutions. With a world population projected to grow by about 2 billion in the next 25 years, the Sahelian countries will contribute towards that projection with a cumulative average growth %age rate population standing at 2.8 as of 2005. The eight Millennium Development Goals (MDGs) ranging from an ambitious plan to halve extreme poverty to environmental sustainability, all by the target of 2015 is currently forming a

³ The Human Development Index is a measure of socio-economic parameters such as life expectancy, income and educational achievement.

⁴ The report is produced annually by the UN Economic Commission for Africa in collaboration with the Commission of the African Union.



blueprint for many development initiatives by government as well as civil society. Only Mauritania aims to fulfill the MDGs by 2015.

Similarly, the Poverty Reduction Strategy Papers (PRSPs) initiated by the IMF and World Bank in 1999 are comprehensive country based strategic plans prepared by governments in low-income countries describing the macroeconomic, structural and social policies and programs to be pursued over several years to promote broad-based growth and reduce poverty, as well as external financing needs and the associated sources of financing. These participative planning and strategy formulation is expected to meet the needs of the worlds poorest, in all developing and emerging economies. Burkina Faso and Cape Verde have specific key themes in their PRSPs. Cape Verde's PRSP plans has a clear system of planning including budgets and timelines, two essential elements for monitoring the goals, visions or themes. Senegal's main focus is on three goals (doubling per capita income by 2015, access to social services through establishment of basic infrastructure facilities by 2010, and eradicate exclusion and ensure gender equality in primary and secondary education by 2015). Only Mauritania has a long term vision till 2015 encompassing full achievement of the MDGs and an actual planning till 2010. Mali has a three fold concern of efficiency, equity and institutional and financial viability determining the PRSP strategy. Niger has specific targets to improve status of women (such as improving women's literacy levels, increasing proportion of girls attending schools in rural areas).

Table C: Key Goals and Themes in the Poverty Reduction Strategy Papers

Key Goals and Themes in the PRSP	Burkina Faso	Cape Verde*	Chad	Gambia, The	Guinea Bissau	Mali	Mauritania	Niger	Senegal
Economic Growth/ Macro Economic Stability	✓	✓	✓	✓	✓		✓		✓
Social Equity (Poverty, Gender)		✓	✓	✓	✓		✓	✓	✓
Basic Social Services	✓				✓	✓	✓	✓	✓
Social Security	✓	✓							
Employment/ Income Generation	✓	✓		✓				✓	
Human Capital Development		✓	✓			✓	✓		
Environment/ Ecosystem		✓	✓						
Institutional Development						✓			
Good Governance	✓	✓	✓		✓	✓	✓		
Basic Infrastructure		✓				✓		✓	✓
Public Resource Management				✓					
Participation						✓			
Key Productive Sectors						✓			
Population Growth Reduction								✓	



In addition to these national policies and plans for poverty reduction there are the recent climate change initiatives of various developed nations and the push to generate an active market in developing countries and emerging economies in the trading of carbon emission reduction certificates and green certificates. All countries except Chad are signatories to the Kyoto Protocol Framework Convention on Climate Change. However, a World Bank report states that '*Africa continues to be largely bypassed by the carbon market. The under-representation of these regions raises deep concerns about the overall equity in the distribution of the CDM market*'⁵. The equity concerns become even more unequal taking the economic and environmental condition and progress of the Sahelian states. Most of the countries rely on traditional fuels and energy imports (mainly petroleum) for their energy needs. Renewable energy resources such as wind and solar remains to be fully exploited in most of the countries.

1.4 Key Barriers for Poverty Reduction in the Sahel

The common barriers to poverty alleviation and access to energy in the Sahel are the security of supply (natural resource and financial) and a high dependence on imports/overseas aid for development. The key PRSP targets provides a good overview of the poverty alleviation indicators towards the enhancement of macro economic growth such as social equity (including gender), basic social services, employment generation, good governance, human capital, and infrastructure. The following are some of the key barriers that need to be addressed toward poverty reduction.

Environmental and Demographic Barriers

The fragility of the Sahelian environment is one of the biggest barriers and a challenge for poverty reduction in all the nine countries. The climatic conditions dictate an ever-increasing period of drought and have decimated large populations. Along with the harsh environment, the high population growth (an average of 2.8% for the nine countries) contributes to the challenge of reducing poverty. Five (Burkina Faso, Chad, Guinea Bissau, Mali and Niger) of the nine countries have the lowest HDI rankings and have an annual population growth of 3 to 3.3% (see table 1.2).

Lack of characterisation of poverty in urban and rural areas

Often, rural and urban poverty is characterised by different influences and factors. In the individual country PRSP's participatory exercises with both rural and urban poor, there is a marked distinction in the characterisation of poverty. In urban areas, people defined poverty as the inability to provide basic living requirements such as electricity and water, and in the rural areas poverty was focused mainly on the means of production such as lack of farm inputs and implements, lack of infrastructure and services such as education and health. Energy is not clearly mentioned as a defining factor for poverty in rural areas.

Social and Cultural Barriers

While a major part of the nine Sahelian countries are lagging behind economically, there are additional social and cultural barriers that prohibit the population to advance in comparison to other countries. In many of the predominant Islamic Sahel countries, higher levels of increase in population often a direct result from polygyny create an economic obstacle to rise above poverty levels (personal communication, Prof. Albert Wright, Burkina Faso, 2007). In Cape Verde, the high level of resignation, fatalism and dependence particularly on the state are believed to contribute greatly to poverty. Children are meant to represent social insurance for old age and there is a growth of single parent households

⁵ State and Trends of the Carbon Market 2006, The World Bank, Washington DC



headed by women (about 40% in 2000). Such attitudes have tended to replicate conditions of poverty in the country.

Feminisation of Poverty

Often, in most parts of the Sahelian countries, the social and cultural norms continue to pressurise women in a lower status compared to men with unequal division in access to education, decision making and assets. For example, in the Gambia PRSP document (2003), it is mentioned that the severity of poverty among women is more and referred to as the 'feminisation of poverty'. Women are involved often in subsistence activities in comparison the men who are economically active. In rural communities, often the absence of legal ownership of land for women means that they have to additionally forsake family properties in the event of their spouse's decease.

Other barriers are addressed below.

1.5 Key Barriers for Energy Policies and Program Implementation

Some of the key barriers for improving access to modern energy services commonly found in all the nine countries are as follows:

Heavy Reliance on imported fuels in the Sahel

In all the nine Sahelian countries, the reliance of imported fuels is one of the crippling factors not only to drain the financial resources of the countries but contributing equally to the low level of modern energy access to the population. The import has led to a permanent pressure on the economy, both macroeconomic (trade balance) and microeconomic level (production costs).

Generalized targets for Electrification

Often, electrification rate targets are not specifically defined for rural or urban areas in national strategic plans. For example, in the 2005 PRSP plan of Cape Verde, there are specific targets for electricity coverage rate and index of LPG Utilization for 2005-2007 but there is no reflection of an urban- rural division for targets to be reached. Unless such divisions and targets are created, it will continue to be difficult to measure energy sectors influence on poverty reduction.

Lack of an active private sector in energy delivery

In all the cases, the lack of an active private sector was clearly evident although Cape Verde has specific aims to strengthen this sector. Privatisation efforts of electricity utilities have brought mixed results. In Cape Verde, the privatised companies in the energy sector showed to have serious performance problems. In Chad, the lack of a dynamic private sector has been specifically mentioned to be an obstacle for the transformation of the economy. In Guinea Bissau, the private sector was significantly affected by the war and there was a move to implement institutional reforms for the energy sector including transfer of public electricity company. Similarly, in Burkina Faso, the incentives for privatisation and private sector stakeholders are being recognised and slowly brought through the development of regulatory frameworks. In Mauritania, the absence of strong regulatory frameworks encouraging public private partnerships as well as issues of property rights proved to be a hindrance to privatise the country's power utility SONELEC.

The lack of an active private sector also impacts on rural development as can be explicitly seen in the case of the Multi Functional Platform development in Mali whereby after a decade of work, only about 500 platforms were installed. While the solar sector is the best developed, there are still no sustained impact of its success through the private sector as is often seen in other parts of Africa. The sector depends largely on external funds and grants



rather than on the full scale development of an active local private sector market. The success of the renewable energy subsector is hugely affected by this factor.

Lack of political support for the development of the energy sector

Political changes in some of the countries have deterred the expansion of the energy, in particular the electricity sub sector. Conflict and war has also impacted on privatisation processes. Rural electrification in particular is not extremely high in the political agenda particularly in terms of supporting sub sectors such as renewable energy development.

Lack of government support for household energy sector

In the household energy sector, the support is even lesser particularly because of the overlapping role of the energy sector and the forestry sector. Often, there is a lack of legal recognition from the government as in the Niger Household Energy Project. There are found to be unequal power relations between forestry officials and local people coupled by vague forestry laws.

Low exploitation of renewable energy sources

Renewable energy sources (solar, wind, biogas, micro hydro) have yet to be fully developed. Although potential is high in most of the Sahelian countries, the cost of renewable energy technology such as solar has withheld the sector to progress. Firewood for cooking is becoming a major concern in the Sahel as it contributes to increasing desertification. CILSS has initiated a Regional Program for the promotion of Household and Alternative sources in the Sahel (PREDAS) and contribute to the sustainable management of forest resources.

Rapid Expansion of Urban areas

The rapid expansion of urban areas in the Sahel and the reliance on fuelwood and charcoal in the domestic energy sector is adding to the pressure of environment and also a shortage of energy resources. In the Gambia for example, a complete reliance on imported petroleum fuels has resulted in heavy dependence on limited foreign exchange and balance of payment. The impact has been an acute shortage of electricity supply, low investments and productivity impacting on the overall economy (IMF 2006).

Weak Linkages to Poverty Reduction Strategies

In most of the initial PRSP documents, the energy sector is not well linked to the PRSPs. For example, the first PRSP document in 2000 of Burkina Faso does not clearly mention linkages to poverty alleviation but by 2003, there were inclusion of the energy sector into the strategy. However, the energy was considered to be infrastructure development rather than acting as a catalyst for poverty reduction. In Senegal and Niger, PRSP documents do not show targets or linkages between poverty reduction and energy sector. The closest to poverty reduction targets for the energy sector in the PRSP documents has been the mention of rural electrification or household energy interventions through the promotion of renewable energy resources and technologies.

Lack of Capacity in the progression of the energy sector

There is clearly a lack of institutional capacity in the Sahelian countries in the energy sector. While energy interventions and programs are successful in Sub Saharan Africa with a strong capacity building element, in the Sahel, this is only beginning. The network PREDAS under CILSS are now collating information and building up capacity in the biomass and household energy sector. While the solar sector has had donor support in the Sahel, the capacity has still not been self sustaining with stakeholders depending on further donor support. The success of many Multi Functional Platforms in Mali and Burkina Faso are creating skills and capacity to manage and maintain energy systems at the local level. In the Gambia, the lack of capacity in the energy division is pointed out as



creating a barrier to the progress of the energy sector. However, a concerted effort to build capacity at all levels, from the national to the local level, the public and private sector are imminent needs if energy programs and policies were to be successful in the Sahel.

Lack of adequate financial mechanisms

Financing of energy projects, especially for the poor are one of the major constraints in all the nine countries. In Gambia, it was found that the private banks are interested only in short term financing. There is also an overwhelming dependence on external financing and local channels of financing are not explored. The Governments are often short of financial resources to support energy entrepreneurs. Renewable Energy subsidy policies for rural areas are still not looked at and there are still many options that have yet to be tried out.

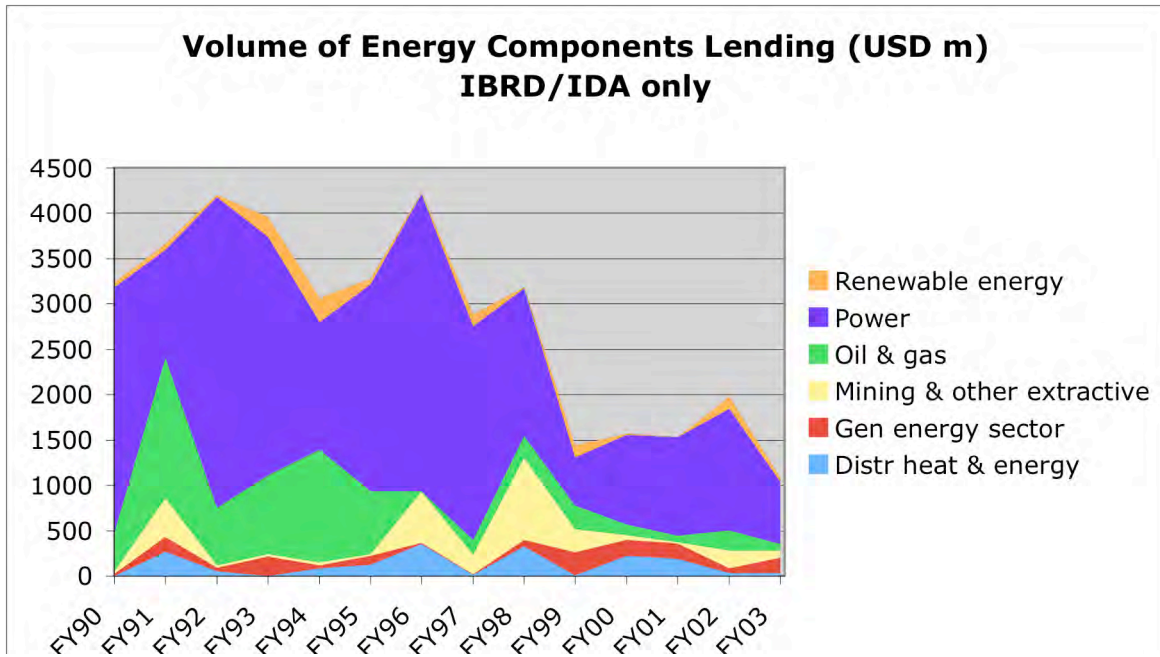


CHAPTER 2 THE ROLE OF INTERNATIONAL ORGANISATIONS IN ENERGY POLICY DEVELOPMENT

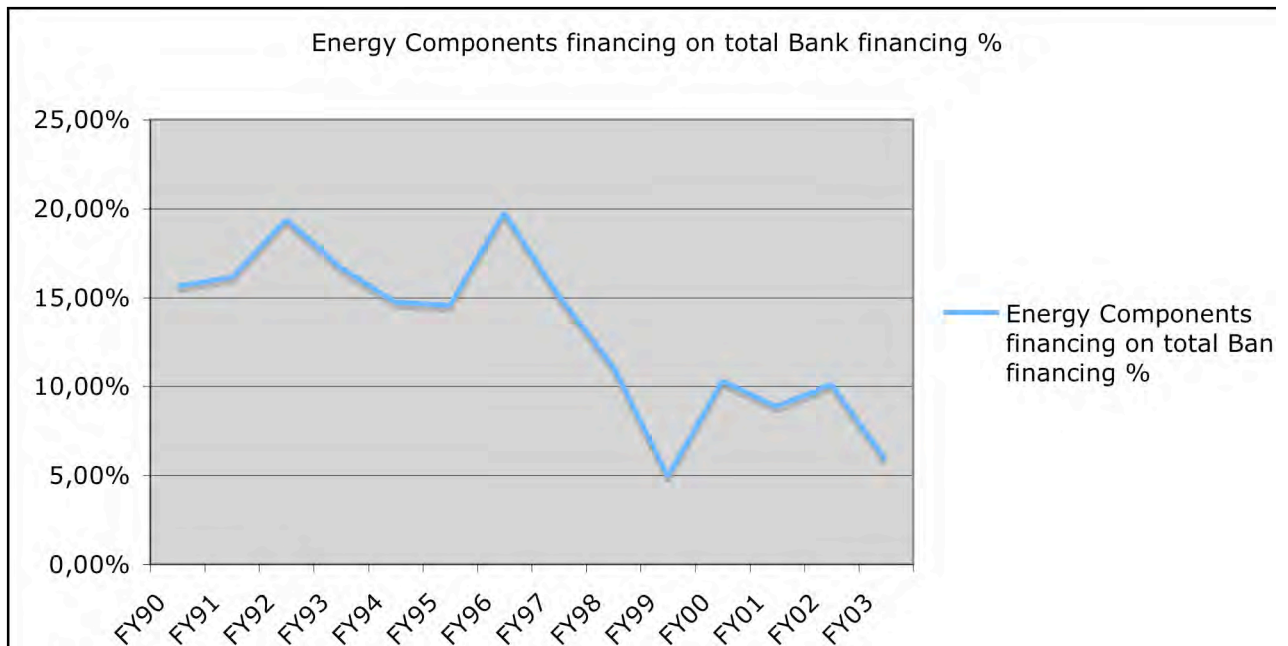
This chapter analyses the role that international organizations play in shaping the energy policies of developing countries through their support and advocacy activities. The first section will analyse the policies of the World Bank Group, by far one of the most important player in shaping the energy policies of developing countries followed by the UN Energy Initiatives that have played an active role in recent years. The presence of these international organisations in most of the Sahel countries has had a significant impact especially in the definition of national energy policies and programmes.

2.1. The World Bank Group Energy Policies.

The World Bank Group is a major player in shaping international energy policies through research, advocacy and financing activities. The Bank funded projects encompasses fossil fuels and extractive industries, internal market organization, electric utilities, and renewable energies. The Bank also hosts in Washington an annual "Energy Week", one of the major gathering of policy makers and the 2006 edition was centred on the theme 'Energy for Development' in occasion of the United Nations 14th Session of the Commission of Sustainable Development. Since its formation, the World Bank's involvement in the energy sector in developing countries has been prominent representing almost 25 % of all the lending activities referred to energy. More recently however the share has dropped to a level between 5 % and 10 % resulting after a focus on market reforms and favouritism towards private sector participation in the energy sector after 1992.



Graph 1: Volume of IBRD / IDA Energy Components Financing (USD millions).source World Bank: Renewing our Energy Business, 2004.



Graph 2: Energy components financing on total Bank Financing (IBRD/IDA only). Source World Bank: *Renewing our Energy Business*, 2004.

The policies advocated by the Bank and the projects therefore supported have changed over the years in accordance with the changes in global economies and politics, aid directives, globalization and open markets and, in the later years a stronger attention to social and environmental issues (also with a greater support to renewable energy sources) to finally arrive to poverty reduction strategies including related energy needs. The focus of the Bank policies has therefore changed from support to national utilities and large infrastructures (which is still a major focus), to structural adjustments, regulatory and market reforms, to focus on poverty reduction and support to sustainable development. In 2001, the Bank adopted an energy program along four business themes. To be approved by the Bank a project must be consistent with at least one of the following:

- i. Improve access of the poor to modern energy services;
- ii. Improve macroeconomic and fiscal balances;
- iii. Promote Good Governance and Private Sector Development; and
- iv. Protect the Environment.

The objectives of the World Bank energy policy are the fuel transition from traditional to modern energy use for poor households, efficient and environmental sustainable use of energy, greater choice of energy services for consumers and macroeconomic and fiscal stability. The World Bank Group envisages energy to be used in productive ways in order to sustain economic growth. To monitor the progress in this sector, a set of eight targets to be reached by 2010 was established, of which four refers to market conditions, privatizations and regulations, two to energy efficiency, one to environmental issues and one to the social aspects.



Box 1: World Bank Energy Quantitative Objectives to be reached by 2010

- i. Increasing the share of households with access to electricity from 65 % to 75 %.
- ii. Increasing the share of large cities with acceptable air quality from 15 % to 30 %.
- iii. Reducing the average intensity of carbon dioxide emissions from energy production from 2.90 tons per ton of oil equivalent to 2.75.
- iv. Reducing the average energy consumption per unit of GDP from 0.27 ton of oil equivalent per thousand dollars of output to 0.24.
- v. Increasing the share of economies where industrial consumers have a choice of supplier from 15 % to 40 %.
- vi. Increasing the share of economies where the power industry is no longer a burden on the government's budget from 34 % to 50 %.
- vii. Increasing the share of economies where private ownership and financing play a dominant role in energy supply from 25 % to 40 %.
- viii. Increasing the share of economies where regulators are required to oversee natural monopolies in an objective, transparent, and non-discriminatory manner from 35 % to 50 %.

2.1.1 The World Bank Group policies in the electricity sector

During the 70's and the 80's the electricity sector, both in developed and developing countries, was characterized with few exceptions by integrated state-owned utilities. At that time the economic paradigm was skewed towards the state rather than the current leaning towards markets, and the government in most countries, including in the Sahel, controlled directly or indirectly large sectors of the economy. The guidelines for the support to state owned electric utilities have been fixed in a document in 1978, The Bank Operation Manual Statement 3.72 for public utilities projects where the following four objectives were formulated:

- a) Provide power service on the basis of least-cost development programs.
- b) Strengthen the sector's institution and improve their efficiency.
- c) Increase local resource mobilization and catalyse co-financing.
- d) Improve access to electricity by disadvantaged groups.

The progress towards these objectives has been reported to be slow and unsatisfactory in many developing countries. In the 80's and at the beginning of the 90's, for various reasons, the state of the electricity sector in developing countries deteriorated. Many utilities faced poor financial performances that prevented to make further investments and assure a decent quality of service, and absorbed considerable financial resources from the state. The Bank pointed that this was due to three set of factors:

- Exogenous factors; raise in oil prices, access to foreign loans, interest rates and inflation.
- Inappropriate national policies on energy pricing, investments, institutional development and governance,
- Enterprise related factors, conflicting objectives, lack of management accountability resulting in technical, operational and financial problems.

In 1993 the Bank decided to intervene on the last two factors by taking a completely new approach in supporting electricity utilities. The document "The World Bank's Role in the Electric Power Sector - policies for effective Institutional, Regulatory and Financial Reform" pointed that *the fundamental problem has been that the closed command-and-control management approach is often subject to political compromise and that in numerous developing countries the political will to implement and adhere to financial and operating covenants and sound pricing policies has been disappointingly weak.* Following the experience developed in Chile,

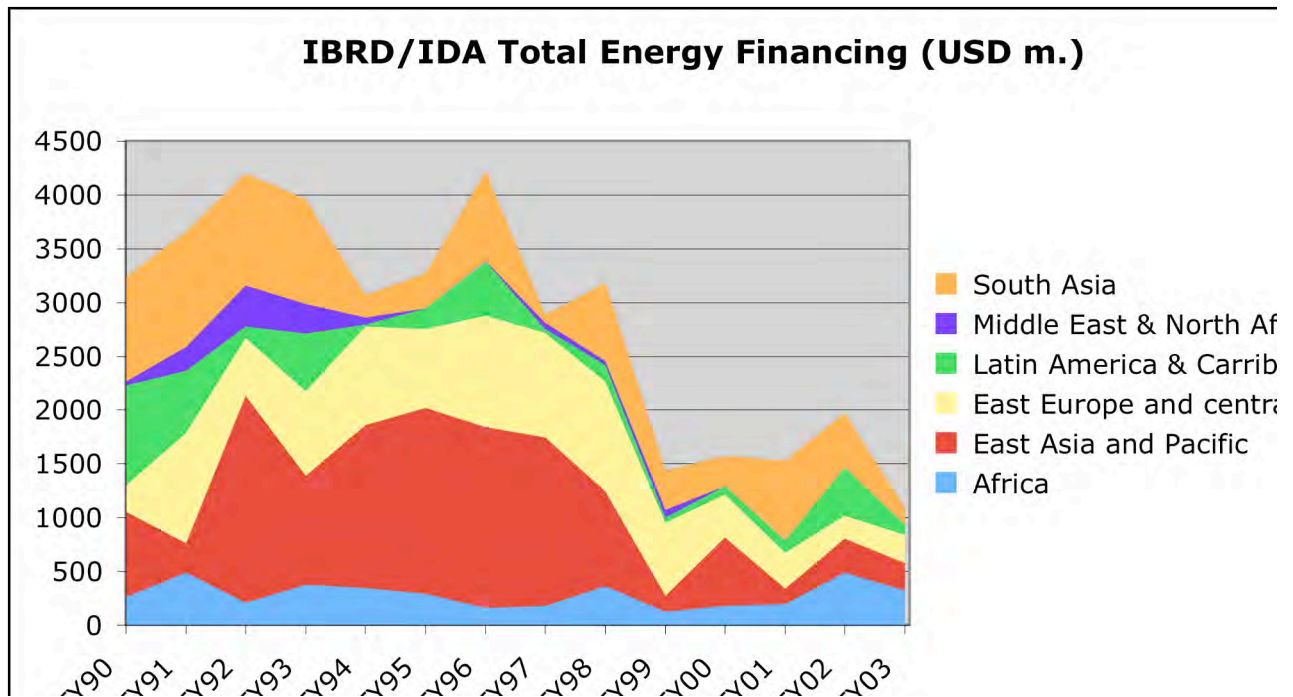


England and Wales, the Bank set the new guiding principles for electricity support, emphasizing the need of market reforms, of the separation between the state regulator and the utilities and the participation of the private sector. In particular the Bank set the following principles:

- I. **Transparent Regulatory Process:** *A requirement for all power lending will be explicit country movement toward the establishment of a legal framework and regulatory processes satisfactory to the Bank.*
- II. **Importation of Services:** *In some of the least developed countries with the presence of weak public and private sectors and a relative lack of market forces and undeveloped capital markets, an early step in bringing about power sector reform and increasing sector-management efficiency will be to bring local, developed-country, or more advanced developing-country electric power services into the sector.*
- III. **Commercialisation and Corporatization:** *The Bank will aggressively pursue the commercialization and corporatization of and private sector participation in, developing-country power sectors.*
- IV. **Committed lending:** *The Bank will focus lending for electric power on those countries with a clear commitment to improving sector performance in line with the above principles.*
- V. **Private Investment:** *To encourage private investment in the power sector, the Bank will use some of its financial resources to support programs that facilitate the involvement of private investors.*

The new guiding principles did not leave much choice to developing countries, often burdened by huge external debts with the Bank, IMF or with OECD countries. To get additional assistance they had to implement the above-cited reforms. Effectively the energy reforms were not isolated, as they were a part of a wider package of economic reforms, known as Structural Adjustment Programs (SAP) that have been the base for Bank's support to developing countries in the '90s, and also presented the same framework of sound regulation, good governance, macroeconomic stability, market reforms, and trade liberalisations and committed lending.

The reformation path was not easy as the World Bank Evaluation Department in 2003 pointed that the 1993 *policy enunciated what to do, but because of the limited experience worldwide in implementing such policies it was not accompanied by a strategy on how to do it* and that the Bank was aware of that and *anticipated that the necessary experience would be obtained by a "learning by doing"*. The OED continues affirming that the Bank recognised what was already a reality in the power sector in many countries, massive private investments, and formalized it. The parallels with what was happening in the private sector independently from the Bank are very strict. The international investments in developing countries power sectors growth considerably in the first part of the 90s, reaching a peak of 50 USD billions in 1997 , driven by the boom in Independent Power Projects in East Asia and large privatizations in South America. With the 1997-1998 Asian financial crisis, followed by the crises in Argentina and in other parts of the world, the private sector drastically reduced its investments in energy projects in developing countries and, as shown in graph 2 and 3, the World Bank lending also dropped significantly after 1997, both in absolute and in relative terms to total Bank financing. From the data shown, it seems that the Bank assistance has been accompanying the private investments and, when these dropped, did not provide additional resources to replace them.



graph: 3 IBRD/IDA Total Energy Financing (energy projects plus energy components in other projects) by region. Source World Bank: Renewing our Energy Business, 2004.

The principal advantages of the new approach in the Bank vision would come from three aspects. First, the removal of subsidies and market distortion measures would have led to a better allocation of resources. Second the profit would have given a strong incentive to the efficient use of inputs. Third competition, where possible, would have lowered the costs and passed benefits to the consumers. Experience from developing countries suggests that two necessary conditions must be met *before* the reforms are attempted: first the reform should be generally perceived as desirable and, second, it should be politically feasible (Bacon and Besant Jones, World Bank, 2002).

The reforms introduced Private Sector Participation in the electricity sector in about 80 countries, and reshaped in a decade the structure of the electricity systems.

As noted before, an important part of the reform packages was about removing the country subsidies to the electricity and let the consumers pay for the marginal costs of electricity, as unbiased price signals are essential for the correct functioning of a marked based system. These measures did not prove particularly popular especially because this occurred many times before and consumers could not see any quality advantage in the new system.

The current Bank vision about subsidies in the electricity sector is that they should be implemented only if it specifically targets the poor. The provision of generalised subsidies favour the part of populations that are already connected to the grid thereby the richer populations absorb huge financing resources that could be spent on poverty reduction programs. In a recent paper, Jamal Saghir, vice-president of World Bank and chief of the Energy and Mining Sector Board, suggest to design subsidies for capital costs for rural electrification and not for operating costs and to develop off-grid rural electrification and use low cost technologies solutions. Also, Saghir points that cross subsidies could be used when necessary moving resources from wealthier consumers to the poorest ones, not only in rural areas but also for the poor urban consumers and that they should be used also to



lower the up-front costs of connecting to the grid, spreading it over the years, for example with micro-credit solutions. There is a lot of debate both inside and outside the Bank on the role of subsidies, and on their outcomes and Saghir himself recognises that *subsidy design is an area where more work is needed*.

In the same paper Saghir points that, *even well meaning energy reforms that will probably benefit the poor in the long run can cause them immense difficulties in the short run* because they cannot stand even a little increase in energy expenditures. Moreover the World Bank vice president affirms that *private service providers need incentives to serve the poor households or otherwise the benefits of reform will accrue mainly to wealthier households that already have service. Thus it is vital to protect the interest of the poor during the reforms* (emphasis added by the author).

2.1.2 World Bank and Extractive Industries.

The passage between the XXth and the XXIth century has been characterised, among other things, by a wave of anti-globalisation protests that hit the streets of the cities where International Summits were held. The protesters in the streets fought for issues like fairer trade agreements, respect for the environment and for human rights, respect for the needs of developing countries, a stronger effort to fight poverty, HIV-AIDS, and a general pro-poor, more democratic and transparent functioning of international institutions. The World Bank summit of September 2000 in Prague was one of the many that were characterised by a high degree of criticism outside and inside the delegates' rooms. One of the issues that have been raised in that occasion was about the consequences of extractive industries projects in developing countries on the poor and on the environment, and if these kind of activities would be justifiable for the World Bank Group mission. During the meeting, WB president James Wolfensohn, in response to criticism announced that he would have appointed an independent review of the Bank's involvement in extractive industries projects. In June 2001, Dr. Emil Salim, former environment minister of Indonesia, was asked to lead this process and after two years the Extractive Industries Review report "Striking a Better Balance" was ready.

Striking a better Balance, the Extractive Industries Review, 2001-2003.

The Extractive Industries Review has been a two years process designed to involve all stakeholders, governments, NGOs, labour unions, local communities, industry, academia, international organization and of course World Bank staff. There have been five regional workshops (Brazil, Hungary, Mozambique, Indonesia and Morocco).

The principal question to be answered was if the projects in extractive industries could be compatible with the objectives of sustainable development and poverty alleviation of the WBG. In few words *EI projects considered for World Bank support should be evaluated to ensure that their expected benefits – especially for the poor – are sufficiently higher than their estimated costs, including environmental and social costs.*

The EIR identifies three kinds of challenges for extractive industries, at the project, at the country and at the global level.

The project level challenges are essentially the environmental and social problems that may arise in the site of the project. Often extractive industries have strong negative effects on the environment, and the communities that are living in the affected areas might be seriously compromised and constrained to emigrate or to live in a degraded condition.

Moreover, in a number of countries, severe human rights violations have been connected to extractive industries, and several armed conflict are direct or indirect consequence of the extractive industries activities.

The country level challenges refers to the fact that in the case of extractive industries, the benefits are not dispersed in the local economy but are concentrated in few sectors, the revenues are channelled to the central government and they might represent the main source of government



financing. The challenge is how to assure that the money generated by extractive industries is used for poverty alleviation, how to assure the rule of law, transparency, and fight corruption. Corporate governance plays also a central role in this process.

The global challenge is about two things. First climate change caused by green house gases is already in act, and we should maximize all the efforts in order to develop clean and renewable energy sources. Second, extractive industries are integrated highly capital intensive industries. Governments of developing countries may often negotiate with big extracting industries on an unequal position, not only for the relative size of the two entities, but also for the asymmetries in information between the two partners.

After two years of consultation and research the EIR concluded that the WBG has been mostly successful in their role of helping in reforming the legal and regulatory framework, promote private investments and privatization and commercialisation of public-owned enterprises. On the contrary EIR judges that the efforts to improve public governance in order to protect social and environmental issues have not been sufficient and that increased investments have not necessarily helped the poor, on the contrary often the poor and the environment have been further threatened by the expansion of EI. Considering also the Climate Change issue, **EIR recommends that WBG phase out investment in oil production by 2008**, to address its scarce resources to sustainable energy projects and support Kyoto protocol. .

Anyway, EIR do not deny that the WBG has still a role to play in extractive industries but affirms that this is true only if it contributes to poverty reduction through sustainable development and that can only happen when the right conditions are put in place in the following areas:

1. Pro-poor public and corporate governance, including proactive planning and management to maximise poverty alleviation through sustainable development.
2. Increasing effective social and environmental policies
3. Respect for human rights.

The World Bank Group Management response

In September 2004 the Management of the World Bank issued its response to the Extractive Industries Review. The management of the WBG welcomed the Review and accepted the majority of its recommendations (*but not the one to stop financing oil projects by 2008*). In particular the World Bank management welcomes the fact that, following certain criteria, EI can contribute to sustainable development and therefore there is still a role of the WBG, if these criteria are applied.

The management accepted to revise its policies in the following areas:

Strengthening governance and transparency

- Country assistance Strategies (CAS) for resource rich countries will address EI issues
- The sequencing of activities on EI will be based upon governance capacity and risks
- Transparency will be required as a condition for new investments

Ensuring that extractive industries benefits reach the poor

- The Bank strongly support the principle that communities should benefits from projects that affects them and will work with governments, sponsor and communities to assure that it happens.
- The Bank agree to develop indicators, establish independent monitoring mechanisms

Mitigating environmental and social risks

- The bank supports the principle of non (cut)-go zones, due to high value of biodiversity
- IFC (International Finance Corporation) safeguard policies are being updated
- The bank will expand disclosure of relevant informations



Protecting the rights of people affected by EI

- The Bank strongly support the principle of protecting the rights of those affected by EI projects.
- Free, prior and informed consultations will be required
- The Bank accept the EIR recommendation on security of EI sites and human rights

Promoting Renewable Energy and efficiency to combat climate change

- The Bank Strategy is to promote economically and financially viable renewable energy projects
- The bank commits to increase its portfolio in renewable energy and energy efficiency by 20 % each year, and will publicly report on an annual basis.

The position of the WB management is that even if EI are risky operations, for some developing countries they are valuable assets often one of the few available that should be exploited in a careful and responsible way. Moreover the engagement of the bank in the EI can have an influential role to ensure the sustainability of the industry, and that the best environmental and social practices are followed.

2.1.3 The World Bank Group Renewable Energy Policy

The World Bank Group recognizes the importance of renewable energy and is actively involved in the sector's development. The WBG works with several partners, the more important being the Global Environmental Fund (GEF) established in 1991, the United Nations Development programme (UNDP), and other regional and international organizations. The Bank also launched the Global Village Energy Partnership (GVEP) with projects implemented globally.

In the period 1990-2006, the total World Bank Group lending for renewable energy projects (IBRD, IDA, MIGA, IFC, including GEF cofinancing and Carbon Finance) accounted to USD 7,2 billion, around 12 % of all energy sector commitments. This value is the half of the finance allocated to fossil fuels development (oil and gas accounted for 19%, coal for 3%). To this value, an additional USD 2.8 billions is committed to Energy Efficiency (another 5% of the total), as the World Bank account together renewable energy and energy efficiency projects as they both produce savings on Green House Gases (GHGs) emissions.

In 2004, at the International Conference on Renewable Energies (Bonn - Germany) the World Bank committed itself to increase its financial involvement in renewable energy and energy efficiency by an average 20 % per year in the period 2005- 2009 (from a baseline of USD 209 m.). World Bank affirms that it met more than this target so far, with a total investment of USD 680 millions in 2005 and USD 871 millions in 2006. It has to be noted that the majority of these funds (USD 490 m.) refers to energy efficiency, while the rest is equally divided between hydro projects of a capacity greater than 10 MW and other new renewable projects. More than the half of these funds comes directly or indirectly from International Finance Corporation (IFC), the rest from the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA). The average per year commitment of the IBRD/IDA on new renewable energy has been USD 82 million in the period 1990 - 2003, compared to a value of USD 131.4 million in 2006.

2.1.4 Carbon finance at the World Bank

Carbon Finance is a set of financial instruments, funds, and actions explicitly targeted at developing the market of greenhouse gas emissions from developing and transition countries. Emission generated by Clean Development Mechanism (CDM) or Joint Implementation (JI) projects are internationally traded under the Kyoto Protocol's agreement but, under its rules, Official Development Assistance (ODA) funds cannot be diverted for financing emission-reducing projects. So a new set of specific instruments was



necessary for this scope: carbon funds. This kind of funds are created by OECD Governments and private companies and are used, unlike other WB funds, not to lend or grant financial resources to developing countries, but to buy emission reductions certificates produced by JI and CDM projects, and so promoting cleaner technologies. The types of projects interested are in large part new renewable energy projects and waste to energy projects, but there is also a share of fuel switching, and other projects directly reducing emissions (like reducing of gas flares and leaking). The World Bank participates in several funds:

The Prototype Carbon, the Bio Carbon Fund, The Community Development Carbon, The Italian Carbon Fund, The Netherlands CDM Facility, The Netherlands European Carbon Facility , The Danish Carbon Fund, The Spanish Carbon Fund, The Umbrella Carbon Facility and The Carbon Fund for Europe.

Carbon Finance may be an important part of a project and increase its profitability, and it is supported not only financially but also with other kind of actions, like capacity building, technical assistance, resources for project developers, for service providers and national state. To this regard the Bank has issued the CF-Assistance program that provide assistance for establishing national focal points and Designated National Authorities, to give technical assistance to project developers and to integrate carbon financing in mainstream project financing.

2.2. The United Nations Energy Strategy

The United Nations, through the mother organization and its various agencies, extensively deal with energy issues and participate in the formulation of international and national energy policies, particularly in developing countries. The focus on energy and its linkages with poverty has strengthened in the recent years and currently has become one of the pillars in the development policies aimed at achieving the Millennium Development Goals, while probably in the past the sector has been undervalued. The activities of the UN in this matter can be divided into two groups: first the organization of several International Conferences during which stakeholders, Heads of States and International Organizations agreed on certain principles and found consensus on policies and strategies and, second, the research and cooperation activities of each UN branch and agency on this matter. In the following sub section a brief and non-exhaustive description of the principal activities of the two types.

2.2.1 International Conferences and related programmes

2.2.1.1. United Nations Conference on Environment and Development (UNCED), Rio 1992.

The Conference that opened in Rio in 1992 was the first of a series that happened in the following decade. It was unprecedented both in terms of size and presence of Heads of State. The focus of the conference was the relation about environment and development and on the necessary strategy to achieve both economic development and environment protection. The Rio message was that both excessive consumption and poverty, put much stress on the environment. The Rio conference dealt both with energy and poverty issues but not specifically on their mutual linkages. On energy, the focus was on environment degradation, green house gases emissions, climate change and sustainability of energy systems. On poverty the focus was essentially on the linkages between local environment degradation, biodiversity, on the necessity of eradicating poverty and reducing disparities in living standards. The Rio final Declaration did not explicitly mention energy. The summit anyway was the base for several initiatives that focused much more on energy, like the United Nation Framework Convention on Climate Change, Agenda 21, the statement of Forest Principles and the Commission of Sustainable Development (CSD).



2.2.1.2 Agenda 21

Agenda 21 is a comprehensive blueprint of actions developed by the UN, presented and approved in Rio, in order to carry out the Rio principle with action at the international, national and local level. Energy is extensively discussed in Agenda 21, in particular for its linkages with environment and natural resources: for example in Chapter 4 - Changing Consumption Patterns - A21 recommends increasing energy efficiency and the use of renewable energy sources and internalizes environmental costs. In chapter 6 Agenda 21 deals with the environmental consequences of energy production and in chapter 7 - promoting sustainable human settlement development - A21 deals extensively with energy policies in the household and transport sectors.

2.2.1.3 The UN Commission on Sustainable Development (CSD).

The Commission on Sustainable Development (CSD) has been created following the recommendations contained in chapter 38 para 11 of Agenda 21⁶. It is a functional body of the UN Economic and Social Council and its works are organized in thematic sessions. The 5th session dealt with the progress report of the Rio Conference, the 9th Session and the 14th Session (in 2000 and 2006 respectively) focused an important part of their works on energy and, this time, more specifically on the energy-poverty linkages.

2.2.1.4 The World Summit on Sustainable Development, Johannesburg 2002 (WSSD - Rio +10)

Ten years after Rio, another great conference evaluated the progress made and proposed new actions. At WSSD energy was approached not only on its environmental aspects, but also for its role in combating poverty. Energy is quoted in the Johannesburg declaration as a basic need, together with clean water, sanitation, adequate shelter, health care, food security and the protection of biodiversity. The action to be taken to preserve this and other objectives are contained in the Johannesburg Plan of Implementation.

2.2.1.5 The Johannesburg Plan of Implementation

The Johannesburg Plan of Implementation (JPOI) highlighted the role of energy services to promote sustainable development and to facilitate the achievement of the Millennium Development Goals and called for maximum efforts from the international community. One important aspect of the JPOI is the possibility of establishing partnerships in order to carry on projects and programs to achieve the objectives indicated at WSSD. Partnerships gather together international organizations, regional organizations, NGOs, think-tanks, national and local government, and other stakeholders. In the field of energy some of the most important WSSD Partnerships are: Global Network for Energy and Sustainable Development (GNESD), the Global Village Energy Partnership (GVEP), the Renewable Energy and Energy Efficiency Partnership (REEEP), and the EU Energy Initiative (EUEI).

⁶ 38.11. In order to ensure the effective follow-up of the Conference, as well as to enhance international cooperation and rationalize the intergovernmental decision-making capacity for the integration of environment and development issues and to examine the progress in the implementation of Agenda 21 at the national, regional and international levels, a high-level Commission on Sustainable Development should be established in accordance with Article 68 of the Charter of the United Nations.



2.2 United Nations Institutions

2.2.1 The UN-Energy

The UN in 2004 created a brand new inter-agency dedicated to the theme of Energy with the scope of coordinating the work of the UN Agencies on the theme and to ensure participation of non-UN stakeholders to the process established at WSSD on energy, and to highlight the importance of energy in achieving Sustainable Development Goals. One of the first publications of UN Energy is a report on the importance of Energy in achieving the Millennium Development Goals and the strategy to be followed. Other work is being carried out to map and coordinate UN Agencies projects and dissemination activities.

2.2.2 Other UN Agencies

Each UN agency has its specific focus and competences and approach energy as a cross cutting issue with other sectors. In this context, the activity of the various regional UN Economic Commissions is devoted to their specific energy needs while the Food and Agriculture Organizations has activities in the field of biofuels and food security. The International Atomic Energy Agency produces energy models, assistance to countries for the civil use of nuclear energy and acts as the most important forum on Atomic Energy Security. The UN-Habitat on the contrary works on energy for households and urban transportation. One of the major players in the UN- system is the United Nations Development Program that plays an active role in capacity building, promotion of rural energy and clean energy development including increase in investments and advocating operations. Another major player is the United Nations Environment Program (UNEP) and the United Nations Industrial Development Organization (UNIDO). The United Nations Framework Convention on Climate Change (UNFCCC) is responsible for the implementation of the Kyoto Protocol on the reduction of GHGs in the atmosphere. The World Health Organization (WHO) implements many projects and programmes related to the health consequences of energy especially indoor pollution and security.

Finally, the Millennium Project (MP) was commissioned in 2002 by UN secretary general Kofi Annan to develop concrete action plan to achieve the Millennium Development Goals. The MP developed specific analytical tools and guidelines and worked with national governments to prepare MDG based Poverty Reduction Strategy Papers. The importance of MP for Energy Policy is that it seriously advocated the importance of making energy one of the pillars of the MDG strategy and developed a series of conceptual tool (like the MDG energy gap, i.e. the energy necessary to achieve the MDGs) that helped to refocus international policy on energy and on the energy needs of the poor.



CHAPTER 3

REGIONAL ENERGY INITIATIVES

3.1 The African Policy Initiatives

In the last years, several policy initiatives, co-operation programs, policy declarations and development projects have been initiated and completed in Africa. In the following sections, a list of the principal policy agreements and initiatives subscribed by the African states and specifically for the Sahelian States are presented.

3.1.1 The New Partnership for Africa's Development

The **New Partnership for Africa's Development (NEPAD)** is an initiative adopted in 2001 by the Summit of the head of state of Organization for the African Union (OAU, now African Union). The NEPAD objectives are to reduce poverty levels, promote sustainable development, halt the marginalisation of Africa in the process of globalisation and accelerate the empowerment of women. The Partnership is a holistic programme that covers many issues, starting from good governance, peace and security, capacity building, financing, infrastructure and others. It is intended to be a process that is driven by the Africans and achieved with additional support from international donors. The NEPAD framework document includes a section on energy with the following objectives:

- ❖ To increase access to reliable and affordable commercial energy supply from 10 to 35 per cent or more within 20 years for Africans;
- ❖ To improve the reliability and lower cost of energy supply to productive activities in order to enable economic growth of 6 per cent per annum;
- ❖ To rationalize the territorial distribution of existing and unevenly allocated energy resources;
- ❖ To strive to develop the abundant solar resources;
- ❖ To reverse environmental degradation that is associated with the use of traditional fuels in rural areas;
- ❖ To exploit and develop the hydropower potential of the river basins of Africa;
- ❖ To integrate and transmission grids and gas pipelines so as to facilitate cross-border energy flows;
- ❖ To reform and harmonise petroleum regulations and legislation on the continent.

One of the actions indicated in the document is to create an **African Forum for Utility Regulation**. Energy related projects in the NEPAD framework are especially related to the modernization of infrastructures.

3.1.2 The African Energy Commission

In 1980, the African Head of State of the OAU (Organization for the African Unity) adopted a Lagos Plan of Action and recommended the creation of an African Energy Commission (AFREC) in Nigeria. The recommendation was not implemented immediately and was re-affirmed in several meetings and declarations throughout the



nineties. In July 2001, the African Ministers of Energy met and adopted a declaration creating the African Energy Commission, with headquarters in Algiers. The declaration was signed by 37 African states, but only ratified by eleven. It is stated that to enter into force the convention should be ratified by at least 15 African States. In the Sahel region, only Mali and Senegal have ratified the convention.

The Commission, when and if it will be fully operative, will have between her duties to map out the energy development policies, strategies and plans based on sub-regional, regional and continental development priorities and recommend their implementation and design, create and up date an energy continental data base and facilitate rapid dissemination of information and exchange of information among Member States, as well as among the Regional Economic Communities (RECs), plus various harmonization, advice, capacity building and seek for financing activities. Part of these activities already started with the support of the World Energy Council WEC and the International Energy Agency IEA that made some efforts to create an African Energy Information System (AEIF).

3.1.3 The Forum of Energy Ministers of Africa - FEMA

On the 3rd of August 2005 the Ministers of Energy of African States established a **Forum of Energy Ministers of Africa (FEMA)** with headquarters in Kampala, Uganda. The vision of the forum is to *achieve effective African and regional cooperation, social and economic development leading to poverty eradication in Africa through the promotion of environmentally sustainable use and management of energy resources*. The key objectives of FEMA are:

- Raising the profile of the energy sector in national and regional planning to reflect its central role in achieving the Millennium Development Goals.
- Developing a coherent energy strategy for Africa, including re-strategizing in order to increase modern energy supply and access.
- Promoting a common approach expressed through specific, national and regional projects of benefit to African countries.
- Speaking with a common voice and collectively advocating for the financing of regional projects.
- Promoting interconnectivity, and developing common technical standards and codes of conduct.

The FEMA interim Secretariat is hosted by the Ugandan Minister of Energy (and chaired by the Ugandan Minister). It received support both from the World Bank's Energy Sector Management Assistance Program (ESMAP) and the German technical co-operation GTZ and is designed on the basis of the previous successful experiences of other African Forums, like the African Ministerial Conference on the Environment (AMCEN) operational since 1985 and the African Ministerial Council on Water (AMCOW) from 2002. The Forum of Energy Ministers shall meet every two years, while the steering committee has an annual meeting schedule.

In order to achieve its objectives and the Millennium Development goals, the FEMA proposed to fulfil the following energy targets:

- doubling the consumption of modern fuels
- 50% of inhabitants in rural areas should use modern fuels for cooking
- 75% of the poor in urban and peri urban areas should have access to modern energy services



- 75% of schools clinics and community centres should have access to electricity as this would enhance their competitiveness
- Motive power should be available to rural areas.

Financing needs to achieve these goals are huge, for the electricity sector only it is estimated an annual requirement of USD 4 billions for operation and infrastructure plus an additional USD 4,8 billions to provide electricity to an additional 150 million in Sub Saharan Africa. The FEMA is expected to complement and collaborate with AFREC once this will be fully operative.

More specifically for the Sahel region, the most important policy steps in the field of energy have been carried out in the framework of two organizations that comprehend the majority of the States of the region under study: the UEMOA⁷ and the ECOWAS⁸. In the following sections, a brief list of the principal regional energy policies and initiatives in ECOWAS/UEMOA member states are provided.

3.1.4 The Common Energy Policy - La Politique Energetique Commune (PEC)

In 2001 the states of UEMOA adopted an Energy Common Policy with the objectives to:

- put in place an integrated energy planning system
- promote renewable energies, and
- accelerate the interconnection of energy systems in collaboration with the ECOWAS

3.1.5 The WEST AFRICAN Power Pool

The institution of a West African Power Pool - WAPP was decided by ECOWAS members in 1999 with the objective to multiply by four the interconnection capacity between member states for the period 2005-2020. The WAPP project is to extend for more than 5600 km the interconnection lines between Nigeria, Benin, Togo, Ghana, Ivory Cost, Niger, Burkina Faso and Mali) with investment to be realised for about USD11,8 billion in 19 years. The objective is to reach, for the ECOWAS region, a capacity of 17000MW of installed capacity in order to satisfy the planned demand for the year 2023.

3.1.6 The ECOWAS Energy Protocol

The ECOWAS Energy Protocol is a legal text formalising the juridical framework of enterprises in the energy sector, and has been designed as a guarantee for the foreign direct investments in the energy sector. The adoption and ratification of this convention is an eligibility criterion to have access to the World Bank Facility for the WAPP.

3.1.7 Interstate Natural Resources Management

There already exist sub regional institutions created in order to manage water and energy resources. The *Organisation pour la Mise en Valeur du fleuve Sénégal* OMVS, manage the

⁷ The UEMOA is the West African Economic and Monetary Union or Union économique et monétaire ouest-africaine in French and comprehends Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo.

⁸ ECOWAS is the Economic Community of West African States and comprehend Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.



Manantali dam and shares resources between Mali, Sénégal and Mauritanie. The *Organisation pour la mise en valeur du fleuve Gambie* OMVG and the *Autorite du Bassin Du Niger* ABN also are other examples of interstate cooperation in the field of natural resources.

3.1.8 The ECOWAS / UEMOA initiative and the White Book for a Regional Policy

The most ambitious regional project in the field of energy is summarised in the "White book for a regional policy". Following the engagements taken by NEPAD and later by the Summit of African Energy Ministers at FEMA in 2005, the 29th Conference of the Head of State of ECOWAS/UEMOA in Niamey on the 12th of January 2006 with the decision A/DEC.24/01/06 adopted an ECOWAS/UEMOA regional policy on access to energy services for populations on rural and peri-urban areas for poverty reduction in line with achieving the MDGs in Member States. The policy objectives and the accompanying white book guidelines are ambitious and call for:

a) **One global objective:** Increase access to modern energy services of rural and peri urban populations, to provide by 2015, access to modern energy services to **at least half** the populations living in rural and peri urban areas. This entails multiplying by four the number of people with access to modern energy services in comparison to 2005. This also entails supplying 36 million more households and 49 000 more localities with access to energy services.

b) **Three Specific Objectives:**

[1] To strengthen regional integration by pooling knowledge of good practices, exchanging experiences, adopting a regional information system and developing cross-border co-operation, with a view to fostering development and building capacities.

[2] To help harmonise political and institutional frameworks (i.e. PRSPs, MDG monitoring framework, etc.), in taking into account essential role energy services play in boosting human development and achieving the MDGs.

[3] To develop, on the basis of national political frameworks, coherent energy policies based on reducing poverty in rural and peri-urban areas and achieving the MDGs. The energy programmes will focus in particular on:

- Stimulating productive activities, especially those related to processing and added value to agricultural produce,
- Modernising basic social services (healthcare, education, water, etc.) and improving living conditions,
- Improving the situation of women, who are disproportionately, affected by all aspects of poverty, most particularly health problems (arising from the difficulty of chores such as wood-gathering and water-drawing, cooking on smoke emitting stoves etc.).

c) **Three targets**

[1] 100% of the total populations or 325 million people, will have access to a modern cooking fuel;

[2] At least 60% of people living in rural areas will have access to productive energy services in villages, in particular motive power to boost the productivity of economic activities;

[3] 66% of the population, or 214 million people, will have access to an individual electricity supply, or: (a) 100% of urban and peri-urban areas; (b) 36% of rural populations; (c) Moreover, 60% of the rural population will live in localities with (i)



modernised basic social services – healthcare, drinking water, communication, lighting, etc. (ii) access to lighting, audiovisual and telecommunications service, etc. and (iii) the coverage of isolated populations with decentralised approaches.

The document also states that the actions should conform to several guiding principles and between them we may mention: participatory approach, cohesion, consultation and co-operation, multisectoral approach, technological neutrality, public-private partnerships, sustainable development, gender equity, security of supply, optimisation and raising of current financial resources. The White Book not only affirms the link between the provision of energy services and the achieving of the Millennium Development Goals but also makes an action plan, a cost estimation of the action that have to be taken in order to reach its ambitious objectives.

The implementation of the regional UEMOA/ECOWAS energy policy is led by a Steering Committee comprising:

- ECOWAS/UEMOA Technical Secretariat
- ECOWAS/UEMOA Energy Committee
- Regional multi-sectorial committee
- Representative of civil society, and
- Donors.

The political level coordination is to be held by an annual **Regional Forum of Access to Energy in ECOWAS Countries** attended at ministerial level. A high profile annual meeting is considered of an extreme importance for the visibility of the sector, experience sharing and political guidance. The implementation work has to be done by a dedicated permanent **Regional Agency for Access to Energy Services** with operational autonomy. This Agency, whose legal status has to be negotiated between member states, would be after a first initial period, financially autonomous through a levy on the additional investments that it would be able to mobilize and its functions would be revised on a 5 yearly basis.

Finally the total **costs and the investments** estimated by the UEMOA/ECOWAS white book are the following:

- 17.5 billions of dollars over ten years for investment in equipment, studies and accompanying measures.
- 34.6 billions of dollars over ten years for energy costs
- the total cost is estimated to be 5.2 USD billions each year, that is about 4,6% of regional GDP and 16 USD per year per inhabitant.

These costs appear very high, but it has to be reminded that the above figures include the whole cost of the investment, studies and consumption of energy in the entire region.

The **ECOWAS/UEMOA Regional Action Plan** is the action plan designed to start this process and mobilize further investments, its cost is estimated to be of 248 USD millions over ten years, subdivided into the following action lines:

- Capacity building for private and public actors - 83.1 USD millions - including 34.8 USD millions for feasibility studies
- Support to fund mobilization - 121.2 USD millions - including 90 USD millions for 200 demonstration projects.
- Promotion and dissemination of experiences - 15.6 USD millions
- Promotion of local production of energy service equipment - 12 USD millions



- Preparatory activities and operation of the energy - 16.8 USD millions. The regional agency for the promotion of energy access is estimated to have an annual cost of USD 1million.

Energy Targets for achieving the Millennium Development Goals 2015.

	UN Millennium Project	FEMA	ECOWAS/UEMOA white paper
Objectives	MDG 2015	MDG 2015	MDG 2015
Area	Developing Countries	Africa	EEOWAS / UEMOA member states
Domestic Energy	50% of the ones that today do not have access	50% of Rural habitants with modern fuels	100% with modern cooking fuels
Urban and Peri Urban Population	100% with electricity access	75% with modern energies	100% with access to electricity
Villages	100% with mechanic or electrical power	Motive powers "available"	60% with access to motive energy in villages, 36% with access to electricity
Others		75% of school and clinics with electricity	60% of the population living in localities with energy powered healthcare, drinking water, telecommunications..



CHAPTER 4

IMPLEMENTATION OF ENERGY POLICIES IN THE SAHEL REGION

The Sahelian countries present huge disparities and commonalities in energy and poverty related issues. All the countries have policy priorities of poverty reduction and economic development and the relation between the objectives and provision of reliable and affordable energy services is strong and evident.

The majority of the population in almost all the countries relies heavily on traditional biomass to satisfy its energy needs, with a %age in some cases higher than 80 % of the total energy use and with severe adverse effects on the environment. The electricity consumption is the lowest in the world and in some cases has not significantly improved between 1980 and 2003.

Table xxx: Basic Energy Indicators

HDI Rank	Country	Traditional fuel consumption (% of total energy requirements)	Electricity consumption per capita (kWh)		CO2 Emissions Per capita (mt)		Ratification of international treaties	
			1980	2003	1980	2003	UNFCCC	Kyoto Protocol
106	Cape Verde	0.0 ^d	55	100 ^d	0.4	0.3	✓	✓
153	Mauritania	35.8 ^d	60	60 ^d	0.4	0.9	✓	✓
155	Gambia	66.7	70	101 ^d	0.2	0.2	✓	✓
156	Senegal	70.9	115	192 ^d	0.6	0.4	✓	✓
171	Chad	98.6	10	11 ^d	-	-	✓	X
173	Guinea Bissau	50	18	45 ^d	0.2	0.2	✓	✓
174	Burkina Faso	83.3	16	32 ^d	0.1	0.1	✓	✓
175	Mali	86.7	15	38 ^d	0.1	-	✓	✓
177	Niger	85.6	-	40 ^d	0.1	0.1	✓	✓

^d Data are estimated produced by the United Nations Department of Economic and Social Affairs, Statistics Division

✓ ratification, acceptance, approval, accession or succession

(Source: Human Development Report UNDP 2006)

The high dependence on traditional energy is caused both by an infrastructure issue, with the insufficient production capacity, low reliability and extension of the energy distribution network, and also by low performing economies, as modern energy services when available may be too expensive for the poor. The price and availability of modern energy services highly affects also the development of any economic activities and so of the effectiveness of the strategies to reduce the poverty. Costs are even higher when we consider the necessity of using self-generation in any situation in which the consistency of supply is critical. In almost all the Sahelian countries, at the national level, the high dependencies on imported fossil fuels is among the most important expenses in foreign currencies and represent a considerable part of all export revenues. International price shocks in fossil fuels highly affect trade balances, state budget and street prices.

⁹ The Human Development Index is a measure of socio-economic parameters such as life expectancy, income and educational achievement.



However, most of the countries have undergone several political actions and reforms on the energy sector, at national or regional level, and some countries included energy issues in their poverty reduction strategies.

4.1 Analysis methodology

For each country and at the regional level, the following aspects has been analysed based on literature resources and direct interaction with local stakeholders. It is divided in the following sub chapters:

1. *General principles / macro policies: This section analyses the general principles of the Energy policies*
2. *Public Institutions: This section lists the main institutions regulating the sector with their respective roles and responsibilities*
3. *Electricity Sector: In this section, the rules and the policies of the electricity sector are analysed and their recent developments. In Particular the following points are analysed:*
 - a. *Structure of the Electricity Sector: Vertical and horizontal structure, and reforms.*
 - b. *Ownership of the electricity industry: Public ownership and the privatizations*
 - c. *Regulation of the electricity industry: Regulatory bodies.*
4. *Forestry / Biomass Energy: In this section, the analysis focuses on the presence of forestry policies and biomass energy policies, eventually linked with policies to combat desertification*
5. *Fossil Fuels: In this section the principal policies for petroleum, gasoline, natural gas, including subsidies are analysed*

4.2 General principles / macro policies

The Regional Energy Policy varies from country to country, but there are some aspects that can be encountered almost anywhere in the region as briefly presented below:

1) **Fight against desertification.** Desertification is a serious problem that most of the Sahelian countries face and is caused by both climate change and unsustainable land use, either for disruptive agricultural practices and additional pressure of the population on the environment. Unsustainable fuelwood collection also adds to the serious affect on the environment and encourages desertification. Thus, any policies aimed either at rationalising the exploitation of fuelwood resources or decrease of fuelwood consumption through fuel substitution and efficient cook stoves can contribute to the fight against desertification. Within the region, there are various examples of policies like the promotion of natural gas (Senegal), the valorisation of Forestry Resources (The Gambia, Mali, Burkina Faso), and rural electrifications (in all countries with different degrees of achievement).

2) **The privatization of national electric utilities** has been attempted in all the Sahelian countries. The move towards privatisation policies has been largely advocated by the World Bank /IMF as part of the economic reforms linked to structural adjustment plans and to the country PRSPs. While the privatization of other parastatal industries including some in the energy sector has been achieved in many cases, the privatization of the electricity sector proved much more difficult due to the particular nature of this industry. Despite several regulatory reforms being implemented through the adoption of new electricity laws, establishment of independent regulatory bodies and defining roles and responsibilities of the state and of the electricity enterprise, the process of privatization generally failed in all the countries. The states that went ahead with privatizations (Cape



Verde, Senegal, Chad and Mali) retracted on their steps after a short period of time¹⁰, while the others did not find any interested buyer.

3) **Development of fossil fuel reserves** has been pursued wherever available or those that have been economically recoverable. Oil fields have been discovered in some areas and activities started in Mauritania and Chad. The development of fossil fuels resources might have severe impacts on the environment and on the local population, and so its link with poverty reduction has been questioned by many, including the Extractive Industries Review of the World Bank. The use of the oil revenues, the respect for human rights and the environment and the principle of compensation of affected communities have been accepted as standard for international WB funding for similar projects.

4) **Regional Integration** is becoming stronger over the years. The integration has various forms, like the large project of regional network interconnection of the West Africa Power Pool, the transnational connections of many villages that are located near the border of the states, the management of important Hydroelectric resources on the rivers Senegal, Niger and Volta. The regional integration is also enforced by the numerous intra regional seminars, conferences and experience exchanges that have characterised the last years.

4.3 Public Institutions

The energy reforms started in all the countries have modified the public institution dealing with energy. The role of the state is still predominant but beside the traditional Energy Minister, other bodies have appeared in the sector such as independent regulatory agencies that in some cases regulate both the electricity sector and other sectors (see later point 4.4.3).

In a majority of the cases, the public enterprises have been corporatised and have assumed the form and the rules of the private sector with the shares in the hands of the state or private investors.

4.4 Electricity Sector

The electrification rate in Sahelian Countries is very low, especially in rural areas where most of the times, infrastructure development is very low. In urban areas of some countries, the electrification levels are still at low levels (Niger 9%, Mali 12%).

Electricity consumption per capita is generally very low but growing, and production is not able to satisfy demand in most of the cases, with resulting low reliability of the service and need for additional investment to raise production capacity and reduce the system losses. The electricity sector is in the difficult situation of needing consistent investment in infrastructures but with uncertain returns, due to the low power consumption and the difficulties and adverse effects of raising tariffs after a certain level. State owned utilities often have not excelled in transparency of the budget, and relied heavily on the state for the repayment of the passivity: the state itself is the first client of the electric industry but not always the best.

To tackle all those issues, a number of policy reforms have taken place in the energy sector in the Sahel in three areas: structure, ownership and regulation.

¹⁰ This issue is treated more in detail in point 4.4



4.4.1 Structure of the electricity sector

The process of reforms did not only concern privatisation but also the vertical and horizontal structure of the societies. Given the prevalence of the current electricity systems, they could be broadly divided in four groups:

1. Monopoly - One utility handles generation, transmission and distribution;
2. Purchasing agency - Independent Power Producers (IPPs) sell electricity to a single buyer that handles transmission and distribution
3. Wholesale competition - Different distribution companies may buy electricity directly from generators and have it delivered to their area under open access arrangements with the transmission entity.
4. Retail competition - Allows all customers to choose their electricity suppliers.

The reforms designed a path to move from model 1 to model 2 or 3.

The changes in the structure however have not been radical, and most of the countries still conserve a vertical integrated company handling generation, transmission and distribution in the whole country, being quite far from the multi player competitive market established in other developing countries.

The most important vertical innovation has been the introduction of Independent Power Producers (IPPs) to address quickly the lack of production capacity. IPPs are already producing a large part of electricity in Senegal (and in many other African countries) and are foreseen to grow from the new electricity acts in other Sahelian countries. The electricity produced by IPPs is then self-used and/or resold to the national utility under the terms of a purchase agreement.

Horizontally the main innovation has been in some cases, the provision of concession for areas not yet served by the main enterprise to smaller local societies. In Burkina Faso and Senegal, the law allows independent generation and distribution in the zones not yet served. In Mali, there exists two decentralised "Services Societies" and in Niger there is a separate company that produces electricity mainly for the uranium mines and partially also for the state owned utility NIGELEC. However, the process has not been homogeneous. In Cape Verde, for example, there has been a process of horizontal integration between ELECTRA and the municipalities' utilities that were serving water and electricity in various islands. Between 1998 and 2004, due to these mergers, the number of employees of ELECTRA nearly doubled, and the number of clients for water and energy more than doubled.

i. Ownership of the electricity industry

In the mid nineties, the energy sector in all the countries under study was dominated by the State. Electricity was provided either by private, but state controlled, enterprises or directly by a specific state company. All the states started a process of corporatization and privatization of the public owned energy enterprises led by the IMF/World Bank. The process encountered many difficulties, from the lack of interest from foreign investors, lack of commitment from governments to privatise, to serious disagreements between the state and the privatized enterprises that eventually led the States to re-acquire the shares sold just few years before.

- In **Burkina Faso** a law of 1998¹¹ has specified that the private sector should oversee production, transmission and distribution of electricity. In 2006 a decree¹² plans

¹¹ Law 60/98/A Burkina Faso

¹² 2006/28 Burkina Faso



privatize Sonabel (Société National Burkinabé d'électricité) and end its monopoly.

- In **Cape Verde**, at the end of 1999, 51% of Electra SARL was sold to a Portuguese consortium of the (public controlled) Portuguese utilities of water and electricity. After serious disagreements between the government and the management of privatized Electra, over tariff readjustment and investment plans, serious black-outs affected the capital Praia and other zones of the country starting from September 2005. In summer 2006, after an agreement between the Prime Ministers of Cape Verde and Portugal, the majority of stock of Electra returned under the control of the Government of Cape Verde.
- In **Chad** in 2000 the STEE (Société Tchadienne d'eau e d'électricité) was started to be managed by Veolia (ex Vivendi environment) as a first step of the privatization process. In March 2004 Veolia resigned from the contract and the privatization process has been frozen.
- In **Guinea Bissau** the government expressed its intention to reform the energy sector and opening financial bids for a long-term leasing contract for EAGB (Electricidade e Agua Guinea Bissau). The commitment was in a letter of intent and memorandum of understanding with the IMF in November 2000¹³. The same commitments were re-expressed in July 2006¹⁴.
- In **Mali** in 1995 EDM (Electricité du Mali) delegated its management to an external consortium, composed of SAUR International, Hydro-Quebec, EDF, and CRC SOGEMA. In 1998 due to unsatisfactory performances the contract management ended. In 2000 the government made shares available to the public (and the society was recapitalised from USD 4.7 millions to USD 60.2 millions). In 2002 the company shares distribution were the following 40% for the government and 60% for the group SAUR/IPS - West Africa. The concession contract for EDM SA covers 97 localities for 20 years. EDM committed to invest USD 140 millions in the first three years. Hydroelectric facilities remain in the ownership of the state. In October 2005 Saur International decided to withdraw from EDM for unresolved differences with the government (especially about tariffs). After this decision the stock of EDM is now owned for the 66 % by the state and for the remaining 34 % by IPS.
- In **Mauritania** the government committed itself to privatize the power and electricity utility SOMELEC (Société Mauritanienne d'électricité) with the World Bank and IMF. In 2002¹⁵ the government declared that *the privatization of SOMELEC could not be completed on time due to technical factors and factors outside the control of the government*. The idea of privatizing SOMELEC has been later abandoned (Mauritania PRSP, 2007).
- In **Niger** the Enhanced Structural Adjustment Plan foresaw the privatization of the electric utility NIGELEC back in 1996. The original plan was to privatize the company in the period 1997-1999 but this proved unfeasible. At present the privatization of NIGELEC has been delayed mainly due to the difficulty in finding private companies ready to invest US\$60-100 million required for expansion and rehabilitation of the power system. (IMF Art.4 consultation report, Jan 2007).

¹³ Letter of Intent and Memorandum of understanding, Guinea Bissau, November 13, 2000.

¹⁴ Letter of Intent, Memorandum of Economic and Financial Policies, and Technical Memorandum of Understanding, Guinea Bissau, July 2006.

¹⁵ Letter of Intent, Memorandum of Economic and Financial Policies, and Technical Memorandum of Understanding, June 2002. IMF Mauritania.



- In **Senegal** in 1998 the energy sector was started to be reformed with two acts (98-29 and 98-06) that transformed SENELEC in a stock company and created a Regulatory Commission of the Electricity Sector (CRSE). In 1999, through a tender process the shares of SENELEC have been divided in: 41% the State, 10% Company employees, 15% floating on the local stock exchange (Bourse Regional des Valeurs Mobiliaries) and 34% to a consortium of Hydro-Quebec (Canada) and Elyo (France) the latter being a subsidiary of Suez Lyonnaise des Eux. The Consortium however gained full management control. In September 2000, the State re-acquired the shares of the consortium as it was not able to increase the generation capacity as specified in the contract. After a while, a second tender was issued and two companies were short-listed, Vivendi International (France) and AES (USA) but the necessary agreement was not concluded, due to the financial difficulties of the two companies. In August 2002 the Government of Senegal halted the process of privatization.
- In **The Gambia** the government set up a Gambia Divestiture Agency back in 2001 to dismiss state participation in several enterprises, between them also The National Water and Electricity Company NAWEC, whose ownership is at 97% owned by the government. In 2007 the company still is state owned and no significant progress has been made on this agenda.

The difficulties have risen in particular by two factors, either the lack of investors / buyers, or a bad relationship with the buyers and investors. The first barrier mainly caused the bad economic conditions of the state controlled electric utilities, the huge need of investment, the political instability and - in general - by the uncertainty of the return on the investment. The second barrier is a consequence of the conflict on tariff and contractual obligations between the state and the energy utilities, mainly a consequence of a non definitive role between the state and the private enterprise, and also a conflict between energy policies that were market or social oriented. In both cases, it was demonstrated that the privatisation of the power sector in the Sahel has been largely unsuccessful. Other identified barriers to the successful privatization and management of the electric utilities are the fragility of the private sector, political instabilities, weak institutional structures, and capacity and knowledge issues.

4.4.3 Regulation of the electricity sector

The reform process changed the regulation of the electricity sectors in many ways. In most of the cases a new electricity act has been approved by the parliament, defining the entities responsible for regulations, the role of the state, of the private sectors and the rights of the clients. One delicate issue to be regulated is the electricity tariffs and their adjustments, as the cases of Cape Verde and Mali clearly demonstrate. Tariff freezing or even reductions might be used as a policy measure to mitigate prices and obtain consensus, but these measures seriously undermine the financial stability of the energy utilities. On the other hand, it is true that a raise in tariffs, apart for being highly unpopular and for having adverse effects on the economy is difficult to justify with the actual low quality of the services, even with the good reason that the raise of the tariffs is necessary to make the investments for improving the quality in the future or, simply, to cope with the raise in fossil fuels.

Before the reform in all countries the rules of the game were decided by the competent ministry of energy and applied directly to the state owned utility. This is still the case in many countries. However, progress was also found in the process of reformation of established specific regulatory agencies such as in:

- Cape Verde that established an Economic Regulatory Agency



- The Gambia with the establishment of the Public Utilities Authority
- Mali : Water and Electricity Regulation Commission
- Niger: Multisectorial Regulation Authority, and
- Senegal : Regulatory Commission of the Electricity Sector

The role of the State, the degrees of power and independence of the different regulatory bodies vary from state to state and the most positive experiences, by many observers, belongs to the regulatory agencies that cover more than one sector.

In all the other countries (Burkina Faso, Chad, Guinea Bissau and Mauritania) the sector is directly regulated by the Government through the Minister of Energy.

4.4.5 Rural Electrification Agencies / Social Access policies

In rural areas, modern energy services are inaccessible in most of the cases, and specific programs are being implemented in many countries to address this situation. The rural electrification strategies are of two types: centralised and decentralised and their financing is made by cross-subsidies or by direct financing by the State or by the donors.

A Rural Electrification fund is foreseen in Burkina Faso and in Niger (financed through a levy on each kWh sold), while in Mali, in Mauritania and Senegal a specific agency has been already established. In Senegal the Agence Senegalaise d'Electrification Rurale (ASER) has divided the country in several concession to be assigned to private companies, with 35% of the costs subsidised and another 35% by a medium or long term loan guaranteed by ASER itself. In Mali, about 500 Multi-functional platforms have been installed in rural isolated villages to provide mechanical energy and electricity, generally owned and managed by women cooperatives and partially financed by the Government, UNDP and other donors. Multifunctional Platforms model is rapidly spreading in other countries of the region such as Burkina Faso, Senegal proving to be successful.

4.5 Forestry and Biomass Policies

As traditional fuelwood is the most used energy source in the region, the sustainable management of the forestry resources is crucial for each country to limit the desertification process, protect the environment and ensure durable and rationale use of the resources. Several countries adopted specific codes to regulate what kind of forest resources may be cut, how much and by whom. For example in Gambia and in Mali reforms have been carried out in the direction of a decentralised use and control of the resources, promoting community management and sustainable use, providing incentives to increase professionalism in the sector and establishing local markets. In Senegal, the LPG program highly reduced the consumption of fuelwood for cooking, and the pressure on local forests. Burkina Faso also recently implemented a new forestry act. Forestry degradation can be also reduced by a more rationale and efficient utilisation of the available collected biomass, through the implementation and diffusion of improved cookstoves that seriously diminish the quantity of wood necessary to cook each meal.

In the region there are several programmes and projects dedicated to the conservation of the forestry resources through a better management and a lower consumption. One of the most important programmes is the PREDAS that dedicated a lot of effort to the promotion of policies for the sustainable use of fuelwood resources in the whole region.



4.6 The Fossil Fuel

In the Sahel region under examination, only Chad and Mauritania produce fossil fuels, but exploration is underway in other countries. In Chad in 2003 a pipeline linking the oil fields in the south of the country to the sea terminal in Cameroon was inaugurated. The USD 4.1 billion project was almost entirely financed by the oil companies, but the support of the World Bank was considered essential to assure the right political conditions. The Bank therefore supported the project and assured a financing of USD 90 millions to the two governments, on the basis of a Petroleum Revenue Management Program that should have assured that a consistent part of oil revenues would have been spent in poverty reduction strategy. However at the end of 2005 Chad government modified the law managing the distribution of oil revenues and the Bank subsequently suspended all loans and grants to Chad until a new agreement on the oil revenues has been signed after several months of negotiations.

Senegal is the only country in the region that carried out, since the seventies, a comprehensive strategy to favour the penetration of LPG in the country. With public investments in infrastructure and several subsidies, now progressively phased out, the country has been particularly successful in this field. Dakar is the city of the region with major penetration of LPG for house cooking, and also the other urban centres present much higher levels than neighbouring countries. At present in Senegal there is a large and well-established market, and production facilities able to serve also neighbouring countries.



CHAPTER 5

RENEWABLE ENERGY RESOURCE ASSESSMENT –

Renewable resources and technologies constitute a reliable and environmentally sound long-term energy alternative for many African countries as they have abundant and unexploited biomass, solar, wind and hydro resources. What is still unclear is the extent to which renewable energy technologies can assist in addressing the energy needs of Africa’s poor— mainly due to the lack of reliable and accurate data regarding renewable energy potentials.

In this chapter the major findings from the extensive literature review carried out during the project are presented. The mostly theoretical review focussed on the assessment of the renewable energy sector potential for each source (wind, solar, biomass, hydro & geothermal) in the Sahelian countries of Cape Verde, Mauritania, The Gambia, Senegal, Guinea Bissau, Chad, Mali , Burkina Faso and Niger. The limited availability of reliable and up to date assessment reports in the region proved to be challenging and the results presented below are based on the best possible data sources.

5.1 Wind energy

The theoretical wind energy potential (average wind speeds m/s) was investigated for the nine Sahelian countries, and the literature survey provided the following data:

Table 5.1: Theoretical Wind Potential

Sahelian Country	Theoretical Wind Potential m/s [1]
Cape Verde	Range from less than 4 to 7 (see detailed table below)
Mauritania	5-6 greater part 4-5 NE & S 6-7 W. Coast
The Gambia	n.s.
Senegal	2-3 overall 5-5.9 - 200 Km l, 20 Km w strip of land Dakar-St. Louis [2]
Guinea Bissau	n.s.
Chad	7-7.5 Central
Mali	n.s.
Burkina Faso	n.s.
Niger	n.s.

Source: Helimax 2004

In comparison to other countries, Cape Verde had the best data resource available. Cape Verde is basically an archipelago consisting of 10 islands and 5 islets, divided into the windward (Barlavento) and leeward (Sotavento) groups, more detailed data is provided for this specific country in the table below. The 6 islands in the Barlavento group are Santo Antão, São Vicente, Santa Luzia, São Nicolau, Sal, and Boa Vista. The islands in the Sotavento group are Maio, Santiago, Fogo, and Brava. All but Santa Luzia are inhabited.

Table 5.2: Theoretical Wind Potential of Cape Verde

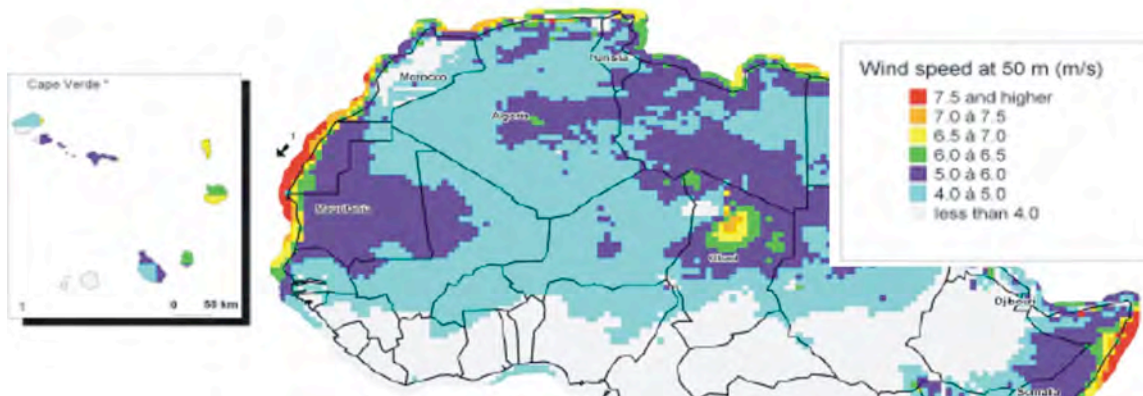
Cape Verde	Theoretical Wind Potential m/s [1]
Fogo & Brava	<4
S.Antao	4-5 N.Coast 6.5-7 E.Coast



S.Vicente, S.Nicolau, S.Lucia, Branco & Raso	5-6
Santiago	4-5 SW 5-6 N & SE
Maio	5-6 S 6-6.5 N 6.5-7 E
Boa Vista	6-6.5 N-half 6.5-7 S-half
Sal	6.5

Source: Helimax 2004

Wind map



The countries identified with the most significant wind resource in the Sahel are: Cape Verde, Mauritania and Chad. In Senegal, wind energy offers poor potential due to the very low wind speeds and the abrupt variations in peak wind conditions, but it can be harnessed for water pumping purposes.

In Cape Verde and Mauritania, the political interest seems favourable for the development of small scale wind projects and the context seems favourable for wind energy to be competitive with respect to other available energy sources, in particular for the production of electricity in isolated grids. The technical feasibility of wind projects of small or medium size is also found to be possibility (electrical grid, electrical load, etc.).

In Chad, the political stance has not been clearly stated with regard to the development of wind energy projects and the technical feasibility of wind energy projects is non conclusive, at least in the medium term (electrical grid, electrical load, layout of the land, etc.). In addition, other forms of renewable energy are perceived to be either more competitive or more appropriate in the national context (geothermal, hydraulic, bio-combustible, solar photovoltaic) (Helimax, 2004).

5.2 Solar energy

The Sahel is a region that receives a great deal of solar insolation per year and thus most solar energy technologies can be applied with very good results. The main technologies that have been applied and should continue to do so but at an increased rate are PV technologies for electrification, solar cookers, solar dryers, and solar water heaters. Despite the Sahel's large solar potential, solar thermal power generation is a technology that requires large investments and it is maybe a rather ambitious target for the poverty-



stricken Sahelian countries. A solar power plant of 25 kW was built in Senegal during the 1970's but it was not as efficient as diesel systems and was abandoned.

Table 5.3: Theoretical Solar Energy Potential

Sahelian Country	Theoretical Solar Energy Potential (Insolation kWh/m ² /day)
Cape Verde	5
Mauritania	6.7
The Gambia	n.a.
Senegal	North – e.g. Dakar = 5.8 South – e.g. Ziguinchor = 4.3 Avg = 5.05 • 5.48
Guinea Bissau	n.a.
Chad	n.a.
Mali	6
Burkina Faso	5.5
Niger	6

Sources: Sarr, S. and J. P. Thomas (2005) and World Bank, 1999

5.3 Biomass energy

Besides residues from agriculture and forestry from other residues like municipal solid waste (MSW) or sewage sludge, from energy crops and biofuels, biomass mainly comprises firewood and is the most important source of energy in the Sahel. According to the FAO study, *The Role of Wood Energy in Africa* (FAO, 1999), *woodfuels* include all categories of primary or converted wood used for energy: fuelwood, charcoal and black liquor.

Fuelwood: Primary wood combusted as it is for satisfying energy needs, and they can be used under different forms (direct, indirect, recovered/recycled).

Charcoal: energy item that is derived from fuelwood and used to satisfying final sectoral energy demand or even for electricity generation where relevant.

Black liquor: specific wood-derived fuel that is recovered and used as fuel for paper manufacturing. The derived energy comes from the lignin removed from the wood pulp.

Carbonization Ratio (Tons Wood/1 Ton Charcoal): Usually 4.35 tons wood for 1 ton charcoal, but in the case of Africa, where the carbonization efficiency is significantly lower, it ranges from 5 to 12.6 tons of wood for 1 ton of charcoal.

Africa is the most intensive user of woodfuels in per-capita terms, with an average annual per-capita consumption of 0.77 m³, or 0.18 toe. In Africa, almost all countries rely on wood to meet basic energy needs. The share of woodfuels in African primary energy consumption is estimated at 60% to 86%, with the exception of North African countries and South Africa. On average, about 40% of the total energy requirement in Africa is met by fuelwood.

The use of wood and other biomass for energy purpose in rural areas maybe sustainable or not, depending on the relative density of the population and of the vegetation, and on the local management of the forestry resources. The major problem is the drainage of wood



from periurban and urban areas, which can cause local deforestation around the cities and also pressure on the environment of distant locations.

Another important issue is the conversion of biomass in useful energy. The traditional techniques are often low efficient and emitting dangerous gas for health. Dwellings are small and biomass burning for cooking inside the house (rather than in the exterior like in rural areas) leads to increase respiratory diseases affecting mainly women and children.

The table below shows the fuels used for cooking in rural households for selected sub-Saharan African countries (% of fuel)

Country	Firewood	Gas, Kerosene	Charcoal	Electricity	Other
Gambia	97	1	1	0	1
Mali	97	0	0	02	
Burkina Faso	91	1	1	0	7
Niger	90	1	0	0	9
Senegal	84	2	12	0	2

Source: World Bank 2000

5.3.1 Biomass Data Availability & Quality Issues

The lack of precise estimates of both supply and more particularly, demand of woodfuel in most Sahelian countries makes the estimation of "shortfalls" and "surpluses" an exercise clouded by uncertainty. The most current and probably most reliable and collective set of data is that of the World Energy Council (WEC) that has also derived estimates from the FAO study - The Role of Wood Energy in Africa, presented in the following tables. It is important to show what the FAO (1999) reports - under the Executive Summary chapter - with regard to data quality issues:

1. *Woodfuels have not been included as a basic sector in Africa's planning processes.*
2. *Such targets are obstructed by the scarcity, limited scope, and poor quality of existing data.*
3. *The FAO database is the only source of data that includes almost all African countries and provides continuous time series for each country.*
4. *However even the FAO database presents estimates rather than actual figures - no detailed sectorial figures.*
5. *The FAO insists upon the necessity of a relevant effort aiming at improving knowledge on woodfuel demand and supply, as well as on its economic and social role, that should clearly be undertaken. Specifically through sustainable and systematic data collection, compilation and analysis processes, with a unified approach and with the involvement of the major international organizations in this field.*

**Table 5.4: Wood: land area, forest area and fuelwood production in 1999**

Country	Total land area (in 000 km ²)	Forest area (in 000 km ²)	Fuelwood production (million tonnes)	Charcoal production (tonnes)
Senegal	193	62	3.3	110,708
Mali	1,220	132	5.7	93,148
Mauritania	1,025	3	0.2	125,592
Niger	1,267	13	3.1	409,798
Burkina Faso	274	71	9.2	110,000
Gambia	10	5	0.7	45,605
Guinea-Bissau	28	22	0.3	
Cape Verde	4	1	0.1	
Chad	1,259	127	1.7	301,287

Sources: The data shown on Fuelwood production reflect as far as possible those reported by WEC Member Committees in 2000/2001; if information was not available from this source, estimates for 1999 were projected from FAO 1999 time-series of fuelwood production Also the charcoal data is from FAO].

Table 5.5: Bagasse: estimated potential availability in 1999 [7]

Country	Cane sugar production (in '000 tonnes)	Bagasse potential availability (in '000 tonnes)
Burkina Faso	30	97
Chad	32	105
Mali	31	102
Senegal	95	310

Source: WEC 2004, other countries data not available

Bagasse = the pulp remaining after the extraction of juice from sugar cane, used as a fuel or for making paper.

The energy content of one ton of bagasse is 2.85 GJ/ton cane milled.

The bagasse potential availability conversion factor assumes a yield of 3.26 tons of fuel bagasse at 50% humidity / ton cane sugar produced.

5.3.2 Biomass over-consumption issues and future resource scarcity

The general consensus on biomass availability in almost every Sahelian country is that consumption of woodfuels continues to grow at a higher rate than the average annual increment of forest cover. For example in The Gambia, annual fuelwood consumption surpasses wood production by more than 100,000 m³ (Sallah, 2000) and the first National Communication also reports that the natural forest cover continues to be altered by forest fires (not less than 85% of the land area of The Gambia is burnt annually).

Some countries like Senegal and Mali have reported substantial available quantities of agricultural residues and other energy plants. For some indicative figures see the following country specific sections. Detailed data are available only for Senegal

Senegal**Table 5.6: Quantities of agricultural residues (1998 data)**

Production Type	Quantity (tons)	Agricultural Residue (MS tons)
Groundnut	544,800	871,680
Sorghum	118,300	343,070
Maize	60,300	126,630
Millet	426,500	1,322,150
Watermelons	261,300	182,910
Rice	173,700	312,660
Manioc	46,600	88,540
Cotton	40,000	4,400

Source: Sarr, S. and J. P. Thomas (2005)

Also domestic waste evaluated in 1999 in the Dakar area at 4 million tons. This is in addition to the existing stock in Mbeubeuss dump, which has accumulated some 6.3 million tons of refuse over the last 25 years

Mali

Cotton is the leading crop of Malian agriculture and it is estimated that about 8,000 tons of crop residues are generated from cotton production alone annually.

The *Jatropha Curcas*, is a shrub that grows in southern and western Mali, that is drought resistant. *Jatropha* seeds contain about 35% of non-edible oil, which could be extracted and used as a substitute for diesel oil in diesel engine. In 1996, Mali had about 10,000 km of *Jatropha* hedges with a growth rate of 2,000 km per year, which represents a then potential of 5 million litres of oil (Edjekumhene, I. (2003).)

5.4 Hydroelectric energy

Water resources in the Sahel are relatively limited, the major sources that are already being exploited, with large hydro installations - mainly the Manantali Dam, are the Senegal River and Niger River and to some degree the Gambia River.

The Manantali Dam

Eskom Energie Manantali (EEM) is the Independent Operator for River Senegal Development Organization (OMVS) Interconnected Network (RIO) composed of:

1. The Manantali Interconnected Network (RIMA) with the following features:
 - A hydroelectric power station with an installed capacity of 200 MW;
 - 12 high-tension posts;
 - 1700 km of high-tension lines: 225 kV, 150 kV and 90 kV;
 - An average power generation of 807 GWh /year
2. The national networks of 3 countries: Mali, Mauritania and Senegal



An agreement between the States defines the sharing of power generated at Manantali among the 3 countries: 52% in Mali, 33% in Senegal and 15 % in Mauritania [10]. Mali receives approximately 420 GWh/year.

According to the literature survey carried out during IE4Sahel, the major findings from various sources, regarding available resource potential for hydro, are summarized in the following table:

Table 5.7: Different estimations for hydro potential.

Sahelian Country	Source 1	Source 2	Source 3	Source 4
Cape Verde	-	-	-	-
Mauritania	-	-	-	-
The Gambia	-	-	-	-
Senegal			Technical (1986) = 4.250 TWh/yr	Gross Theoretical = 11 TWh/yr Technical = 4 TWh/yr Economical = 2 TWh/yr
Guinea Bissau				Gross Theoretical = 1 TWh/yr
Chad	Economical & Technical = 150 GWh/yr			
Mali	Economical & Technical = 5 TWh/yr	1000 MW or 5 TWh/yr		Gross Theoretical > 12 TWh/yr Technical > 5 TWh/yr
Burkina Faso	Economical & Technical = 216 GWh/yr		Gross Theoretical = 150 MW (~1316 GWh/yr) Economical & Technical = 75 MW (~ 215 GWh/yr)	Gross Theoretical = 1 TWh/yr
Niger	Economical & Technical = 1300 GWh/yr			Gross Theoretical > 3 TWh/yr Technical > 3 TWh/yr Economical = 1 TWh/yr

Sources

- 1. Bartle (2002). Hydropower potential and development activities, Energy Policy 30 (2002) 1231-1239. Elsevier.
- 2. World Bank (2003). MALI - Mali Household Energy and Universal Access Project (HEURA), Report No. PID11607, Africa Regional Office.
- 3. Small Hydro Atlas website: <http://www.small-hydro.com>
- 4. WEC (2004). Survey of Energy resources 2004. World Energy Council.

5.5 Geothermal energy

The only geothermal resources are located in East Africa. The East African countries of Tanzania, Djibouti, Malawi, Burundi, Ethiopia, Zambia, Comoros, Eritrea, Kenya, Rwanda, and Uganda all lie in the highly volcanic East African Rift.

There is no geothermal potential detected so far in the Sahel region. There may be low temperature heat, maybe in deep aquifers, but there have been no measurements so far, probably due to the cost.



5.6 Conclusions

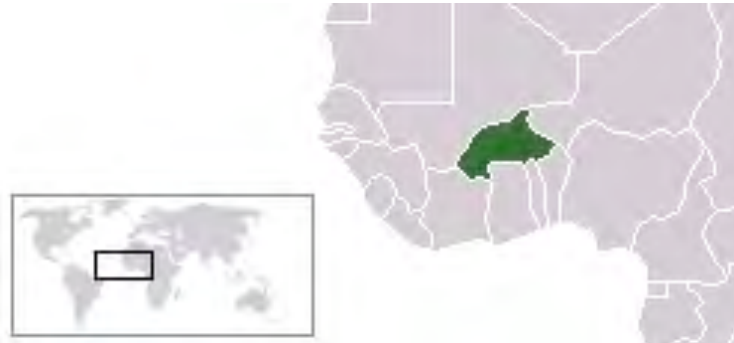
Renewable energy sources are the most important energy source for Sahel, but their utilisation is mainly in the form of traditional energy resources for domestic use, essentially fuelwood and charcoal for cooking. The over exploitation of fuelwood for domestic energy has severe negative impacts both on the environment and on health and poverty. There exist, however, a consistent array of possibilities of developing modern energy sources depending on the nation and on the local conditions. Solar is abundant everywhere and, while PV technology is expensive, it is often the only solution to generate electricity in areas far away from the electrical grid and for small appliances. Wind is available in some nations, especially Cape Verde, but its development is far from reaching its full potential while Hydro has been developed so far with few large dams that are generating an increasing capacity of electricity generation for the region. Further development is expected where the necessary conditions are met. One important source of energy, and still underdeveloped, is the utilisations of the agricultural residues from the large farms that exists in the region, both in the form of direct burning and for their possible transformation in biofuels, and some experiments in this areas are giving early encouraging results.



CHAPTER 6
BASIC NATIONAL DATA ON ENERGY AND POVERTY



5.1 BURKINA FASO DATA SHEET



SOCIO-ECONOMIC INDICATORS		
Population	13.23 Millions (2005) 18% URBAN - 82% RURAL	[2]
Growth Rate	3.1%	[13]
HDI	175 out of 177 - value 0.317 (2003)	[1]
GNI Per Capita	USD 400 PPP Atlas method (2005)	[13]
Population Below Poverty Line	46.4% total - 52.3% Rural and 19.9% Urban (2003)	[3]
Primary School Enrolment	45.2%	[13]
Life Expectancy	48	[13]

ENERGY RESOURCES AND PRODUCTION		
Electricity		
Installed Capacity	171 MW (2002), 78 MW (1992)	[6],[7]
Production	444.6 GWh - (2003).	[6]
Fuel Mix	78,4% Thermal 21,6% Hydro (2003)	[6]
Energy Imports	USD 139 millions (23,5% of total imports). It imported 69 GWh of electricity	[6] [9]
Renewable Energy resources		
Biomass / Forestry	10.5 millions of tonnes of fuelwood in 2002 and 110,000 tonnes of Charcoal production	[15]
Hydro Potential		



Solar Potential	5.5 kWh/ m ² /	[16]
Wind Potential	Not significant, technically and economically viable wind potential.	[15]
Fossil Fuel Resources	None	[15]

ENERGY CONSUMPTION		
Overall Consumption	Energy	29 Kg Oil Equivalent per capita (in 2001) [2]
Traditional Consumption	Fuel	Overall 83.3%, more than 90% of total population use wood-energy as main source of cooking energy and 85% of this population use kerosene for light [15]
Electrification Level		Urban electrification growth from 29 % (1994) to 34% (1998) to 45.7 % (2003). Rural electrification level in 2003 was stable at 1.1 %, in 1994 was 1%. [8]
New Customers Each year		The number of low tension connections raised of 6,52% in 2002 and 11 % in 2003 on a year to year basis. The total number of low and medium voltage connections was respectively 226,025 and 666 (in 2003). [6]
Electricity Consumption (per capita)		16 KWh (1980), 32 KWh (2003) per capita [14]
Electricity Tariff		22.5 US cents/kWh for households on average. [10][5] [14]
Fossil Fuels		NA
Biomass / Forestry		

ENERGY POLICIES		
ELECTRICITY		
Regulation	Since the year 2000 the Ministry of Mines, Quarries and Energy is in charge to define and implement energy policies and regulations	[6] [7] [14]
Ownership	State-owned but the government plans to privatize	[6][7]
Structure	The present structure is a vertically integrated monopoly with SONABEL handling generation, transmission and distribution. The law N° 060/98/AN predict the end of the monopoly for generation transmission and distribution but at present only little auto-generation plants are private owned. The law allow independent generation and and private distribution in the zones not yet served	[6] [7]
Fossil Fuels	There are plans to open the capital of SONABHY to the private sector	[10][5] [14]
Biomass / Forestry	Several Reforms have passed, to protect and valorise forestry resources, including decentralisation.	[11]



ENERGY-POVERTY AND DEVELOPMENT STRATEGY		
Poverty Reduction Strategy Paper (PRSP)	Energy is mentioned in the PRSP for its important role and rural electrification targets are set. Priority Action Program to Implement the Poverty Reduction Strategy Paper 2004–2006 extensively deals with energy	[11]
Rural Electrification	The Law 060/98/AN predicted an electrification fund. The Decentralised Rural Electrification of at least 10-15% of the rural population by 2020 is planned to be achieved through the establishment of rural electrification cooperatives, for medium scale electrification. For smaller scale village applications (electrification, mechanical power and water pumping) there is growing number of Multi-functional platforms running in the country.	[7] [8]
Main Development Projects	Construction of the Bobo-Ouagadougou Transmission Line (to connect with Côte d'Ivoire), reinforcement of the Existing Transmission Lines Bagre Kompienga-Ouagadougou and construction of a 14MW thermal generation in Kossodo. Burkina Faso participate to the West Africa Power Pool project.	

NOTES

[1] UNDP: <http://hdr.undp.org/statistics/data/countries.cfm>

[2] UN Common Database: <http://globalis.gvu.unu.edu/>

[3] UNDP 2003. Burkina - Faso: Rapport Pays suivi des objectifs du Millenaire pour le Developpment.

[4] World Bank 2005. Burkina Faso: Reducing Poverty Thought Sustained Equitable Growth: Poverty Assessment. Report No 29743 -BUR

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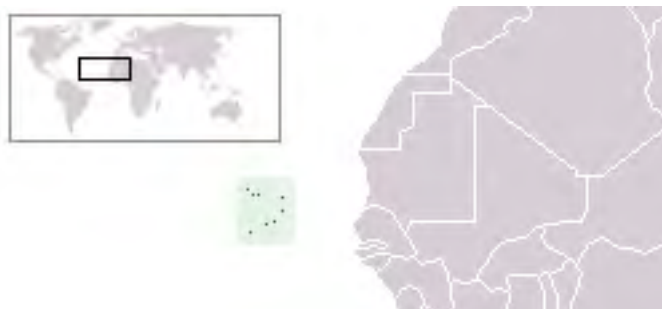
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5.2 CAPE VERDE DATA SHEET



SOCIO-ECONOMIC INDICATORS		
Population	0.5 millions (2005)	2
Growth Rate	2,3% (2005)	2
HDI	Rank 105 out of 177	1
GNI Per Capita	1930 USD PPPAtlas	2
Population Below Poverty Line	37% of the population is poor and 20% very poor	11
Primary School Enrolment	90.1%	1
Life expectancy	71	1

ENERGY RESOURCES AND PRODUCTION		
Electricity		4
Installed Capacity	79.36 MW (2004)	4
Production	218.813.232 kWh (2004)	4
Fuel Mix	76.19 MW diesel (96%), 2.4MW wind (3%) and 0.77MW thermal (1%) in 2004	4
Energy Imports	In 2004 Electra consumed 17.7 millions of litres of diesel, 25.4 millions of litres of fuel oil 180 and 8.5 millions of liters of fuel oil 380	4
Renewable Energy resources		
Biomass / Forestry	Scarce, 0.1 million of tonnes produced in 2004	12



Hydro Potential	-	
Solar Potential	Good, 5 kWh/ m2/day	14
Wind Potential	Very good, between 4 and 7 m/s, depending on the island	13
Fossil Fuel Resources	Not available	

ENERGY CONSUMPTION			
Overall Consumption	Energy	122.196 TOE in 2000	15
Traditional Consumption	Fuel	32% of total consumption for domestic use, 64% in rural areas	15
Electrification Level		58.2% of households in 2002	3
New Customers Each year		Between 2000 and 2005 electricity consumption grew considerably in Cape Verde. The sales of Electra increased from 92GWh in 2000 to 162GWh in 2005 (an increase of 76%) and the number of clients rose from 47149 to 76895 (an increase of 68%) within the same years.	4
Electricity Consumption (per capita)			
Electricity Tariff		17 CVE kwh in average. The inability to find an agreement on tariff readjustment between the state and the privatized ELECTRA is at the base of the failure of the privatization.	4,5,6
Fossil Fuels		In 2000 94975 TOE	15
Biomass / Forestry		Biomass for cooking is used by 62% of the poor household for cooking (against around 24% of non poor families)	3

ENERGY POLICIES			
ELECTRICITY			
Regulation		An Economic Regulatory Agency (ARE) has been created to supervise the energy and telecommunication sector.	7
Ownership		In December 1999, 51% the shares of ELECTRA SARL have been sold to EDP- Electricidade de Portugal (30.6%), and ADP Águas de Portugal SGPS (20.4%). In summer 2006 the government re-acquired the majority of the shares.	Various sources
Structure		ELECTRA is the monopolistic utility, and serves electricity on all the islands and also desalinated water in many cases. It is vertically integrated	4
Fossil Fuels		Two companies dominates the market, Shell and the recently privatized Enacol	
Biomass / Forestry			

ENERGY-POVERTY AND DEVELOPMENT STRATEGY			
Poverty Reduction Strategy Paper (PRSP)		Energy is part of the 4 th pillar of the PRSP - Pillar 4: Develop the infrastructures, promote land use planning	



	and protect the environment. Even if there has been some experiment on this matter, there is no large scale project to fill the energy gap between the poor and the non-poor.	
Rural Electrification	No specific target	

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5.3 CHAD DATA SHEET



SOCIO-ECONOMIC INDICATORS		
Population	9.7 millions, 2005	7
Growth Rate	3%, 2005	7
HDI	Rank 172 out of 177	1
GNI Per Capita	400 USD PPP Atlas Method 2005	7
Population Below Poverty Line	64%	1
Primary School Enrolment	61%	7
Life expectancy	44	7

ENERGY RESOURCES AND PRODUCTION		
Electricity		4
Installed Capacity	20.8MW	6
Production	106 MWh (2002), 76MWh (1995)	5
Fuel Mix	100% thermal	6
Energy Imports		
Renewable Energy resources		
Biomass / Forestry	1,8 million of tonnes of fuelwood produced in 2002, 301,287 tonnes of charcoal	



Hydro Potential	Estimated potential 150 GWh/ year	9
Solar Potential	n.a.	
Wind Potential	7m/s in certain part of central Chad	10
Fossil Fuel Resources	Oil production started in 2004, estimated recoverable reserves are around one billion barrels of oil. The oil is stated to be relatively heavy crude of about 170 – 240 API with a sulphur content of less than 0.1%. The oil is exported through a pipeline that reach the sea in Cameroon.	8

ENERGY CONSUMPTION		
Overall Energy Consumption		
Traditional Consumption	Fuel Around 90% of total energy consumed	1
Electrification Level	9% in the capital and around 1% in rural areas	5
New Customers Each year		
Electricity Consumption (per capita)		
Electricity Tariff	around 170 CFA KWh, one of the highest in west Africa	3
Fossil Fuels		
Biomass / Forestry		

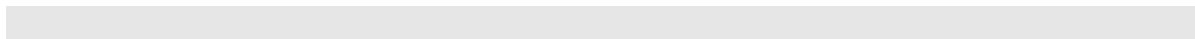
ENERGY POLICIES		
ELECTRICITY		
Regulation	The government is predominantly responsible for the regulation of the electricity industry including price regulation, through the Ministère des Mines, de l'Énergie et du Pétrole	
Ownership	The Société Tchadienne D'eau et D'électricité is state owned. In 2000 Veolia (ex Vivendi environment) started to manage the STEE under a management contract and was planned to acquire the society in the upcoming privatization process. In 2004 anyway Veolia resigned from the contract and the privatization process has been frozen.	
Structure	(STEE) is vertically integrated.	
Fossil Fuels	In December 2006 the modification of the Petroleum Revenue Management Law caused an halt of the assistance by the World Bank, that resumed in July 2007 after another agreement was reached with the government. The new document is a commitment to spend 70 % of its 2007 budget to priority poverty reduction programs and to develop a new PRSP in the course of 2007, in order to allocate resources to poverty reduction in the following years	
Biomass / Forestry	A household energy project has been launched in the mid-nineties	



ENERGY-POVERTY AND DEVELOPMENT STRATEGY		
Poverty Reduction Strategy Paper (PRSP)	The 2003 PRSP also mentions the need to promote alternative energy sources such as solar and wind to lessen impact of cutting down fuelwood and also expand energy usage for productive activities such as agriculture and industry.	4
Rural Electrification	National urban and periurban electrification program is underway	4
Main Development Projects		

NOTES

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5.4 THE GAMBIA DATA SHEET



SOCIO-ECONOMIC INDICATORS		
Population	1.5 millions (2005)	12
Growth Rate	2.6% (2005)	12
HDI	Rank 88 out of 177	1
GNI Per Capita	290 USD PPP Atlas (2005)	12
Population Below Poverty Line	59.3% <1USD 82.9% <2USD 64% < National Poverty Line	1
Primary School Enrolment		
Life expectancy	57	12

ENERGY RESOURCES AND PRODUCTION		
Electricity		4
Installed Capacity	Installed and available capacity is 27 -30MW (Kotu power station), in rural areas there are other 6 small power station that together do not exceed 2.2 MW of installed capacity (largely insufficient to meet demand). There exist also an independent Power producer - Gampower - with a plant of 8.5 MW that sells electricity to NOWELEC.	5, 6, 7
Production	1996/1997 - 93 631 MWh 2003 - 160 958 MWh (huge year by year fluctuations)	4, 7
Fuel Mix	the main central power station is in Kotu and runs on Heavy Fuel Oil, other 6 smaller power stations run on diesel	4, 7
Energy Imports	In 2004 the country imported 113 million litres of petroleum products.	13



Renewable Energy resources		
Biomass / Forestry	0.7 millions of tonnes of fuelwood and 45.605 tonnes of charcoal produced in 2005	15
Hydro Potential	n.a.	
Solar Potential	The country receives 2500 hours of sunshine annually, giving a daily solar potential of 2.5kJ per sq. cm	15
Wind Potential	n.a.	
Fossil Fuel Resources	There is currently no domestic oil production, but companies are exploring deposits offshore.	

ENERGY CONSUMPTION		
Overall Consumption	Energy 467000 TOE in 2005	13
Traditional Consumption	Fuel Around 80% of total energy consumption. In 2004, 485,000 tonnes of fuelwood was used to meet the energy needs of 90% of the population. 60% of this is consumed by the rural population for cooking	13
Electrification Level	In Banjoul the electrification rate is about 70%, in the Greater Banjoul Area and in other provinces is no more than 20%	7
New Customers Each year	Residential consumers were 25,496 (1996) and 62,060 (2002) (huge fluctuations on a year per year basis)	4
Electricity Consumption (per capita)		
Electricity Tariff	1996 (D2.08 / D 2.21 / D 2.54) 2003 (D 1.81/D 2.21 / D 2.54) 2004 prov (1.55-6.98 / 7.25 / 8.02) (residential, commercial, others)	4, 8
Fossil Fuels	83120 TOE of Petroleum and 1590 TOE of LPG in 2004	13
Biomass / Forestry	374890 TOE in 2004	

ENERGY POLICIES		
ELECTRICITY		
Regulation	A public utilities authority was established in 2001, In 2005 a National Energy Policy (NEP) has been approved	7
Ownership	The government owns the electricity utility NAWEC, privatization is planned,	3
Structure	NAWEC is a vertically integrated company and single buyer for the independent power producers.	3
Fossil Fuels	The government utilise a price formula to maintain market stabilisation this is controlled by the Department of State for Finance and Economic Affairs and the Customs Department. Taxes vary greatly between products. Kerosene is subsidised, LPG has no taxes and other fuels may reach up to 40% of taxes.	13



Biomass / Forestry	<p>Two main act regulate the sector:</p> <ul style="list-style-type: none"> - the Forestry Act of 1998 - that set the obligatory of licences for the production, the commerce and the trasportation of wood, it also regulate what kind of trees may be cutted and the number of workers for each licence. - the New Forestry Policy (1995-2005) - that promotes conservation and reforestation, community management and education on the subject. <p>The fuelwood market is de facto controlled by the Fuelwood Vendors Association FVA established in 1996. price of fuelwood is uniform trhoutout the country</p>	13
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ENERGY-POVERTY AND DEVELOPMENT STRATEGY		
Poverty Reduction Strategy Paper (PRSP)	The PRSP identifies a number of energy options which would contribute to efforts to alleviate poverty. But, these lack focus and the PRSP does not appear to put in place clear plans for achieving them.	9
Rural Electrification	A rural electrification project has been running in the country since 1993 and should be completed by 2016	16

NOTES

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5.5 GUINEA BISSAU DATA SHEET



SOCIO-ECONOMIC INDICATORS		
Population	1.6 millions (2005)	8
Growth Rate	3% (2005)	8
HDI	rank 172 out of 177	1
GNI Per Capita	180 USD PPP Atlas	8
Population Below Poverty Line	21% - extreme poor 65% - poor 48,7% - (National P.L.)	1, 9
Primary School Enrolment		
Life expectancy	45	8

ENERGY RESOURCES AND PRODUCTION		
Electricity		
Installed Capacity	25,2 MW, of which 17.5 MW is in Bissau. The installed capacity effectively available is estimated to be the 50% of the nominal capacity. Auto-generation is widespread in the country, and estimated to be at 15 MW	7
Production	Around 20 GWh per year in 2003, plus self production (it was the double before the 1998 war)	2, 3, 7
Fuel Mix	100% diesel	2, 3
Energy Imports		



Renewable Energy resources		
Biomass / Forestry	Abundant forestry resources. 300,000 tons of fuel wood are produced each year Agricultural residues (cashew nuts above all, but also rice, cotton) are abundant (estimated at 67.000 m3 per year) and are starting to be utilized for electricity generation.	10
Hydro Potential	the country theoretical potential is estimated to be at 184 MW	
Solar Potential	n.a.	
Wind Potential	Not significant	
Fossil Fuel Resources	Petroleum reserves exist on and offshore, but political instability and high development costs have thus far prevented exploitation of these resources.	7

ENERGY CONSUMPTION		
Overall Energy Consumption	60.0 kg of oil equivalents per capita in 2001	
Traditional Fuel Consumption	Around 50%	13
Electrification Level	Overall 4%	5
New Customers Each year		
Electricity Consumption (per capita)		
Electricity Tariff	Between 81 and 245 CFA kwh per domestic use, depending on the class of consumers	4
Fossil Fuels		
Biomass / Forestry		

ENERGY POLICIES		
ELECTRICITY		
Regulation	The government's Ministry of Energy and the state owned electricity company are the two main stakeholders that take responsibility for regulation of the electricity industry	2, 3
Ownership	EAGB is owned by the national government, . The intention of the government is to privatize it but no effective steps have been taken in this direction	2, 3
Structure	EAGB is vertically integrated	2, 3
Fossil Fuels	The oil industry is regulated by the Ministry of Natural Resources and Industry. . The government currently fixes the retail price for petroleum products by decree. The products covered are fuel, diesel, special mixtures, and diesel reserved for the electricity company. Under this system, the retailers margin changes with the cost of oil.	12
Biomass / Forestry	The government's plan is to rationalise the use of wood-fuel through devolvement of responsibility to local	13



communities and also through the diversification of fuels.

ENERGY-POVERTY AND DEVELOPMENT STRATEGY		
Poverty Reduction Strategy Paper (PRSP)	The 2000 Interim PRSP seeks to reform the energy sector by transferring the public electricity sector (EAGB) to a private sector operator and establish an independent energy regulatory agency	14
Rural Electrification		
Main Development Projects		

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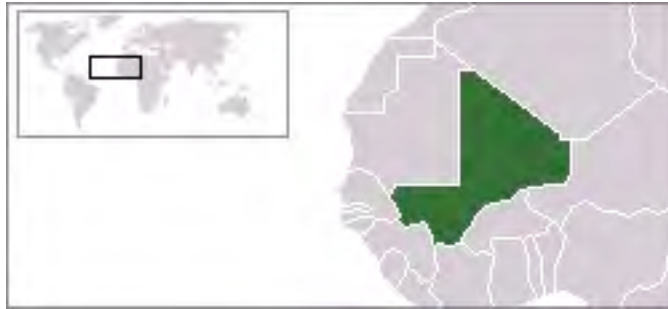
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5.6 MALI DATA SHEET



SOCIO-ECONOMIC INDICATORS		
Population	13,5 millions (2005), 32% Urban	8,
Growth Rate	3% (2005)	8
HDI	Rank 172 out of 179	1
GNI Per Capita	380 USD Athlas PPP	8
Population Below Poverty Line	1 USD - 72,3% 2 USD - 90.6% NPL - 63.8%	1
Primary School Enrolment	50.9%	8
Life expectancy	49	8

ENERGY RESOURCES AND PRODUCTION		
Electricity		4
Installed Capacity	186.1 MW total, of which 92.7 MW thermal 92.6 MW Hydro (total hydro capacity is higher but shared with Senegal and Mauritania) 0.85 MW PV	4, 5
Production	521,4 GWh,, Manantali dam alone produce around 807 GWh /year for Mali, Senegal and Mauritania.	4, 5
Fuel Mix	73% Hydro	4, 5



Energy Imports		
Renewable Energy resources		
Biomass / Forestry	6.1 millions of tonnes of fuelwood and 93148 tonnes of charcoal in 2002, 310'000 tonnes of potentially available bagasse, consistent resources in Jathropa and cotton residues	9
Hydro Potential	Consistent Hydro potential, 250 MW has been developed so far at the Selingue and Sotuba dams on the Niger River and the Manantali dam on the Senegal River. The electricity produced at Manantali is shared with Senegal (33%) and Mauritania (15%)	4, 5
Solar Potential	Around 6 kWh/m ² /day	10
Wind Potential	n.a.	
Fossil Fuel Resources	Some oil reserves have been discovered in 2003 in the north of the country, Other fossil fuels discovered are bituminous sand and lignite.	

ENERGY CONSUMPTION			
Overall Consumption	Energy	260 Kgeo (Kilograms of Equivalent Oil) well below the African average of 600 Kgeo, of which only 45 Kgeo of oil products and 3 Kgeo of electricity	7
Traditional Consumption	Fuel	85% of primary energy consumption is met by traditional biomass, essentially fuelwood and charcoal	1
Electrification Level		12-13% total, around 2% rural	5
New Customers Each year		Consistent increment in the last years, from 41062 in 1990 to 118806 in 2001	5
Electricity Consumption (per capita)		Around 2002 - 40.3 kwh in 2002, the double with respect to 1990 levels	5
Electricity Tariff		Between 64 and 112 CFA Kw/h, depending on class of consumption	5
Fossil Fuels			
Biomass / Forestry		4.7million tonnes of fuelwood in 2004	11

ENERGY POLICIES			
ELECTRICITY			
Regulation		Independent regulatory Agency (CREE) has been created in 2000	4, 5, 6
Ownership		EDM is owned at 66% by the state, after the withdraw of Saur International that detained the majority of the shares since 2002	4, 5, 6
Structure		EDM is vertically integrated. There exists other 2 societies that serve areas not interconnected with the main grid.	4, 5, 6
Fossil Fuels			
Biomass / Forestry		The forestry and domestic energies policies have been reformed are based on local control, management and	5



	exploitation, on increasing professionalism and ownership of local communities and fuelwood professionals.
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ENERGY-POVERTY AND DEVELOPMENT STRATEGY		
Poverty Reduction Strategy Paper (PRSP)	The original Poverty Reduction Strategy Paper, published in 2002, addresses energy in various aspects.	
Rural Electrification	Agence Malienne pour le Developpement de l'Energie Domestique et de l'electrification Rurale has been created to manage the HEURA program, Initiatives by the Electricite de France (EDF) setting up Renewable Energy Service Companies (RESCOs) has been deemed successful in the western parts of the country.	5
Main Development Projects	Multifunctional Platforms (MFP) implemented by UNDP and UNIDO are installations of diesel engines (8-12HP) connected with a plurality of tools for water pumping, electricity generation, processing of agricultural products etc. The MFP are managed by cooperative of women and financed jointly by the villages' cooperatives and the donors. The MFP program started in Mali with the support of UNDP with initial few installations. The program quickly gained the support of the government and encountered the favour of the rural populations with more than 500 MFP currently installed and operating in rural villages around the country with more plans for scaling up the program.	12

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5.7 MAURITANIA DATA SHEET



SOCIO-ECONOMIC INDICATORS		
Population	3.1 millions (2005), 38% rural	6
Growth Rate	2.9% (2005)	6
HDI	rank 152 out of 177	1
GNI Per Capita	580 USD Atlas PPP	6
Population Below Poverty Line	1USD - 25.9% 2USD - 63% NPL - 46.3%	6
Primary School Enrolment	72.2%	6
Life expectancy	58	6

ENERGY RESOURCES AND PRODUCTION		
Electricity		4'
Installed Capacity	82 MW	
Production	375,5 GWh of which around 150 GWh imported from Manantali Hydro	
Fuel Mix	Local production is 100% thermal	
Energy Imports		
Renewable Energy resources		
Biomass / Forestry	with an annual production (1999) of 200,000 tons of fuel wood and 125,592 tons of charcoal	7



Hydro Potential	a technically exploitable capacity of >5 TWh/yr, Mauritania receives 15% of the power generated at Manantali Dam on the Senegal River	7
Solar Potential	6.7 Kwh/m ² /day	
Wind Potential	Between 4 and 7 m/s depending on the zones	8
Fossil Fuel Resources	Mauritania has proven oil reserves of 1 billion bbl. Mauritania has offshore oil and gas deposits and a growing upstream oil industry. Offshore oil extraction began in February 2006. oil production is expected to peak at 88,000 barrels a day in 2015	

ENERGY CONSUMPTION			
Overall Consumption	Energy	The per capita energy consumption for 2002 was 4954.22 kWh projected to 5087.35 kWh for 2003. In 2003 Mauritania consumed 164.3 million kWh of electricity	12
Traditional Consumption	Fuel	consumption is estimated at 380,000 tonnes of fuel wood and 70,000 tonnes of charcoal, i.e. about 30.4 per cent of the total energy consumption for the 85% of the population in 2004	9
Electrification Level		Urban 41%, rural 2%, The proportion of households connected to the electricity grid increased from 18% in 2000 to 24% in 2004	5, 10
New Customers Each year			
Electricity Consumption (per capita)		2002 - 58 kWh	1
Electricity Tariff			
Fossil Fuels			
Biomass / Forestry			

ENERGY POLICIES			
ELECTRICITY			
Regulation		In March 2005, the Mauritanian government created a separate ministry of oil and energy to handle the energy portfolio	
Ownership		The Mauritanian government committed itself to privatization of the national electricity utility, SOMELEC (Société Mauritanienne d'Electricité) in 2001. However, the privatization of SOMELEC could not be completed on time for various external factors	
Structure		Integrated	
Fossil Fuels		Liberalization of imports of petroleum products (1994)	
Biomass / Forestry			

ENERGY-POVERTY AND DEVELOPMENT STRATEGY			
Poverty Reduction Strategy		The first PRSP points to the following developments to	



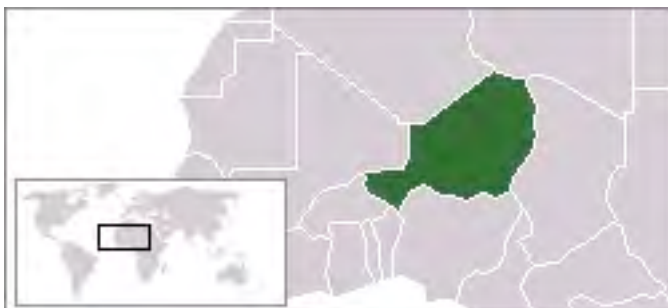
Paper (PRSP)	<p>increase access to electricity in Mauritania:</p> <ol style="list-style-type: none"> 1) Privatisation of the electricity branch of SONELEC in 2001, 2) Establishment of the Rural Electrification Development Agency (ADER) <p>The energy sector is mentioned in all the PRSP documents.</p>
Rural Electrification	<p>The L'Agence de développement de l'électrification rurale (ADER) is responsible for rural electrification whilst SOMELEC handles power generation and distribution.</p>
Main Development Projects	

NOTES

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5.8 NIGER DATA SHEET



SOCIO-ECONOMIC INDICATORS		
Population	14 millions (2005), 76,7 % Rural	2, 3
Growth Rate	3.3% (2005)	2
HDI	Rank 177 out of 177	1
GNI Per Capita	240 USD PPP Atlas	2
Population Below Poverty Line	63% of the population is poor and 34% is extremely poor (1994),	1
Primary School Enrolment	39.9%	2
Life expectancy	45	2

ENERGY RESOURCES AND PRODUCTION		
Electricity		
Installed Capacity	103 MW (2003)	5
Production	Total production in 2005 has been 202GWh, of which 158GWh from SONICHAIR (for the uranium industries) and rest from NIGELEC.	5, 11
Fuel Mix	100% Thermal	5
Energy Imports	Around 300 GWh/year imported from Nigeria	5, 11
Renewable Energy resources		
Biomass / Forestry	Estimated production of 3.5 millions of tonnes per year of	13



	fuelwood and half million tonne of charcoal.	
Hydro Potential	No plants active actually, the potential is low due to climatic and hydrogeologic conditions and rainfall seasonality.	
Solar Potential	6kWh/sqm/ day.	11
Wind Potential	n.a.	
Fossil Fuel Resources	Currently no production of fossil fuel in the country, but the China National Petroleum Corporation is currently exploring for reserves in the Agadez Region	12

ENERGY CONSUMPTION			
Overall Consumption	Energy	. The annual per capita value estimated by various sources is between 0.15 and 0.30 toe	14
Traditional Consumption	Fuel	85.3% in 2002	1
Electrification Level		7.23 in 2005 (was 5.4 in 2000)	5
New Customers Each year		125.982 in 2005 (was 80944 in 2000)	
Electricity Consumption (per capita)		Different sources estimate a per capita consumption between 25 and 40 kWh /year	5, 1
Electricity Tariff		An average of 88 CFA /kWh	15
Fossil Fuels			
Biomass / Forestry		Fuelwood is used for cooking in 85% of urban households and 95% of rural. The demand is considerably superior than production.	16

ENERGY POLICIES		
ELECTRICITY		
Regulation	The regulation of the electricity industry is mainly between the duties of the Ministry for Mines and Energy. The Government directly controls NIGELEC, the formulation of policy objectives, the development plans, the tariffs, the authorisations, the technical aspects. The Multisectorial Regulation Authority has more a control role, and much less effective powers.	5, 7, 8
Ownership	NIGELEC was one of the 12 state-owned enterprises whose privatization was foreseen by the Enhanced Structural Adjustment Plan back in 1996, but not achieved yet.	5, 7, 8
Structure	The (NIGELEC) handles all the steps of the electricity chain (with the exception of the energy produced for the mines by SONICHAR). Independent Power producers are foreseen by the chapter 6 of the electricity bill of 2003, but not yet implemented.	5, 7, 8
Fossil Fuels	SONIDEP is the state-owned company, founded in 1977, that has the exclusive authorisation for the international trade in fossil fuels and owns the necessary storage facilities. In the original government's plan, back in 1996,	5, 7, 8



	SONIDEP should have been privatized in the period between 1997 and 1999. The privatization has never been finalised due to the lack of interested investors. In the retail sector several companies offer their services	
Biomass / Forestry		

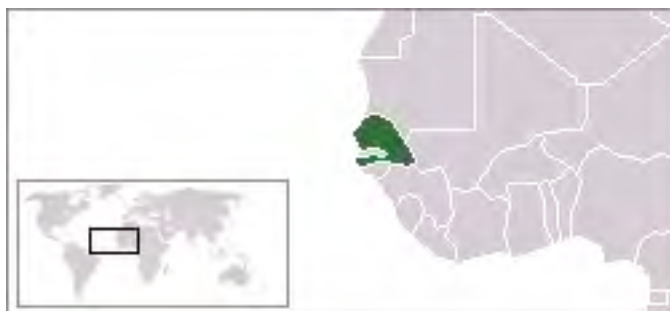
ENERGY-POVERTY AND DEVELOPMENT STRATEGY		
Poverty Reduction Strategy Paper (PRSP)	The PRSP recognize the importance of energy in the development process and in the strategies to reduce poverty	16
Rural Electrification	The government plans to implement a specific agency, for the moment there is a levy on each kWh sold to finance rural electrification programs.	5, 7, 8
Main Development Projects	Projet de Développement du réseau électrique interconnecté du Niger (DREIN - Project for the Development of Niger's Interconnected Electric Network).	9

NOTES

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5.9 SENEGAL DATA SHEET



SOCIO-ECONOMIC INDICATORS		
Population	11.7 millions (2005)	10
Growth Rate	2% (2005)	10
HDI		1
GNI Per Capita	700 USD Atlas PPP (2005)	
Population Below Poverty Line	< 1 USD - 26.3%	10
	< 2USD - 67.8%	
	< NPL - 33.4 %	
Primary School Enrolment	76.2%	10
Life expectancy	56	10

ENERGY RESOURCES AND PRODUCTION		
Electricity		
Installed Capacity	The capacity in 2005 was 526 MW, the net peak point was 374 MW, plus about 66 MW of the electric capacity of the dam of Manantali (Mali) under the agreement with OMVS (Organisation de la Mise en Valeur du Fleuve Sénégal).	4, 11
Production	1449.617 GWh from SENELEC in 2005, plus 297.6 GWh from the independent power producer GTI, plus 266.9 GWh from Manantali dam, plus other 156 GWh from other producers. Consistent increment in the last few years.	4
Fuel Mix	Internal production is 100% thermal.	
Energy Imports	Senegal imported 31,000 of oil bbl/day in 2003	5



Renewable Energy resources		
Biomass / Forestry	In 1999, 3.3 million tons of fuel wood and 110,708 tons of charcoal were produced.	11
Hydro Potential	There is hydro potential on the Senegal and Volta river.	11
Solar Potential	There is an annual sunshine of more than 3000 hours and average irradiation of 5.4 kWh/m ² /day promises significant opportunities for generating thermal and photovoltaic power in Senegal. In 2004, the peak generating capacity of installed PV solar systems was 165,526 kWpico	13
Wind Potential	Generally limited, except between St. Lois and Dakar. Wind for water pumping is widely utilised	13
Fossil Fuel Resources	Produced and consumed 50 million cubic metres of natural gas. In 2003	5

ENERGY CONSUMPTION		
Overall Consumption	Energy	
Traditional Consumption	Fuel	43.4% 7
Electrification Level	In 2001, latest available year, was 55% urban and 7.5% rural, with annual improvements	
New Customers Each year	550'000 customers in 2004, with an annual progression between 30 and 50 thousand clients year	5
Electricity Consumption (per capita)	The annual per capita electricity consumption in 2004 reached the level of 145.6 kWh progressing from 105.9 kWh in 1995	5, 14
Electricity Tariff	The average selling price is 80.5 CFA kw/h (0,12 Euro). There exists a special tariff for poor consumers, to subscribe to this category two months advance payment has to be payed (CFA 19361 - 29.5 EUR) based on a national average, plus other costs for the meter and administrative fees.	5
Fossil Fuels	Highest LPG prenetation per capita in the region. 14.5%	
Biomass / Forestry		

ENERGY POLICIES		
ELECTRICITY		
Regulation	The regulation of the industry is set by the Ministry of Energy and the Regulatory Commission of Electricity Sector (CRSE)	
Ownership	After two tentatives of privatizations failed, the controlling shares are state owned	
Structure	At present, SENELEC is a vertically integrated industry covering generation, transmission and distribution. SENELEC however has not the monopoly neither in generation, neither in distribution. SENELEC buys	4, 5, 6, 7,



	electricity from the following several Independent Power Producers (IPPs):
Fossil Fuels	Senegal carried out since the mid-seventies a national programme to encourage LPG use, also through subsidies now partialled phased out.
Biomass / Forestry	There exist several programs to favorize a sustainable use of fuelwood (PROGEDE, PREDAS).

ENERGY-POVERTY AND DEVELOPMENT STRATEGY	
Poverty Reduction Strategy Paper (PRSP)	The PRSP was presented in 2002. The Matrix of Measures (2003-2005) contains a sub sector dedicated specifically to Energy. Moreover ASER launched the PRÉMS (Multisectorial energy projects) to identify the energy needs of the poor and link energy provision with income generating activities.
Rural Electrification	Independent distribution networks are foreseen to enhance the access in rural areas, trough the Agence Senegalaise d'Electrification Rurale -ASER.
Main Development Projects	

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CHAPTER 7

POLICY RECOMMENDATIONS

The appropriate exploitation and use of energy resources as well as the wide variety of technological options can prove to be a catalyst towards attaining poverty reduction goals. However, targeted indicators for energy delivery services such as for rural electrification, targeted productive energy enterprises, use of energy technologies for water pumping and irrigation, gender and health friendly technologies for cooking, fuel switching, use of cleaner technologies based on renewable energy, participation of women and the poor in decision making, are only some of the energy and social indicators that could be used to help the economic growth and alleviate poverty in the long term.

During the Ministerial Conference on Energy and Poverty Reduction in Sahel (Ouagadougou, 31 May 2007) that successfully closed the IE4Sahel project, twelve recommendations for the promotion of sustainable energy policies to help fight poverty in Sahelian countries were presented. The recommendations originated from the debates and the works performed during the IE4SAHEL, and also from the analysis of the most recent policy development at the African and international level. Below are the policy recommendations and a brief explanation for each of them.

Recommendation 1: Mainstreaming energy requirements of the poor in all the PRSPs and strategies for achieving the MDGs and their appropriate funding

The country PRSPs are the most important documents that drive both the internal national development policies and objectives and also the assistance from donor countries and international agencies. However, the energy needs of the poor are not highlighted in all the PRSPs and there are few cases in which the specific energy needs of the poor are provided with budgetary resources. The inclusion of the energy needs of the poor in the PRSP, as also suggested by the Forum of Energy ministers of Africa -FEMA - in their meeting in Maputo in 2007¹⁶, is an essential step to carry on specific pro poor energy policies and thus address one of the most important barrier to human development. To mainstream energy requirements, specific sub recommendations would include:

Creation of specific energy access Targets and Program areas for Poverty Reduction

Energy policies and strategies need to differentiate targets and budgets specifically for urban and rural areas. Even within rural areas, poverty pockets needs to be determined further. A step by step process would need to be followed such as:

- Identify the different target areas: regional/ poverty distribution in different areas etc.
- Identify basic energy resources in each region
- Calculate the costs of developing these energy resources and the distribution of this within regions. The costs needs to be calculated so as to form a basis of investments required.
- Financing strategies and plans internal to the country and required external funds
- Time plan to deliver equal access to energy for all (short, medium and long term)

Integration of appropriate strategic targets to benefit the poor in the PRSP

Both energy policies and programs are often not specifically targeted for poorer areas as the economic returns are deemed to be low. However, unless energy needs of the poor are properly assessed and targets set to meet them in the PRSP, definite budgeting for these

¹⁶ see www.fema-africa.org/



areas will always remain low priority. In almost all the PRSP, energy issues as well as electrification targets have a geographical divide of reaching urban-rural areas only. However, no direct indicators were set in any of the nine country PRSP on how these targets will be made. Energy is often considered as an infrastructure and not considered key in helping reduce poverty. The linkage needs to be significantly researched and built up. If clear strategic plans are drawn up within an institutional framework, international assistance may also be channelled in appropriately.

Increase in inter-ministerial/ inter-sectoral dialogues in-country. Inter ministerial dialogues within the region, and inter-sectoral stakeholder dialogues are essential if energy access for poverty reduction is to produce results. In some of the PRSP documents such as in Senegal, the Ministry of Forestry looked at alternative initiatives for household energy management but no linkages were made with the Ministry of Energy. In Chad, household energy management actions are laid down under the Ministry of Agriculture (PRSP 2003). In the Gambia, the lack of co-ordination among fragmented energy institutions is being recognised as one of the barriers to provide access to energy services. In Guinea Bissau, the Government intends to broaden the solar energy program for water pumping within the Water and Sanitation Sector Master Plan.

In Mauritania, funds were channelled in through the Ministry of Economic Affairs and Development (MEAD) rather than the Ministry of Hydraulic and Energy (MHE) for reforms in the energy sector. The institutional responsibility of the MEAD was mainly economic matters, concurring with reform goals but not necessarily the correct institution to reform the energy sector leading to a setback in regulation and progress of the sector. Thus, it is important that there is an enhanced participation of the relevant Ministries.

Recommendation 2: Review the energy reforms to better adapt them to the Sahelian reality, by taking into account the energy requirements of the poor, particularly women through participation

Energy reforms have been carried on with mixed results in the majority of developing countries since the mid-nineties. The reforms have followed the agenda set by World Bank /IMF that envisaged corporatization, private sector participation, independent regulation and in some cases unbundling and concurrence. Even if the situation that African (Sahelian) energy utilities face is quite different from the situation found in other developing countries in South America and Asia, the reforms have been implemented in similar way and with few adjustments to local conditions and this is one of the reason behind the failure of the privatizations in the Sahel. As also suggested by the FEMA there is the need to "Re-assess past energy sector reforms to develop more appropriate options that better reflect African countries' specific characteristics, with the aim of attracting both local and foreign investment as well as improve the performance of relevant energy institutions including strengthening the performance of our utilities.

In addition, establish a conducive regulatory environment that can attract and mobilize both local and external private sector investment and initiatives to the energy sector. There needs to be a sufficient interaction and building up of knowledge on market barriers and overcoming it to enable designing effective regulatory frameworks and mechanism for the participation of the private sector. If private sector participation is a key indicator, it is necessary that apart from market barriers, political and sectoral contexts be examined in depth as well. The private sector will not risk investments where there is a lack of financial market, or a conducive policy support or poor infrastructures. Thus, privatisation in energy sector reform needs to be carefully balanced if the overall political and economic conditions in a country are equally conducive to investments. Public- private partnerships are also to be carefully suggested or planned.



In addition to regulatory mechanisms, it is also important to increase decentralised participation, especially for women. Although participation at the local level is recognised to be extremely important, there is often no clear defined legal or regulatory framework to strengthen this approach. For example, decentralised forestry management requires a clear and defined legal framework that clearly includes legal recognition of local institutional structures. This should also need to be carefully worked out with the participation of both the institutions responsible for forestry and energy. Other initiatives such as RESCOs or enterprises supporting decentralised rural energy delivery services should be encompassed into any legal or regulatory frameworks to enable a faster growth in the actual implementation of projects. Participation however needs to be strengthened and supported to ensure sustainability. Monitoring of local management practices is needed and capacity built wherever appropriate.

Gender issues also need to be considered, especially allowing for the active participation of women while designing and implementing energy and poverty reduction programs. Specific gender and poverty reduction indicators need to be created and monitored.

Recommendation 3: Promotion of renewable energy sources and development of low-cost local technologies for decentralised energy production

Renewable energy sources are the most important contributor to the Sahel Energy Balance. However, the great part of this energy comes from the use of fuelwood, often collected in unsustainable ways and therefore causing harmful consequences on the environment. In some states a major proportion of electricity generation is from few large dams while the production of energy from local and decentralised renewable energy sources is still limited in Sahel although there is a large potential for cost-effective modern energy solutions to a widely dispersed rural population. As some success-stories clearly highlight, like the Multi Functional Platforms in Mali and Burkina Faso, the implementation of local decentralised generation increase the wealth of the community also through the creation of local jobs for assistance and maintenance reinforcing the local technical capacity to find solutions well suited for the specific Sahelian environment.

To promote decentralised energy provision, it is crucial to 'increase rural electrification targets'. Rural electrification enhances the productivity of rural populations. However, rural electrification targets are often low or unmet. Decentralised rural energy co-operatives are also an option to act as catalysis for positive change and to enable effective implementation of targets.

Most importantly, within these rural electrification targets, there should also be additional renewable energy policies and targets. While PRSPs of most countries mentioned the promotion of renewable energy policies and targets, there were no clear and specific targets. Many of the Sahelian countries do not have the appropriate institutional and legal frameworks for the promotion of renewable energy. The development of local capacity for renewable energy technologies need to be specifically targeted. Policy incentives, delivery of appropriate subsidies for different renewable energy technologies need to be country specific depending on the availability of resources.

To reach these goals, it is important to design an energy resource information base for each country. Information is crucial to the planning and monitoring of energy policies and programs. There should be full support for the design of atlas on renewable energy potentials (solar, biomass, wind, others) or GIS in all countries. A proper information system or database will enable both policy makers and program developers to design and implement realistic plans and projects especially if they are specific poverty pockets within a country.



Recommendation 4: Respect for human rights, the rights of the communities concerned and the environment when using fossil resources and utilisation of oil revenues for alleviating poverty

The development of fossil fuel resources might have a high negative impact on the life of concerned communities and on the environment, as it was recognised from the Extractive Industries Review of the World Bank and later endorsed by the board of directors. Following the EIR the Bank adopted more strict policy guidelines for the sustainable development of fossil fuel resources and for the utilisation of oil revenues in poverty reduction programs that should be carefully followed in the development of an upstream fossil fuel industry. The problem is of particular actuality in Sahel, because new oil projects are being developed such as in one case - Chad - the changing of the oil revenue law led to a crisis of the relationships between the Bank and the government that lasted several months and temporary halted the donor's assistance.

Recommendation 5: Development of adequate measures to overcome barriers to access to modern energy services for the poor, including reduction of fixed costs and micro-credit;

The barriers that the poor face to access modern energy services need specific policy, economical and financial instruments to be overcome. In particular it is not only necessary to bring energy services "out of the door" (technical access) but to increase the capacity of the poor also to economically access modern energy services, that for cost reasons are out of the reach of the urban poor. The principal problem that the poor face toward the economical access is that their low and erratic incomes do not generally allow them to pay the initial fixed costs and a fixed monthly fee. The poor are so obliged often to buy very little quantity of energy (small quantities of fuel, illegal or derived electricity connections etc.) at a relatively high price.

This is a field where much is needed to experiment innovative solutions and to learn from success stories in various developing countries. In some there have been experimented with certain success the implementation of life-line tariffs, of pre-paid cards, of microcredit and financing of the initial connection costs in several lower monthly fees, of standardized low cost meter, of various forms of social tariffs. These solutions have to be adapted to the particular energy and social conditions of each country.

Recommendation 6: Promotion of private economic initiatives and decentralised rural electrification cooperatives;

Promotion of private economic initiative is essential for any strategy of development and poverty reduction. In the case of energy private economic initiative may play an important role both in providing energy services and in the creation of jobs. In Sahel some experiences with local electrification cooperatives are promising and should be properly encouraged especially considering the centralised electrification approach often revealed as inefficient and very expensive. The integration of rural electrification cooperatives into the national energy system may play an important role to spread the access to modern energy services in the areas not yet served but it needs the proper legal and institutional environment to be carefully developed.

Create appropriate Financial Mechanisms and Delivery Mechanisms

One of the critical elements for success of energy programs lies in the design of appropriate financial and delivery mechanisms. Often, the lack of upfront capital prevents the consumers to connect to electricity or buy renewable energy systems even if available.



The growth of solar home systems in the Sahel has been stunted because of this factor. Any government or donor led intervention need to carefully design a single performance based financing mechanism to enable the poor to access funds. Micro credit is often used effectively in many other developing countries and this should be explored further within the Sahelian context.

Create adequate legal and regulatory mechanisms

There is a lack of adequate legislation in most energy sectors and sub sectors in all the Sahelian countries especially for investments to be made in the sector. Governments need to provide tax and customs exemptions for energy equipments (particularly renewable energy) that provide benefit to the poorer, rural or peri urban sections of the country.

Regulatory mechanisms and institutional frameworks needs to be created to specifically encourage public private partnerships, especially in large scale grid connected projects. In countries such as Mauritania, privatisation faltered because of inadequate incentives to the private sector. In addition, the non clarity of regulations led to conflicts among subsector agents and lack of consensus on strategies for delegating public electricity service.

Recommendation 7: Strengthening of regional integration in terms of policy planning and scientific and technological exchanges

Regional integration can be a powerful force to the improvements of the national energy systems. Some integration initiatives are already being put in place, like the development of large dams, or the interconnection lines foreseen by the West African Power Pool (WAPP) project and the ECOWAS white book. Regional cooperation is important for the development of local energy sources, technologies and policy solutions able to meet the peculiar needs of the Sahel region.

In order to strengthen regional integration and exchange, it is also important that national manufacturing and delivery services be built up. Various capacity building measures need to be taken at all levels of the energy delivery chain. This would need to range from policy makers to local manufacturing and to all the stakeholders in the energy sector. Even at the public sector, training and capacity building is required from the local to the national level. These capacity building measures should be integrated into the strategy and planning.

Within the Sahelian region, some countries such as Mali and Senegal have more expertise and experience in the planning and delivery of energy programs in rural areas. The MFP is an excellent example of lesson learning of the same initiative in different countries. Such initiatives need to be strengthened and implemented by governments in addition to other stakeholders. Scientific and technological exchanges need to be made to enhance the growth of the sector particularly in the adaptation of interventions and technologies.

Recommendation 8: Promotion of integration and synergy amongst the various initiatives for energy in Africa

In the past decade, the attention to the African Energy situation, especially the lack of access for the poor, has been growing considerably and several regional and international initiatives have been put in place to deal with policy and technological aspects (NEPAD Energy Agenda, FEMA, AFREPEN, AFREC, various JPOI partnerships etc). It is therefore important that all these initiatives and institutions works well together with the ultimate



goal of promote economic development and fight poverty, also through the provision of modern energy services to the consistent part of Africans that do not have any. Regional integration can effectively reinforce the position of African states facing donor countries and international institutions and optimize the development of resources.

Increase skills and capacity of public sector institution stakeholders

It is clear that capacity building is needed not only for the stakeholders but also for public sector institutions and stakeholders. For example, public institutional stakeholders need to build up capacity to enable them to carry out sectoral reforms. Lessons from neighbouring countries with good public sector energy reforms may be taken as examples. For example, Mauritania looks towards Morocco's regulatory and reform efforts on grid connects through renewable energy technology to enable designing similar regulatory frameworks. In many of the Sahelian countries, significant institutional reform process is needed. A clear institutional analysis of the gaps in capability and capacity needs to be assessed bridged through adequate and appropriate staff training and exposure to successful implementation strategies.

Recommendation 9: Promotion of the productive use of energy to create wealth in rural areas

Energy programs are successful when productive uses are integrated as a core component in policy or program development. Provision of modern energy services to a community do not ensure by itself the creation of jobs and wealth if the energy is not utilised in productive ways, even if the availability of energy for public lighting and pumps for water (for example) will by itself improve significantly the quality of life. To combat poverty, it is absolutely essential that productive uses of technologies be supported in addition to consumptive needs. It is therefore important to design integrated community development plans that comprehend the access and use of modern energy as a pillar and that promote its productive uses to create new jobs, and added value activities able to generate a sufficient income to repay the cost of energy and generate some profit. Poverty reduction is possible only when the poor or rural areas start to be more productive in their outputs. In addition, energy is a catalyst for local job creation especially if enterprises are set up in rural areas.

The experience from multi functional platforms in Mali and Burkina Faso and other similar projects clearly shows that it is possible to develop a successful energy business model in rural areas with positive outcomes on the life of the involved communities.

Recommendation 10: Environmental protection through the sustainable use of biomass and its optimization

The Sahel is the region of the world with greater share of use of traditional biomass over the total energy consumed, in some cases this value is of 80% of greater?. The intense use of traditional biomass has many negative effects, on the environment, on health, on the living and working conditions, but fuel transition is a process that can take decades even with consistent policies. Meanwhile, it is of great importance to put in place specific policies that will limit the damages related to traditional fuel consumption. In Sahel, there have been positive experience, for example, with community management of forest resources, improving the professionalism of the operators of the woodfuel chain, with improved carbonisation techniques and improved cook-stoves.

There should be a concerted increase in efforts to the efficient use of traditional biomass energy sources. Data information systems for developing effective strategies for reducing



reliance on traditional biomass are still underdeveloped. There should be appropriate mechanisms and budget to document the supply and consumption so that appropriate measures and targets to reduce it can be effectively administered and measured. In addition, the barriers to the uptake of improved biomass technology options should be listed and addressed in individual countries. Successful cases from other neighbouring countries or other African countries can be used for widespread replication.

In the household energy sector, there should be creation of clear legal rules especially for the fuelwood markets. The overlap of energy and forestry administration and legal recognitions needs to be synchronised carefully. In countries like Niger where rural fuelwood markets successfully meet increasing urban fuelwood demand, there needs to be a regulatory mechanisms and support for local management of forest resources including transparent and accountable processes both from government officials and locals.

Recommendation 11: Promotion of sound energy use

Energy saving is an important source of energy even in countries with extremely low per capita energy consumption. Not only end user technology in developing countries is often far less efficient than the state of the art, but the rapid process of urbanisation poses new threats to the equilibrium of the systems with the fast growing use of electrical devices, air conditionings, cars etc. It is therefore important that developing countries will be able to attract the most energy efficient technologies from the developed world but also that they will be able to adapt them for a very different environment and combining with an intelligent use of traditional techniques. In the case of buildings, for example, the combined use of traditional design and cooling systems with modern technologies can provide comfortable climate without or with a limited use of air conditioning and new solar technologies can be used to cool air without the use of electricity. In rural areas, CFL and LED lighting can be utilised in houses to replace candles and kerosene. A PV system can be shared amongst neighbours and family members.

Recommendation 12: Strong appeal to donor countries to support financially the African countries' efforts aimed at allowing the citizens to have access to modern energy services in accordance with the MDGs.

There is large consensus in the international community that access to modern energy services is essential to achieve the MDGs. However, till now, the approach of international agencies and donors has been more focused on energy reforms, privatisations, large infrastructures rather than developing integrate strategies to increase the access for the poor. So it is urgent that both the donors and the national governments move forward to a more pro-poor approach in designing the energy policies and that the international community will be able to support the efforts in this direction if it is serious about the importance of achieving the MDGs.

However, to gain support, all countries need to carefully develop a Monitoring and Evaluation Plan that will allow them to be specific on goals, targets and plans for their countries. The monitoring plan should be able to clearly lay out:

- Monitoring baseline data whereby appropriate indicators needs to be drawn up
- Timelines and budgets for monitoring both the investments and implementation
- Timely evaluation to assess the existing conditions and create new plans and targets

If energy for poverty reduction and MDG targets were to be achieved, monitoring of the following might be additionally required.



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- Monitoring the provision of electricity for social service sectors (health, education, etc)
 - Monitoring the provision of electricity for productive sectors



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