Exploring energy poverty perspectives in Senegal: The applicability of scenarios

by

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ABSTRACT

Energy poverty refers to a situation where physiological energy needs are not met with the resources available for cooking, lighting, and heating. Billions of people worldwide still rely on biomass fuels such as wood, charcoal, and dung to satisfy their primary energy needs. With high population growth and urbanization trends, energy poverty is especially prominent in sub-Saharan Africa, where electrification rates remain low and biomass use continues to rise. The need for solutions and strategies to increase the access to clean, efficient and sustainable energy resources has never been greater. However, projects by local governments and international development agencies have met limited success in alleviating energy poverty concerns, largely due to a lack of local involvement in the project planning, implementation, and continued operation.

One method that has been advocated as a tool to increase public participation through non-traditional techniques is the use of scenarios. Scenarios have proven effective as an aid in creating policy for various sectors, and involve describing future possible events and conditions in efforts, by decision makers, to consider possibilities that cannot be captured by studying past data. While benefits of scenario use are well documented, a paucity of literature exists regarding the procedural details and effectiveness of each stage of the scenario method. Therefore, the purpose of this study was to bring together a diverse group of research and policy professionals from Senegal and examine the effectiveness of the scenario process in capturing their perspectives and priorities on energy poverty in Senegal.

Research methods included document research, participant observation, focus group research, semi-structured interviewing and questionnaire surveying. A two day scenario workshop was conducted in Dakar, Senegal and involved 22 research and policy professionals. The workshop revealed that political cohesiveness, social cooperation, and economic development were the three most influential forces influencing energy access. The local participants' perspectives of the issues, barriers, and possible future outcomes of energy poverty in Senegal were documented, and the results and conclusions will help fill a void in the literature on energy poverty perspectives in West Africa and Senegal. The scenario process proved to be an effective, financially efficient means to engage policy and research professionals in a participatory process. The process fostered open communication between all participants and encouraged cooperative learning.

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LIST OF ACRONYMS

BCEAO	Banque Centrale des États de l'Afrique de l'Ouest (Central Bank of West African States)
CFGS	Centre for Global Studies
CIDA	Canadian International Development Agency
ECOWAS	Economic Community of West African States
EE	Exposure effectiveness
EIA	Energy Information Administration
ENDA-TM	Environnement et Développement du Tiers Monde (Environmental Development Action in the Third World)
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross domestic product
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Cooperation)
IEA	International Energy Agency
IEPF	Institut de l'Énergie et de l'Environnement de la Francophonie
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
LPG	Liquid Propane Gas
NGO	Non-governmental organization
PM-10	Particulate matter below 10μm
PV	Photovoltaic (solar electricity)
SENELEC	Senegal's Societe Nationale d'Electricité
TWh	Terawatt-hour (electricity)

UEMOA	Union Économique et Monétaire Ouest Africaine (West African Economic and Monetary Union)
UNDP	United Nations Development Programme
UNSD	United Nations Statistics Division
USAID	United States Agency for International Development
WAGP	West African Gas Pipeline
WAPP	West African Power Pool
WEC	World Energy Council
WHO	World Health Organization

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DEDICATION

To Moussa Kola Cissé, who sadly passed away on October 30, 2004 in Dakar, Senegal. Your dedication to energy research and improving the lives of the poor was inspirational.

CHAPTER ONE

INTRODUCTION

1.1 Purpose of the Study

The purpose of this study was to incorporate perspectives of a diverse group of research and policy professionals from Senegal on energy poverty and energy access issues into a policy and strategy development process.

The main objective was to examine the application of scenarios as a tool to encourage forward thinking discussions among policy professionals, while capturing local perspectives and priorities on energy poverty in Senegal. Specific objectives were:

- To develop a scenario based exploratory method to involve policy and research professionals from Senegal to study energy access problems.
- To test the developed scenario method in the context of energy poverty in Senegal by evaluating the process of utilizing the tool.
- To identify key problems, factors and alternatives of energy poverty in Senegal for input to policy and strategy development in UEMOA (Union Économique et Monétaire Ouest Africaine, West African Economic and Monetary Union).
- To determine if the use of scenarios may be recommended as a simple, effective and low cost tool to explore and document energy poverty perspectives.

1.2 Justification

The concept of energy poverty represents a condition that affects over 2.5 billion people in economically poor countries and addresses the lack of access to convenient, efficient and healthy energy sources as a contributing barrier to the fulfillment of basic

human needs (WEC, 1999; UNDP, 1996). This problem is especially grave in sub-Saharan Africa, where nearly 90% of the population do not have access to clean, affordable fuel options and rely on traditional biomass (IEA, 2002). Basic human needs include the minimum requirements for food, shelter, water and sanitation to enable a healthy and productive lifestyle (Streen *et al.*, 1981). Energy itself is not a human need, but it is increasingly recognized as a critical element in the ability to satisfy basic needs (Kammen *et al.*, 2002; Goldemburg and Johansson, 1995).

Multiple types of energy sources exist and satisfy a wide range of activities, including electricity for water pumping and lighting, and petroleum-based fuels for machinery operations in manufacturing, commercial applications, and for motorized transport. Electricity is recognized as a key component to help alleviate poverty (Turkson and Wohlgemuth, 2001; Youm *et al.*, 2000). For example, electric lighting helps increase the amount of time available for productive work and education. However, current electricity generation capabilities are insufficient in most economically poor countries and the minimal output is largely reserved for medium to high-income households and commercial activity (Karekezi, 2002). The predominant energy requirement for economically poor populations is fuel for cooking and heating (Kammen *et al.*, 2002). Cooking and heating are linked to provision of healthy foods and comfortable shelter, which have impacts on productivity, and traditional or natural fuels are most commonly used for these purposes (Xiaohua and Zhenmin, 2000). Primarily, in economically poor countries around the world, traditional biomass energy sources, such as woodfuel, charcoal, and dung, are the most relied upon fuels for cooking and heating (WEC, 1999).

The indoor combustion of biomass fuels has been found to contribute to respiratory problems, and in some areas, intensive wood fuel collection has had negative impacts on biodiversity, ecosystem, and agriculture land health (Karekezi and Kithyoma, 2002; Cecelski, 2000a). The transition to cleaner (lowered particulate, hydrocarbon, and nitrous and sulfur oxide emissions) and more efficient modern fuels such as kerosene and liquid propane gas (LPG) is a challenge and often impossible for the rural poor, which comprises over 70% of sub-Saharan Africa's population (Youm *et al.*, 2000).[1] Throughout sub-Saharan Africa, increases in income have been correlated to increases in the consumption of cleaner, efficient fuels such as LPG and butane (Karekezi, 2002; Karekezi and Majoro, 2002; Wolde-Ghiorgis, 2002). However, income is not the only factor affecting the choice of fuel. Selection may also be based on accessibility of alternative fuels, abundance of biomass supply, and traditional local practices (e.g. cooking styles and preferences) (Kammen *et al.*, 2002).

A relationship exists between the transition to modern fuels and socio-economic development. The heavy reliance on traditional fuels perpetuates levels of poverty in several different ways, including the impacts of low grade indoor fuel combustion on respiratory health, which in turn affect productivity and the ability to generate income (Edwards *et al.*, 2004; Kammen *et al.*, 2002; Goldemberg and Johansson, 1995). Also, traditional biomass collection contributes to the loss of forest resources, which decreases the sustainability of fuel sources and directly affects the people and activities relying on these sources (Karekezi and Kithyoma, 2002; UNDP, 1996).

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[1] Modern, clean, and efficient are not synonymous with sustainable. Cooking with LPG is much cleaner and more efficient than cooking with wood. Yet LPG is a non-renewable resource, while wood has the potential to be managed in a sustainable manner.

The physical aspects of climate change (e.g. climate variability, drought, and desertification) pose an additional threat to the populations of economically poor countries (Beg *et al.*, 2002). Poor populations are heavily reliant on agriculture, scarce water resources, and wood for energy provision, and therefore are affected by variations in climate. Subsistence lifestyles are frequently practiced, and agriculture is often the sole source of income for many people. These populations may not be able to cope with the effects related to climate change (Davidson et al., 2003). Social and economic vulnerabilities place further constraints on improving access to modern energy, since income is often a requirement. Development goals of sub-Saharan African countries may be hindered by climate change because development issues are related to the production of food, the provision of water, and access to energy to enhance productivity, all of which are negatively effected by climate change (Davidson et al., 2003).

Unfortunately, current worldwide trends in poverty alleviation and related fuel use are not encouraging. The use of woodfuel and other traditional fuels is increasing in many Asian and African countries and this trend is predicted to continue (Kammen *et al.*, 2002; Youm *et al.*, 2000; Chaturvedi, 1999). Currently, biomass has been estimated to comprise 9-13% (45 ± 10 exajoules) of the world's total energy use (UNDP, 2000; IEA, 1998; WEC, 1998). Based on its population growth and energy use projections, the IPCC (1996) estimated that total worldwide biomass use, as a percentage of total energy consumption, could increase to as much as 50% by 2050 (325 exajoules)[2].

A variety of approaches exist in attempts to address and alleviate the effects and symptoms of energy poverty. For example, renewable energy projects and electrification

[2] The IPCC (1996) projections assume marginal progress in technology development and implementation, and limited change in global development patterns.

programs are being funded by bilateral aid agencies in sub-Saharan Africa (see GTZ, 2003, 2001). Sub-Saharan Africa is undergoing the world's largest challenges related to the use and provision of energy due to many factors, primarily stagnant economic development and political instability (Davidson et al., 2003). It is widely recognized that energy consumption will have to increase to enable living conditions to improve through economic development (Goldemberg and Coelho, 2004; Davidson and Sokona, 2002; Davidson et al., 2003; Karekezi, 2002; Sokona and Thomas, 1999).

Recent research has focused on working towards sustainable energy strategies that encompass economic, environmental and social factors (e.g. Turkenburg, 2000; Sokona and Thomas, 1999). Renewable energy strategies have been encouraged, such as agricultural waste ethanol production, photovoltaic (PV) electricity, and wind, geothermal and tidal energy generation production (Turkenburg, 2000). However, the total net impact of the efforts on reversing poverty and increasing living standards has been marginal (Davidson *et al.*, 2003). The marginal success rates have been attributed to the inadequate concern for improving rural energy services from policy makers and from within the international development agenda, and inadequate consultation and involvement of local community organizations in energy project development (Kamen *et al.*, 2002; Karekezi and Majoro, 2002; Wolde-Ghiorgis, 2002; Youm *et al.*, 2000; Goldemberg and Johansson, 1995). Furthermore, energy related development efforts, as well as government financing and subsidies, mostly benefit medium to high income households and the urban based commercial sector (Karekezi and Majoro, 2002).

Many documented studies cite situations of populations with limited energy access and make recommendations for future projects. Yet local consultation and

involvement is often not addressed (see Edwards *et al.*, 2004; Karekezi and Majoro, 2002). The involvement of local organizations and networks during needs assessment, research, planning, implementation, and evaluation stages is critical to project success (Habtetsion and Tsighe, 2002; Karekezi, 2002; Wolde-Ghiorgis, 2002; Thomas and Sokona, 1999). Yet, evaluations of local energy needs and demands have not been widely published in the literature, which has limited the sharing of local perspectives for policy makers, development agencies and energy project designers.

In order to incorporate local perspectives on energy issues, methods are required to guide the process and yield credible and useful accounts. A participatory process using scenarios offers a great deal of promise in fulfilling this task based on its documented potential: to capture a range of perspectives in rich detail, to overcome communication barriers in hierarchal situations, to yield new and creative ideas by considering a wide range of possible future developments, to increase communication and community involvement, and to unearth previously hidden underlying factors; all in an easy to facilitate, flexible, and cost effective manner (van der Heijden, 2004; Hodgkinson and Wright, 2002; Phelps *et al.*, 2001; Ringland, 1998; Schwartz, 1996; Schoemaker, 1995). Scenario planning originated as a tool for military strategizing, but today the tool is widely used in the public and private sectors (Wilson, 1978). Many variations of the tool have been developed during the past three decades, and they can be separated into two major categories: 1) qualitative methods (see van der Heijden, 2004, 2000, 1998, 1994; Schwartz, 1996); and 2) probability based quantitative models (Godet, 2000, 1987, 1979). Qualitative scenario approaches are particularly relevant to the exploration of energy poverty, as they involve multiple actor participation, focus on

identifying perceptions and opinions, and help to enrich understanding of complex issues (Berkhout *et al.*, 2001; O'Brien, 2004). Energy poverty problems in sub-Saharan Africa have been long standing, with no encouraging signs in sight for rapid positive change (UNDP, 2000). Therefore, it is a worthwhile exercise to try an innovative approach. Scenario building may succeed where past attempts have failed – by including local voices in discussions and considering their views as input.

The use of scenarios has evolved considerably since its inception in the late 1950s. Most advocates agree sound planning requires a view of the future, and that the use of scenarios can help satisfy this planning requirement (O'Brien, 2004). Scenarios can be defined as "possible views of the world, providing a context in which managers can make decisions" (Ringland, 2002, p.3). A key term in this definition is the word *possible*, which is critical in the creation and use of scenarios. The goal in using scenarios is not to predict the future, but rather to surpass facts and forecasts, and to consider various possible future outcomes (van der Heijden, 2004; Ringland, 2002; Bunn and Salo, 1993). The outcome of a scenario exercise is a number of snapshots of possible future states, or descriptions of the evolution towards possible futures in the form of a narrative or story. The scenario process helps identify influential factors and forces, drivers of change, and developments over a broad range of categories. In turn, the information yielded aids managers and strategists in assessing and developing strategies, and preparing for the future by managing uncertainty and risk. The method has been argued to be preferable to conventional strategic planning because it offers perspectives not normally considered when solely examining data from the past (Maack, 2001). Above and beyond the strategy development benefits associated with scenarios, the tool

offers great potential as a forum for learning in organizations, communities and multi-stakeholder groups (Bunn and Salo, 1993).

Scenarios have been advocated for use in military and business applications, city and regional planning, environmental policy, and national strategy formulation. Scenario use is now common in the private sector, and in 2001, 37% of large, international corporations claimed to use scenarios for strategic planning (Rigby, 2001). Scenario use has also increased in the public sector in recent years. Examples of use include: sustainability strategy development in Tel-Aviv (Shiftan *et al.*, 2003), electricity supply planning in Thailand (Soontornrangson *et al.*, 2003), urban growth planning in the Netherlands (Maack, 2001), and lending policy developments within the World Bank (Schoemaker, 1995). Regardless of the sector, practitioners claim that the tool has the potential to be an effective part of planning by helping incorporate public or stakeholder perspectives into the process (Ringland, 2002).

Although scenario use may have great potential in energy poverty research, based on the documented use of the tool in private and public settings, a gap in the literature exists regarding exactly 'why' and 'how' the tool works. Descriptions have been published on the applications and product, but it has been recognized that the literature fails to provide a complete performance evaluation of the entire process using a set of criteria that would provide evidence of 'why' and 'how' the tool succeeded or failed (O'Brien, 2004; Burt and van der Heijden, 2003; Harries, 2003; Hodgkinson and Wright, 2002; Phelps *et al.*, 2001; Bunn and Salo, 1993). Also, the experiences and voices of participants in the process are frequently not included in published accounts of successes or failures (e.g. Hodgkinson and Wright, 2002). This information would be beneficial to

organizations contemplating the use of scenarios to ensure that they understand what the tool can and cannot accomplish. Detailed evaluations would enable future practitioners and methodologists to refine and adapt the tool to ensure the process is suitable for their application.

1.3 Background of the study

This research was linked to a two-year collaborative research project between the University of Victoria Centre for Global Studies (CFGS) and Environmental Development Action in the Third World (ENDA-TM) with the objective to assess the potential adverse effects of the international climate change agreements on countries in francophone West Africa. Social, environmental and economic problems were studied in relation to potential conflicts between the policies and mechanisms of international climate change agreements and the development needs of individual countries in the region. The goal of the project was to improve the understanding of climate change and its associated impacts in the region, and to provide policy makers from the region with better information for national and international policy and strategy development. The project was entitled *Adapting to the adverse effects of an international climate change agreement: a study of countries in sub-Saharan Africa*, and was funded by the Canadian International Development Agency (CIDA). This thesis contributed to the project by facilitating consultation with government, NGO, and private sector representatives in energy and development sectors based in Senegal. Furthermore, the perspectives documented from the research served as input to energy and climate change policy discussions in the UEMOA region.

CFGS acted as host organization for the research. ENDA-TM was instrumental in facilitating and providing access to local contacts. CFGS is a non-profit, interdisciplinary research institute that focuses on collaborative, policy based inquiry related to global issues of security, governance, finance, sustainable development and the environment. The centre was formed in 1998 at the University of Victoria, Canada, and engages in action-oriented research approaches to help make advances in human and environmental security. The Division of Environment and Security at CFGS was the major host for the research and provided financial and administrative support. ENDA-TM is an international non-profit organization, established in 1972 and headquartered in Dakar, Senegal. The organization has 13 branches in developing countries and over 12 associated research partners worldwide. ENDA-TM focuses on development alternatives, including issues of poverty, health, agriculture, energy, youth, and the environment. Research, action, fieldwork and training are conducted within the various research topics at local, regional, and international levels. This research was conducted in partnership with ENDA-TM's energy program in Dakar.

1.4 Area of the study

1.4.1 Geography and demographics

Senegal is an economically poor country occupying the westernmost tip of Sub-Saharan Africa, between Guinea-Bissau and Mauritania. Senegal has 2,640 km of land boundaries divided accordingly: The Gambia, 740 km, Guinea, 330 km, Guinea-Bissau 338 km, Mali 419 km, and Mauritania, 813 km (Devey, 2000). The country's climate is dry and tropical, and two distinct seasons exist: a hot, dry season from November to May, and a rainy season from June to October (Littman, 1991; Nelson, 1975). The southern

region of the country is characterized by a transition between savannah and forest, with a short intense rainy season, while the central and north-eastern regions have sahelian-type vegetation (steppe and savannah), and relatively abundant rainfall (Fensholt, 2004; Nelson, 1975).

The estimated population of Senegal in 2003 was 10.0 million, and the average population growth rate has been 2.3% since 1997 (World Bank, 2004a). This growth rate, combined with a low life expectancy (52.3 year average for male and females) has contributed to a skewed population profile; 58% of the population is less than 20 years old and less than 3% is above the age of 65 (UNDP, 2001). The country has an urbanization trend that is among the most prominent of sub-Saharan African countries (UNDP, 2003a). From 1997 to 2001, the percentage of the population living in urban areas and suburbs rose from 45.2% to 48.1% (UNDP, 2003a). This trend has created localized areas of high population density, and, when these are combined with a lack of infrastructure, problems with health, malnutrition and high infant mortality rates have proliferated. However, living conditions, as measured and indicated by the UNDP's Human Development Index (Figure 1.1), have continuously increased over the past 30 years and the HIV/AIDS infection prevalence is the lowest in West Africa (UNDP, 2001, 2003).

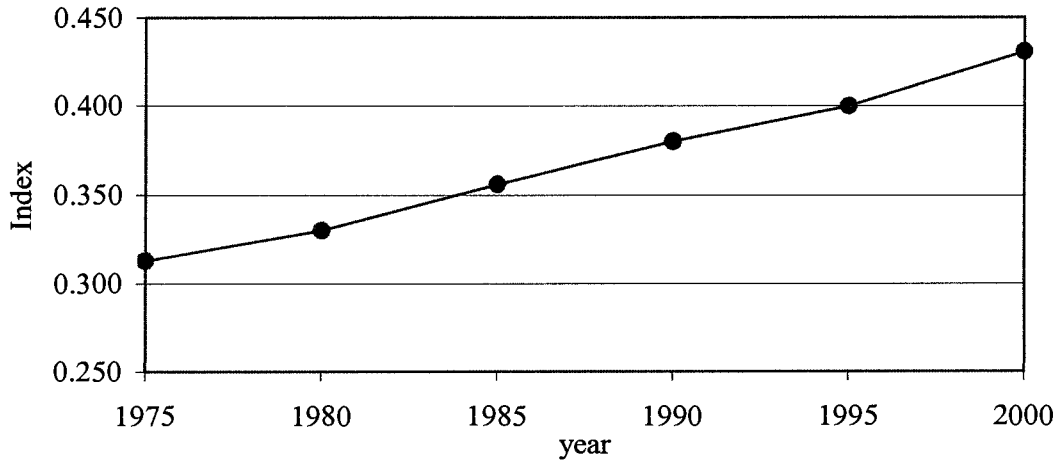

Figure 1.1 Human Development Index Trends for Senegal (Data source: UNDP, 2003a)

1.4.2 Economy

Senegal is classified as a least developed country (LDC), but it has been following a path of moderate economic growth during recent years (UNDP, 2003a). Since 1993 the per capita GDP growth rate has been positive and in 2003 the growth rate was 6.3 % (UNSD, 2004) (Figure 1.2). While this data may be indicative of a buoyant economy, in reality these results can be misleading (Ford, 2003). For example, approximately 15% of the GDP is received from international development agencies (Ford, 2003). Wealth is not distributed equitably: 26.3% of Senegal's population lived with less than US$1 per day (between 1990-2002) and 67.8% of the population lived with less than US$2 per day (between 1990-2002) (UNDP, 2003a). Senegal also continues to have a large national debt, which was equivalent to 70% of the GDP in 2000, and two thirds of the country's debt is owed to international lending agencies linked to the IMF (Ford, 2003).

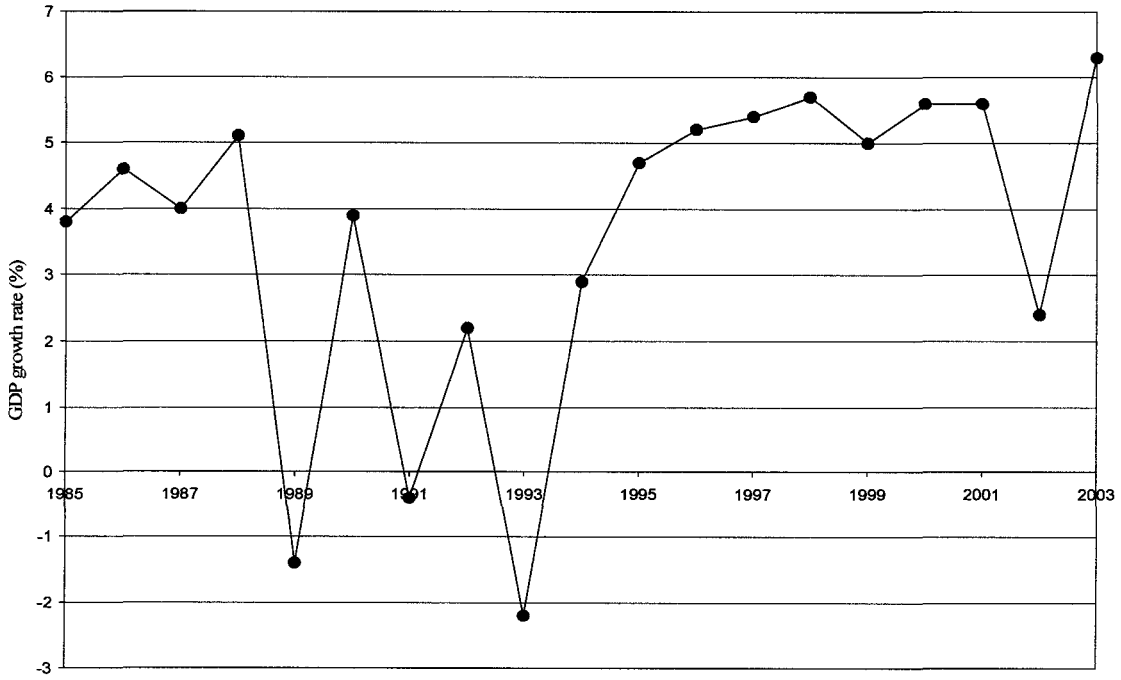

Figure 1.2 Annual gross domestic product (GDP) growth rates in Senegal between 1985 and 2003 (Data source: UNSD, 2004)

Senegal has an economic, social and political history with close links to France. The 'franc zone' was created in 1939 and included France's African colonies (Korner, 2002). This zone saw many transitions and developments as France's colonies started to gain independence in the late 1950s and eventually two regional blocs were created dividing the Eastern and Western colonies (Korner, 2002). The Western bloc of countries, which included Senegal, later formed the Union Économique et Monétaire Ouest Africaine (UEMOA). France attempted to maintain some protectionist control during the 1970s and 1980s in the form of "stability clauses"; however when this control was lost in the mid 1980s, deficits compounded and commodity prices collapsed, partially related to ineffective banking policies and insufficient markets (Korner, 2002; Berthélemy, 1996; Terrell and Svejnar, 1989).

In January 1994 the economic situation had deteriorated to such an extent that dramatic action was required. Senegal undertook a bold and ambitious economic reform program as a result of pressure from the French government, the World Bank and the IMF (Berthélemy, 1996). This reform included a 50% devaluation of the CFA franc, which is linked at a fixed rate to the French franc (Berthélemy, 1996). Further reforms included the gradual abolishment of many government price controls and subsidies, and structural reforms in the public and commercial bank sectors and money supply management (Devey, 2000; Lavergne, 1997).

After seeing its economy contract by 2.1% in 1993, Senegal experienced some economic turnarounds, measured by sustained increases in GDP, relatively low inflation rates, and reduced fiscal deficit (UNSD, 2004; Devey, 2000) (see Figure 2.2). This progress was partially due to economic reform programs, (Ford, 2003). However, Senegal relies considerably on support from bilateral and multilateral aid agencies. In 2000, Senegal received an estimated $398 million in development assistance from various sources, including (ranked by total amount): France, the World Bank, Japan, the European Union, Taiwan, Germany, the African Development Bank, the United States and Canada (USAID, 2004). Senegal's federal government has been proceeding with further reforms since the devaluation of the CFA franc. The government passed a liberalized labour code, to help lower the cost of labour and improve the manufacturing sector's competitiveness (Korner, 2002).

While the Senegalese government claims success with reform efforts; civil unrest and instability remain a concern. For example, resistance to World Bank and IMF policies has grown due to the apparent negative effects of privatization schemes on the

poor (e.g. lack of democratic process, layoffs, increased costs of public services) (Ma'anit and WDM, 2004). Also, political upheaval resulted from President Wade's dismissal of his entire cabinet in 2002 as a response to public outcry over the government's handling of a major ferry tragedy (Ford, 2003). Finally, independence seeking rebels in the Casamance area in Southern Senegal continue to prevent the tourism economy from attracting much needed foreign income (Ford, 2003).

1.4.3 Resources

Unlike some African countries such as Nigeria (oil) or South Africa (minerals), Senegal does not have a large non-renewable resource base to act as a driver of the economy (USAID, 2004). Senegal's economy is currently dominated by agriculture (mostly in peanut production), fishing, phosphate mining and processing, tourism, and chemical processing (Ford, 2003; Terrell and Svejnar, 1989). Peanut oil, fish, phosphates and tourism currently account for 60% of the country's export revenues, mostly serving markets in the European Union (USFCS and USDS, 2000). The fishing and mining sectors are both extremely important for both export earnings and employment; however they also present problems due to fluctuations in world commodity prices and the lack of competitive ability of Senegalese industries due to high production costs and outdated technologies (USAID, 2004).

Moderate future development potential has been claimed by the oil, gas and energy industry (see Dombroski and Faye, 2000). Exploration for oil and gas in the country and the offshore perimeter date back to 1952, with the first well drilled in 1953, and since then approximately 30 test wells have demonstrated some degree of promise (PETROSEN, 2004). Petrosen, Senegal's state owned oil and gas company, has recently

undertaken a concerted effort to promote foreign investment in the exploration and development of oil and gas reserves and is actively seeking partners for specific exploratory areas (PETROSEN, 2004). The government of Senegal revised its Petroleum Code in 1998 to create more favourable investment conditions for all available shallow and deepwater offshore exploration blocks (Dombroski and Faye, 2000). To date, approximately 10 billion cubic meters of natural gas reserves have been identified in Senegal and its offshore perimeter (UNSD, 2003).

1.4.4 Infrastructure

Compared to other UEMOA and sub-Saharan African countries, Senegal has moderately well developed transportation, utility and financial infrastructures (Lavergne, 1997). However, external business analyst such as Citibank and agencies such as USAID, the U.N. Centre for Human Settlements, the German Cooperation Agency (GTZ), the French Development Agency (AFD), and the European Development Fund (EDF) identify Senegal's minimal infrastructure as one of the main hindrances to substantial economic development (National Habitat Committee, 2001). The country has a total of approximately 15,000 km of roads, yet only one third are paved and transport links between countries are far from efficient (Devey, 2000). While Senegal has a modern international airport (Leopold Sedar Senghor, LSS) and a high capacity port in Dakar (Port Autonome of Dakar, PAD), a lack of infrastructure exists outside of Dakar to deliver basic needs (National Habitat Committee, 2001).

The percentage of the population residing in urban areas in Senegal increased from 34.2% in 1975 to 48.9% in 2002 (UNDP, 2003a); this high rate of urbanization has led to the proliferation of informal neighbourhoods outside of Dakar and other major

cities such as: Dalifort, Thiaroye, Bignona, and Saint-Louis (National Habitat Committee, 2001). These new neighbourhoods represent over 30% of the total housing in Senegal and are plagued by minimal access roads, lack of safe water, electricity, septic systems, education, and health facilities (National Habitat Committee, 2001). The unfortunate result is the increase in health problems and concentrated areas of unemployment and crime.

The government of Senegal and the international aid community have recognized the problems associated with poor infrastructure (USAID, 2004; Devey, 2000). Examples of efforts to improve infrastructure include a US$28.8 million loan to fund the National Rural Infrastructure Project (NRIP) by the World Bank, a project coordinated by the Business Partners for Development (BPD) to link a private firm, Senegalese des Eaux (SdE) with the state owned water utility company (SONES) and efforts by non-profit development organizations, such as ENDA-TM, to promote the development of rural safe water delivery (World Bank, 2004b; Colin and Lockwood, 2002).

1.4.5 Alliances

Senegal is a member of two major political and economic alliances: the Union Economique et Monétaire de l' Afrique de l'Ouest (Economic and Monetary Union of West Africa) (UEMOA), and the Economic Community of West African States (ECOWAS). UEMOA member countries include: Bénin, Burkina Faso, Côte d'Ivoire, Guinée-Bissau, Mali, Niger, Senegal, and Togo (Figure 1.3). UEMOA was created by the Treaty signed in Dakar on January 10, 1994 by the Heads of State and Government of the seven countries of West Africa having jointly the use of a common currency, FCFA (UEMOA, 2004; Lavergne, 1997). On May 02, 1997, Guinea-Bissau became the 8th

Member State of the Union (UEMOA, 2004). The objectives and purpose of the UEMOA include free trade (including labour, capital, goods and services), cooperative financial and economic policy development and harmonized taxation policies (UEMOA, 2004).

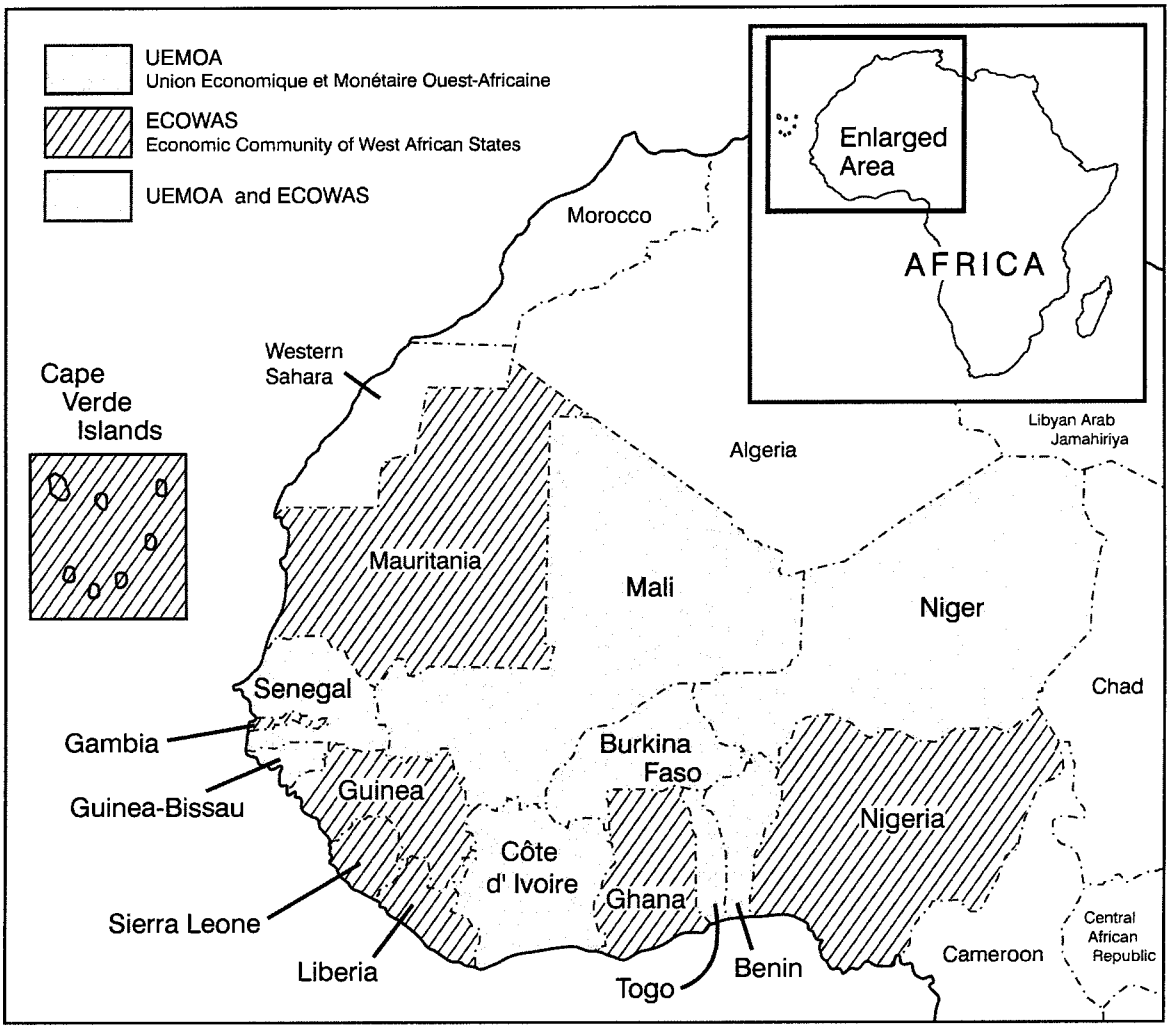

Figure 1.3 Map of UEMOA countries (courtesy of O.Heggen, 2004)

The ECOWAS treaty was signed in 1975, and includes all the countries from UEMOA plus the remaining countries that form West Africa, with the exception of Mauritania (ECOWAS, 2004; Lavergne, 1997). The additional ECOWAS countries are: the Republic of Cabo Verde, the Republic of Gambie, the Republic of Ghana, the

Republic of Guinee, the Republic of Liberia, the Republic of Nigeria, the Republic of Sierra Leone, and Togolese Republic. The goals of the founding countries include: the suppression of customs duties and equivalence taxes, the establishment of a common external tariff, the harmonization of economic and financial policies and the creation of a monetary zone (ECOWAS, 2004). However, progress towards the realization of these goals has been slow due to numerous factors, including political instability, poor governance, weak national economies and the lack of fiscal stability (ECOWAS, 2004).

While both the UEMOA and ECOWAS unions have encountered difficulties, both unions have been recognized for making great advancements in promoting economic trade between member countries (Lavergne, 1997). The Banque Centrale des États de l'Afrique de l'Ouest (Central Bank of West African States) (BCEAO) has been instrumental in attempting to create an attractive climate for foreign investment, which is directly linked to the efforts of forming unions between West African countries (Lavergne, 1997). In addition, tariffs on intra-regional trade in goods produced within the UEMOA countries were eliminated and a mechanism was created to help compensate impoverished landlocked countries for the lost revenue previously collected from tariffs (Harsh, 2002). However, it is still recognized that more efforts are needed to improve the effectiveness of regional integration, including the full involvement of civil society groups and business sector representatives, striking an equitable balance between public and private sector initiatives, and improving communication networks (Harsh, 2002; Lavergne, 1997).

1.5 Organization of thesis

This thesis has been organized into seven chapters. This first chapter demonstrates there is a gap in the literature pertaining to local perspectives on energy poverty in economically poor countries and details the assumptions and reasons behind the decision to utilize scenarios to explore the topic of energy poverty. The chapter also discusses the inadequate evaluation of how and why scenarios succeed within the literature. An overview of the study area is also provided. The purpose of chapter two is to review the literature pertaining to energy poverty and identify specific issues pertaining to Senegal and West Africa. The third chapter includes a review of scenario literature, including the history behind the method and an outline of approaches utilized in energy poverty settings. Methodology and research phases are described in Chapter four. Chapter five explores findings of the scenario method and identifies dominant issues and connections to existing literature. An evaluation of the process of scenarios as an exploratory tool is presented in Chapter six, which also includes the development of a criterion and limitations encountered with the use of the technique. Finally, Chapter seven merges the scenario process with the key factors, priorities and alternatives on energy poverty that were identified during the research. Conclusions, discussion and recommendation for future research are also included in this final chapter.

CHAPTER TWO

LITERATURE REVIEW ON ENERGY POVERTY

2.1 Introduction

In order to better understand the key views of energy research and policy professionals from Senegal on local energy access issues and concerns, a review of local and international research on energy poverty is needed. This chapter accomplishes this by summarizing characteristic problems associated with energy poverty. The specific effects and causal factors of energy poverty are then described on a global scale, and in the context of Senegal. Finally, the barriers that have hindered past attempts to alleviate energy poverty and the recommendations to eliminating these barriers are discussed.

2.2 Energy Poverty

The link between energy and poverty has increasingly been discussed in literature on international development policy (see for example, Reddy, 2003; Karekezi, 2002; Yang, 2003; Wolde-Ghiorgis, 2002; Smith *et al.*, 1994; Tyler, 1994). The term poverty, once predominantly used in reference to a single dimension of monetary resources, now commonly refers to an individual or group of people that cannot meet a minimum defined standard of living and fulfill basic health, nutritional, educational, sanitation, and shelter needs (Pachauri *et al.*, 2003; Reddy *et al.*, 1997). Energy is increasingly recognized as a separate and distinct measure of poverty (IPA, 2003). Energy is essential to living and meeting even basic subsistence needs, as it is universally required for cooking to help achieve nutritional and health requirements, and it is necessary for space heating in countries with cooler climates (Pachauri *et al.*, 2003). Thus, when energy needs are not

met, already difficult and complex situations of poverty are further aggravated and people's efforts to improve living standards are seriously constrained (Habtetsion and Tsighe, 2002).

A review of the literature on the link between energy and poverty reveals multiple definitions for the term 'energy poverty'. A widely used definition is, "The energy dimension of poverty – energy poverty – may be defined as the absence of sufficient choice in accessing adequate, affordable, reliable, quality, safe and environmentally benign energy services to support economic and human development" (UNDP, 2000, p.44). In simpler terms, 'energy poverty' refers to a situation where physiological energy needs are not met with the resources available for purposes such as cooking, lighting or heating (IPA, 2003). Recently, attempts have been made to quantify the term using socio-economic indicators, illustrated by the following examples:

a) an 'energy resource threshold', stipulated by a maximum percentage of household income that can be devoted to energy expenditures (e.g. for the purchase of wood, kerosene or electricity),

b) an 'energy consumption threshold', measured by the proportion of income required to purchase enough energy to satisfy a defined standard of living (e.g. heating to achieve a WHO household temperature recommendation of 18-20°C), and

c) an 'energy poverty line', based on using the widely cited US$1/day poverty line and calculating the average energy consumption of households that fall within 10% of this poverty line (IPA, 2003).

2.2.1 Fuel types in relation to poverty

Stark differences exist between the types of fuels used by people of different economic classes. Approximately half of the world's population still uses traditional biomass to satisfy basic energy requirements (EIA, 2003; IEA, 2002; UNDP, 2000; Smith *et al.*, 1994). The term 'traditional biomass energy' typically encompasses fuels such as wood, charcoal, agricultural residues, and dung. Collectively, these forms of fuels have been referred to with many different labels, such as "traditional fuels", "biofuels", "biomass fuels", "rural energy", and "combustible renewables and waste" (Victor and Victor, 2002). A high portion of the people relying on traditional biomass also consume less than US1$/day worth of goods and services (UNDP, 2000; Smith *et al.*, 1994).

The concept of the 'energy ladder' is commonly used to describe the interrelationship between income and energy source, and the transition from traditional to modern fuels (Edwards *et al.*, 2004; Hosier and Dowd, 1987). Positive correlations have been observed between increases in income and economic development with transitions to cleaner and more efficient energy sources (see Figure 2.1) (Reddy, 2003; UNDP, 2000; Reddy and Reddy, 1994; Smith *et al.*, 1994; Tyler, 1994; Hosier and Dowd, 1987). At the low end of the energy ladder are the traditional biomass fuels, which produce significantly less usable energy per unit weight by combustion than fuels at the top of the ladder such as kerosene and gas (Reddy *et al.*, 1997). Furthermore, the low-end fuels emit proportionally higher amounts of harmful emissions and pollutants than those at the opposite end of the spectrum (Karekezi, 2002).

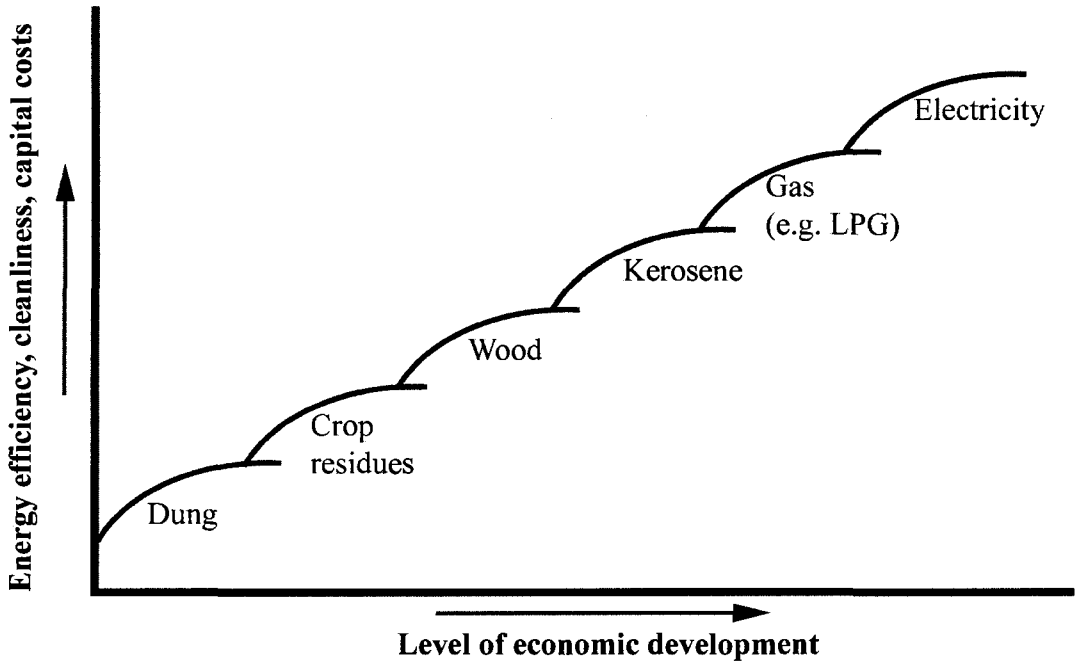

Figure 2.1 The Energy Ladder (modified from Smith *et al.*, 1994)

The process of moving up the energy ladder is influenced by four main factors: income, availability of fuels, urbanization, and industrialization (Victor and Victor, 2002). Several other variables also affect the progression upwards, including affordability, cultural preferences, traditions, and values (IEA, 2002, Tyler, 1994). Moreover, the energy ladder theory has been criticized as being over simplistic, and it has been argued that direct linear progressions 'up the ladder' are rarely observed (Wamukonya, 2002). Rather, with increases in income, households may chose to utilize several different types of fuel for various activities, which has been called a multiple or combined fuel-use approach (Kammen *et al.*, 2004; Wamukonya, 2002). However, the literature predominantly agrees that income is the principal factor that affects the ability to choose cleaner, more efficient modern fuels over low-grade biomass fuels (Karekezi, 2002; Karekezi and Majoro, 2002; Wolde-Ghiorgis, 2002; UNDP 1996; Reddy and Reddy, 1994).

The progression up the energy ladder is also viewed as a two-dimensional process. Firstly, a shift tends to occur towards modern fuels to satisfy cooking requirements, and then secondly, the use of electricity and gradual acquisition of electrical appliances occurs for applications such as lighting and refrigeration (Tyler, 1994). The shift to modern energy services and appliances may enhance the life of economically poor people (IEA, 2002). For example, modern cooking fuels and stoves reduce exposure to harmful emissions, refrigeration extends the life of food and medicines, and electric lighting increases the amount of productive time available during the day (IEA, 2002). It is important to note that the provision and access to modern energy cannot directly eliminate situations of poverty; rather, the access to modern energy may help create an environment that is more conducive for income generating activities, and the provision of health care and education (Kammen *et al.*, 2004).

2.2.2 Gender and health implications of energy poverty

Gender plays an important role in the discussion of energy poverty, due to the fact that in economically poor countries women are often the primary collector, producers and users of energy resources (Malhotra *et al.*, 2004; Reddy *et al.*, 1997). As the dominant use of energy in these circumstances is for cooking, and non-ventilated biomass stoves are often used in enclosed locations, women are typically most prone to the health damaging effects of the emissions (Reddy *et al.*, 1997). Women are also highly vulnerable to the increasing scarcity of fuel wood since dwindling sources nearby will create a need to travel further for fuel, which often results in less time available for other household activities (Malhotra *et al.*, 2004). For example, travel distances over 10 kilometers per day for fuelwood collection have become common for rural populations in

the Sahel (Davidson and Sokona, 2002; UNDP, 1996). As a result, less time and physical energy can be channeled towards agricultural tasks and income generating activities (Chaturvedi, 1999; UNDP, 1996). In fact, it has been estimated that 60% of all rural women in Africa are affected by fuel wood scarcity (UNDP, 2000).

The combustion of fuels in the lower rungs of the energy, such as wood fuel and charcoal, is not only inefficient when compared to modern fuels, but also produces high levels of emissions that are harmful to human health (Jaber, 2001; Youm *et al.*, 2000). The health-related problems of emissions are compounded by the fact that the majority of households in economically poor countries use non-ventilated biofuel stoves, resulting in families being directly exposed to highly concentrated amounts of CO, NO_2, $S0_2$, and PM-10 (particulate matter below 10μm) (Karekezi, 2002). Exposure to airborne emissions is measured in terms of 'exposure effectiveness' (EE), and households with unventilated stoves often have EE levels that are 10 to 100 times greater than outdoor emission sources (Smith *et al.*, 1994). The inhalation of indoor pollution generated by biomass stoves has been linked to respiratory illness, asthma, acute respiratory infection, obstetrical problems (stillbirth, low birth weight, blindness), congestive heart failure and heart disease (IEA, 2002; Reddy *et al.*, 1997). In sub-Saharan Africa, indoor air pollution is recognized as a leading cause of respiratory illness (Karekezi, 2002). The WHO estimated that 2.5 million women and young children in economically poor countries die prematurely each year due to exposure to biomass combustion fumes (Desai *et al.*, 2004). Fuel type also has a large role, and as determined in a case study in Pune, India, the exposure to NO_2 and PM-10 from non-ventilated indoor cooking dropped with the use of

fuels higher up on the energy ladder, and only with liquid propane gas (LPG) did the exposure levels meet WHO recommendations (see Table 2.1) (Smith *et al.*, 1994).

Table 2.1 Daily exposure level to emissions from indoor cooking in Pune, India (Data source: Smith et al., 1994)

Fuel type	PM-10 (mg-h/m^3)	NO_2 (mg-h/m^3)
Biomass	17-26	.22-.66
Kerosene	2.4-3.6	.08-.11
LPG (liquid propane gas)	0.4	.05
WHO recommendations	0.56	0.7

Other health problems have been indirectly linked to households that are economically poor, such as increases in diarrhea and parasites related to a decreased tendency to boil water (Reddy *et al.*, 1997). This relationship may be due to the fact that economically poor households typically rely on fuels in the lower rung of the energy ladder, and both quantity and quality of these fuels is often insufficient to meet health and sanitation needs. Furthermore, the lack of access to clean and efficient energy often hinders poverty reduction efforts, as energy is linked to nutrition, health, and productivity (Reddy *et al.*, 1997). For example, efforts to increase rural income generating capacity through education can be handicapped by the lack of lighting and the presence of health problems such as respiratory illnesses and malnutrition, all of which can be linked to energy needs. People are also required to expend great amounts of time and physical energy collecting biomass fuels, which limits the time available for education and income generating activities (Habtetsion and Tsighe, 2002; Goldemberg and Johansson, 1995).

2.2.3 Land use implications of energy poverty

The reliance on biomass as a primary fuel source has also proven to be unsustainable in many countries and is a factor contributing to land degradation in urban areas (Karekezi, 2002; Wolde-Ghiorgis, 2002; Reddy *et al.*, 1997). High levels of charcoal demand in such cities as Lusaka, Zambia, Nairobi, Kenya, and Dar-es-salaam, have been a dominant factor in the degradation of forests close to the cities (Wolde-Ghiorgis, 2002). Worldwide, but particularly in economically poor countries, forest resources are cut and cleared at rapid rates. In Africa, woodfuel consumption has been noted to account for as much as 92% of total wood removal (Amous, 1998b).

While over-harvesting is linked to fuel wood demand, large-scale agricultural practices, forestry and ranching are cited as other contributing causes of forestland degradation in Africa and Southeast Asia (Amous, 1998b; Tyler, 1994). In localized situations near urban centres, land clearing for wood fuel and agricultural residue, is directly related to a reduction in nitrogen in the soil, which hampers regeneration of vegetation (Reddy *et al.*, 1997).

2.2.4 Attempts to alleviate energy poverty: Global Perspective

The importance of energy for development and poverty alleviation has been recognized by various levels of organizations over the past 30 years, including international development agencies, academic institutions, non-profit organizations and national governments of economically poor countries (Edwards *et al.*, 2004; Sagar, 2004; Habtetsion and Tsighe, 2002; Wolde-Ghiorgis, 2002; Youm *et al.*, 2000). Broad and specific research efforts to study and help solve energy poverty problems have occurred during the past two decades, yet success in addressing problems has varied greatly across

the globe. For example, in Asia, the seriousness and urgency of energy-related problems, and the need for specific policy measures were documented in many case studies over a decade ago (e.g. Tyler, 1994). However in both rural and urban settings, limited implementation of the recommended changes to policy has occurred, and the provision and access to modern energy has not kept pace with population growth (Sagar, 2004; Karekezi and Majoro, 2002). Thus, in many regions of the world, energy has still not received adequate recognition from a policy perspective (Sagar, 2004; Karekezi and Majoro, 2002). In rural India, where access to modern energy is a serious problem, scattered energy and poverty statistics are available; yet, there is a paucity of locally published studies relating to the link between energy and poverty (Pachauri *et al.,* 2003). Thus, policy makers have little access to consistent and comparable socio-economic and geographic information about households directly affected by energy poverty (Pachauri *et al.*, 2003).

In China, efforts to combat rural energy poverty appear to be more promising, and the federal government has been involved with programs to increase rural electrification since 1949 (Yang, 2003). Various levels of government have been involved in programs including initiatives such as small hydrothermal plants, rural power networks, and solar and wind projects, which increased the rural household electrification rate to 95.5% in 1997 (Yang, 2003). However, more than 20 million people still do not have access to electricity (Yang, 2003). Thailand's government has also been actively supporting rural electrification programs, and the portion of the rural population with access to electricity rose from 86% in 1997, to 90% in 2001 (Yang, 2003). While electrification projects in countries such as China and Thailand have social benefits, rural electrification in general

has yet to prove financially viable, thus the projects often require government or external subsidization (Yang, 2003). Electrification has positive attributes, such as extending productive time with electric lights, but it often does not serve as the primary energy source for cooking in many economically poor households, since electrical appliances are still not financially feasible for these households (Reddy, 2003). For example, rural access to electricity in India surpassed 10% in 2000; however over 75% of households still rely on fuel wood as their primary energy source (Reddy, 2003). Furthermore, it is not necessarily access to electricity that will decrease biomass reliance, but rather access to fuels such as kerosene and LPG (Reddy, 2003). This is due to the fact that cooking fuel needs are greatest and as mentioned, electricity is rarely used for cooking in economically poor countries due to the expense of electric stoves, the price of electricity, and cultural preferences (Reddy, 2003).

In the 1997 UNDP publication 'Energy after Rio', the uneven global distribution of energy services was highlighted, and it was estimated that 2 billion people worldwide were reliant on biomass for cooking, and between 1.5 to 2 billion people did not have access to electricity (Reddy *et al.*, 1997). The report further emphasized that the existing energy consumption patterns among the economically poor contributed to further increasing their level of poverty (Reddy *et al.*, 1997). In 1996, the World Bank recognized links between sustainable economic development, improvements in the quality of life and access to modern energy services, and they estimated that $US 18 billion was required for energy sector investments in sub-Saharan Africa alone (Turkson and Wohlgemuth, 2001). However, despite the many such hallmarked reports, and numerous literature-based recommendations to policy makers during the 1980s and

1990s, progress in alleviating energy poverty has not been promising. In 2002, the IEA claimed the total number of people reliant on biomass as a primary fuel source had increased to 2.4 billion, and they also estimated that in the absence of new policies, this figure might increase to 2.6 billion by 2030 (IEA, 2002). Furthermore, electrification rates have remained flat, and it was estimated in 2002 that 1.6 billion people worldwide were still without access to electricity, of these 99% lived in economically poor countries (IEA, 2002).

2.2.5 Energy Poverty in Sub-Saharan Africa

While energy poverty affects the economically poor on a global spectrum, Africa, and more specifically sub-Saharan Africa, is recognized as the geographic area facing the greatest challenges in the fight to increase people's access to modern energy (Figure 2.2) (Karekezi, 2002; Victor and Victor, 2002). As of 2000, 575 million people in sub-Saharan Africa, 89% of the population, relied on biomass for cooking and heating purposes (IEA, 2002), which is a higher proportion of people than any other continent (Victor and Victor, 2002). Since the late 1980s, the proportion of people living below the US$1/day poverty line in Africa has increased, and the absolute number of economically poor people living in the continent has grown roughly five times more than in Latin America or South Asia (Karekezi, 2002). This socio-economic trend has created a situation in which few changes in energy consumption patterns and progressions up the energy ladder have taken place (Figure 2.2, 2.3) (Karekezi, 2002). In fact, in sub-Saharan Africa, both the average per capita consumption of modern fuels for households, and the per capita consumption of electricity dropped from 1990 to 1997 (Karekezi, 2002).

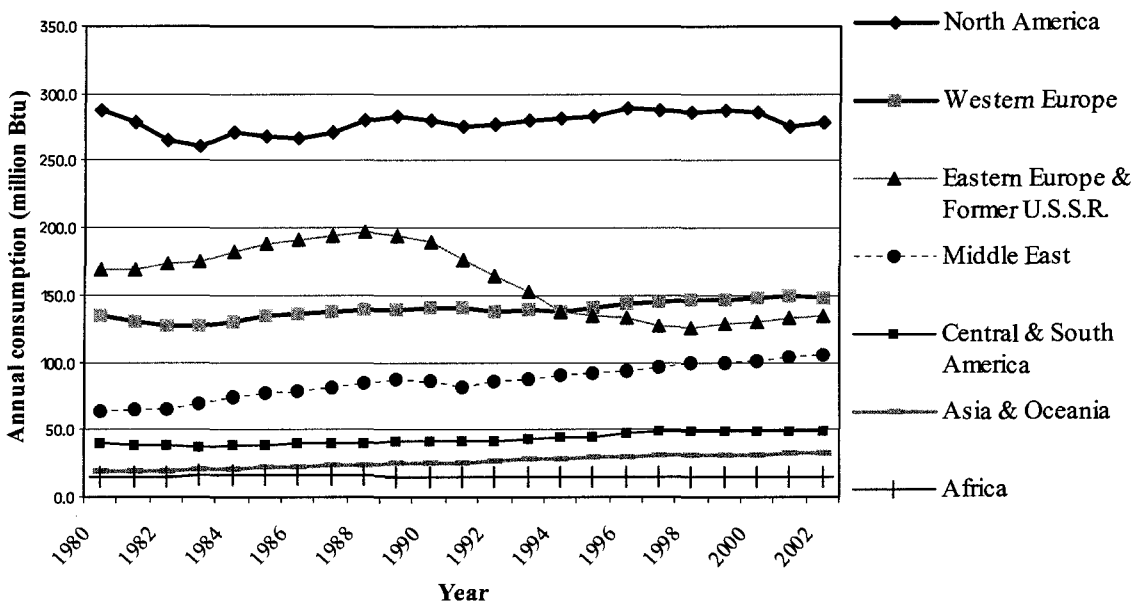

Figure 2.2 Global trends in annual per capita primary energy consumption (million Btu) (Data source: EIA, 2004; EIA, 2003)

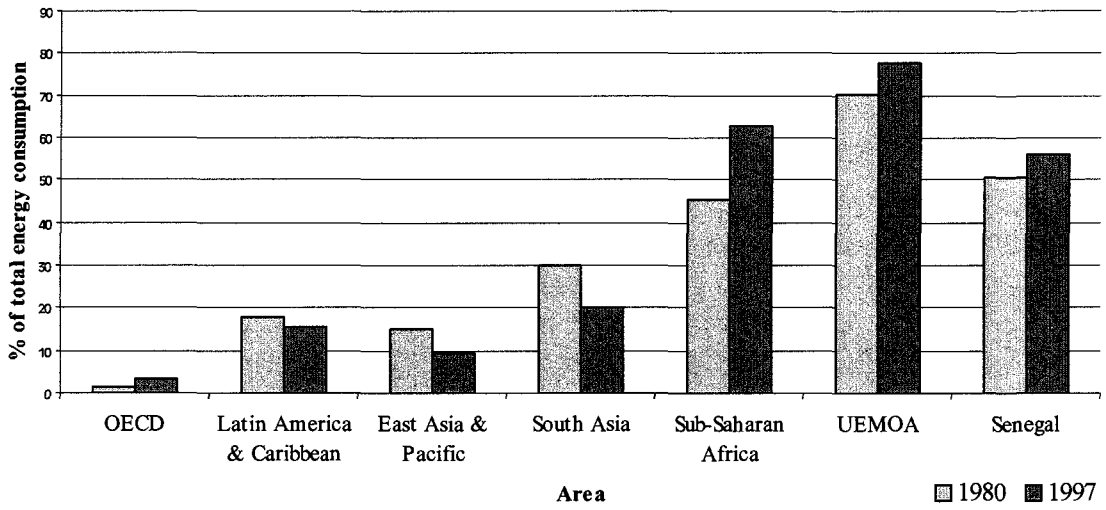

Figure 2.3 Comparison of household biomass energy use in major areas worldwide as a percentage of total energy consumption (Data compiled from UNDP, 2003a; UNDP, 2001; EIA, 1999)

Sub-Saharan Africa is also faced with demographic pressures, which have a significant effect on energy poverty. Urban population growth is roughly double the

overall population growth rates, and the demand for energy services and supplies has increased as a result (Karekezi and Majoro 2002). During this same period, economic growth has remained stagnant in many countries in sub-Saharan Africa and incomes have not increased (Karekezi, 2002, Karekezi and Majoro, 2002). Consequently, problems in accessing modern energy remain paramount. Countries in Latin America and Asia have also experienced similar, although not as dramatic urbanization trends; however levels of industrialization and economic activity have also increased, which in turn has positively affected income levels and the ability to afford modern energy (Karekezi and Majoro, 2002). Urban energy poverty in sub-Saharan countries is a serious problem, but it has not become prominent on international development agendas (Karekezi and Majoro, 2002).

The lack of enforced policy, coupled with stagnant economic growth in most of sub-Saharan Africa, has the potential to keep modern energy out of reach for the bulk of the population, and "current trends indicate most of the increase in urban energy consumption will be in the form of traditional biofuels" (Karekezi and Majoro, 2002, p.1017). The problems in urban areas cannot overshadow the needs of those in rural locations, as households, farmers and small businesses in rural areas are often neglected when large-scale, centralized initiatives are directed towards urban areas (Habtetsion and Tsighe, 2002).

The countries belonging to UEMOA face energy provision and access challenges that are akin to many other countries in sub-Saharan Africa: limited fossil fuel resources, weak economic activity, deteriorating energy related infrastructure, and serious desertification in rural areas (Youm *et al.*, 2000). Furthermore, UEMOA countries have some of the highest biomass reliance rates and the lowest electrification rates in the world

(Youm *et al.*, 2000). The UEMOA average electrification rates are approximately one-fifth of the average rates of Canada, and no UEMOA country has an electrification rate higher than 50% (Figure 2.4). For example, Burkina Faso had an average electrification rate of 13% in 2000, compared to 22.6% for the entire sub-Saharan Africa regions, 40.8% for South Asia, 86.6% for Latin America 86.9% for East Asia/China, and 90.3% for North Africa (IEA, 2002). Senegal is considered to be one of the economically strongest countries of the UEMOA group; yet it is burdened with many energy related problems. Traditional biomass fuels comprise close to 60% of total fuel consumption, and electrification rates have remained stagnant at approximately 30% (IEA, 2002; Youm *et al.*, 2000). In rural areas the energy poverty situation is more serious, as over 90% of households burn biomass fuels for cooking purposes, and as 1999, the majority of some 13,000 villages were not connected to an electricity grid (Youm *et al.*, 2000).

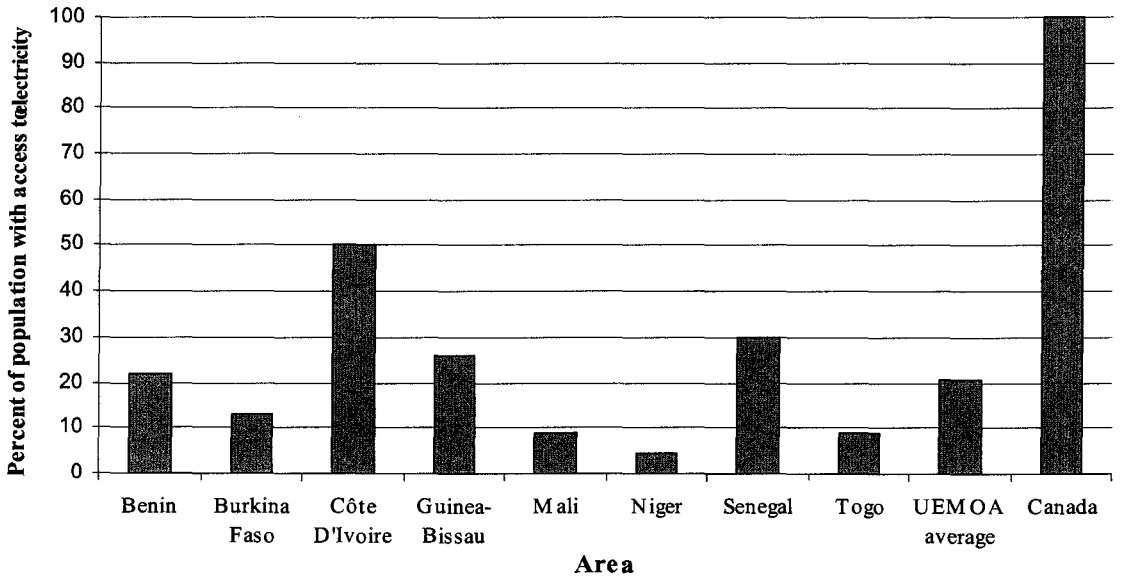

Figure 2.4 Electrification rates of UEMOA countries compared to Canada based on percentage of population with access to electricity, 1997-2000 (Data compiled from IEA, 2002; IEPF, 2004)

2.2.6 Energy poverty in Senegal

Senegal has very limited supplies of indigenous fossil fuel energy resources, thus the majority of energy is imported (Youm *et al.*, 2000). Oil deposits located off the Casamance coast (Dôme Flore field) have not proven economically feasible; however reserves of natural gas outside of Dakar have been tapped and used for electricity generation (Diam Nadio area), and peat deposits in the Niayes area are being explored for possible development (PETROSEN, 2004; Dombroski and Faye, 2000; Youm *et al.*, 2000). The electrical production capacity of the country was 1.200 TWh in 1998, compared to 192.015 TWh for South Africa in the same year, and the majority of that limited supply was generated by six thermal stations (5 oil, 1 natural gas) (Turkson and Wohlgemuth, 2001).

The state of limited supplies is not due to a lack of projects attempting to develop and improve the state of energy use and consumption. For example, the West African Gas Pipeline (WAGP) project is intended to bring natural gas to Ghana, Benin, Togo, and possibly Senegal, while ECOWAS launched the West African Power Pool (WAPP) to develop power generation facilities and interconnect country grids, and construction of the Manantili Dam began with the hope of being able to provide 800 megawatts of power (EIA, 1999). Yet, the project goals often go unmet, with success being limited by external factors often beyond the control of Senegal (and other involved vulnerable countries), and internal and national factors including governance, socio-economic constraints, and a lack of technological and human resource capacity (Sagar, 2004; Youm *et al.*, 2000). As a result, the alleviation of energy poverty has proven to be particularly

difficult in Senegal. Thus, the need to explore options for 'moving forward' is still a primary concern today.

2.3 Barriers limiting the success of energy projects

Discussions regarding the links between the insufficient funds and the improvement of energy access for the urban and rural poor often target government, NGOs, development organizations, and other actors (Sagar, 2004). However, the reality is not so simple. Innumerable interrelated factors affect energy poverty in Senegal, and act as barriers to progress in improving energy access. Until project design takes these issues into account, progress will continue to be limited (Sagar, 2004). To gain a better understanding of the multitude of barriers and the complexity of energy poverty, five key themes can be identified, including:

1) external barriers (e.g. turbulent oil prices, climatic variability, and fluctuating levels of development assistance);
2) political barriers (e.g. civil unrest, unfocused policy efforts, and insufficient institutional frameworks);
3) socio-economic factors (e.g. lack of private capital and income generating programs);
4) communication and training (poor community consultation and inadequate information on which to base decisions); and
5) technology (e.g. inappropriate technologies for local needs and lack of technical support)

The issues that have been identified by leading international researchers have been summarized in Table 2.2, and are discussed more thoroughly in the following sections.

Table 2.2 Summary of the major barriers associated with improving energy access and energy poverty in economically poor countries

Barrier	Citations
External barriers	
High reliance on bilateral and multilateral organizations and external loans	Wamukonya, 2002; Turkson and Wohlgemuth, 2001
Climatic variability (drought, floods, etc.) affecting agriculture, water and accelerating urbanization	Kituyi, 2001; Sokona and Thomas, 1999
Poor integration of biomass fuel considerations in international policy measures and forums (WSSD)	Kituyi, 2001
Energy is not given requisite attention by the development community as a basic need	Cecelski, 2000b
Reliance on external oil imports and highly susceptible to market fluctuations	Youm et al., 2000
Political barriers	
Civil conflict and corruption	Habtetsion and Tsighe, 2002; Victor, 2002; Kituyi, 2001; Turkson and Wohlgemuth, 2001; Cecelski, 2000b; Sokona and Thomas, 1999
Lack of government policy to fund and coordinate modern energy programs	Diarra and Akuffo, 2002; Habtetsion and Tsighe, 2002; Turkson and Wohlgemuth, 2001; UNDP, 1996
Lack of institutional framework to oversee energy projects and financial programs	Diarra and Akuffo, 2002; Habtetsion and Tsighe, 2002; UNDP, 1996
Lack of focused policies to target poor, informal business sector, and rural areas	Habtetsion and Tsighe, 2002; Karekezi and Majoro, 2002
Lack of funds allocated to rural energy at government departmental level	Habtetsion and Tsighe, 2002
Focus on privatization as a panacea to improve access, increase capital, etc.	Wamukonya, 2002
High degree of damaging bureaucratic and political interference in energy projects	Youm *et al.*, 2000
Socio-economic barriers	
Renewable and modern energy projects and fuels are financially inaccessible to the majority of populations	Diarra and Akuffo, 2002; Karekezi and Majoro, 2002; Wamukonya, 2002; Victor, 2002; Sokona and Thomas, 1999; Youm *et al.*, 2000
Lack of access to financing options for urban poor, including women	Diarra and Akuffo, 2002; Karekezi and Majoro, 2002; Wolde-Ghiorgis, 2002; Wamukonya, 2002; UNDP, 1996
Low household purchasing power	Karekezi and Majoro, 2002; Victor, 2002; Wamukonya, 2002; Sokona and Thomas, 1999

Lack of private capital to invest in construction and rehabilitation of energy infrastructure and develop new projects	Wamukonya, 2002; Turkson and Wohlgemuth, 2001
Predominance of welfare focused programs rather than income generating programs	Habtetsion and Tsighe, 2002; Wamukonya, 2002
Uneconomic and unsustainable programs - lack of lifecycle costing	Habtetsion and Tsighe, 2002; UNDP, 1996
Government inability to finance projects due to increasing government deficits and economic instability	Youm *et al.*, 2000; Sokona and Thomas, 1999
Lack of ownership of projects by local communities and individuals	Karekezi and Kithyoma, 2002
Inefficient vertical state owned monopolies in electricity sector, poor rates of return	Turkson and Wohlgemuth, 2001
Communication and Training barriers	
Exclusion of end-users and community groups (including women) from project design stages - poor coordination between donor community and local communities	Malhotra *et al.*, 2004; Diarra and Akuffo, 2002; Habtetsion and Tsighe, 2002; Wamukonya, 2002; Cecelski, 2000a, 2000b
Lack of socio-economic and environmental information, scattered and poor quality data, lack of resources allocated to data collection	Youm et al., 2000; Amous, 1998a; FAO, 1998
Shortage of skilled labour and capacity building	Malhotra *et al.*, 2004; Sokona and Thomas, 1999
Lack of institutional capacity to collect and analyze energy data (needs, demands, consumption, etc.)	Habtetsion and Tsighe, 2002
Poor linkages between stakeholders, policy makers, and funders	Habtetsion and Tsighe, 2002
Poorly integrated national, regional and sub-regional networks	Turkson and Wohlgemuth, 2001
Lack of integration between energy solutions and other sectors (water, agriculture, etc,)	Sokona and Thomas, 1999
Inefficient energy consumption habits	Sokona and Thomas, 1999
Technology barriers	
Inappropriate technologies for local needs	Malhotra *et al.*, 2004; Diarra and Akuffo, 2002; Habtetsion and Tsighe, 2002; Wamukonya, 2002; Cecelski, 2000; Sokona and Thomas, 1999
Lack of technical support for specific modern fuel technologies, including after sales service, quality control, and capacity building	Malhotra *et al.*, 2004; Diarra and Akuffo, 2002; Karekezi and Kithyoma, 2002; Wamukonya, 2002
Low levels of electricity trading among neighbouring countries	Turkson and Wohlgemuth, 2001
Low electricity demand	Youm et al., 2000
Increased demand on biomass fuels due to urbanization	Kituyi, 2001

2.4.1 External barriers

Key barriers affecting the success of many attempts to develop sustainable and renewable options for energy access are often due to factors beyond the borders of the nation enduring energy poverty situations; they reflect the influence of international market prices. A prime example of the effects of the international market involves the price of oil, which typically is far beyond the control of any one specific country, especially if that country does not have its own source of fossil fuels (Youm *et al.,* 2000). As a result, countries such as Senegal that import fuel, and any development projects in this region that may rely on petroleum or petroleum products, are extremely vulnerable to the fluctuations on the international market (Youm *et al.,* 2000), regardless of the organizational efforts and intentions behind the project.

Besides the influence of market prices, a second barrier that frequently related to the effectiveness of energy solutions is misguided foreign aid. The intention, administration, and delivery of foreign assistance are all affected by three factors during the life cycle of any development project. Firstly, donor countries may have agendas that reflect their own national priorities, which can influence the type of aid and subsidies they are willing, or are able, to provide during a project (Sokona and Thomas, 1999). Secondly, energy is not recognized by the development community to be on par with priorities such as food and water and is therefore often overlooked during the creation of project goals and objectives (Cecelski, 2000a). Thirdly, the project goals supported by donors and investors are often not coordinated with national needs or policy objectives, despite the fact that these may have been previously documented within the recipient country itself (Turkson and Wolhgemuth, 2001).

A further barrier involves the problematic and complex nature of relying on the private sector in solving development and energy poverty problems. The private sector is often looked to as a source of capital and technological investment (Wamukonya, 2002; Turkson and Wohlgemuth, 2001). However, the fact remains that capital from trans-national companies will often be provided with other, sometimes conflicting goals, thereby creating barriers to the success and completion of energy development and improvement projects. For example, during the late 1990s, the Senegalese government was encouraged by the World Bank and IMF to decrease its shares in SENELEC (Senegal's Societe Nationale d'Electricité), and in 1999 a consortium of utility companies, including Hydro Québec, acquired a 34% interest in the company. However, organizational and management problems continued, profits were not realized, and ultimately the joint ownership was not successful, with the result that the consortium sold its shares back to the government (Youm *et al.*, 2000). In fact, further negotiations to encourage private sector involvement with SENELEC have also failed, as the likelihood of economic feasibility and future profits is limited (Youm *et al.*, 2000). To summarize these reported experiences, if a private, large-scale company is investing in a project in an energy poverty-stricken country, shareholder expectations will remain profit-driven, rather than based on corporate philanthropy (Habtetsion and Tsighe, 2002; Wamukonya, 2002).

Finally, a major external barrier to improving access to energy and developing sustainable and renewable energy options is the lack of capital for small scale power projects by multilateral lending agencies, such the World Bank or IMF (UNDP, 1996). Historically, their mandate tends to support large-scale projects such as hydroelectric

dams or gas-generating stations (e.g. the Manantili dam project on the Bafing river in Mali by the World Bank) (Youm *et al.*, 2000). Over US$7 billion annually is allocated to the energy sector in economically poor countries by multilateral development banks; however, the areas principally targeted included conventional energy exploration, refinancing of existing projects, and distribution of electricity (Wamukonya, 2002; UNDP, 1996). Critics of this type of support point to the fact that large-scale projects fail to target urban and rural households (Sagar, 2004; Wamukonya, 2002; UNDP, 1996). However, recent projects have demonstrated some improvements and change in this area. For example the World Bank partnered with the UNDP, U.S. Department of Energy, and the government of the Netherlands to develop a program called FINESSE (Financing Energy Services for Small Scale Energy Users) (UNDP, 1996). Furthermore, there is evidence that multinational and bilateral institutions have even started to include participatory methodologies in project design stages to better capture local desires (Cecelski, 2000a).

2.4.2 Political barriers

While many external barriers affect the success of development projects aimed at improving the energy poverty situation in Senegal, many barriers at the national political level are also responsible for complicating and hindering attempts to alter the current situation. These political barriers may include a lack of institutional capacity within government, as well as a lack of organizational structure, work incentives, lack of government leadership, and the associated problems and instabilities caused by civil unrest.

The lack of policy framework and funding largely contributes to the lack of institutional capacity that exists in Senegal today (Youm *et al.*, 2000). The absence of effective solutions for the magnitude of problems linked to energy poverty conditions is not surprising in many economically poor countries, since higher level resource managers often do not acknowledge the status of energy use and access, or renewable options within policy documents (Diarra and Akuffo, 2002; UNDP, 1996). For example, in Eritrea, existing policies have failed to address energy poverty as a national problem, and no single policy exists to address rural energy access issues (Habtetsion and Tsighe, 2002). Furthermore, the funding to develop and implement policies that target this problem is not provided to the appropriate bodies (Habtetsion and Tsighe, 2002). These types of problems are manifested in the political agenda within Senegal and the lack of political will to prioritize energy poverty issues (Youm *et al.*, 2000; Sokona and Thomas, 1999). Drought, disease, civil conflict and poor governance are all contributing factors to energy poverty in sub-Saharan Africa, yet African ministers gave no special attention to biomass energy in the draft position presented to the World Summit for Sustainable Development in 2001 (Kituyi, 2001).

Within the context of this discussion, the term 'lack of institutional capacity' may refer to the poor accountability, transparency, governance, or organization of the bodies that control energy use and access (Victor, 2002). Quite often, even if the idea of improving energy access and efficiency exists in theory, the means to organize, administer, and deliver project or policy goals are not available in practice (Habtetsion and Tsighe, 2002; Turkson and Wohlgemuth, 2001; Cecelski, 2000a). In addition to the appropriate organizational structure not being in place, incentives to ensure that programs

are properly executed also rarely exist, and often outdated management practices are dominant in most workplaces (Reddy, 2003; Habtetsion and Tsighe, 2002). The presence of appropriate incentive programs may play a key role in motivating employees to ensure projects are fully implemented and focus on delivering services or products (Habtetsion and Tsighe, 2002).

Another gap arises between energy solutions and development attempts when political agendas do not reflect local concerns, but act as the driving force for the project goals. For example, government may focus on extending electricity grids more for political reasons, which negates the fact that grids may not be the most appropriate solution to addressing local priorities and needs (Sokona and Thomas, 1999). Also, similarly to the manner with which external development projects may neglect the needs of the local, economically poor regions, government projects and subsidies often serve the needs of the formal commercial and industrial sector, as well as the medium to high income households, but fail to focus on the rural and urban poor (Karekezi and Majoro, 2002).

Energy access issues are also exacerbated by societal disorder, which can greatly affect energy, particularly energy infrastructure (Victor, 2002; Kituyi (2001). Without the rule of law, energy infrastructure is not well protected. For example, electricity transmission lines or gas pipelines are often targeted by organized civil disobedience, which delays development progress, disrupts service to existing clients, and further deters investors from financing these types of projects (Victor, 2002). Civil strife can often transfer government attention from the issue of energy poverty, and the presence of

conflict and the inherent instabilities of a country during war may deter investors from providing funding (Habtetsion and Tsighe, 2002; Sokona and Thomas, 1999).

Bureaucratic interference, whether due to the lack of institutional capacity or lack of political commitment, often is responsible for the disruption or stalling of development projects (Youm *et al.,* 2000). Corruption within the higher levels of government has also been noted as a contributing factor. For instance, in Nepal the corruption in national government was cited as a limitation to projects aimed at strengthening energy infrastructure and the human resource base (Cecelski, 2000a). For obvious reasons, corruption is not a well-documented issue in any country, including Senegal. However, the possibility of corruption can exist anywhere and may in fact be a concern that warrants further exploration in order to strengthen successful governance.

2.4.3 Socio-economic barriers

From a socio-economic perspective, the most critical aspect in explaining the failure of energy development projects in Senegal is the low purchasing power of its citizens, which is only worsened by the tendency of development projects to be welfare-focused (e.g. Karekezi and Majoro, 2002; Victor, 2002; Sokona and Thomas, 1999). Each of these issues is strongly interconnected with the external and national factors discussed in the previous sections.

Energy development projects are often welfare-focused, with support being provided from donors and investors in the form of subsidies, grants, and donations rather than focusing on income-generation (Habtetsion and Tsighe, 2002). When the purchasing power is low, people cannot afford the alternatives that may be offered through development projects. For example, renewable projects involving solar panels,

photovoltaic technology or micro-hydroelectricity, are only accessible to wealthy households due to the high costs of the equipment and installation (Karekezi and Majoro, 2002). Even improved biomass stove projects are twice the cost of traditional use stoves, and unless all of these newly introduced technologies are heavily subsidized, the new forms of energy will not be utilized and benefits from the development attempts are not accrued (Karekezi and Majoro, 2002). Economies of scale and economies of scope are a particular concern when projects continuously require subsidies and monetary input (Wamukonya, 2002). In this sense, many projects that are initiated by donors are actually uneconomic, meaning they are not cost-effective or financially realistic. A common error in project development is to budget only for the creation and initial implementation steps of a project, neglecting the complete life cycle of the project, in addition to regular maintenance and education that should be a part of any development or technology transfer project (UNDP, 1996). Thus, most projects are not economically viable for the entire course of their projects (UNDP, 1996). Projects are also often unsustainable, since self-sufficiency of the recipients is not attained when the state of local purchasing power is never improved (Habtetsion and Tsighe, 2002).

The interrelationship between the national factors and socio-economic barriers is most obvious when concerned with state-owned monopolies that deal with energy, such as electrical-generating and distribution companies. At the federal level, the government itself cannot afford to continue funding existing or new projects or state-owned utility companies (Youm *et al.,* 2000). For instance, in the case of electricity in Senegal, there is a lack of capital to rehabilitate existing installations and build new infrastructure, mainly due to the poor financial status of the state-owned utility company, SENELEC

(Turkson and Wohlgemuth, 2001). The lack of financing and lack of institutional capacity results in inefficiently operated and managed companies, which perpetuates the problem by causing low rates of return (often negative). Although exceptions do exist, many of these organizations often have dismal performance records and do not deliver adequate services to their clients (Turkson and Wohlgemuth, 2001). Consequently, a profit or source of funding is not built that can be re-invested into capital and operational costs for improving access and existing delivery (Turkson and Wohlgemuth, 2001).

Projects that aim to develop and implement solutions to the lack of purchasing power and the dominance of welfare-focused projects (versus income-generating) are poorly documented in the literature to date. Initiatives and strategies for financing, such as support for micro-financing and credit facilities for rural communities, support to administer loan programs, and co-ops have all been recommended in the literature (e.g. Diarra and Akuffo, 2002; Wamukonya, 2002; Wolde-Ghiorgis, 2002; UNDP, 1996), but limited efforts have resulted to implement these types of programs.

Poor access to credit is an even more severe problem for women. Women typically are the primary users of the technologies introduced, such as more efficient cooking fuels and techniques, and are often the intended benefactors from energy resource improvements (Wamukonya, 2002; Cecelski, 2000a). Yet, women are often unable to obtain loans due to cultural beliefs that women should not have power in economic decision making and their labour contributions are often not recognized in economic terms (Reddy, 2000). Recognizing these realities, a review of the literature reveals that a true ingenuity gap exists between the needs of the Senegalese population and the goals of the projects taking place.

2.4.4 Communication and training barriers

As discussed in the external, national, and socio-economic sections, the gap between the needs of the population and the proposed solutions poses considerable barriers. The existence of this problem is largely due to poorly established methods of communicating and training, which consequently results in the inadequate participation of local communities in all aspects of a project cycle including design, implementation, ownership, and services (Diarra and Akuffo, 2002; Cecelski, 2000a). As a result of these poor communication practices, linkages between stakeholders, policy-makers and those providing energy resources are not well established (Habtetsion and Tsighe, 2002).

An example of the effects of poor local participatory involvement is one biomass stove implementation project in Mauritania, funded by World Bank in 2000 (Wamukonya, 2002). Project targets were extremely poor due to a lack of consultation, particularly with the local women, even though women are the primary users of the stoves (Wamukonya, 2002). These findings have been common in other projects in Rwanda, Ethiopia, Kenya, and Uganda and suggest that the technology itself is often not appropriate, because it did not meet the values or needs of the women (Malhotra *et al.,* 2004; Wamukonya, 2002; Cecelski, 2000a). One reason that participation by women is limited is that appropriate tools and methods to involve rural women in Senegal throughout the process of project development and implementation are limited (Malhotra *et al.,* 2004). For example, a framework or a published record of how to successfully involve women, including the inherent cultural norms, is not available. Unfortunately, the limited outreach often results in the development of projects that are not only

insensitive to local populations' needs, but also to the socio-cultural background of the area (Malhotra *et al.,* 2004).

The partial failure of some projects may also be due to a lack of sustained communication between energy technology providers and the users (Diarra and Akuffo, 2002). That is, after-sales service and post-implementation communication will be necessary if a new technology has been introduced in a household or community. Without this sustained communication, individuals or communities may encounter problems and will not have a source of assistance, thereby forcing them to abandon the new technology. If the system is heavily subsidized in the first place as discussed in section 2.4.3, and appropriate communication and training is not facilitated, ownership of the technology will never fully develop (Karekezi and Kithyoma, 2002; Diarra and Akuffo, 2002).

Communications also seem to fall short in the aspect of coordinating project goals and other development projects. For example, water, agriculture, and health are all inextricably linked to development, as is energy (Sokona and Thomas, 1999). Therefore, coordinating the development efforts that are taking place in those areas, with the efforts to improve access and sustainable use of energy may prove to be more effective than the disjointed series of projects that have taken place in the past (Sokona and Thomas, 1999).

A critical impediment to fostering communications and training is the limited availability of high quality data. Data on energy resources is often scattered, not standardized, not in a format that is easily analyzed, and/or not regularly collected (Youm *et al.,* 2000; Amous, 1998a). For example, in some African countries, as much as a decade can exist between updates of data records (Amous, 1998a). The lack of

systematic data collection inevitably means that little sharing, analysis, and networking can take place (Youm *et al.,* 2000; Amous, 1998a). Even the FAO (1998), who collects and presents statistical data specifically on fuel wood and charcoal in the Forest Products Yearbook, declares the need for improvement in data, grouping, and presentation.

As described in previous sections, the lack of institutional capacity, including a shortage of the skilled labour which is required for data collection and energy resource monitoring, plays a large role in explaining the inability to effectively collect, analyze, and share data (Habtetsion and Tsighe, 2002; Sokona and Thomas, 1999). Current data have not accurately captured the supplies, the demands, and the diverse needs of local individuals for energy resources (Habtetsion and Tsighe, 2002). Inevitably, policy creators and development projects do not have enough, or accurate enough, information upon which to base decisions (Habtetsion and Tsighe, 2002; Youm *et al.,* 2000; Amous, 1998b).

2.4.5 Technological barriers

Although poor communication networks and financing are critical factors in thwarting the success of energy use and access development projects, the specific role of technology must also be addressed. Technological barriers have two opposing features. With any given energy fuel type, a myriad of technologies exist. However, even with effective communication and ample financial support, the success of a technology in any given area is entirely dependent on its suitability to local needs, uses, and customs (e.g. Wamukonya, 2002). Yet, regardless of the efficiency of a technology, if installation and maintenance require high amounts of capital, or production and distribution are

expensive, the solution may not appear cost-effective and will not be readily taken up by local individuals or communities (Habtetsion and Tsighe, 2002).

For example, a simple stove upgrade project in Kenya involved lining stoves with a ceramic insulating material (Karekezi and Majoro, 2002). While this upgrade resulted in drastic reductions in fuel use, with savings often exceeding 25%, the stoves typically cost twice as much as traditional unlined stoves (Karekezi and Majoro, 2002).

Project success is also dependent on acceptance of the technologies, not just distribution or provision. For example, the government of India sponsored several cooking energy programs in the 1980s, including the National Project on Biogas Development, which attempted to improve health, sanitation and to minimize time and energy spent by females on coal collection (Malhotra *et al.,* 2004). However, an independent study performed by the National Council of Applied Economic Research found that only 55.6% of distributed stoves were actually utilized (Malhotra *et al.,* 2004). Therefore distribution numbers were not necessarily a true indicator of success of the biogas stove project.

Reasons for poor acceptance or suitability of technological implements are innumerable, including structural and functional failures of the technology, lack of quality control of the products, poor maintenance, all in addition to insensitivity to local needs (Malhotra *et al.,* 2004). Technical support is also rarely available in countries such as Senegal, so little assistance for system maintenance exists (Karekezi and Kithyoma, 2002).

2.4.6 Recommendations for overcoming barriers

Similarly to the copious literature that describes the barriers faced during energy use and access development projects, numerous recommendations have been documented in the literature, including specific steps to take and priorities. For obvious reasons, the majority of these recommendations emerged as a direct result of the previously identified barriers (see Tables 2.2 and 2.3). Several recommendations may evolve to cope with one single barrier due to the depth and breadth of the barriers themselves. However, a single recommendation may also be applicable to several different barriers, including the previously discussed factors of institutional capacity, national and external politics and policies, and socio-economic issues. Other recommendations may also have evolved based on the specifics of energy resource utilization, or exclusively for certain projects (refer to Table 2.3).

Table 2.3 Strategies recommended to improve energy access in economically poor countries from leading international research

Strategy recommendation	**Citations**
Socio-economic	
Diversification of funding strategies (international/national/local, private/public, small/large scale, loans/grants, micro-credit/rural credit, taxes on fossil fuels, etc.)	Habtetsion and Tsighe, 2002; Karekezi, 2002; Karekezi and Majoro, 2002; Turkson and Wohlgemuth, 2001; Cecelski, 2000b; Sokona and Thomas, 1999; Youm *et al.*, 2000; UNDP, 1996
Increase population purchasing power through focus on income generating activities (e.g. small scale enterprises)	Habtetsion and Tsighe, 2002; Karekezi, 2002; Victor, 2002; Wamukonya, 2002; Wolde-Ghiorgis, 2002; UNDP, 1996
Targeted subsidies for energy components and projects (LPG cylinders, electricity compact ready boards, renewable technologies, capital costs)	Reddy, 2003; Kammen et al., 2002; Karekezi and Majoro, 2002; Goldemberg and Johanson, 1995
Focus on economic development with enhanced private sector participation	Diarra and Akuffo, 2002; Turkson and Wohlgemuth, 2001
Focus on local ownership of projects	Victor, 2002; Sokona and Thomas, 1999
Separate focus on income generation for women in energy sector (female owned/managed micro-enterprises)	Karekezi, 2002
Capacity building	
Participative and collaborative project design and management (including local full/partial ownership, private/public partnerships)	Diarra and Akuffo, 2002; Habtetsion and Tsighe, 2002; Kammen, 2002; Kammen *et a.,* 2002; Karekezi, 2002; Victor, 2002; Wamukonya, 2002; Cecelski, 2000a; Cecelski, 2000b; Sokona and Thomas, 1999; UNDP, 1996
Networking and information sharing between local groups, NGOs, private sector, bilateral, multilateral, national (project experience, data, professional skills, etc.)	Edwards et al., 2004; Diarra and Akuffo, 2002; Habtetsion and Tsighe, 2002; Kammen *et al.*, 2002; Wamukonya, 2002; Karekezi, 2002; Cecelski, 2000a; Cecelski, 2000b; UNDP, 1996; Goldemberg and Johanson, 1995
Capacity building to develop local energy research, evaluation, and management (various fields - science, engineering, economic, and technical)	Diarra and Akuffo, 2002; Karekezi, 2002; Wolde-Ghiorgis, 2002; Sokona and Thomas, 1999; Goldemberg and Johanson, 1995; Amous, 1998a; FAO, 1998
Local needs determinations (involvement of local grass roots groups, observe local customs, gender, ethnicity issues, social hierarchy, etc.)	Malhotra *et al.*, 2004; Kammen *et al.*, 2002 ; Wamukonya, 2002; Cecelski, 2000a; Sokona and Thomas, 1999; Youm *et al.*,2000
Include gender considerations in all project stages and aspects	Malhotra *et al.*, 2004; Karekezi, 2002; Karekezi and Kithyoma, 2002; Cecelski, 2000a; Cecelski, 2000b; Youm *et al.*, 2000
Improvement and standardization of data collection, analysis, and monitoring methods in energy sector (fuel sources, type of use, consumption rates, etc.)	Edwards *et al.*, 2004; Karekezi, 2002; Cecelski, 2000a; Cecelski, 2000b; Amous, 1998a; FAO; 1998
Inter-sector research (e.g. energy and health)	Edwards *et al.*, 2004; Karekezi, 2002

Politics and Policies	
Fully integrated poverty reduction and sustainable development (energy project development and investment in conjunction with water, health, agriculture, etc.)	Davidson, 2003; Karekezi, 2002; Victor, 2002; Wolde-Ghiorgis, 2002; Wamukonya, 2002; Cecelski, 2000a; Cecelski, 2000b; Sokona and Thomas, 1999
Concentration on the creation of sound institutions with increased productivity and decision making structures (emphasis on governance, transparency, and rule of law) (encourages private sector confidence)	Reddy, 2003; Habtetsion and Tsighe, 2002; Victor, 2002; Wolde-Ghiorgis, 2002; Turkson and Wohlgemuth, 2001
Lowered tariffs and taxes for energy fuels and utility connections	Reddy, 2003; Cecelski, 2000a; Habtetsion and Tsighe, 2002; Karekezi, 2002
Creation of government agencies and policies dedicated to renewable and modern energy promotion and delivery to both rural and urban areas	Habtetsion and Tsighe, 2002; Wolde-Ghiorgis, 2002; Youm *et al.*, 2000
Priority to most vulnerable populations with energy projects	Edwards *et al.*, 2004
Integration of energy projects with global climate change policy objectives	Edwards *et al.*, 2004
Privatization of energy and water utility sectors	Diarra and Akuffo, 2002
Legalization of informal power distribution	Karekezi and Majoro, 2002
Mechanisms to increase the voice of civil society in decisions making	Cecelski, 2000b
Consideration of regional physical and environmental features in planning	Sokona and Thomas, 1999
Resources Utilization	
Promotion of energy efficiency (through improved technologies and methods of use)	Reddy, 2003; Karekezi and Kithyoma, 2002; Karekezi and Majoro, 2002; Goldemberg and Johanson, 1995
Diversification of energy solutions (renewable and fossil fuel)	Victor, 2002; Cecelski, 2000b; Sokona and Thomas, 1999
Emphasis on renewable resource use	Karekezi, 2002; Karekezi and Kithyoma, 2002; UNDP, 1996
Enhanced inter-country distribution (power pools, direct country to country sales)	Turkson and Wohlgemuth, 2001
Improved electricity distribution management (load and peak demand leveling)	Victor, 2002
Priority to renewable resource projects for petroleum poor countries	Diarra and Akuffo, 2002
Protection and enhancement of renewable energy supply (e.g. tree planting)	Youm *et al.*, 2000
Projects	
Community lighting in low income areas through various technologies, such as PV and distributed generation, with financing options	Diarra and Akuffo, 2002; Karekezi and Majoro, 2002; Karekezi, 2000; Youm *et al.*, 2000
Decentralized, distributed generation (fossil and renewable technology based) / small grids	Victor, 2002; Turkson and Wohlgemuth, 2001; Cecelski, 2000b; Sokona and Thomas, 1999

Close analysis of the broad range of recommendations reveals a common theme—that is, the involvement of local participants and recognition of local needs. Yet, a review of the literature demonstrates that a limited number of research and development projects in Senegal, or for that matter sub-Saharan Africa, have incorporated this type of approach into their strategy, and that the same barriers continue to prevail, perpetuating Senegal's energy poverty situation. Therefore, the goal of this research was to address that need by facilitating discussion among local decision makers of Senegal's policies to determine priorities for strategic and development options. By gathering information on the direct knowledge and opinions of local policy professionals, a comparison can be made with the priority barriers and recommended solutions documented to date in the literature. These results may then provide input for the development of adaptation strategies for rural energy access and use in Senegal, and UEMOA countries.

2.5 Conclusion

This chapter examined the far-reaching causal factors and effects of energy poverty globally, and specifically within Senegal. It described how energy is increasingly being recognized as a distinct measure of poverty and how efforts to improve living standards in economically poor countries are being hindered by the lack of access to clean, efficient fuel sources for needs such as cooking. Biomass fuels such as wood and charcoal are on the bottom rungs of the energy ladder, and in Senegal, these fuels compromise over 50% of the total energy consumption. The chapter explained how energy poverty predominantly affects women, and how indoor fuel use has serious health and ecosystem implications. Next, it was demonstrated how global efforts to alleviate energy poverty have had marginal results, especially in sub-Saharan Africa, where over

half a billion people still rely on biomass fuel for cooking and heating purposes, and electricity is out of reach for the majority of the population.

Many issues have been noted in the literature as barriers to improving access to modern energy, and these barriers were summarized into five major categories: external, political, socio-economic, communications and training, and technological factors. Dominant barriers included the lack of capital available to individuals and governments for energy project development, and the lack of capacity of local governments and communities to effectively network and share information regarding energy needs. The chapter concluded by providing an overview of the recommendations for overcoming the various barriers as published in the literature. Potential solutions included diversification of funding strategies, participative and collaborative project design and management, and the promotion of energy efficiency through improved technologies and methods of energy use. The numerous recommendations were summarized under the following headings: socio-economics, capacity building, governance, resources utilization and projects. The common underlying theme was the importance of local participation in assessing effective design and implementation strategies to ensure continuing acceptance of energy projects.

CHAPTER THREE

LITERATURE REVIEW ON SCENARIOS

3.1 Introduction

Both the purpose and format of scenarios have evolved through time. To better understand the rationale behind their use in this study, it is important to first explore the history of the tool. This chapter provides a definition of scenarios and the formats in which they may be used. The chapter also discusses the use of scenarios in the past, their strengths and benefits, and clarifies the way in which potential weaknesses were addressed, and benefits were optimized, in the design of this study. The use of scenarios as a tool for exercises in the energy sector and the gaps in the literature that remain are then described.

3.2 Defining Scenarios

The use of scenarios in various sectors, including both corporate and non-corporate organizations, has proliferated in recent years. The origin of scenarios can be traced back to literary and arts disciplines as far back as the 4th century B.C., and the term originally referred to a synopsis or outline of a play (Kleiner, 1996; Wilson, 1978). However, during the late 1950s, the term was transposed into military planning venues by Herman Kahn, and a new definition for the word resulted: "a hypothetical sequence of events constructed for the purpose of focusing attention on causal processes and decision points" (Kahn and Weiner, 1967, p.6). Similar to that of a play, Kahn's version of a scenario was a description of events, or acts, that were created in part from the imagination (Kahn, 1962). Yet, this new military forum distinguished scenarios as a tool,

as they were created and analyzed to help develop strategies for action, as opposed to entertainment purposes (Wilson, 1978).

References to scenarios became increasingly prevalent during the 1970s, with economic uncertainties of the petroleum industry and fears over world fossil fuel resource shortages acting as the catalyst (Chermack and van der Merwe, 2003). Resource managers were faced with tough decisions in constantly changing environments and as a result new tools and approaches to strategic planning were needed during the 1960s to late 1980s, leading to developments such as strategic planning, operational systems planning, integrated strategic change and trans-organizational change (Mintzberg, 1994). The purpose of these new methods was to help organizational leaders better understand their operational environments (Chermack, 2004). Scenario planning emerged under the banner of strategic planning, and offered a way to combine the creative elements of crafting "stories" with the structure provided by models (see Figure 3.1) (Ghanadon and Koomey, 2004). For example, Pierre Wack utilized scenarios for Royal Dutch Shell Oil in 1975, and the tool was heralded as a process that could harness creativity, entrepreneurial spirit, and foresight in ways that might benefit corporate planning during times of rapid change and high uncertainty (Wack, 1985; Wilson, 1978). Thereafter, the expanding use of scenarios led to a multitude of definitions, depending on the nature of the application. In a planning context, the term 'scenario planning' is commonly cited, which typically encompasses drafting future possible sequences of events and conditions, in efforts to take account of uncertainty and broaden the realm of possibilities for decision makers (Phelps *et al.*, 2001; Hyde, 1999; Schwartz, 1996; Porter, 1985; Wack, 1985). Several related 'futures' methodologies have been developed, including decision

analysis, Delphi, and environmental scanning (e.g. see Hill and Fowles, 1975). While these tools may share some common features with scenario planning, they are indeed distinct methods outside of the limits of this research (Cairns *et al.*, 2002).

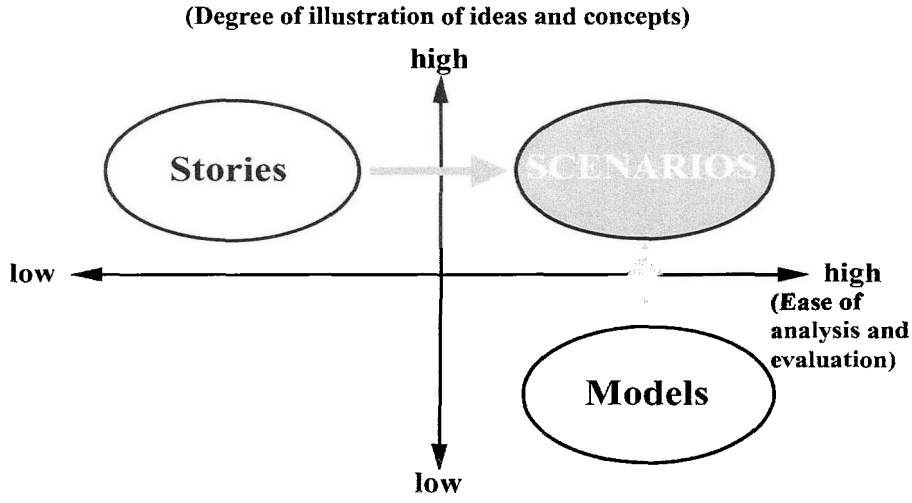

Figure 3.1 Positioning of qualitative scenarios in relation to stories and models (modified from Ghanadan and Koomey, 2004)

A clear distinction exists as between the actual scenarios produced during this process, and the resulting actions implemented. Claims have been made that scenario planning can be utilized to develop robust strategic plans, to identify social, political, economic and technological forces, and to offer perspectives which could not be captured through the examination of past data (Maack, 2001; Schwartz, 1996; Godet, 2000). However, the basic ingredient for scenario planning is the creation of a rich and detailed depiction of a plausible future world or specific situation, including the course of events that guides one to understand the progression from the present to future (Millett, 2003; O'Brien, 2000; Enserik, 2000; Godet, 2000). The word 'scenario' is not synonymous with 'strategy' (Godet, 2000). The scenario narrative, or portrait of the future must in

turn be analyzed to help understand causal processes and decision points that may be faced in the future (Wilson, 2000), that may in turn shape the development of strategies. Scenarios have the potential to help make decisions, but must be treated as tools to help guide the decision process (Wilson, 2000). As eloquently stated by Pierre Godet, "Unfortunately, there are no statistics about the future, and often personal judgment is the only information available to deal with the unknown. It is, therefore necessary to "gather people's opinions before forming one's own, and then to place bets in the form of subjective probability" (Godet, 2000, p. 7).

3.2.1 Scenario Formats

While in theory any individual may be involved in creating scenarios, in practice the process typically involves the formation of a group of experts or a network of people (Roubelat, 2000). The creation of scenarios is considered a highly qualitative and intuitive process, and the dynamic interactions among the people involved help create a product that could not be produced from linear computer models or simulations (Schnaars, 1987). However, without a group that has an adequate background in the subject concerned, realistic and meaningful scenarios cannot be created (van der Heijden, 2000). Scenario utilization has been compared to action research, as the process aims to understand complex systems that are difficult to deconstruct, and intuition is a key component to understanding the various related factors and forces (van der Heijden, 2000). The actual composition of the group may vary greatly, and can involve leaders, policy makers, managers, scientists, and association representatives, either insiders from one organization, or outsiders within a specific discipline or subject area (Roubelat,

2000). However, all participants in the process are typically labeled experts[3], meaning people whose opinions are beneficial and useful for the future thinking exercise (Roubelat, 2000). Moreover, the actual mix of this people is critical to the quality of the final product, as homogeneity may lead towards a single vision, while heterogeneous, multidisciplinary teams prompt creative debate which will enhance the richness and breadth of future options considered (Enserik, 2000; Roubelat, 2000).

The format of a scenario can also vary greatly. Narratives may be long, elaborate stories that guide a reader systematically over a set number of years (Schwartz, 1996). Or, a scenario may be limited to a point form depiction of a final future state, with major events and specific consequences briefly noted. Regardless of the particulars, the format must meet the goal of understanding the mix of uncertainties and challenges to be faced with any particular strategic decision (Enserik, 2000). In all cases, the scenarios are not predictions, but must be regarded as one sketch of hypothetical events, and the possibility of any one scenario materializing exactly as depicted is minimal (Hodgkinson and Wright, 2002; Wilson, 1978). The development of scenarios is typically facilitated by an 'outside' person, and often driven by practical constraints such as time and costs (Ringland, 2002). Whereas lengthy, relatively unstructured processes may help crystallize group cohesion and build trust in politically sensitive situations (van der Heijden, 2000), realistically, most scenario development occurs in short intensive workshops (Enserik, 2000). These workshops rely on flexible, yet facilitated and planned discussions, and often include the use of methodological tools such as focus group research, core competency and five-forces analysis, and simulation models (van der

[3] Current practice increasingly extends the expert label to include those with traditional or local knowledge, or simply extensive local experience (e.g. women cooking using biomass fuels).

Heijden, 2004). Format and process details aside, in order for scenarios to be beneficial to organizations they must be: 1) possible, rather than necessarily probable; 2) narratives to provide meaning via synthesis of isolated facts and trends; 3) multiple, rather than singular story lines; 4) plausible, yet imaginative; and 5) consistent, avoiding vague and contradictory causal relationships (Heugens and van Oosterhout, 2001).

3.2.2 The Use of Scenarios through Time

As previously stated, the use of scenarios has diversified into many new disciplines since its origins in military planning by Kahn and the Rand Corporation in the 1950s. The U.S. government and Ford Foundation published reports on energy scenarios in 1974 (Wilson, 1978). Scenarios of population growth, resource use, and human impacts on earth were the focus of the 1972 publication 'Limits to Growth' (Meadows *et al.*, 1972); however these scenarios may be more accurately classified as projections. General Electric and Shell Oil were the first corporate pioneers of the decision making tool in the early 1970s, with Shell Oil's famous use of the tool during the 1973 oil crisis (Hyde, 1999). In 1975, René Zentner published the first academic journal article detailing the methodological steps required to utilize the tool in such corporate settings (Zentner, 1975). The 1970s were also a period of redefining of scenario use, involving key methodological developers such as Ian Wilson (General Electric and the Boston Consulting Group), Pierre Wack (Shell Oil), and Peter Schwartz (Stanford Research Institute (SRI) International) (Millet, 2003). The 1980s were a significant developmental period for scenario planning, and by the mid 1980s, a paradigm shift occurred in corporate planning, catalyzed by the failure of traditional strategic planning systems (Ringland, 1998; Mintzberg, 1994). Michael Porter popularized the concept of

'competitive advantage' and advocated the use of scenarios as a form of sensitivity analysis, which involved considering the various forces exerting pressure on any specific market in which a company is involved (Porter, 1985). However, other 'schools' of practice also emerged at this time. 'Intuitive Logics' was the product of SRI, the Global Business Network, and Shell Oil, and involved the creation and analysis of highly qualitative scenarios (Ringland, 1998). The Futures Group developed 'Trend Impact Analysis' for the U.S. defense industry, following in the footsteps of the Rand Corporation and Herman Kann (Ringland, 1998). 'Cross Impact Analysis' was popularized by the Battelle and Godet of France, which involved quantitative analysis and the use of proportional probabilities (Millett, 2003).

Today, a resurgence has occurred in both qualitative and quantitative scenario analysis (e.g. Schwartz, 1996; Godet, 1987), and its application has diversified into non-profit and government sectors (van der Heijden, 2004). Moreover, the tool is no longer limited to planning purposes, and the creation of scenarios has been advocated as a learning tool for organizations, networks and industries (Heugens and Oosterhout, 2001). The four main areas of scenario use include: 1) sensitivity/risk assessment, 2) strategy evaluation, 3) strategy development with a planning focus, and 4) strategy development without a planning focus (e.g. learning, networking, etc.) (Wilson, 2000). Furthermore, two major categories of scenario use have been identified, which include exploratory and anticipatory (Godet, 2000). Exploratory, or descriptive scenarios begin in the present and explore future trends, are used for the purpose of better understanding the interactions of various factors and forces (Alcamo, 2001). Anticipatory, or prescriptive scenarios investigate the path to a prescribed end state, and have the specific purpose of helping

decision makers draft strategies about how to achieve the future end state and develop contingencies (Alcamo, 2001). While accounts depicting the use of scenarios in the literature have increased considerably, the term is frequently misused and confused with forecasting based planning, which involves probabilities and the use of historical trends (e.g. Remmer and Kaye, 2001; Dansky, 1996) (see Table 3.1).

Table 3.1 Comparison of the use of forecasting methods to scenarios methods (modified from Ghanadan and Koomey, 2004)

	Forecasting (what is probable?)	**Scenarios** (what is possible?)
Focus	Rational analysis, end product and outcomes	Process, development/testing strategies, and learning experience
Objective	To map the most probable pathway and outcome, and identify uncertainties	To develop and richly describe multiple plausible pathways and outcomes, including the exploration of uncertainties
Methods	Analytical models utilizing drivers as variables	Qualitative narratives grounded in reality
Treatment of uncertainty	Probability based statistics and explicit assumptions	Identification of predetermined and uncertain elements during the development stage, and exploration of key uncertainties
Key participants	Experts, planning staff	Facilitators, strategists, problem solvers

3.2.3 Strengths and benefits of scenarios

The main goal of scenario-building is to promote diverse thinking through a collective process. Some of the primary benefits to using this method include developing and testing strategies, making sense of complex situations, advancing organizational learning, organizing novel ideas and thoughts. These specific benefits are well advertised (e.g Godet, 2000; van der Heijden, 2000; Ringland, 1998; Schwartz, 1996). An advantage of utilizing 'future thinking' in a group environment is that collective intuitions aid in unearthing the forces underlying change (van der Heijden, 2000). The use of scenarios offers a way in which principles and questions can be illustrated and

challenged (Zentner and Gelb, 1991; Kahn, 1962). The results from the activity can help planners and decision makers develop and test strategies, manage risk and build consensus for change by developing a better understanding of possible future dilemmas that may be encountered (Millett, 2003; Maack, 2001; O'Brien, 2000; Zentner and Gelb, 1991).

Compared to conventional planning which frequently involves an examination of past data to predict trends, the use of scenarios can help change the 'mental maps' of both individuals and collectives (Wilson, 2000). Many advocates and practitioners of methods involving scenarios are quick to point out that the future is impossible to predict (Schwartz, 1996; Wilson, 2000). Yet, imagining possible futures, the interactions between the many complex factors and their outcomes can be better understood, which can help policy and decision makers cope with their eventualities (Enserik, 2000). Furthermore, it is not just the story told by any particular scenario that is important; rather the entire analytical process during the scenario development helps increase awareness, including the tensions and factors that currently cause (or will in the future) specific elements of different scenarios (Enserik, 2000).

The early historical account of scenario planning by Shell Oil and General Electric primarily focused on the benefit of the tool towards developing and testing strategies. More recently, scenario planning has been advocated as a tool for organizational learning (e.g. Chermack and van der Merwe, 2003; Heugens and Oosterhout, 2001; Bunn and Salo, 1993). The creation and deployment of strategies in both public and private organizations is considered a dynamic process that requires individuals who are trained to inquire, reflect and construct mental abstracts (Chermack

and van der Merwe, 2003). In order to 'think the unthinkable', in the phrase coined by Herman Kann (Kahn, 1962), mental models and preconceptions have to be challenged, social influences must be identified, and situational and contextual realities must be constructed to reflect the many possibilities involved with the future (Chermack and van der Merwe, 2003).

The development of scenarios in organizations is also seen as a method to promote divergent thinking, yet retain an integrated approach to planning and developing strategy (Cairns *et al.*, 2002). Throughout any organization or network of people, diverse perceptions, beliefs, and values are always present, albeit the degrees of difference may vary greatly depending on the exact location or culture (Cairns *et al.*, 2002). However, by developing scenarios as a group, these diversities are recognized and can be thematically structured without the requirement to distill the ideas to a common, singular theme (Cairns *et al.*, 2002). Consequently, groups can share intent, but retain individual visions of the future. This notion is further supported in sensitive political environments, where the sharing of peripheral ideas may not typically be supported, and only with anonymity will individuals voice honest opinions (Blanning and Reinig, 1998). While workshop based scenario planning may not avoid this problem, electronic variations have been developed to enable actors to interact anonymously and produce satisfactory results (see Blanning and Reinig, 1998).

3.2.4 Addressing weaknesses

In theory, scenarios may appear to be the panacea of strategic planning, however, weaknesses exist. Firstly, the benefits of the tool are often difficult to measure because the timescales of the scenarios may be quite lengthy (e.g. 5-50 years). Therefore, it is not

always possible for corporate and non-corporate practitioners to observe immediate benefits (Millett, 2003). In order to avoid disappointment, practitioners must realize that the use of scenarios is a dynamic process and typically is merely one component of strategic planning. The effectiveness of a scenario exercise is often difficult to evaluate, and only by following up over the time scale outlined in the scenario narratives, will the results truly be known (Cairns *et al.*, 2002). However, short term benefits may be realized through the enhanced ability to take action to deal with uncertain circumstances and unexpected events.

A second weakness recognized in the literature is the difficulty in formulating policy from the information created in the scenarios (Enserik, 2000; Wilson, 2000). The use of scenarios in planning does not fit into the typical linear 'reflexion-decision-action' structure of many organizations (Roubelat, 2000). In fact, a management process based on the range of futures presented by scenarios can be criticized, since picking the 'right' one on which to base strategies is impossible (Mintzberg, 1994). Also, with a limited number of scenarios, management faces a risk of developing a narrowed vision and excluding peripheral factors (O'Brien, 2000). However, the creation of scenarios offers a method to explore future possibilities and facilitate understanding, rather than seeking to identify or predict what will happen in the future (Cairns *et al.*, 2002). The tool works to challenge beliefs of decision makers and a switch must be made from reactive management to proactive management, which involves seeking problems and troubleshooting, rather than merely addressing them once they have emerged (Cairns *et al.*, 2002).

A third weakness can be attributed to the cultural and psychological manifestations present in organizations and work environments. To effectively use scenarios, the organizational culture must evolve or transform from single point forecasting to dynamic planning (Soontornrangson *et al.*, 2003; Wilson, 2000). This may involve redefining corporate norms, attitudes and values, especially in hierarchal organizations, which tend towards traditional planning with centralized decision-making structures (Chermack and van der Merwe, 2003). Single point focused managers and decision makers must be encouraged to avoid the tendency to skip the creative and exploratory phases in order to immediately develop a strategy to cope with the outcome of one particular scenario (Wilson, 2000). Furthermore, scenarios take time to develop, and the people involved must be given ample opportunity to learn basic skills involved with the process and encouraged to overcome the barriers involved with challenging traditional beliefs and thought processes (O'Brien, 2000; Roubelat, 2000).

3.2.5 Optimizing benefits

Networked organizations with diverse goals may often be better suited to utilizing scenarios for planning, as increased emphasis is often placed on learning and the dialogue required to achieve consensus on differing goals and purposes (Chermack and van derMerwe, 2003). Yet, the tendency to work away from the peripheral possibilities, and move towards middle 'safe zones' must be avoided (Chermack and van der Merwe, 2003). This is not to say that scenarios cannot be utilized in traditional, hierarchal organizations, rather, the facilitators and organizers must ensure that an environment is created to allow open and legitimate involvement by all participants without fear of consequence for opinions and ideas expressed (Chermack and Lynham, 2002). Shell

Oil's successful use of scenarios has been linked to the cohesion between the groups of experts familiar in the topic, who were productive in working together towards developing future visions (Millett, 2003).

In addition to the steps required to prepare an organization for realizing the benefits of scenario applications, it remains paramount that the method not be unreasonably stretched beyond its capabilities. Firstly, scenario planning is not a prediction tool (Kahn, 1962). Secondly, the specific application may require tailoring and refinement. Thirdly, creative components may need to be combined with analytical models to link scenarios to realistic possibilities (Millett, 2003). One of the weaknesses of purely cognitive scenarios is that they have little connection to decision or policy outcomes (Heugens and van Oosterhout, 2001). This weakness can be avoided to some extent by embedding physical elements and indicators in the narrative structures of the scenarios and establishing firm links to implementation and outcomes of the decisions (Heugens and van Oosterhout, 2001). Ownership of the scenarios is also considered a key component, and if outside organizations are involved with the development of the scenarios, firm ties must be developed with the local participants or stakeholders (Heugens and van Oosterhout, 2001; O'Brien, 2000). Moreover, setting out clear goals and expected outcomes before utilizing scenarios in planning is critical (Cairns *et al.*, 2002). Broad goals such as 'determining key uncertainties about the future', and 'producing narratives describing plausible futures' are useful in framing the exercise, but a grounded, specific and clear purpose statement helps all actors involved work towards a common vision (Cairns *et al.*, 2002).

Another key consideration associated with the utilization of scenarios is the facilitation of the process (e.g. workshops, focus groups, etc.). Scenarios are the product of collective efforts and intuitions, and facilitation is critical in creating an environment conducive to open expression of thought (Ringland, 1998). Contrary to conventional management consulting, the facilitator is not present to offer expert solutions, but rather to promote the internal generation of ideas (Cairns *et al.*, 2002). While some scenario methodologists believe that a facilitator has to be either a complete outsider or insider (Schoemaker, 1995), more recently arguments have been made that facilitators possessing a general level of knowledge and expertise about the subject area may actually benefit the process (Cairns *et al.*, 2002). When the facilitator can provide input to the specific grounded ideas presented by the participants, and support divergent thinking, the final product may be superior to the results produced by a purely internally or externally facilitated workshop in innovation or originality (Cairns, *et al.*, 2002).

3.3 Scenario use in the energy sector

Scenarios have been mentioned in energy sector literature; however the term is often used to refer to projections and estimations of future resource demands based on changes in the external environment (see for example IPCC, 2000) (Ghanadon and Koomey, 2004; Soontornrangson *et al.*, 2003). These types of applications typically demonstrate future outcomes when key variables are changed, and demonstrate the effects of response plans to undesirable outcomes (see Remmer and Kaye, 2001; Dansky, 1996). However, a limited number of recent studies have used qualitative scenario planning to explore energy options. Scenario planning has been used in two separate accounts for energy planning in California, including electricity demand and global

warming (Batter and Calandri, 1992), and the consideration of alternative energy options (Chanadon and Koomey, 2004). A study on long-term electricity demand in China employed scenario research to better understand causal relationships and dominant forces affecting energy situations in the country's rural and urban settings (von Hirschhausen and Andres, 2000). The tool was also used to explore electricity demand in Thailand (Soontornrangson *et al.*, 2003) and the promotion of renewable energy technologies in Mauritius (Weisser, 2004). Finally, a detailed research project in India presented a technique for employing scenarios in micro-level planning for community based energy needs (Devadas, 2001).

The use of scenarios in energy projects in economically poor countries has great potential when compared to conventional planning that focuses on historical trends. The use of scenarios can help consider unforeseen events that could significantly affect energy resources, such as economic collapses, natural disasters, periods of extreme climatic disturbances, and civil unrest (Soontornrangson *et al.*, 2003). For example, Thailand's energy planning did not consider the impacts of severe economic recession, which did occur from 1997 to 1998, and caused a dramatic drop in electricity demand for several years, which resulted in severe generation overcapacity (Soontornrangson *et al.*, 2003). The importance of decentralized planning, especially in areas of economic recession, rampant poverty and high unemployment, has been stressed, and scenarios have been identified as a tool to help develop plans and arrive at decisions by considering local needs (Devadas, 2001).

While socio-economic conditions in California are certainly not comparable to Thailand or the situation in Senegal, the state has experienced energy problems similar to

many economically poor countries, including blackouts and high energy prices relative to other goods due to the inadequate capacity of state energy infrastructure (Ghanadon and Koomey, 2004). These types of conditions, coupled with the need to develop methods and techniques to share existing information, determine concerns and needs, and outline desired outcomes, has led to scenarios being identified as a prime exploratory tool to consider long term energy planning options in California (Ghanadon and Koomey, 2004). The tool was able to connect available information to include immediate concerns and future outcomes, and helped facilitate organizational learning (Ghanadon and Koomey, 2004).

The previous case examples indicate that qualitative scenarios have potential in energy sector planning, particularly in economically poor countries. However, based on their experiences, the researchers involved have also identified areas where the tools need improvement. It is stressed that the final step of documenting the final ideas and drafting the scenario narratives is highly important and is often neglected (Soontornrangson *et al.* 2003). When participants are not given adequate time to record all the ideas, when the group disbands, much of the information may be lost (Soontornrangson *et al.* 2003). Moreover, the stories can easily exceed the limits of reality and can go too far to the abstract (Ghanadan and Koomey, 2004; Soontornrangson *et al.* 2003). Ghanadan and Koomey (2004) stress that explicit assumptions of the research should be made clear to all participants involved and concrete indicators, such as economic factors, should be included in the contextual narratives. As aforementioned, organizational culture with linear and hierarchal management and ingrained conventional planning based on historic

trends poses a large threat to the successful use of scenarios since it may impede the creative process (Soontornrangson, 2003; Bunn and Salo, 1993).

The recent publications of scenario use in the energy sector in Thailand, India, China, Mauritius, and California have made important contributions to furthering the understanding of the benefits and pitfalls of the tool in energy sector applications. However, despite repeated calls for detailed research into the efficacy of the technique, procedural analysis and inclusion of the voice of participants (Burt and van den Heijden, 2003; O'Brien, 2004; Hodgkison and Wright, 2002; Bunn and Salo, 1993), the literature remains deficient in these areas. The accounts of scenario use in the energy sector do not extensively discuss the procedural elements or mention the perceptions of the people involved. Scenarios were touted as a beneficial exploratory and analytical tool to explore energy choices and enhance organizational learning in California (Ghanadan and Koomey, 2004), yet a systematic analysis of the process, and comments on the ease of use, or the experiences of the participants were not included. The research by Weisser (2004) in Mauritius has made an important contribution to both energy poverty and scenario research, by stressing the importance of the link between energy needs for development, and the need for local, regional and national level involvement. The research strove to learn more about behavioural aspects and the interaction of the various factors involved with renewable energy options in relation to policy making through the use of scenario planning (Weisser, 2004); however the perceptions of the local people were not reflected in the synopsis. The use of scenarios in micro-level planning in India claims to take advantage of the fact that location specific characteristics, and local knowledge and experience can be included (Devadas, 2001). While this research did take

steps to outline procedural steps of the research from a methodological perspective, the involvement of local stakeholders was not well documented. In order to determine the effectiveness of each step of the scenario process, it is helpful to know what ideas were generated and understand the perceptions of the actual participants.

Detailed accounts of the use of scenarios in energy sector planning in economically poor countries are needed and the voices of the participants need to be included. Systematic analysis of the efficacy of the tool would benefit future practitioners of the increasingly utilized tool, by enabling further refinements to the procedures and methodological details (Chermack, 2004). The final results and evaluation also add credibility to the decision making process of organizations. A copious literature exists that review the benefits and weaknesses of the use of scenarios, yet a literature describing, critiquing and suggesting improvements to the processes is not readily available (Chermack, 2004). Analysis of failures is also important and to date has been very limited (see Hodgkison and Wright, 2002; Phelps *et al.*, 2001). The recent support for the tool in organizational learning (van der Heijden, 2004, Schwartz, 1996) is encouraging, but supporting evidence is needed. The efforts by Chermack (2004) make an important contribution in detailing steps required as part of a process to determine whether scenarios can actually meet the various documented claims. This present study aims to provide an analytical account of the use of scenarios in the energy sector and contribute to the literature by including direct perspectives of participants, commenting on procedural elements and experiences, and commenting on the efficacy, simplicity and cost effectiveness of the tool.

3.4 Conclusion

Scenario planning originated in a military venue but has since evolved to become a useful tool for the private and public sector, as well as NGOs. While scenarios can be either quantitative or qualitative in nature, this chapter focused on the latter. The definition of scenarios was discussed and described as the drafting of future possible sequences of events and conditions for the purpose of better informing decision makers and taking into account uncertainty. Scenario planning was emphasized as only one component of strategy development. The chapter then explained the different formats that have been used through time, including the use of scenario workshops which allow for ideas to be created through the interactions between diverse participants. Case examples of scenarios were summarized to demonstrate the strengths and benefits of the tool. Specific strengths included the tool's ability to benefit from collective intuitions, change mental maps, and enhance organizational learning. As can be expected, using scenarios in some circumstances has limitations; thus, weaknesses of the tool were discussed and included the difficulties with measuring results, problems encountered when moving from scenarios to policies, and the challenge of having a futuristic type of thinking accepted by organizations. To maximize the benefits of the tool, the chapter explained the study design modifications that can be made to compensate for potential concerns, such as allowing ample time for drafting narratives, setting clear and realistic goals, and ensuring stringent facilitation. Next, past experiences of scenario use in the energy sector and its potential effectiveness in economically poor countries were addressed, particularly the tool's ability to take into account unforeseen events in rapidly changing environments.

One of the major gaps in the literature surrounding this entire review is the lack of a complete analysis of the efficacy of each stage involved in the scenario process. This chapter discussed the fact that very few authors have documented the pros and cons of the application of the tool in their specific circumstances. The difficulties this presents for future users needing to understand how well the tool works at each stage and the potential problems that can occur during the individual stages were then reviewed. Finally, the chapter concluded that the literature does little to provide a "voice" for the participants who were involved in the process, which decreases the 'learning value' that previous experiences can provide for future users of the tool. This research attempts to address that gap.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

The central focus of the research was to document and interpret perspectives of a group of policy and research professionals from Dakar, Senegal, while evaluating the use of scenarios as an exploratory tool for this interpretive process. In this chapter an explanation is provided of the ontological, epistemological, and methodological position of the research paradigm chosen: constructivist theory. Next, the chapter discusses how qualitative rigour was established and provides descriptions of the five data collection strategies: 1) document research, 2) participant observation, 3) focus group research, 4) semi-structured interviewing, and 5) questionnaire surveying. The methods of the research phases are then detailed. Finally, the chapter discusses the methods for data analysis for both the scenario results and the evaluation of the scenario process.

4.2 The research paradigm

This research was guided by constructivist theory. The aim of the inquiry was to interpret, understand, and reconstruct the constructed views of reality held by a select group of people. Ontological assumptions include the notion of relativism and context-specific social construction. The relativist position involved with this research included accepting that realities are socially constructed under specific local conditions (Riley, 2000). The research hinges on the belief that social phenomenon and their underlying meanings are in a continuous state of change and revision due to the interactions between the various individuals and groups intimately involved with the subject studied (Grix,

2002). Hence, it is also accepted that the social constructions are alterable, and may or may not be shared across groups or cultures. Furthermore, personal sensory experience is recognized as forming the basis from which meaning of the world is constructed (Riley, 2000).

The epistemology involved with this constructivist research is subjectivist. It is recognized that as a researcher, I am interactively linked to the subject of the study and participants involved. The knowledge derived from the study is the result of transactions between researcher and participants, in addition to document-based research. Human interpretation enables a form of reality to be constructed, but an absolute or objective value of reality and knowledge cannot be determined (Riley, 2000). It is recognized that the research involved a two-way exchange of information and ideas between the actors involved, and that social interaction is a key component to accumulating knowledge, which is a shared, rather than an individual, experience (Doolittle, 2000). Furthermore, it is accepted that the research is bound to a place and time since it was constructed within a specific socio-cultural context (Riley, 2000).

The research is largely based on a dialogical/dialectical methodology (Guba and Lincoln, 2004). This approach was chosen since multiple dialogues between the researcher and participants formed the basis of the inquiry, and individual constructions were elicited through this interactive process. Dialogical methodology stresses the importance of interaction and participation, in addition to the creation of an atmosphere of openness and respectful inquiry (Guba and Lincoln, 2004). Through a process of dialogue, in addition to document analysis, contradictory values could be dissolved and a

complementary whole formed, which can help form a rich synthesis of ideas that reveals underlying assumptions of a reality (Elgarah *et al.*, 2002).

4.3 Towards constructivist research

All qualitative research has been shaped by positivist and post-positivist traditions (Denzin and Lincoln, 2000). The positivist framework includes the view that the purpose of research is to critically study, capture, and understand reality, and a strong emphasis is placed on the verification of theories (Denzin and Lincoln, 2000). Positivism typically includes the presumption of an objective standpoint and the goal of isolating and identifying specific cause and effect relations. Post-positivism eventually emerged and offered some flexibility in research, due to the belief that complete objectivity is nearly impossible to obtain in qualitative research and the interpretation of data may only lead to approximations with limited application. However, the positivist and post-positivist perspectives did not prove flexible enough for some researchers, and during the 1960s several new frameworks started to emerge as alternatives and critiques of the 'traditional' emphasis on science, technology, rationality, scientific method, and reason (Creswell, 1998). This marked the beginning of the postmodern era of research.

Postmodernism became prominent in the 1970s and involves a diverse range of theoretical approaches (Creswell, 1998). Approaches that come under the banner of postmodernism include: constructivism, phenomenology, semiotics, deconstructivism, grounded theory[4] and neopositivism (Creswell, 1988; Denzin and Lincoln, 1998b). As previously mentioned, a constructivist research paradigm was chosen for this study. Both

[4] Grounded theory is considered related to postmodern theory according to some researchers (see Annells, 1996), for others it is believed to be more closely linked to positivist and post-positivist methods (see Gephart, 1999)

phenomenology and grounded theory were also considered as frameworks, but the elements of constructivism best suited the scope of the research.

Phenomenology is a research framework that seeks to understand human experience and involves attempts to make implicit structures explicit (Saunders, 1982). While it considers multiple subjective realities, constructivism focuses on mutual constructed realities, which is much more suited to scenario based research (Creswell, 1998). Unlike phenomenology, constructivist research involving groups has the advantage of benefiting from intersubjectivity, including the value created from the experiences developed through relationships and the interactions of the subjects (Fisher, 1999). Finally, as opposed to phenomenology, the concept of an ultimate reality does not exist with constructivism, which is an accepted tenet of this research (Guzzini, 2000).

Grounded theory hinges on the premise that data collected in the field serve to 'ground' theories by the inherent comparisons made by the data collected by various means (e.g. interview, participant observation, survey, literature) (Glaser, 1992). Similar to constructivism, the central aim of grounded theory research is to understand a research situation by considering the emerging data (Glaser, 1992; Creswell, 1988; Glaser and Strauss, 1967). Where grounded theory and constructivism differ is in the position of the researcher and the incorporation of 'scientific rigour'. Grounded theorists strive to set aside theoretical ideas and approach the research objectively, whereas the constructivist acknowledges subjectivity (Denzin and Lincoln, 1998b). Furthermore, grounded theory is reliant upon some degree of quantifiable 'scientific rigour' evident by its systematic structure which includes an emphasis on data coding and categorization (Fontana and Frey, 1998).

Constructivist theory is a substantial departure from 'traditional' research as attempts are made to divert from pure logic and empiricist methodology, to focus on understanding the 'meaning' of social phenomena and recognize the inherent subjectivity of the research perspective (Schwandt, 1998; Berger and Luckmann, 1966). It is recognized that human beings construct and organize their everyday life through intertwined streams of consciousness and constructivist research strives to understand the complexity of situations through experiences of interaction (Guba and Lincoln, 2004). Rather than capture and objectively describe subjects and situations as with positivist research, constructivism interprets findings as they are "created" throughout the research process (Guba and Lincoln, 1998). Constructivist research has been used in public policy and international relations research and offers a method to present alternative views to policy work not covered by mainstream and traditional positivist research (Hopf, 1998).

4.4 Research design

This study was undertaken without an overt hypothesis and focused on studying and documenting West African perspectives on energy issues. By capturing one constructed representation of these perspectives, the intention was to better understand current problems and to move towards change in future ways of thinking, while investigating the applicability of scenarios as an exploratory tool.

The research was designed to include four phases (preparation, testing, data collection and data analysis) and utilized five data collection strategies (document research, participant observation, focus group research, semi-structured interviewing, and questionnaire surveying). Due to this combination of data collection strategies, the research was subjective. A close link was formed between the researcher, research

subjects, and the topic of energy poverty, as a result of the extensive literature review and exploratory field season, which involved participant observation and allowed for substantial exposure to various opinions on energy poverty.

The focus group workshop, and specifically the objective to create scenarios, was a creative process that aimed to create multiple speculations on the future through the inclusion of the voices and opinions of the participants of the study. An important point to note is that in this study, the researcher *worked with* the participants, rather than *used* the participants (Pile, 1991). With this type of interpretive fieldwork, complex and unstable social and intersubjective power relations are involved (Pile, 1991). For example, in the focus group research in Senegal, I was an active observer, yet also an "outsider" with recognized presuppositions, which created several layers of relationships between both the participants themselves, and between me and the participants.

The research process utilized a systematic "step-by-step" approach; however flexibility was crucial to permit differences of opinions to be debated as they surfaced. The information created throughout the scenario process, and the points of debate were recorded while recognizing the presence of intersubjective relationships. The "voices" of the participants were included in the research to add context and to reflect the multiple perspectives present among the group. An evaluation of the scenario approach was completed by the participants (survey), the researcher (participant observation), and my research colleague (semi-structured interview).

The various perspectives documented on energy poverty issues in Senegal through the focus group and scenario creation process were accepted as context-specific and group-specific. It is accepted that the documentation of the research cannot fully

capture and articulate all nuances present during the workshop activities; however, it is believed that the documented results provide an accurate reflection of the consensus of ideas.

4.5 Ensuring qualitative rigour

The rigour with which this study was conducted and the recognition of intersubjective relationships were both factors in ensuring that the research was valid. Developing and maintaining rigour, or trustworthiness of the research, was of paramount importance to this qualitative study (Sharts-Hopko, 2002; Eyles and Smith, 1988). The concepts of credibility, confirmability, and transferability were used to develop a criterion in which the rigour of the research could be evaluated (Baxter and Eyles, 1997). To add credibility, or 'truth' to the findings, the research methods were triangulated; that is, focus groups, surveys, and participant observation were all used, and the workshop results were also presented to the participants to verify their accuracy (member checks) (Sharts-Hopko, 2002; Denzin and Lincoln, 2000). Triangulation can be defined as a method of crosschecking one source of information by comparing it to others and ensuring that underlying factors are not confounding the data (see for example, Fetterman, 1989). Confirmability, or the adequacy of the reported information, was also enhanced through triangulation and the development of an "audit trail", in which all field notes, process notes, participant produced materials, photographs, summaries, and synthesis notes were analyzed and retained for future reference (Sharts-Hopko, 2002). Transferability was achieved by including sufficient information about the context of the research and the participants to ensure that the findings could potentially be applied to other settings in the future (Walker, 1985).

4.6 Data Collection Methods

The different data collection methods used in this study included: document research, participant observation, focus group research, semi-structured interviewing, and questionnaire surveying. The focus group workshop was the primary source of data collection. The methodological process was additive since with the completion of each method, or stage, resulting insights were incorporated into the design of subsequent stages. For example, the literature review and participant observation were essential to the progress of the research as they helped with the process of designing an appropriate focus group workshop format and subsequent questionnaire style surveys. Then the questionnaires and a semi-structured interview were utilized to collect information to evaluate the workshop process and profile the participants.

The field work included two separate trips to Dakar, Senegal, totalling six weeks. After the preliminary exploratory trip, participant selection criteria were developed and included age, professional experience and specialization, level of education, and gender, in order to form a diverse group of participants for the scenario workshop focus groups sessions. During the focus group sessions, the participants were engaged for approximately 16 hours. The guiding procedures and the conversations and materials produced during the scenario building process were recorded and described. Where possible, translations of direct quotes from French to English were included to ensure concept and ideas were represented in the participant's own words.

4.6.1 Document research

Document research can be simply defined as the use of 'texts' to gather information and perspectives on a central topic (Forbes, 2000). The use of documents

has often been viewed as a method primarily reserved for historians. However, the breadth of its application has increased in recent years. No longer is the definition of a 'text' limited to printed matter such as books or manuscripts; 'texts' now may include maps, diaries, photos and music, in addition to written materials such as academic publications and government reports (Hay, 2000; Denzin and Lincoln, 1998a).

As a data collection strategy, document research has gained credibility in qualitative research circles, for the many advantages that are realized when they contain factual information, theoretical interpretations, opinions on methodologies, and historical perspectives, especially since techniques such as content analysis have been developed to handle the distinguishing features of 'texts' and enhance validity (Scott, 1990). Texts can help the researcher to access subjects that could not be researched directly due to geographical or temporal constraints (Hesse-Biber and Leavy, 2004; Hoggart *et al*, 2002). In addition, the method does not have the potential for volatility as with interviews and may allow the researcher to prod more deeply into situations that typically have restricted access, such as policy negotiations. For these reasons, document research is often beneficial in the cross validation of results obtained using other methods, such as interviews or direct observation (Hoggart *et al*, 2002).

In this study, document research was employed in the form of a literature review for two distinct purposes: to understand the concept of energy poverty, and to aid in the development and testing of the scenario method. Energy poverty literature was reviewed to record perspectives of the issue in various geographical locations, including, but not limited to, Senegal and West Africa. The research established a knowledge base that later allowed the researcher to understand and compare the dominant viewpoints that

surfaced during the energy poverty scenario workshop. A literature review of scenario methods was also conducted as a means to survey the landscape of information documented on the development and use of the strategic tool. This information was used to develop the specific workshop format, and later, to analyze the results of the process and evaluate the approach.

4.6.2 Participant observation

The act of observing, "consists of gathering impressions on the surrounding world through all relevant faculties" (Adler and Adler, 1998, p.80). Traditional qualitative research limited interaction with 'subjects', but participant observation emerged in the late 1950s as a means for gathering information while simultaneously interacting with participants. Participant observation can be defined as the process of observing and recording events for scientific and other purposes, by immersing oneself in the subject being studied (Denzin and Lincoln, 2000). The principal purpose behind participant observation is to 'experience' (Berg, 1989). As a research tool, participant observation does not follow a set of systematic procedures; rather it encourages introspection by the researcher towards his or her relationship with the events unfolding (Kearns, 2000).

Participant observation has been heralded as a useful tool for numerous types of qualitative research. It can be used to observe casual discussions, community celebrations, and professional interactions, and is typically used for studying organizations, organizational structures, and social roles in groups (Berg, 1989). It is also effective in reconnaissance visits to a field study and is often associated with ethnographic fieldwork (Kearns, 2000; Berg, 1989). By interacting with people who are central to the topic or phenomenon of study, while conscientiously observing and noting

such details as mannerisms, customs, clothing, and speech, the researcher may better understand how to relate to the participants. This may increase the degree of success for the research efforts and help frame interview techniques and questions. Furthermore, key individuals may be identified as 'gatekeepers' to help facilitate opportunities for interviews (Kearns, 2000). The research process may help build rapport with 'locals', identify potential guides or informants, and locate subgroups for in depth study (Berg, 1989).

Participant observation has great potential for adding depth and richness to research through its potential for creativity and flexibility to yield fresh insight in a variety of situations (Jorgensen, 1989). However, the technique does have inherent challenges and has been criticized as being unscientific, idiosyncratic and non-objective (Evans, 1988). Validity is one such challenge since the researcher is forced to rely on his or her own perspectives, which will be strongly biased due to subjectivity involved with interpretation (Adler and Adler, 1998). However, the inclusion of quotes to enrich the data, and the cross-checking of information recorded with another observer will help mitigate this potential pitfall. Bias is difficult to eliminate since the very presence of the researcher will have some influence on the behaviour of the subjects. Yet, the researcher can strive to be natural and acknowledge presuppositions and his or her relations to the research subjects to minimize the effects of bias (Adler and Adler, 1998; Evans, 1988). Reliability is another challenge associated with data derived from participant observation. It is difficult to confirm the 'reality' of the data and eliminate the effects of chance (Jorgensen, 1989; Adler and Adler, 1998). Hence, the researcher must recognize that the

findings may only be applicable for one specific group and have limited applications to larger populations.

In this research, participant observation was utilized in two stages. The first opportunity was during the four week exploratory research trip, which placed the researcher inside the host organization, working alongside other researchers with similar interests. Formal interviews were not conducted; instead notes were taken to record perceptions on the work environment, organizational structure and dominant cultural traits. This information was valuable in the design stage for the scenario workshop. Participant observation was again employed during the focus group workshop, to collect information on the effectiveness of the scenario tool. Throughout the two days of the workshop, notes were recorded based on my observations on the process and the interactions between the participants. My research colleague also recorded notes on her impressions to permit cross validation later.

4.6.3 Focus group research

A focus group is a planned discussion with a purpose of obtaining perceptions on an area of interest in a permissive, non-threatening environment (Krueger, 1994). One of the principal reasons behind the development and use of the method was to reduce the strong potential for influence of the interviewer and the limitations associated with closed ended questions (Krueger, 1994). Throughout the 1970s the method was principally used for marketing research; however, during the 1980s, the use of focus groups increased dramatically in numerous fields of research (Cameron, 2000). Focus group research has been used for theoretical applications, such as academic research and theory development and confirmation, and for applied purposes, including strategic planning, needs

assessment, and program evaluation (Fern, 2001). Recently, the method has increased in prominence in exploratory research and phenomenological studies, due to its ability to capture diverse opinions and to observe interactions in a time effective manner (Cameron, 2000).

When organizing focus groups, considerations that may influence group interactions and the quality of the data collected include the physical setting of the workshop, the role and mannerisms of the facilitator, and inter-group demographic and cultural differences. However, structure, size, and time are the most critical factors affecting the success of a focus group. Depending on the research purpose, the size may range from 2 to 30 people; however, most of the literature recommends that the optimal group size is between 4 and 12 people (e.g. Fern, 2001; Hay, 2000; Morgan, 1998; Walker, 1985). In general, the quality of the results decreases with increasing group size, due to a decrease in opportunities for all participants to voice their opinions and the difficulty for the facilitator to maintain a focus on the topic of research.

Group structure and composition is critical, and a balance between homogeneity and heterogeneity must be achieved (Krueger, 1994). Homogeneity permits participants to be at similar expertise, education, and cultural levels for discussion purposes, but it may place restrictions on the range of issues raised and positions taken (Morgan, 1998). Heterogeneity helps to increase the diversity of opinions and expertise; yet, discussions may reach deadlocks due to incompatibilities between participants (Fern, 2001). Participants must be selected by purposeful sampling, ensuring they are chosen based on their ranges of experience and familiarity with the research topic (Cameron, 2000).

Time management is also crucial for success, and the optimal uninterrupted session length is from 1½-2 hours (Cameron, 2000; Walker, 1985). The longer the session, the more difficult it is for the facilitator to sustain interest, but sessions that are too brief do not permit discussions to reach their full potential of productivity (Cameron, 2000). Throughout the workshop, the facilitator plays an important role; he/she must maintain group dynamics and energy, encourage discussion and provide stimuli for the participants (Walker, 1985).

The benefit of focus group research is that the sessions act as an extremely powerful tool that can stimulate energetic discussions through the interactions between group members (Morgan, 1998; Berg, 1989). The method allows research to proceed with a narrow and defined focus and has the potential to produce large amounts of data in a relatively short time when compared to other methods (Krueger, 1998a; Walker 1985). When compared to individual interviews, the focal question(s) may appear simple and easily answered by an individual; yet, when posed to a group, emotions surface and may challenge individual beliefs and responses (Fern, 2001). Further benefits of focus groups include the ability to produce rich, elaborate data, at a relatively low cost, compared to conducting multiple individual interviews (Morgan, 2004; Cameron, 2000). One other benefit to focus group research is the information generated through the discussions is often unique due to the inherently creative properties of the method (Fern, 2001).

While the merits of focus group research are plentiful, some literature criticizes the fact that the strong focus on the 'group' and the wide ranges of opinions present among participants, does not permit the researcher to gain in depth information about one specific individual, or one specific topic (e.g. Morgan, 1998; Walker, 1985). However,

the intention of this research was to understand the opinion of the group, as a group, rather than to find individual opinions. The collective opinion was considered a more accurate reflection of the policy decision-making process.

Focus group research is demanding of the researcher, as it requires a balance of flexibility, objectivity, empathy, persuasiveness and attentiveness (Fern, 2001; Cameron, 2000; Krueger, 1998b). The researcher must balance these skills to ensure all members participate in the discussions, including a participant that may have trouble expressing opinions in front of others, and ensure that one person or small coalitions do not dominate the workshop (Krueger, 1998b). The researcher must be aware of the influence of the dominant group culture, as it has the potential to suppress individual expression and produce artificial responses (Walker, 1985). Trust is essential to the process. To establish a non-threatening environment, the facilitator should control judgment and body language, must focus on listening and observing the attitudes and perceptions that surface, cannot be in a position of power over the individuals, and should probe gently when needed (Krueger, 1998b).

In this study the focus group method was employed during the scenario workshop. The workshop included 22 participants, a number purposefully selected so that sub-groups could be created and facilitated by me, my research colleague and two assistants chosen from the focus group. The workshop was conducted as a series of focus groups, over a two day period, each continuous session or stage lasting no more than 2 hours. The overall group facilitation was conducted by me.

4.6.4 Semi-structured Interviewing

A semi-structured interview is a focused, yet conversational, communication between an interviewer and interviewee (Wengraf, 2001). This open framework method allows the respondent ample time and scope to talk about their opinions on a particular subject (Wengraf, 2001). Semi-structured interviews typically use a guide that includes a list of topics to be covered and explicit research goals are revealed to the interviewee (Fetterman, 1989; Dixon and Leach, 1978).

In this study, one semi-structured interview was used as a cross-validation exercise for the participants' and the researcher's evaluations of the scenario process. The interview was conducted with a research colleague who assisted with the facilitation of the scenario workshop. Open ended questions were utilized and followed a set list of topics based on information and insights gained from the review of the literature, and to ensure consistency with the questions posed to the workshop participants via a questionnaire survey. The questions allowed a high degree of latitude for expansion and original perspectives. To minimize the potential for bias, my own perceptions were not revealed, and questions were carefully selected to minimize my own influence. The one hour interview was conducted at the University of Victoria in a distraction free environment that was chosen by the participant. Notes were recorded throughout the interview and feedback was given at frequent intervals to ensure the accuracy of the recordings.

4.6.5 Questionnaire Surveying

A formal survey, or questionnaire, is considered a type of structured interview, and the most rigid form of information exchange in qualitative research (Dooley, 1995;

Fetterman, 1989). It can be simply defined as a method to learn about people's thoughts and beliefs and gather information about personal history (Weisberg and Bowen, 1977; Moser and Kalton, 1971). Traditionally, surveys have been used to collect data for statistical analysis and as a means to add scientific rigour to research; however, the technique is now used to cover many forms of empirical research, including interviews and 'pencil and paper' questionnaires (Berg, 1989; Marsh, 1982). The actual format of the survey varies considerably depending on the type of research question asked. Questionnaires are a popular format of most survey research and are typically utilized either for description purposes, such as gathering demographic information at a fixed point in time, or for experimental purposes, which may include checking for opinions or support of an idea (Fink, 1995; Moser and Kalton, 1971).

Granted, the use of surveys must be approached with caution. Questionnaires often use structured questions, and this contributes to the development of a distance between the researcher and the respondent (Smith, 1989). Furthermore, the lack of opportunity for immediate clarification of questions, as with semi-structured interviews, enforces the need to consider context during data analysis (Fetterman, 1989). The weak stature of surveys as a credible qualitative research methodology has been documented (Fetterman, 1989; Hagburg, 1968). However, with careful question design and diligent administration, surveys are viewed as an efficient means to obtain remote data collection (Moser and Kalton, 1971), and are best employed as a complementary tool to other research methods, and are useful for follow-up interviews or the validation of data (Berg, 1989).

The design of survey questions is an important and often difficult task. Discussions with experts familiar with, and separate from, the study can help maximize the effectiveness of survey design (Moser and Kalton, 1971). Open-ended questions have the risk of the respondent deciding on the form, detail and length of the answer, but this very freedom can yield rich data, including *how* people think rather than just their opinions (Smith, 1989; Weisberg and Bowen, 1977). Narrow, closed questions have the advantage of providing a uniform frame of reference for the respondents and the results may be easy to analyze; however over-compartmentalization of the data is a risk (Dooley, 1995; Moser and Kalton, 1971). Combinations of open and closed ended questions are preferable to maximize the richness of data obtained (Dixon and Leach, 1978).

The design of questions also faces the task of ensuring that a respondent actually answers the question, and does so accurately. Attitudes and opinions are difficult to measure accurately, thus scaling methods, such as the Likert Scale, are often utilized to benefit both the respondent and the researcher (Alwin, 1992). Summated rating scales are used to allow the respondent to indicate their relative degree of an opinion or feeling towards an issue (Moser and Kalton, 1971).

Lastly, question design must incorporate considerations of 'reliability' and 'validity'. To ensure reliability, questions must be carefully worded to avoid ambiguity and must have specific objectives (Smith, 1989; Weisberg and Bowen, 1977). Validity requires that questions actually be measuring something as intended about the topic of interest (Smith, 1989). The potential for bias is not completely removed through questionnaires, since the wording of questions may mislead people. Thus careful

question design, wording, and layout are critical to avoid making some questions or answers more favourable than others (Smith, 1989; Weisberg and Bowen, 1977).

Two separate questionnaires were utilized in the research (see Appendices VII and VIII). The first questionnaire was descriptive in nature and was used as a means to collect demographic information on the participants, such as educational background, nationality, professional experience and age. A second, more extensive questionnaire was administered immediately after the scenario workshop to gather data on impressions and opinions on the scenario method process. This survey focused on gathering data on specific components of the scenario process. The questionnaire formats were varied, and included open, closed and scaled questions.

The draft questionnaires were reviewed by University of Victoria faculty members to evaluate the question design. The surveys were also tested on colleagues and graduate students to solicit feedback on the wording of the questions and the respective benefit of the information generated from each question. This enabled ambiguous questions to be modified and enhanced the validity of the survey. The surveys were still recognized to have limitations in terms of the honesty in the responses received. However, this problem was minimized by guaranteeing anonymity to the respondents.

4.7 Research Phases

4.7.1 Preparation – Exploratory trip and Literature Review

Research was conducted in several distinct phases from September, 2002 until December, 2003. The research began with an exploratory phase prior to the design of the primary data collection method. The exploratory phase consisted of a one month field season in Dakar, Senegal from November 2002 to December 2002 spent with energy

policy researchers at a non-governmental research institute. The purpose of this trip was two-fold: 1) to broaden my understanding of West African energy issues, and 2) to gain a basic understanding of Senegalese culture and the hosting partner institution.

The informal research work conducted in Dakar was facilitated by ENDA-TM and an office space was provided in a downtown office in which their Energy Program is located. This location provided access to senior and junior energy research staff, and a small library containing energy related publications. In addition, the staff helped facilitate information seeking sessions to other agencies located in Dakar. This field season in Dakar was instrumental in obtaining general information and perceptions on energy issues. Participant observation was used and the information gained from specific conversations was not recorded, but rather notes were compiled at the end of the season to document thoughts and to prepare for the progression of the remaining stages of the study.

The review of the literature was a critical component of this research and encompassed two major categories: 1) Energy poverty, and 2) Scenario methods. The accounts in academic literature provided background on the complexities, challenges and benefits involved with using scenarios as an exploratory tool, which was essential in designing the specific approach utilized in Senegal. The review of energy poverty literature enabled current and dominant academic positions on problems and factors involved with energy poverty to be documented. This information was later important during the analysis of the results that emerged during the workshop, and enabled comparisons to be made between the views of prominent academics in the field of energy poverty and those of the scenario workshop group.

While the document review was an extremely helpful tool and building block, published and accessible information on local energy issues in Senegal was limited, and reading documented cultural accounts could not duplicate the anticipated value of first hand exposure. Consequently, informal research was conducted by talking to various researchers and personnel within the host organization to better understand a myriad of topics from energy research challenges, to sources of data for energy related statistics. Particular emphasis was placed on gaining an understanding regarding dominant organizational structure characteristics in Senegal and the type of organizational culture present within the host organization.

4.7.2 Testing – Victoria Pilot Workshop

Following the literature review, various approaches were considered for suitability based on the focal topic, the area of study, and the specific research objectives. A purely qualitative and exploratory scenario based approach was deemed most suitable for the research and the Schwartz (1996) scenario generation approach was chosen as a base template. This approach involves an eight step process: 1) identification of the focal issue; 2) identification of key forces in the local environment; 3) determining the driving forces; 4) ranking of the key forces and driving forces by importance and uncertainty; 5) selecting scenario logics; 6) fleshing out the scenarios; 7) identifying implications; and 8) selecting leading indicators and signposts (Schwartz, 1996). Schwartz's (1996) eight step outline was chosen as an underlying structure for the development of an energy poverty workshop and the outline was subsequently transformed into a practical step-by-step agenda.

In order to test the design of the workshop, a pilot workshop was organized, which served to evaluate the structure of the agenda and the specific techniques used to solicit ideas, gauge the required length of time required to perform group work, and obtain feedback on facilitation skills. The pilot workshop was conducted on May 8th, 2003 at the University of Victoria Graduate Students' Centre. Participants were recruited through an invitation sent by email to established contacts within the departments of Geography, Environmental Studies, and Anthropology. Graduate students, faculty members and professionals were chosen as the target audience due to their familiarity with research methods, availability, and willingness to participate. Out of the 22 people invited, 14 attended the pilot workshop. The group consisted of six geography graduate students, two anthropology graduate students, one geography undergraduate student, three geography faculty members and two professionals from Victoria. The participants wished to remain anonymous.

The workshop agenda was condensed into a two-hour format to focus on the process, rather than the content and production of results (see Appendix I). Since the method necessitated participant familiarity with the focal topic, the pilot workshop was oriented to a Canadian audience.

The focal question was, "What are the factors, key issues and problems (local, national and international) that will influence Western Canada meeting its energy needs in the future?" The agenda involved a mix of individual and group activities and consisted of four distinct stages: factor brainstorming, identification of top ten factors, identification of driving forces/scenario drivers, and scenario shaping. The principal researcher primarily conducted the workshop facilitation, although two participants also

acted in the roles of assistants to help with the facilitation of group work and to take notes on the process. Furthermore, the participants were encouraged to record any comments or suggestions pertaining to the flow of the process and the effectiveness of the techniques utilized throughout the workshop.

Stage 1: The objectives of the research and the specific goals of the pilot workshop were explained to the participants during the introduction, and a set of slides depicting Canadian energy issues were shown without commentary. The purpose of the slide show was to "warm-up" the participants to the focal subject. Once the participants were familiarized with the agenda, the focal question was projected at the front of the room. A booklet of paper was distributed to each participant and they were asked to individually write down five to ten factors they considered to be linked to the question. Subsequently, the participants formed themselves into three groups of four or five people to compare their individual list and agree upon a total of ten top factors. Each of the ten factors was written with a black marker on a 5"x6" white flash card. Finally the groups in rotation presented the various factors, the flash cards were posted at the front of the room, and discussion ensued to determine how to categorize the flash cards. The discussion also permitted duplicate factors to be discarded and new factors to be added.

Stage 2: Once all the factors on the flash cards were organized into categories, each participant was asked to rank and record a top ten-factor list based on importance and influence on the focal question. The participants re-assembled into their small groups and were given a full size poster board, markers and ten 5"x6" flash cards. An overhead of the 'scenario matrix' was projected to the front of the room (Figure 4.1). This matrix was used to permit the participants to organize the factors by relative

uncertainty and importance. The groups were asked to agree upon the top ten factors, write the factors on flash cards, re-create the matrix on the poster board and paste each card on the most appropriate location on the matrix.

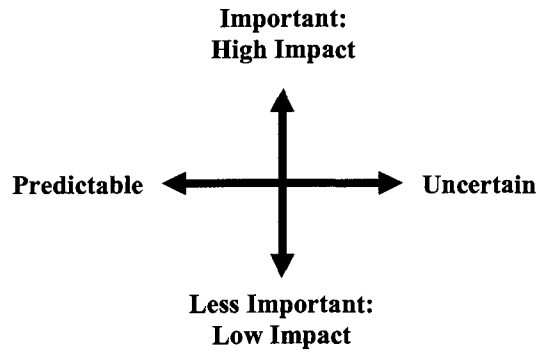

Figure 4.1 Scenario matrix for determining most important and uncertain factors

Stage 3: When each group had completed their matrix, the three poster boards were posted at the front of the room. A 'master scenario matrix' was drawn on a fourth poster board and the entire group engaged in discussion to decide upon the final and relative placement of the various factors in each quadrant of the matrix. At this stage, the time allotted for the pilot workshop was close to being exceeded.

Stage 4: The final and fourth stage of the workshop, scenario shaping, was not completed to permit 30 minutes to be allocated for a group discussion about the workshop methods. Discussion was encouraged between the participants to maximize the detail and richness of the feedback. The comments were recorded by the principal researcher and the two assistants, and subsequently compared and combined into one document for consideration for refining the workshop framework to be utilized in Dakar. Following consideration of this feedback, consultation took place between me and several

recognized experts in the field of qualitative research to ensure the format of the workshop was optimal.

The pilot scenario workshop enabled some of the challenges of the scenario process to be identified prior to conducting the workshop in Senegal. It is recognized that the pilot workshop differed in length and participant mixture when compared to the Senegal workshop, thus direct comparison is not possible. However, the pilot workshop allowed the process and tool to be tested without the need to concentrate on the actual content produced, and the following suggestions that resulted from the pilot workshop were considered when designing the final workshop format:

1) During stage 1 (brainstorming) the participants were initially encouraged to individually record factors, discuss them in group, write the top ten factors on flash cards and then bring these cards forward for discussion and organization into categories. While the combination of individual work and group activities is suggested to improve the flow of ideas (Ringland, 2002), it became evident that the recording process was cumbersome and hindered the flow of ideas. Thus the method was altered. The participants were encouraged to identify numerous factors, while I wrote down the factors on flashcards and posted them at the front of the room. Once all the ideas were recorded, duplicate cards could be removed, ambiguous factors clarified, and the entire collection of ideas organized into major groupings based on input from a plenary discussion. The participants approved of this system and appreciated the opportunity for all their ideas to be recorded and considered during this initial phase. Computer software programs have been recommended to help increase the flow of ideas with individuals and groups novice to scenario workshops (Ringland, 2002). The pilot workshop did not demonstrate any

need for such tools, as even though none of the pilot workshop participants were familiar with the scenario workshop approach, ideas were plentiful.

2) The importance of time management also became very evident during the group sessions, and strict enforcement of time limits, with announcements on time remaining were recommended by the participants to ensure the tasks were completed. The participants also indicated a preference for less individual time for reflection and more group time for discussion.

3) The prioritization, or "ranking", of the factors by group discussion was not effective, as it proved difficult to achieve consensus with the limited amount of time available. One participant suggested an anonymous ranking system that utilized a predetermined number of coloured stickers as a means to indicate the perceived importance of the factors. This suggestion was well received by the other participants, and eventually was refined and adopted for use in Senegal.

4) The use of simplified terminology about the scenario process and stages was also stressed by many of the participants. Confusion arose over definitions of terms such as factors, variables, issues, matrices, and forces. Increasing the level of understanding of the process is recommended by Ringland (2002), and a basic flowchart of the workshop stages was suggested by the participants to help achieve this objective.

5) Finally, the transition from the ranked factors, to the determination of the scenario drivers proved difficult with many of the participants. One of the tools to determine the scenario drivers recommended by Ringland (1998) was the utilization of a scenario matrix (see Figure 4.1). The matrix was explained and templates distributed to the groups, and they were asked to plot their top ranked factors. However, the process was

not intuitive, and the participants could not agree on how to plot the factors, and spent the majority of their group time debating. Further discussion revealed that it would be more time effective to stress the importance of identifying the top factors in terms of importance and uncertainty during the ranking stage, and subsequently further examine the top factors of each group (e.g. socio-economics, technology) and identify barriers and possible "outcomes". This qualitative process would enable a greater range of uncertainties to be considered during the scenario creation stage.

4.7.3 Data collection

4.7.3.1 Participant selection and recruitment

The scenario workshop group consisted of 22 participants from Dakar, Senegal, two assistant facilitators from ENDA-TM, one assistant facilitator from Victoria, Canada and me, the lead facilitator and researcher. Senior staff at ENDA-TM handled the selection and recruitment of the 22 participants, with direction regarding representation provided by the researcher. A general criterion for participant selection and suitability was developed and forwarded to ENDA-TM (see Table 4.1). The participant criteria did not include quotas for specific characteristics, but instead included broad characteristics to ensure optimum diversity in representation for the chosen methodology. Key features for participation included: general knowledge of the concept of energy poverty (academic or professional); familiarity with climate change issues and current events; citizens or residents of UEMOA countries; and knowledge of rural and peri-urban issues such as poverty, energy use, and socio-economic problems. A request was made to strive for equal gender representation and equitable inclusion of people from government, NGOs, and private sector backgrounds. Subsequent email communication ensued with ENDA-

TM regarding workshop logistics, such as participant availability, willingness to participate, workshop location and sector representation. ENDA-TM was chosen to select and recruit participants due to their previous experience and partnerships with various stakeholders, including public citizens, rural and urban non-governmental organizations, government ministries, and bilateral/multilateral agencies operating in the region. Furthermore, ENDA-TM's Energy Program has specific contacts in the Dakar region, with well-established and ongoing relationships.

Table 4.1 Participant criteria and representation goals for scenario workshop

Key feature
General knowledge of energy poverty concept at an academic or professional level
Familiarity with climate change issues and current events
Citizens or residents of a UEMOA country
Knowledge of rural and peri-urban issues, such as poverty, energy use, and socio-economic problems
Representation from government, NGO and private sectors
Equal gender representation

4.7.3.2 Scenario workshop

The scenario workshop was conducted in Dakar, Senegal on May 22 & 23, 2003. The principal researcher conducted the overall facilitation of the scenario workshop. A research colleague from Victoria played a major role in helping coordinate the workshop, assisting with the explanations and translations of the various stages, and documenting products and feedback. Both researchers employed observed and took notes throughout the workshop. Furthermore, two ENDA-TM staff members assisted with the facilitation of group work and were available for consultation about adjustments to the agenda and timelines to best suit the participants. The workshop was predominantly conducted in French, which did not act as a language barrier, since the researcher had previous language training and was at a high level of fluency. English could be used if necessary

to deliver technical explanations since the majority of participants were also fluently bilingual. However, to ensure that comprehension was maximized, the major points of technical explanations were also repeated in French by the Victoria research colleague (a native French speaker).

A structured agenda was prepared for the workshop (Appendix II). A senior associate of ENDA-TM's Energy Programme performed the initial workshop introduction. An explanation was given as to the details and goals of the overarching collaborative research project between ENDA-TM and the University of Victoria, Centre for Global Studies. The scenario workshop objectives were stated in relation to this larger research goal to give the participants an understanding of the practical benefits of the research. Also, an overview was given of renewable energy, the global energy economy, the Kyoto Protocol, and energy poverty. The subsequent delivery of introductory issues was shared between my research colleague, the ENDA-TM assistant facilitators and me. The agenda was reviewed and modified, the balance between French and English was explained, and an overview of the scenario method and its benefits was delivered (see Appendix II). Finally the specific content-related research questions were stated, which included the following: 1) How can energy needs be met in Senegal and other UEMOA countries; 2) What are the barriers to meeting these needs; 3) What are the barriers composed of, and how complex are they; and 4) What are alternative paths and solutions? These questions framed the purpose of the workshop to explore and further understand the issue of energy poverty, and were communicated to the participants to ensure a common goal was shared. The major stages of the workshop are explained in the following sections and detailed in Figure 4.2.

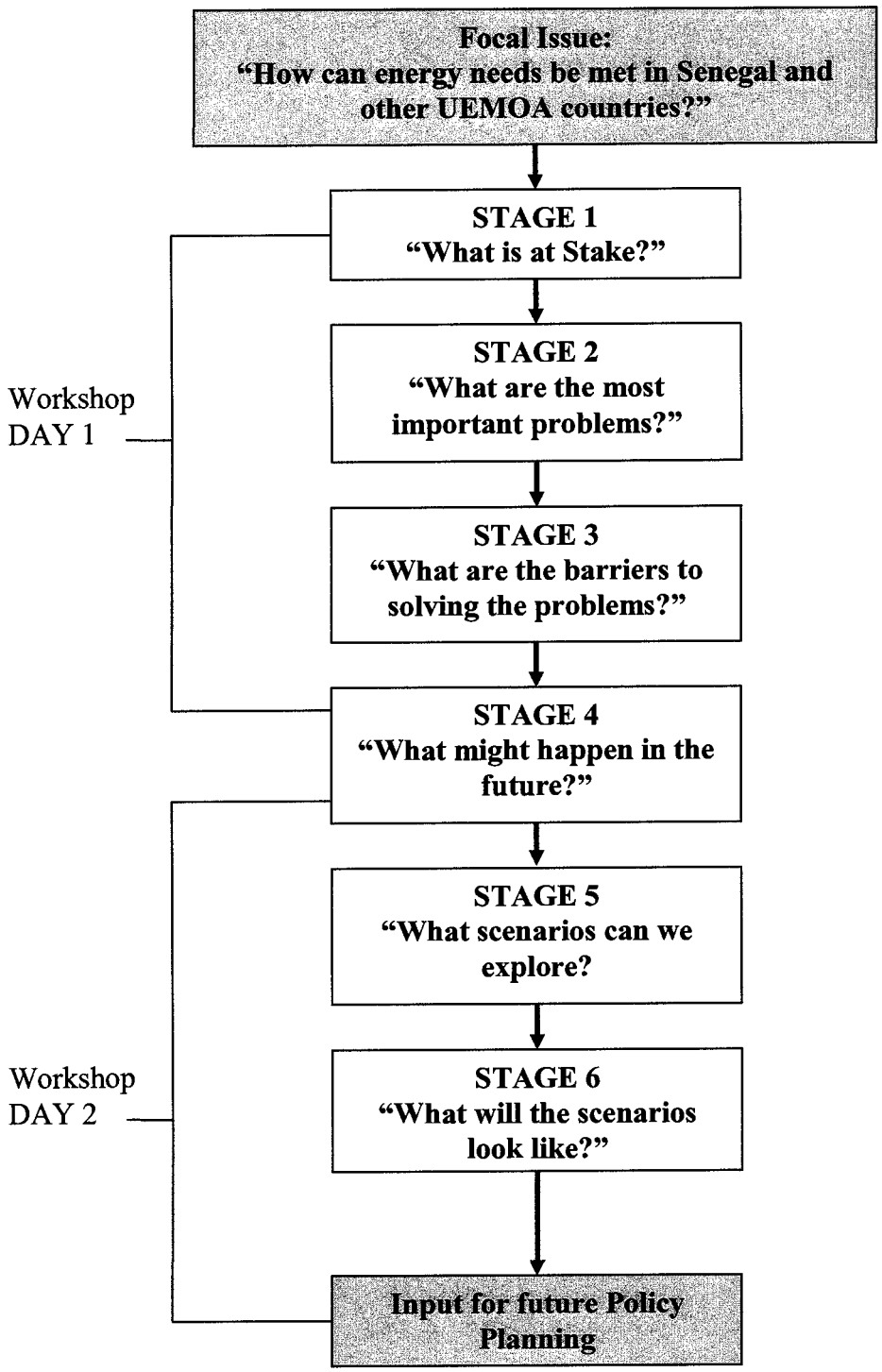

Figure 4.2 Flowchart of scenario workshop stages

Stage 1: The first stage of the workshop was the determination of what can be best termed as defining "what is at stake?" To answer this, two focal questions were posed. First, "what are the key problems with respect to energy in Senegal?"; and second, "why can't these issues be solved?". Further questions were asked verbally to encourage and provoke thought, such as: "what kinds of energy are actually needed?"; "how important is energy?"; and "if we put solar panels in a village to supply electricity, will this make a difference?". To 'warm-up' and increase familiarity with the issues, the participants were asked to take five minutes to discuss these questions with their neighbour. Next, a group discussion was conducted and all ideas were recorded on 6"x8" flash cards with large felt markers by the principal researcher and research colleague. As the ideas were recorded, they were taped to 4' x 6' moveable board at the front of the room. Once the frequency of new ideas decreased substantially, the individual cards were grouped into categories. Discussion was encouraged to determine which ideas were related, to eliminate duplicate cards, to clarify specific ideas, to add new ideas and finally to determine major categories. Consensus was used to determine the final number of categories as five, and when conflicts arose as to the location of some ideas, a duplicate card was created and the idea was placed in two or more categories. The cards in each category were physically moved together and a name was assigned to each category.

Stage 2: Stage two involved determining what the participants considered to be the most important problems out of the results of the brainstorming session. To achieve this, each of the five categories had the individual flash cards taped to a poster sheet, and all five categories of ideas were affixed to a 4' x 4' rolling presentation board. Every card of each category was assigned a number, and each category was given a letter.

Subsequently, the participants were given a sheet of 15, ½" circular stickers and a worksheet (see Appendix III), and it was explained that a maximum of three stickers could be used as 'votes', all for one idea, or split between two or three ideas for each of the five categories. The number of stickers placed beside the numbered idea indicated how important they perceived the idea to be. The worksheets were collected, shuffled, and passed back out to the participants, ensuring that each participant did not hold their original worksheet. Another sheet of 15 circular stickers were distributed to each participant, and they replicated the corresponding 'votes' from the worksheet to the flashcards at the front of the room. Next, each category of flashcards was separated, and the participants were asked to form into groups. Self-selection of groups was permitted to allow the participants to choose a category based on their experience, expertise and interest. Redistribution of names was needed to ensure each group had a minimum of three and maximum of six participants and two categories were combined to yield a total of four groups. The groups separated and decided on the two top ideas based on the number of votes and further clarification of the ideas. The top two 'problems' for each category were written on a poster board and pasted beside the original flashcards.

Stage 3: The third stage was entitled "What are the barriers to solving the problems?" and involved group discussions to agree upon the embedded barriers to each of the top two problems for each category. The groups formed to decide upon the top two problems were retained and one hour was allotted for discussion. Three questions were projected at the front of the room to stimulate and focus the discussions: "what are the embedded barriers?"; "why is the barrier present?"; and "what are the root causes of this barrier?". The groups were instructed to agree upon two barriers for each of the two

problems and record comments and issues raised during the discussions. The instructions were also projected at the front of the room, and the participants were given a transparency template to follow for presenting the results of their discussions (see Appendix IV). The template was also recreated and completed on large poster sheets by each group. After an hour of discussion and preparation time, each group presented their results to the plenary, including: the barriers to each problem, the means by which they agreed upon the results, and contentious issues that arose during group discussions. Questions were fielded by the plenary to each group and the comments and answers were recorded. At the termination of this stage, all notes recorded by individuals during the group work were collected for future reference by the researcher.

Stage 4: Stage four marked the beginning of the highly creative component of the scenario method. The poster sheets with the problems and barriers decided by each group were affixed to the walls of the conference room. Each participant was given three worksheets to be filled out for each grouping except their own group. The worksheet templates consisted of spaces to write the problems and barriers already agreed upon, and additional spaces were allocated for writing down possible 'futures' for each problem/barrier combination (see Appendix V). In addition to a thorough explanation of this phase in both French and English, two questions were projected at the front of the room: "Look in the future 30 years from now – what could this issue look like?", and "Now think about the complete opposite, what could this scenario look like?". After 30 minutes had elapsed, another statement was projected: "Look again – check to see that your possibilities are indeed different". All the completed worksheets were collected and subsequently organized by grouping. This marked the end of day one.

Day two commenced with a review of the results created during the first day of the workshop, followed by a review of the remaining stages to be completed. A revised agenda was agreed upon due to time overruns that occurred during day one and time constraints of some participants. The participants reformed into the same groups from the previous day to complete the remainder of stage four. A total of 42 completed worksheets were collected at the end of day 1, and the corresponding sheets were handed back to each group - resulting in each group having a sheet from each of the other participants, containing notes on what they considered to be possible futures for each of the barriers. Subsequently, the groups were assigned the task of reviewing the individual input and formulating two opposite and highly diverse possibilities for each barrier to the key issue. The groups were encouraged to compose and rewrite the final possibilities to fit the sentence: "How would Senegal meet its energy needs if...?". One hour was allocated for this activity, and the groups were requested to record their products on poster sheets. Each group received between 72 and 96 'possibilities' to review, and had the responsibility to agree upon a total of 8 possibilities: two for each of the four barriers. All poster sheets were collected and taped on one wall of the room in a highly visible position for the next stage. A break was given to the participants to allow them to read and informally discuss the data produced by other groups.

Stage 5: Stage five was entitled "What scenarios can we explore?" and involved creating the outlines for four scenarios. Four blank sheets of poster paper were posted at the front of the room and the possibilities for each grouping were posted on the adjacent wall. A group discussion ensued to determine which possibilities, out of the list of 32, could be linked to create scenarios. The two most extreme scenarios were first created by

collectively agreeing upon and writing down two categories to encompass the major themes within the 'possibilities' on one poster sheet, and their opposites on the second poster sheet. Corresponding ideas from the different categories were added to create two plausible, creative futures. These two extreme scenarios were placed on opposite ends of the display board and the two blank poster sheets were placed in the middle. Further ideas were also chosen from the possibilities identified in stage 5 to fill in the 'gaps' for these two remaining scenarios that differed from the first two to give each scenario distinguishing characteristics. Each skeleton outline was reviewed and the ideas were debated and modified accordingly to ensure that the scenario was unique, plausible, and thematically consistent. The final stage involved naming the scenarios. This was accomplished through a facilitated group discussion and once again creativity was encouraged to yield names that reflected the imagined future and the scenario theme.

Stage 6: The final and sixth workshop stage, scenario creation, was accomplished through group work. New teams were formed to expand upon the scenario outlines and ultimately create detailed narratives. Participants self formed into teams with minimal interference from the principal researcher except to ensure a balance in the number of participants per group. This was effective to ensure the participants would be interested in the topic and participate in the discussions. The expectations of the final product were communicated and focused on key questions such as: "what happens in the future?"; "what problems persist?"; "what changes?"; and "would or how are energy needs met?". Furthermore, it was explained that the stories must be plausible, identify how the future may unfold, and describe how key issues are resolved or left unresolved. Plausibility excluded socio-economic constraints, since some of the possibilities may not actually

happen due to factors such as cultural hierarchy, but they were still included in the scenarios. An overhead transparency was projected to provide a template of the desired scenario format to ensure standardization. Specific requirements included: explanations of how key attributes derived from previous workshop stages will interact within each major category, an outline of key players, a list of notable impacts, and diagrams to illustrate changes over time (see Appendix VI). A copy of this template was distributed to all groups and it was suggested that one group member be assigned the task of recording notes of the discussion to prepare the final narrative. Two hours were allocated for this task, and the principal researcher, research colleague and two ENDA assistants each selected a group to which they joined for the purpose of assisting and providing direction. To remind the groups of the desire for creativity and the future based approach, several verbal clarifications were provided to the whole group at select intervals and a large poster was placed at the front of the room stating, "what will happen if?". To conclude the scenario creation workshop, each group presented their scenario narratives to the plenary and fielded questions.

4.7.3.3 Evaluation survey

At the conclusion of the workshop, a three-page workshop evaluation survey was distributed to all the participants (see Appendix VII). The evaluation was comprised of qualitative questions which covered the participant's familiarity with the scenario method, their interest in the method, their interest in the topic of energy poverty and scenarios, an evaluation of each workshop stage, an evaluation of the facilitation, and recommendations for improvement. A total of 23 questions were posed in the survey:

two closed-ended dichotomous questions, one closed-ended mutually exclusive multiple response question, six open-ended questions, and 13 interval scaled questions.

The two closed-ended dichotomous questions were posed to determine awareness and exposure to scenario modeling. The closed-ended mutually exclusive multiple response question was used to evaluate the preferred length for a scenario workshop in days. The six open-ended questions were posed to solicit feedback on recommendations for determining strengths and weaknesses in the method and suggestions for improving the process. Open-ended questions were utilized to allow the participants to respond in detail to maximize the opportunity to get valuable and useful feedback. The interval scaled questions employed the principles of Likert Scaling, including an odd numbered response scale, to help quantify qualitative factors such as interest level, expertise, or perceived importance (Trochim, 2000). Even-numbered scaling forces respondents to lean towards one end of a spectrum and does not allow for a neutral response (Trochim, 2000). This method was utilized for two survey sections: 1) to gauge levels of interest, suitability, clarity and expectations; and 2) to determine the perceived importance of each workshop stage in reaching the final scenarios. Each question employed five response levels. The scale for the first set of seven question ranged from 'not at all' to 'very', and the six proceeding question employed a range of 'not important' to 'very important'.

The surveys were anonymous and voluntary; thus an opportunity was granted for candid and unreserved feedback. ENDA-TM staff collected a total of seventeen completed surveys. The open-ended responses were predominantly recorded in French and later translated into English.

4.7.3.4 Participant profiling survey

Some demographic details of the participants, such as gender and the organizations they represented were recorded during workshop. However, specific information to profile the heterogeneity of the workshop group was obtained by means of a one-page survey. The survey was distributed directly to each participant via email after the workshop and included a brief cover letter, which explained the intended use and confidentiality of the information (see Appendix VIII). The one page format was chosen to minimize the amount of time required to answer the survey and thereby maximizing the response rates. A total of 19 questions were asked. The survey consisted of six closed and four open-ended demographic questions, followed by nine interval scaled questions pertaining to involvement in specific areas. The closed-ended questions contained mutually exclusive options for basic information such as age, years of professional experience, and type of organization represented. As a means to minimize intrusiveness and maximize the response rate, numerical data was grouped into ten-year increments for age, and five-year increments for experience. Open-ended questions were chosen for information that was difficult to categorize due to different organizational structures in Canada and Senegal, including educational background and principal areas of expertise. For example, many of the participants received formal training through French institutions with accreditation that can only be loosely converted to North American standards. Hence, the respondents were allowed to profile these qualifications with their own words, rather than choosing pre-selected categories from the researcher's perspective.

As with the workshop evaluation survey, Likert Scaling was employed again to estimate the participants' level of involvement for nine one-dimensional factors in terms of low, moderate and extensive. Three levels were chosen to maximize simplicity for respondents and allow for a middle value, such as moderate. This method was chosen to add further depth to the profiles as it introduces a means by which participants can reflect upon their experience levels beyond statistical measures such as the number of years experience in a specific position.

4.7.4 Data analysis

An inductive approach was used for this study, which involved collecting data, analyzing the parts of the whole, and subsequently forming conclusions about the evidence (Lofland and Lofland, 1995). This involved identifying patterns, themes, and categories that emerged from the data during the analysis (Krueger, 1998a). The data were analyzed to produce conclusions about: 1) the scenario workshop results; and 2) the efficacy of the scenario tool. Data used for the analysis included: the final scenario narratives and the results produced during each stage of the scenario workshop, my observations of the interactions of the participants during the scenario workshop, the observations of my research colleague, and the participant profiling and workshop evaluation survey results.

A procedural sequence was developed by borrowing elements from Rubin and Rubin's (1995) 'steps of analysis', theories outlined by Lofland and Lofland (1995); and Krueger's (1998) systematic steps for focus group interviews. A common feature to all the approaches is 'content analysis', which is a systematic process to discover and

categorize themes and concepts embedded in the data (Seidman, 1998). Content analysis was employed at several stages, including:

1) The focus group information recorded on poster boards, templates, flash cards and notes was transcribed directly into electronic format;
2) Copies of the transcriptions were distributed to all participants to permit verification;
3) The various notes were translated into English by the researcher, read and reviewed thoroughly, and noteworthy components were highlighted and coded with handwritten notes;
4) Emergent categories and relationships were identified central to the phenomenon of energy poverty. Diagramming was employed to visualize relationships between categories and concepts;
5) Dominant themes were identified by the researcher and developed into narrative propositions; and
6) The input from local energy research and policy professionals was then compared by the researcher to existing literature.

Throughout the analysis, major categories and themes were established by the researcher. Dominant and representative themes and views were illustrated with direct quotes from participants, where appropriate. I translated the workshop materials from French to English and confirmed the accuracy with my research colleague. Specific details of the data analysis methods for the scenario workshop results and scenario tool evaluation are provided in the following sections.

4.7.4.1 Analysis of scenario results

The analysis of the scenario workshop considered the entire workshop proceedings as a data set and placed equal weight on the information generated during each major stage of the workshop. This analytical approach was complementary to the scenario creation approach used by the participants. All the data were accessible to the participants throughout the workshop, and as concepts evolved participants considered results from prior stages and incorporated previously discussed ideas.

The first set of data from the workshop to be analyzed was the brainstorming and ranked issues. To analyze the ranked voting results from stage two for inter- and intra-category comparisons, the ranked data were standardized. Two factors were addressed in this standardization: 1) the unequal distribution of the number of issues in each category (ranging from 8 to 18) from the categorization process during the brainstorming sessions; and 2) the discrepancy between the number of possible votes available for use in each category and the actual votes made by the participants during the voluntary voting procedures. The standardization formula was: the number of votes received for an issue/(available votes per issue/number of issues in the category). The number of votes given to each participant was three for each of the five categories, and no more than three votes could be within one category. With 20 participants, this equated to a maximum of 60 votes that any issue could have received. The maximum number of votes for one issue (60) was divided by the total number of issues in the category. This generated a value indicative of the number of votes an issue would receive given a random distribution. Subsequently, the actual number of votes received for each issue was

divided by the random distribution value, yielding the standardized value of relative importance for each issue.

Standardization formula $x = \frac{a}{(60/b)}$

x = standardized value of importance
a = number of votes for issue
b = number of issues in the category

The second set of data to be considered for analysis was the barriers connected to the top ranked issues from stage three, and the possible future outcomes if these barriers were addressed in one way or another, or not addressed at all. By means of group consensus, the participants selected the two most important barriers to each issue. Using the input from all participants, the two most extreme, yet plausible, possible futures for each of these barriers were summarized. The analysis then involved a comparison of the issue–barrier combinations that were identified by the participants of this workshop, to the barriers previously recognized in the literature. The document research was limited to articles with a publication date of 1996 and newer, and a total of 16 articles were used. As only one article on energy poverty research in Senegal was found, the search included research accounts, or project findings, in other economically poor regions and countries in Africa and Asia (e.g. China, Thailand, Eritrea, Ethiopia).

It is recognized that limitations exist with this approach of comparing collected data to document research. The various publications were based on a wide array of geographical areas and utilize different research methods to reach conclusions. Each country, and sub-region within the country, may have experienced problems unique to that region. Different research techniques may also yield disparate results. The year of the research may have the potential to bias the type of findings due to unique macro-economic events. However, many of the issues of concern for policy consideration in

literature are based on years of experience researching energy poverty in various economically poor regions (e.g. Karekezi, 2002, Sokona and Thomas, 1999). The articles used were intended to represent a landscape of major conclusions of leading published researchers in the field of energy poverty.

The final set of data considered was the four scenarios that were developed by the participants in stage six. Analysis involved describing each scenario with a brief narrative, identifying common themes and uncertainties that are represented in each scenario, and graphically presenting the relative position of each scenario. Next, quantitative and qualitative indicators, and specific actions or strategies noted in the narratives were isolated and tabulated to further compare the distinct scenarios. Finally, all the data sets were used to elaborate the four major areas of concentration noted during the research process: socio-economics, capacity building, politics & policies, and resource management. This last stage enabled strategies to deal with present barriers, as suggested by the participants, to be highlighted and linked to measurable indicators.

4.7.4.2 Analysis of the scenario tool

The second complete analysis critical to this study focused on evaluating the process of using the scenario tool to determine its efficacy in exploring the topic of energy poverty among local participants. Data from three sources were used: the feedback from the participants (survey results), the facilitator/researcher's observations, and comments solicited from a colleague who was present throughout the workshop and assisted with the facilitation.

The first set of data for this analysis was the workshop evaluation survey results. These results were compiled and calculated to determine the distribution of the responses

and the average values for each of the quantitative questions. Questions measuring the degree of interest, suitability, or satisfaction in a particular aspect of the workshop, and the questions measuring the perceived importance of each workshop stage in reaching the final objectives involved scaled responses from 1 to 5 (1 = low, 5 = high). A formula was used to determine average values for each question: Average = $\Sigma(R \times V)/5$), where - A = average value, R = number of responses for level, V = value for response level. The averaged values and distribution of the scaled answers were considered to draw conclusions about aspects of the scenario process. The answers to the qualitative questions were translated into English and organized by frequency of occurrence. The original wording of general comments and suggestions received were retained to best reflect the participants' intent. The qualitative comments received were combined with the results from the quantitative data to crosscheck validity of dominant viewpoints.

The second data set was the perspectives of the researcher/facilitator. Completing the same evaluation survey that the participants completed would be biased for obvious reasons. Thus, in order to perform a thorough and more objective evaluation, a set of criteria was developed to allow consideration of various factors involved with the scenario development process. The evaluation criterion consisted of the following considerations:

1. Ability to analyze;
2. Ease of facilitation;
3. Time effectiveness;
4. Cost effectiveness;
5. Ability to remove hierarchical barriers;

6. Suitability for promoting learning; and
7. Richness/depth of the data.

It is recognized that other evaluation strategies could be used to contribute to the field of literature, such as empirical research to document and compare organizations using scenario planning to those using other future thinking methods, or evaluating the results generated by the process over the time frame of the scenarios. However, it is not within the scope, or intent of this research to perform time scale analysis, or fully evaluate the results produced by the scenario process versus results produced by alternate methods. Rather, the intent of this evaluation process is to concentrate on a reflection of the process of organizing and facilitating a scenario workshop, and analyzing the results produced from both the pilot workshop and the final workshop, since both workshops provide feedback and insight into the usefulness of the tool.

Finally, the third data set to be considered was the feedback received from my research colleague through the semi-structured interview. The notes made during the interview were typed and categorized into the same seven criteria developed for the researcher/facilitator's evaluation of the workshop. Dominant issues were highlighted and compared to conclusions reached through the analysis of the participants' survey and my own observations.

4.8 Conclusion

This chapter demonstrated the application of the constructivist approach to scenario based research, providing a discussion of the assumptions, methodology and theory behind the data collection and analysis techniques. Data were collected using multiple methods to ensure qualitative rigour, and included document research,

participant observation, focus group research, semi-structured interviewing, and questionnaire surveying. This chapter summarized the history and procedures involved with each technique, and outlined the strengths and weaknesses of utilizing these methods in this study, including a description of the manner with which limitations were met and overcome in the design of this study. The methods and underlying theory of the data analysis were then discussed.

CHAPTER FIVE

PERSPECTIVES ON ENERGY POVERTY AND KEY POLICY ISSUES

5.1 Introduction

This chapter describes the results produced by the collective efforts of the participants during the scenario workshop. The results include insights and perspectives of energy research and policy professionals from Senegal as to the major factors influencing energy access and energy poverty in Senegal. Key problems, barriers preventing progress and future possible outcomes are viewed from four major thematic perspectives identified by the participants: socio-economics, capacity building, governance, and resource utilization. The chapter then highlights the four most highly prioritized issues limiting access to energy in Senegal including the weak purchasing power of the population, the lack of communication and technological expertise, the absence of coherent and voluntary energy policies, and the heavy dependence on external energy sources with the persistence of electricity infrastructure problems. Within the various barriers examined, three key drivers of change included: political action, social cooperation and economic development. The future outcomes of these barriers are then described, which in turn offers a discussion in which to examine the actions and preconditions that might be needed to create an environment that would facilitate and motivate stakeholders to turn theory into action.

5.2 Results and discussion

The following sections provide the results and discussion from each stage of the workshop, including the dominant issues influencing energy access in Senegal, the

barriers to improving energy access and future possible outcomes, and the implications of the barriers for policy development. The scenarios are presented and discussed in relation to the dominant forces and the participants' reactions to the narratives.

5.2.1 Dominant issues influencing energy access in Senegal

A total of 53 key issues relating to energy access were the product of the initial brainstorming session, which were then grouped into five categories that were established and agreed upon by the participants, including: *International Issues, National Politics, Socio-economics, Technology, and Communication/Training* (Figure 5.1). The grouping process was subjective and all decisions of placement were the result of group consensus. To an external reader, the placement of some issues may raise questions (e.g. "strong dependence on biomass" in the *International Issues* category, Figure 5.1); however the principal goal of this exercise was to organize the issues to enable the most important issues to be identified, regardless of the category title. Moreover, the category titles and issues organized within each grouping were further distilled in the later analysis stages. The relative importance of the issues was determined through a structured and confidential voting system and involved ranking the issues. The number of issues within each category varied substantially, from eight in *Communication/Training* to 18 in *National Politics*. This range may be linked to ambiguity or the general nature of certain categories (e.g. *International Issues, National Politics)*, or may also be indicative of the priorities of the group. As described in section 5.2, in order to make meaningful comparisons of the ranks, the total counts for each ranking were standardized. The standardized results demonstrate a wide range of perceived importance regarding issues both within and between categories (see Figure 5.1).

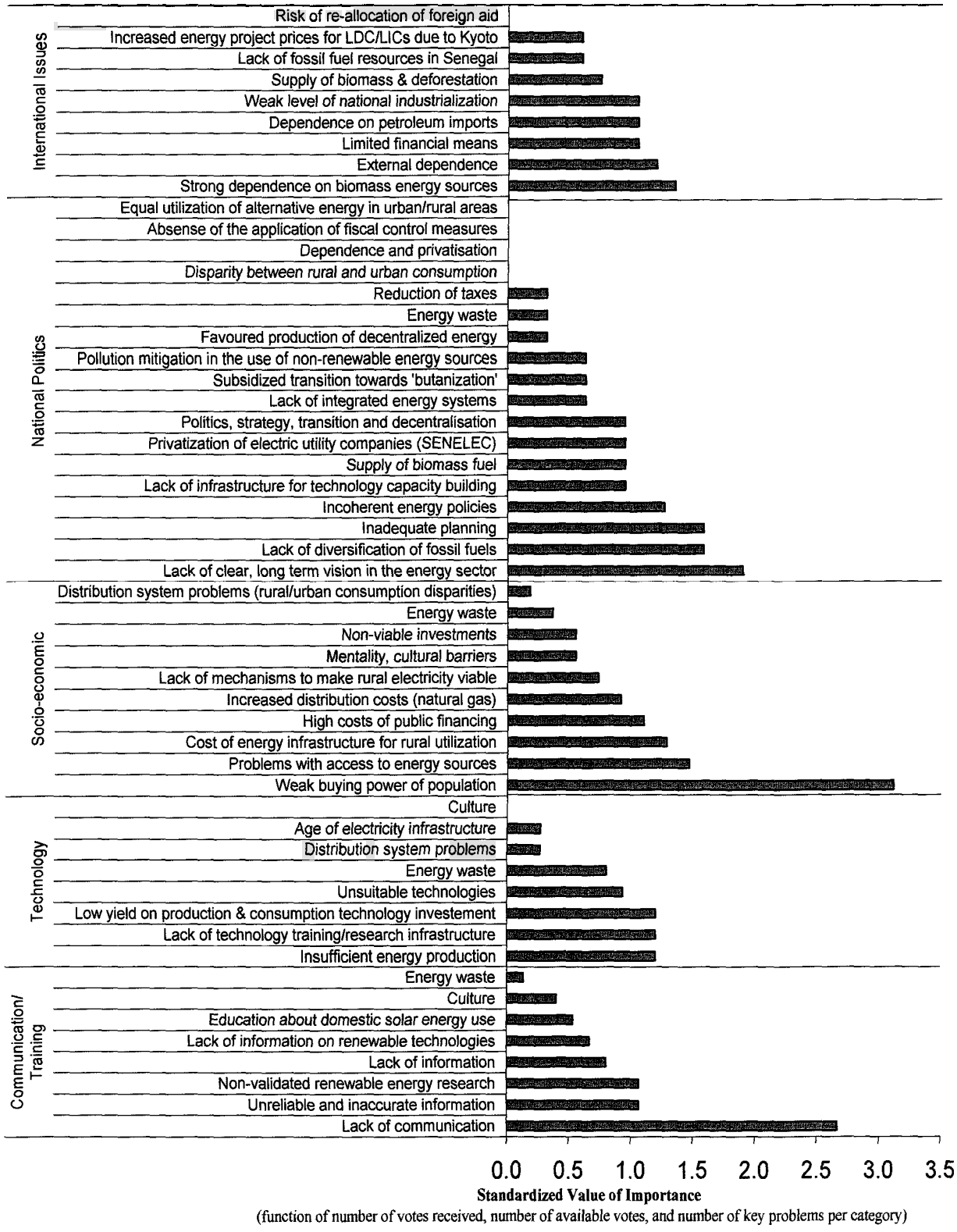

Figure 5.1 Key issues influencing energy access in Senegal

Two key issues surfaced as being substantially more important than others, and both clearly represented the dominant issue within their respective categories: 1) weak buying power of the population (*Socio-economic)*; and 2) lack of communication (*Communication/Training).* Within the *International Issues*, *Technology* and *National Politics* categories, no issue clearly dominated in importance. However, a lack of clear, long term vision in the energy sector (*National Politics*), and strong dependence on biomass energy sources (*International Issues*) were ranked in the top position within their respective categories. The *Technology* category had three issues with values of identical importance: insufficient research production; lack of technology training/research infrastructure; and low yield on production & consumption technology investments. In addition, six issues were raised during the discussion and included on the ballots, but did not receive any vote of importance. These included: risk of re-allocation of foreign aid (*International Issues*), absence of the application of fiscal control measures (*National Politics*), and culture (*Technology*). Out of 53, 19 (36%) issues had importance values above 1.0 and each category had a minimum of three issues that ranked above 1.0 in importance. The maximum value of importance for any issue was 3.1 (weak buying power of population), and only one other issue had a value above 2.0 (lack of communication).

The issues voiced during the brainstorming and ranking sessions reflected the perspectives of the participants and demonstrate what this group of research and policy professionals from Senegal considered areas of high importance for policy consideration. Comparing the perspectives of the group to those reflected in the literature, it was evident that both similarities and differences exist. The two top ranked issues of importance

affecting energy access discovered during the workshop, weak buying power of the population and lack of communication, were also prominent in the literature. The problem of low household purchasing power, and financial access problems related to energy for the majority of the populations in economically poor countries is widely recognized (Diarra and Akuffo, 2002; Karekezi and Majoro, 2002; Wamukonya, 2002; Victor, 2002; Wamukonya, 2002; Youm *et al.*, 2000; Sokona and Thomas, 1999). The problems associated with communication are also well noted in the literature surveyed and the lack of information exchange between various stakeholders, including government, NGOs, communities, and individuals is often cited (Malhotra *et al.*, 2004; Diarra and Akuffo, 2002; Habtetsion and Tsighe, 2002; Wamukonya, 2002; Cecelski, 2002, Turkson and Wohlgemuth, 2001). Most other issues highly ranked by the workshop participants were also well documented in the literature, including data quality and access problems, foreign aid dependence, ineffective government policy and planning measures, lack of technological capacity, and limited access to financing (see Figure 5.1 and Table 2.2, Chapter 2).

While many similarities were found between the workshop results and the literature, some differences did exist. The problem of wasteful energy practices surfaced during the brainstorming session, referring to the inefficient use of existing energy sources such as biomass fuels. However, this issue was not highly prominent as being a major problem in the literature, with the exception of a reference to biomass stove projects that attempt to study, design and distribute new stove designs that utilize fuel more efficiently (Youm *et al.*, 2000). Some participants also discussed the influence of culture on the success of energy projects during the workshop. This issue is not well

documented in the literature, and although the literature emphasizes the importance of local consultation and finding technologies suitable to the local needs (see Malhotra *et al.*, 2004; Cecelski, 2000), it typically does not address the influence of specific cultural norms and traditions in depth. Problems associated with the reliance on imported energy such as oil and gas for countries with weak economies and limited resources have been recognized (e.g. Wamukonya, 2002). Heavy external dependence has been noted to cause balance-of-payment problems, which contribute to fiscal and monetary instability (Commission of the European Communities, 2002). However, the literature does not widely discuss the problems associated with regional energy trade and the integration of energy systems both within and between neighbouring countries, as mentioned during the workshop. Another perspective raised during the workshop that has not been cited in any of the literature reviewed is the potential for international climate change policy, such as the Kyoto Accord, to increase the cost of energy projects in Least Developed Countries. This point was raised by one participant during the brainstorming session and was not carried through to other workshop stages, thus a more thorough explanation of this point cannot be provided. It is possible that this topic will become more widely discussed as further progress is made in breaking the current deadlocks in international climate change policy. Lastly, some participants discussed the problems associated with the lack of available information for end users on renewable technologies, such as domestic solar energy systems. As previously mentioned, communication problems are widely acknowledge in the literature, but the lack of immediate and readily accessible information for local organizations has not been well documented. In addition, it is

possible that the lack of a strong market for PV systems in Senegal, due to financial and technical barriers (UNDP, 2003b) could contribute to the lack of available information.

Just as some of the issues surfaced during the workshop are not well reflected in the literature, the participants did not discuss some issues prominent in the literature. This may in part be due to the geographical energy concerns unique to Senegal, or the current professional priorities of the participants. The issue of the influence of the effects of climatic variability, such as drought and flooding, were not discussed during the workshop. Climatic variability has the potential to adversely affect regional hydrology, which in turn may affect the productivity of agricultural lands and areas supporting woodfuel species, and hydropower generation output (Kituyi, 2001). Senegal relies on hydropower for some of its electricity generation (Youm *et al.*, 2002); therefore changes to water flows could seriously hamper this capacity in the future.

Similarly, civil conflict and corruption are widely cited as being a key impediment to energy project success (Habtetsion and Tsighe, 2002; Victor, 2002; Kituyi, 2001; Turkson and Wohlgemuth, 2001; Cecelski, 2000; Sokona and Thomas, 1999). While the participants did question the effectiveness and coherence of the government in Senegal with respect to efforts concerning energy policies, little mention was made of corruption or conflict. This could be associated with the stability of the country compared to other African countries facing energy access problems (Ford, 2003).

The lack of local financial equity in projects, and the absence of local support and initiative with project design by local communities and individuals have been cited as an impediment to effectively improving energy access in economically poor countries (Karekezi and Kithyoma, 2002). Yet, this issue did not surface during the brainstorming

session. The lack of focus on income generating activities, and the predominance of welfare-based programs has been claimed as problem related to energy project failure. The participants did not directly discuss this factor, although they did often stress weak economic activity as being a key problem related to energy access.

Lastly, the inclusion of gender considerations in energy poverty research is stressed as being a critical component in the literature (Malhotra *et al.*, 2004; Cecelski , 2000; Reddy *et al.*, 1997). Surprisingly, gender was not a dominant factor in any of the discussions by local participants throughout the workshop, which may indicate that locals may not view gender inclusion at the same level of importance as in the literature. However, the need to include females in energy poverty research was voiced by one of the female participants during the early stages of the workshop discussions, but the point was never carried through any of the written documentation stages. The lack of interest in recognizing this issue as a factor may be attributed to cultural gender and hierarchical norms that may have been present among the participants regardless of the facilitator's efforts to encourage equal participation.

5.2.2 Barriers and future possibilities

In the next stage of the workshop, the top ranked issues from each of the previously mentioned five categories were used as the basis for determining prominent barriers that prevented these issues from being solved in present day Senegal. Once barriers were established, participants imagined what could happen in the future for each of these barriers and issues and then selected the two most extreme and opposing possible futures. The barriers to the top issues (and eventually their respective possible future outcomes) were decided by a mixture of individual and group work. The categories of

International Issues, and *National Politics* were merged for discussion purposes due to the overlap between some of the identified issues. While every participant had an opportunity to document their individual ideas on barriers and possible outcomes, each of the four groups were tasked with the responsibility to distil and synthesize the input. It was emphasized to each group that all input should be considered equally; however it was recognized that bias could arise depending on group interactions. Efforts to minimize this effect were made by organizing the groups to represent a diversity of backgrounds, gender, and age within each group. The groups were given leeway to re-formulate the issues as originally written, while not deviating substantially from the quantitative ranking. As a result the issues were refined as listed in Table 5.1.

Table 5.1 Refinement of top issues by participant group work

Category	Original "top issues" (top 4)	Refined Top Issues (used in Table 5.2)
Communications/ Training	Lack of communication Unreliable and inaccurate information Non-validated renewable energy research Lack of information	1) Lack of communication 2) Lack of accurate and reliable data
Technology	Insufficient energy production Lack of technology training/research infrastructure Low yield on production & consumption technology investment Unsuitable technologies	1) Problems with the production and distribution of electricity 2) Lack of technological expertise
Socio-economic	Weak buying power of population Problems with access to energy sources Cost of energy infrastructure for rural utilization High costs of public financing	1) Energy shortage 2) Weak purchasing power of population
National Politics	Lack of clear, long term vision in the energy sector Lack of diversification of fossil fuels Inadequate planning Incoherent energy policies	1) Absence of coherent and voluntary[5] energy policies
International Issues	Strong dependence on biomass energy sources External dependence Limited financial means Dependence on petroleum imports	1) Heavy dependence on external energy sources

[5] The term voluntary has been retained to reflect the original wording and intentions of the workshop participants. Voluntary in the policy context was meant to imply a situation where the action is taken out of free will, without pressure from external agencies such as the IMF or World Bank.

The two top ranked issues in the *Communication/Training* category were retained in their original form. However, many of the issues in the remaining categories were re-worded by the participants to better reflect their priority concerns. Within the *Technology* category, no single dominant issue emerged (Figure 5.1, Table 5.1), consequently the issues used for the discussion of barriers and creation of possible futures appear to have been created by merging the eight separate issues into two dominant themes: infrastructure and technological expertise. In *Socio-Economic*, one issue was clearly dominant, the weak purchasing power of the population, and was retained in its original form. However, the remaining issues, regardless of ranked importance relative to each other, were combined to form "energy shortage" (Figure 5.1, Table 5.1). The issues were combined due to the fact that each was similarly concerned with the condition and costs associated with energy infrastructure and related investment and financing problems. The *National Politics* issue developed as a result of the merging of three of the top four ranked issues, including the highest ranked issue in the category. Conversely, the issue chosen under the category of *International Issues*, heavy dependence on external energy sources, was developed from the second and forth ranked issues. The top ranked issue, strong dependence on biomass energy sources, was not included in the barriers and possible futures discussion even though it ranked first in its category and seventh overall. This treatment can be attributed to the issue not 'fitting' within this category; however it does not necessarily indicate a lack of importance in the overall context.

The variety of barriers that were identified (Table 5.2) is testimony to the complexity of issues that surface when considering the topic of energy access. The

barriers represented were those that were deemed to be most important and highly relevant to the specific issues by means of consensus. Since the barriers represent critical areas of vulnerability, they were then used as the focal point for projecting into the future and postulating possible future outcomes of energy access issues. The projections are represented by the two columns of possibilities and are initial thoughts of how the vulnerabilities may be addressed. The ideas under the column of *Possibility 1* represent the perceived negative future should the barriers or vulnerabilities be neglected and left unaddressed. This was the result of imagining extreme ends of the spectrum of the future, rather than forecasting possible negative outcomes. Many of the possibilities reflect dissatisfactions and warnings for inaction and are very specific. The possibility relating to production and distribution problems and management explicitly states administrative and financial inefficiencies with state managed enterprises (*Technology*). The importance of sub-regional organizations is stressed through the possibility of their disappearance related to the integration of sub-regional energy systems and the dependence on external energy (*International Issues*). In addition, the State is heavily implicated as a key player for governance, leadership and funding.

Table 5.2 Top energy access issues, barriers to overcome and possible futures as identified by workshop participants

Issue	Barriers	Possibility 1	Possibility 2
Communication/Training			
Lack of Communication	Lack of well defined and complementary missions between institutions	Anarchy and research conflicts	The government delegates precise research missions to each institution
	Lack of communication professionals within the energy technology domain	Total lack of professionals within the energy technology domain	Senegal becomes a regional centre for specialized training in information/ communication within the energy sector
	Additional barriers: language, financial means, lack of information networking, lack of capacity building		
Lack of Accurate and reliable data	Erratic collection of data	No collection of data, thus lack of analysis and prognosis	The State purchases data from specialized private firms
	Methodology of data collection/analysis	Anarchy in data collection	Standardization of methods (automation)
	Additional barriers: lack of methodological norms & standards, and expertise in methodological tools, research results not respected		
Technology			
Problems with the production and distribution of electricity	Deterioration of electricity infrastructure	Renovation of electricity infrastructure is slow, demand for electricity increases, frequent power shortages	Renovation plans for electricity infrastructure proceed
	Poor management	The State continues to manage the electricity sector through government owned enterprises at heavy costs	Privatization and liberalization of the electricity sector creating competition
Lack of technological expertise	Inadequate training and education programs	Training is not adequate for the needs of development work	Professional training centres exist, which work in partnership with the North for appropriate technology transfer
	Lack of financial resources for research and development	The government does not provide any funding for research. Universities and research centres are forced to close	Existence of banks, financial institutions and international lending mechanisms - specialized focus on Southern research
	Additional barriers: inadequate transfer of technology into practice at the local level		
Socio-economic			
Energy shortage	Deteriorating and weak infrastructure	Continued aging and degradation	Sub-regional integration that satisfies needs (NEPAD)
	Lack of profitable investment opportunities	Bankruptcy of private and public enterprises	Augmentation of investment rates and returns that are adapted to needs and adjusted to region, good management
	Additional barrier: Weak diversification of energy sources		

Weak purchasing power of population	Weak economic activity	Increased impoverishment, followed by unemployment and a drop in competitiveness	Dynamic and lasting activity in the energy sector, including development and utilization of local resources
	High cost of energy	External dependence	Diversification of energy sources, leading to a drop in costs
	Additional barrier: Lack of immediate action and responsiveness to problems		
National Politics			
Absence of coherent & voluntary energy policies	The government body is not able to make competent decisions	Dictatorship	Appreciation of the importance of the energy sector by decision makers
	Strong external influence (IMF, World Bank) and bilateral cooperation	State with reactive planning lacking long term vision	Elaborated policies by all involved parties
	Additional barriers: poor natural resource utilization and planning, absence of the means to implement plans		
International Issues			
Heavy dependence on external energy sources	Weak development of local resources	Total dependence: lack of efficient technology	Optimal exploitation of fossil fuels and renewable resources
	Poorly integrated sub-regional energy systems	Sub-regional organizations disappear	NEPAD focuses on implementation in the section on energy issues
	Additional barriers: financial means, technological expertise		

The *Possibility 2* column contains positive reflections of the future due to specific actions that address the barriers. Many of the possibilities are core ideas that require further development. They are considerations of the participants that suggest a starting point for action, such as the standardization of research methods (*Communication/Training*), NEPAD focus on implementation issues in the section on energy issues, and diversification of energy sources (*Socio-economic*). Other possibilities are distinct reflections on a desired state to be reached in the process of addressing barriers, such as: Senegal becoming a regional training centre (*Communication/Training*), dynamic and lasting activity in the energy sector (Socio-economic), and appreciation of the importance of the energy sector by decision makers

(*National Politics*). A clear difference exists between the two types of ideas listed under the column of possibilities. However, both play an important role as actions may help achieve visions and the visions are crucial in the process of institutionalizing the actions. Some of the possibilities may create a debate on the effectiveness of the action in addressing the original issue. Privatization and liberalization of the electricity sector creating competition is an example of one such action. Some participants viewed privatization as being a key to improving electricity generation and distribution. Others voiced a concern that the state should have a major role, as heavy private sector involvement would increase electricity rates and make access cost prohibitive for the majority of the population. These types of arguments also exist in the literature (see Turkson and Wohlgemuth, 2001). However, polarization is not necessary, as in many cases the key issue is clarifying appropriate roles for both public and private firms in order to best serve the public.

As discussed in the section 5.2.1, the majority of the results and barriers that were raised during the workshop have been previously mentioned in the literature, and thus the workshop discussion did not reveal an abundance of new information. However, a few barriers did stand out when compared to the literature. The barrier of "weak development of local resources" has not been widely stressed in the literature. This may imply that in Senegal, woodfuel resources may be more efficiently managed, agricultural biogas may be capitalized, and offshore gas development could be encouraged. The collection and management of data and the development of research tools is also a barrier that was stressed during this phase of the workshop. This barrier is only scarcely addressed in the sample of literature (see Amous, 1998a). However, the similarity between the literature

and the workshop findings is an important result. This may demonstrate that the perspectives of the local research and policy professionals correspond well to dominant views voiced by leading academics, and the international journals have accurately captured the essence of local problems. Alternatively, it may be hypothesized that the views of the local professionals are shaped by the international journals.

5.2.3 Implications of the barriers and future possibilities

While many of the barriers recognized by the participants offer further support to existing literature based claims, the documentation of what could happen in the future offers insight as to desirable or disagreeable outcomes from the perspectives of the participants. Many of these future states represent a substantial departure from the status quo. Certain elements are needed to facilitate and motivate change in any environment. Some of these elements underlie the barriers and future possibilities documented and include financial support and stability, social cooperation and power sharing, and political will and strength. In addition, some questions remain, including which actors are implied? What precursory changes are required? What are motivating factors?

For example, data collection and management problems were recognized as a barrier to improving energy access in both the workshop and the literature (see Table 5.2). Moreover, the participants noted that problems might be overcome by the State purchasing data from specialized private firms and the standardization of data collection and analytical methods. However, further questions emerge when contemplating this suggestion. Where do the private firms get the data? Would there be adequate financial motivation and incentives for private firm involvement? Ultimately, the conclusion may be that incentives must be created in order for any agency to collect and manage data,

regardless if they are private or public. In many cases, the primary barrier to change may be the lack of financial resources.

The lack of financial resources was also specifically noted as a barrier for research and development in the energy sector since it limits the ability to increase the level of technological expertise. The "positive" future that was noted during the workshop was the existence of banks, financial institutions, and international lending institutions with a focus on Southern research. Once again, the key point is the access to capital, which leads to questions regarding the incentives that are required for these institutions to fund research activities. Many funding institutions may currently support development projects with the potential for eventual financial returns; however further motivation must exist for financial institutions to fund research.

Another interesting barrier-possibility combination noted in Table 5.2 is the connection between deteriorating or weak energy infrastructure and energy shortages. This connection may be obvious, yet the link to a future state that includes sub-regional integration offers a basis for more detailed discussion. Questions to consider may include: does regional integration imply market integration, expansion and connection between electricity grids, technology transfer between countries? How are these changes facilitated? Besides the considerations needed to achieve this future state, it is also helpful to consider the motivating factors and reasons for such change. It is possible that well integrated energy systems help pool minimal resources, reduce risk and offer better services that individual units can achieve. But how can these separate units be encouraged to collaborate?

Lastly, the absence of coherent and voluntary energy policies was an issue that was prominent throughout the workshop. The government's inability to make competent decisions and the influence of international agencies were quoted by the participants as principal barriers to addressing energy poverty. The participants envisioned a future in which the importance of the energy sector was "appreciated" by decision makers and decisions are achieved through cooperation between stakeholders. Once again, questions surface such as how can political will be created? How can multiple stakeholders be engaged to take initiative and address problems together? While methods and models exist to structure stakeholder consultation processes, the government requires the impetus to take action.

5.2.4 The Scenarios

In the final stages of the workshop, participants discussed all of the possibilities described in Table 5.2, selected those that were considered to be the most highly diverse, and outlined four scenarios that reflected four distinct futures. The key issues, the barriers to addressing those issues, and the possible future outcomes of acting on those barriers were combined to create the scenario narratives. The final result of the workshop included four scenarios of energy access in Senegal, entitled 'Black-out', 'Broken Dream', 'Sweet and Sour', and 'Shining Senegal'. Each of the scenarios describes characteristics, events and actors for a distinct future vision of energy access in Senegal 30 years from the present (see Appendices 10-13). A short synopsis of each scenario follows:

"Adrift (Black Out)"

Senegal falls into a situation of political anarchy. Civil conflict and poverty increase. Shortages in energy are witnessed and externally supplied fuels satisfy primary energy needs. Energy prices are high and local utility companies struggle to provide service to the public. The government struggles to play "catch up" with planning for key human needs, including energy, water, and health. Regional organizations try to address problems but fail to coordinate efforts and pool resources. Due to the political and economic instability in the country, debt accumulates and public and private enterprises start to declare bankruptcy. In response, multilateral and bilateral aid agencies must play an increased role in maintaining some degree of cohesion in society.

"Shining Senegal"

Senegal becomes an economically strong country and a model for governance. The energy sector experiences dynamic changes due to involvement of private investors, the creation of markets, and coordinated government policies. Scientific, technical, and management capacity are increased through networked local and regional programs and training institutions. The improved capacity and inter-organizational networking results in innovative and diversified energy solutions that benefit both the rural and urban populations. Effective resource management reduces the impact of biomass energy use on Senegal's environment. Collaboration between sectors, organizations, and nations yields benefits in multiple sectors (health, water, energy), and ends Senegal's work in isolation.

"Broken Dream"

Senegal does not deviate substantially from its current path in terms of economics, governance, and energy resource management. Visions and proposed solutions are never fully realized. The government attempts to establish a policy environment that would encourage economic development and increased energy access, yet the lack of capital continues to hinder progress. External aid packages such as NEPAD fail to achieve intended goals and fail to have substantial effects on the improvement of the well being (including energy resource access) for Senegalese. In the midst of economic uncertainty, environmental degradation and social tension, some local and grassroots based energy projects emerge, but struggle to improve access for large proportions of the population.

"Sweet and Sour"

Senegal experiences a dramatic withdrawal of private capital. Social and political problems increase, including: overpopulation, health problems, increased crime, and overexploitation of resources. Development aid plays a large role in maintaining some degree of public and essential services. Despite the lack of capital and government support, entrepreneurial spirits are strengthened. Alternative and diversified energy technologies help meet energy small scale energy needs. Regional and national organizations attempt to work together to build local capacity to address immediate energy, health, water, and resource concerns. However, the fragmented structure of government and Senegalese society counteracts the beneficial efforts of these organizations and development projects often end in unsuccessful results.

5.2.5 Dominant forces and relative positioning of the scenarios

While the various combinations of barriers and possible futures could have produced a high number of different scenarios, many of the issues that may have initially seemed unique and important to participants, could be linked to common subjects or uncertainties. Thus, by working with these dominant issues, only a small and more manageable number of scenarios were developed, similar to the recommendations of Wilkinson (1995). The scenarios that resulted from the workshop in this research study have three common and dominant forces that may affect the future of energy access in Senegal (Figure 5.2).

These three forces are highly important and have uncertain future outcomes:

1) the degree of social cooperation;

2) the degree of political cohesiveness; and

3) the status of economic development.

By comparing how these principal forces acting within each scenario helps better understand the required preconditions and context needed to positively affect energy access in Senegal, it is also important to consider the potential roles of various stakeholders. While responsibilities of various actors are not fully elaborated in the scenario synopses presented in section 5.2.4, public and private agencies, in addition to other organizations such as NGOs, research institutes, cooperatives, may all have instrumental roles in controlling the direction of the principal forces outlined. The various uncertainties that helped develop the principal forces are not static, and categorization is difficult. While the uncertainties have been grouped to represent how

the major forces were derived, the boundaries are in fact dynamic and strong links exists between the various uncertainties (Table 5.3).

Table 5.3 Identification of the principal forces for the scenario matrix

Top issues as defined by groups	Distilled uncertainties	Principal forces
Lack of communication Lack of accurate and reliable data Lack of technological expertise Problems with the production and distribution of electricity	Institutional cooperation Regional integration Influence of international community Technology transfer Communication capacity Scientific/technical capacity	Cooperation (cooperative vs. independent)
Energy shortage Absence of coherent & voluntary energy policies Heavy dependence on external energy sources Weak purchasing power of population	Political stability and action Energy resource management Management capacity Institutional capacity	Political cohesiveness (stable vs. fragmented)
	Economic development Energy costs Capital availability	Economic development (improving vs. collapsing)

To better understand and compare the scenarios, they were plotted on a matrix with respect to the three principal uncertainties (Figure 5.2). This matrix contains two orthogonal axes: political cohesiveness (fragmentation vs. stable) and social cooperation (cooperative vs. independent). The third diagonal axis was superimposed on the matrix to represent the dimension of economic development (improving economy vs. collapsing economy). Each scenario is represented by a polygon within a quadrant to indicate the qualitative nature of the forces at work and the relatively "loose" fit of each scenario within the spectrum of each of the three axes of uncertainty.

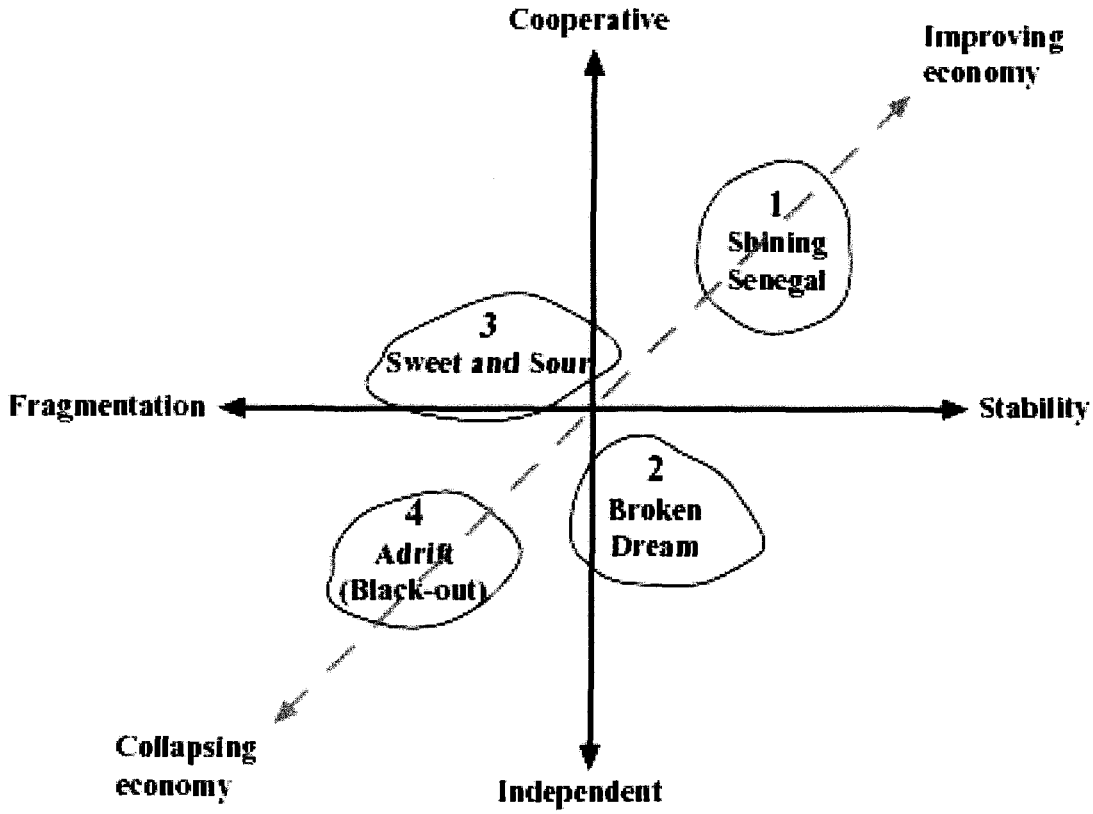

Figure 5.2 The matrix of the four scenarios of the future of energy access in Senegal

The x-axis represents the extreme possibilities of political cohesiveness in Senegal. A principal realm of political cohesiveness is the degree to which political institutions perform according to set norms and rules, and ideological values are satisfied (Minxin, 2000). One extreme of this axis is stability, which represents a society with structure and political institutions with a well-defined scope of authority and norms that are enforceable. These institutions help provide order and plan for present and future needs of the population. Furthermore, political cohesiveness also includes mechanisms to enable representation of diverse interests, power sharing and trust building. "Shining Senegal" and "Broken Dream" are both plotted on the stable side of the cohesiveness spectrum. Both of these scenarios include elements of structured government policy

attempts to address energy access problems. In this case, government institutions would be trusted to operate in the interest of civil society. The opposite end of the spectrum is fragmentation, where state planning is in a state of disarray. The relationships between various state institutions are deteriorated to such an extent that public trust is eroded. External aid may partially dictate the priorities for development. Reactive decisions are made in attempt to solve immediate problems, and a system of functional anarchy prevails. Both "Adrift" and "Broken Dream" are on the fragmented side of this axis, as political institutions are failing and the government is struggling to maintain societal order. This is especially evident in "Adrift", where a situation of anarchy is starting to prevail.

The y-axis of is the character of the social cooperation outlook in Senegal. The extreme of a cooperative society is a situation where energy solutions are orchestrated by the collective efforts of local and regional organizations, and "grassroots" entrepreneurial activities are part of solutions. Integrated regional programs and organizational networking is a principal component of "Shining Senegal", thus it is at one extreme end of this spectrum. While "Sweet and Sour" demonstrates qualities of a cooperative future, yet its position close to the centre of this spectrum reflects the fact that the cooperative efforts are hampered by an instable socio-political climate. The opposite extreme of this axis, isolation, is where cooperation fails, international partnerships are strained, and individualistic efforts dominate. The scenarios "Adrift" and "Broken Dream" are located at the isolation end of this spectrum, reflecting the lack of coordinated efforts between organizations to address energy problems.

The diagonal (z axis) represents the state of economic development in Senegal. Improved economic development would include increased purchasing power of the population, reduced unemployment, and improved access to financing and funding for energy projects. A collapsing economy would be characterized by bankruptcy of business, reductions in the tax base and increases in poverty. As plotted on the graph, as the scenarios move towards societal cohesion and cooperation, improvements are also witnessed in the economy. "Shining Senegal" demonstrates a future with a greatly improved economic outlook in terms of increased purchasing power and foreign investment. "Adrift" represents a state of economic collapse and private capital flight. The two other scenarios, "Sweet and Sour" and "Broken Dream" are both in the middle of this axis, which indicates that the economic situation does not change substantially.

5.2.6 Participants' reactions to the scenarios

The presentation of the scenarios resulted in lively discussions about the particular future visions. In addition to attempts to understand the drivers of change for energy access, the specific thoughts and reactions of the participants is an important aspect of the scenario process. By capturing statements made during the discussion, the participants' voices are heard, which helps add depth and validity to this participatory and exploratory research. The discussions surrounding "Shining Senegal" were especially dynamic. A very optimistic future about energy access and economic growth in Senegal was presented; however, concerns were voiced over the plausibility of the amount of economic growth forecasted. One participant exclaimed in disbelief, "A 10% growth in GDP?". Another participant questioned the path towards such growth, "...this situation has resemblances to South-East Asian countries, is this a model to follow?". This

participant was referring to the "boom and bust" years of economies in Thailand, Malaysia and Indonesia. Conversely, another participant vocalized a concern that a 10% growth in GDP was "...too little for a 'Shining Senegal'". The group responded to apprehensions of the scenario by emphasizing the fact that this was intended to present an extreme future possibility, whilst avoiding probabilities, and claimed that sustained growth in energy supply would complement strong economic growth. The focus on the actual amount of growth demonstrates a difficulty over the quantification of factors within the scenarios. The details of energy provision were also subject to debate. A participant questioned the lack of elaboration on the rural and urban energy solution, and asked, "how are rural energy needs satisfied?". The group responded by explaining that a combination of butane and biomass would serve rural energy needs, and "...with diversification [of energy], people can select by preference.".

The presentation of "Broken Dream" resulted in some confusion being voiced by the participants. Questions were posed surrounding the link between the positive and negative attributes elaborated in the scenario description. The group responded by further explaining that the scenarios "...presented an image of a medicine that alleviates symptoms, but it does not cure [the problems].". Group members emphasized that the negative factors had "more weight", and the positive factors, such as the development of national policies, were not enough to fully overcome the negative attributes. They further elaborated that the "most positive impact is the diversification of energy, but with weak production, the needs are never met.". This explanation seemed to satisfy the participants and further discussion revealed a consensus that the situation may unfortunately have similarities to the current energy situation, or "status-quo" in Senegal. In fact, one

participant provided feedback by email after the workshop indicating the group even considered changing the title "Broken Dream" to "Status Quo".

The group members presenting the "Sweet and Sour" scenario elaborated the relationship of the scenario's key factors and variables in a table format to ensure that effects and consequences were summarized. However, no questions were posed and little discussion resulted, and reasons for this were not evident. The "Adrift" scenario appeared to surprise the audience, since largely negative factors and attributes were associated with this scenario, but the group attempted to include some positive points. For example, civil society was portrayed with a high degree of resilience, leading to the optimization of existing energy resources. The group emphasized the positive results "...are not solutions, rather they are reactions...". The participants applauded the group and one participant's comment summarized the group's efforts, "I find this scenario is well done. Civil society has taken the power in this scenario...when things go wrong at a certain level, civil society will react...". These statements may reflect the perceived benefits of voluntary collective action.

The diverse comments and discussion resulting from the scenario presentations emphasized that each group elaborated their scenarios in very different manners. Some scenarios such as "Shining Senegal" produced a high degree of discussion, while "Sweet and Sour" produced none. The degree of elaboration of each scenario may be a contributing factor. Group dynamics varied greatly, and some groups spent a large amount of time discussing options for the scenario rather than recording the details of how the future will unfold. Regardless, the accumulation of the various scenario notes, in addition to other products of the workshop, yielded a wealth of information on the

group's perspective on energy access problems in Senegal. The subsequent analysis of the results will help isolate some of the key findings.

5.3 Analysis of the scenarios

While comparing scenarios based on the principles of driving forces is helpful to increasing the understanding of the precursors needed for change, it is also important to perform a more detailed analysis of the specific factors within each scenario. To better understand these specific factors, the scenario notes from the participants and observations during the workshop presentation of each scenario were dissected to highlight quantitative and qualitative indicators (Table 5.4). The quantitative indicators extracted from the narratives included any references that possessed numerical measurements or those that had descriptors related to established measurement standards, such as unemployment and level of urbanization. The qualitative indicators included specific factors that are either relative (*e.g.* level of use of technology), involve complex indices (*e.g.* social wellbeing, governance), or are not specific enough to enable concrete measurement (*e.g.* quality of energy services). In addition to the indicators, the scenarios included "actions" required to get from the present to that particular future state. For example, the actions may be specific government action such as the elaboration of energy policies, or actions by organizations to collaborate on developing strategies. These actions are not intended to represent policy recommendations. Instead, they serve as elements that may be part of policy and help draw out major factors to consider.

Table 5.4 Quantitative and qualitative speculations and actions extracted from scenario narratives

	Shining Senegal	Broken Dream	Sweet and Sour	Adrift
Quantitative indicators				
Energy costs (local)	↓		little change	↑
Private sector investment (FDI)	↑	↓	→ eventual increase	↓
Number of local enterprises				↑
Economic growth (GDP)	↑ 4-10%	↓	flat	↓
Energy production		↓		
Energy accessibility (urban & rural)	↑ 90%	flat	flat	↓
Poverty	↓ 50%	↓	↑ (esp. rural)	
Level of urbanization			↑	↑
Unemployment				↑
Comparative value of currency (BCEAO)				devaluation
Qualitative indicators				
Stability in economic climate	Stable	Unstable	Vulnerable	Unstable
Stability in political climate	Stable	Vulnerable	Unstable	Unstable
Dependence on exterior financial support	Reduced		→ eventual reduction	Total
Influence of IMF, World Bank	Weak			Strong
Level of use of technology	High		Increased	
Expertise in management	High			
Expertise in energy sector	High	Medium	Increased	
Vulnerability to adverse effects of climate change	↓			
Governance (good → bad)	Good	Good	Moderate	
Competitiveness (private sector)	↑			
Quality of energy services	High			
Social wellbeing	Good	Moderate	Decreased	Decreased
Level of social services	Good	Degraded	Degraded	Degraded
State of forests	reforestation	Degraded	Degraded	Degraded
Protection of biodiversity	↑	X	X	X
Availability of experts in energy sector	√ (from training)	√ (research)	√ (from where?)	
Existence of information systems	√	X	√	
Condition of energy infrastructure (e.g. electricity)		Degraded		
Actions				
Development of training in energy domain and research	√	√	√	√
Restructuring of financing mechanisms available to the public				√
Economic restructuring				√
Elaboration of energy policies	√	√	√ (through external aid)	
Evaluation of energy policies	√		X	
Exploitation of fossil fuels	Optimal		Pressure reduced	
Exploitation of renewable resources	Optimal		X	√ (forced due to ↑ in fuel prices)

Diversification of energy sources & technologies	√	√	√	
Cooperation with NEPAD strategies	√	X		
Development of N-S / S-N partnerships	√			
Development of energy sector legal/regulatory framework favouring private investment	√			
Collaboration with external agencies	√		√ (energy policies)	
Inter-sector collaboration	√			√
Use of planning in energy sector	√		√	X (reactive)
Development of information systems	√		√	
Government attempts to attract new funds				√
Concentrate on local business opportunities				√
Develop programs with links between energy and socio-economic issues				√
Appeal for debt cancellation or reduction				√
Training in revenue generating activities				

Throughout the tabulated scenario results (Table 5.4), it is evident that gaps existed within some of the scenarios with respect to specific indicators or actions. For the indicators, this is due to the lack of reference to the indicator within the scenario description. In the "actions" section, gaps indicated that no mention of the specific action was documented in the scenario. In some cases a specific reference was made to inaction, such as in "Broken Dream", the lack of cooperation with NEPAD strategies was noted. These occurrences were noted with an "x" in Table 5.4. Some cause and effect correlations could be proposed based on specific actions and results in the form of indicators. However, the information contained in the table for each scenario covers a wide range of sectors, thus it is difficult to isolate any one action as being the sole contributor to cause a change in an indicator. This is exemplified by the action 'development of training in the energy domain and research' which is present in all four scenarios. The consequences of this action could not be isolated due to the interactions and consequences of other factors and the lack of consistency in indicators related to this action. In addition, the presence of multiple gaps in some scenarios made the isolation of

specific actions through cross-comparison difficult. For example, the action "government attempts to attract new funds" was only described in the "Adrift" scenario. Comparing scenarios at this level is difficult because of the inconsistent representation of the quantifiable and qualitative indicators, and actions. Therefore, it is useful to further explore the scenarios by studying a culmination of all the data sets presented thus far.

5.4 Compilation of data sets

After considering the results from each step of the scenario process separately, the overall implications related to policy could be more easily explored when data from each step were combined. Links and similarities between some of the major issues became obvious. Four dominant themes emerged that encompassed the majority of the ideas raised throughout the workshop as illustrated in Figure 5.2: socio-economics, capacity building, governance, and resource utilization. These themes encompass the three principal drivers of change described in section 5.2.5, and the forces are influential to each theme. Lack of communication, lack of accurate and reliable data, and lack of technological expertise all related to the theme of capacity building. The theme of resource utilization included: problems with the production and distribution of electricity, energy shortage, and the heavy dependence on external energy sources. The two remaining issues retained much of their original classification: the theme of socio-economics included the weak purchasing power of the population and the absence of coherent voluntary energy policies is under the theme of governance.

To simplify the results of the workshop for policy makers, the scenario ideas were applied to the four themes to allow more direct connections to be made between the barriers, actions and results (Table 5.5). The issues within each theme remained closely

connected with the results of the quantitative ranking exercise. The combined results helped visualize the effectiveness of the entire process, and identified input that may be useful for energy policy strategists. In addition, a sample of indicators were suggested, which may be used to evaluate the progress of alleviating energy poverty in Senegal.

The material presented is still intended to represent the diverse perspectives of the workshop participants and is not intended as a normative process. The participants specifically focused on examining energy access in Senegal. However, many other sectors such as agriculture and water are related to aspects of the energy sector, and other problems may be higher in priority for government planning. For example, the issue of the weak purchasing power of the population and the high costs of energy are cited as factors that limit energy access. Economic restructuring and development was viewed as a means to overcome these types of barriers. Yet it must be understood that solving energy problems will likely not be the driver of change for economic development and other components of the economy require attention. In addition, political action may not always be rational, and motivational techniques must be included in strategies developed. For example, decision makers must be motivated to "appreciate" the importance of the energy sector and to move towards engaging stakeholders in any future processes.

Table 5.5 Thematic areas relevant to energy access and the sequential development of highest ranked issues

Theme	SOCIO-ECONOMIC		CAPACITY BUILDING		GOVERNANCE		RESOURCE UTILIZATION	
Issue	Weak purchasing power of population		Lack of communication and technological expertise		Absence of coherent and voluntary energy policies		Heavy dependence on external energy sources and the persistence of electricity production and distribution problems	
Future Scenarios	Dynamic, long term activity in energy sector, including decreased energy costs	Further external dependence, increased unemployment and a reduction in economic competitiveness	Senegal becomes a regional centre for information communication training, along with the development of N-S/S-N training institutes, with financing and lending mechanisms	Lack of training and job-flight leads to a total lack of energy technology professionals, coupled with a prominence in research conflicts and lack of funding opportunities.	Decision makers appreciate the importance of the energy sector, and include stakeholder in the development of policies	Short sighted and reactive energy planning occurs by dictatorship	Optimal exploitation of fossil fuels and renewable resources, in conjunction with the renovation and improvement of electricity infrastructure	Total dependence on external energy sources and continued degradation of infrastructure, hence compounding the instability of electricity service
Barriers	-Weak economic activity -High cost of energy -Lack of immediate action and responsiveness by government		-Lack of defined and coordinated inter-institutional missions -Lack of communication professionals within energy technology -Weak availability of financing for R&D -Inadequate training & education programs -Inadequate technology transfer to local level -Lack of data collection methods, expertise, and utilization		-Lack of data collection standards -Government body is not equipped to make decisions -Strong external influence (IMF, WB, bilateral and international private firms) -Poor resource planning -Lack of implementation means		-Weak development of local resources -Poorly integrated sub-regional systems -Weak financial means -Lack of profitable investment opportunities -Lack of technological expertise -Inability of state to efficiently manage electricity infrastructure -High costs involved with state-run utility enterprises	
Actions	-Economic restructuring -Restructuring of public finance		-Development of training and research (energy sector)		-Multi sector energy policy elaboration		-Optimal fossil fuel exploitation -Renewable resources exploitation	

	mechanisms -Government attracts new funds -Concentration on local business opportunities -Development of programs with links between energy & socio-economic issues -Appeal for debt cancellation or reduction -Training in revenue generating activities -Diversification of energy sources * -Diversification of energy technologies * -Development and use of local resources -Development of favourable legal and regulatory framework to encourage private investment	-Development of N-S/S-N partnerships -External agency collaboration -Inter-sector collaboration -Development of management information systems (MIS) -Government delegation of research missions -Government funding for research -Utilization of banks, financial institutions and international agencies for research funding, including the involvement of private firms -Focus on local level technology transfer -Utilization of research, data collection and data analysis standards – see GOVERNANCE	-Evaluation of energy policies -Development of new energy policies -Cooperation with NEPAD strategies -Energy sector planning -Development and utilization of data collection standards and systems	-Diversification of energy sources and technologies -Privatization and liberalization of electricity sector -Encouragement of competition in the electricity sector -Focus on improving management and administration of utilities -Augmentation and adjustment of interest rates and returns specific to regional needs -Focus on NEPAD energy implementation issues -Efficient technologies utilization -Technological training – see CAPACITY BUILDING -Regional integration – see CAPACITY BUILDING -Financial investment and loan mechanisms – see SOCIO-ECONOMIC
Possible measurable results	• Reduction in energy costs • Increased private sector investment • Increased foreign direct investment • Increased number of local enterprises • Increased GDP growth • Reduced unemployment • Stable value of BCEAO • Increased competitiveness • Economic stability • Reduced dependence on external financial aid	• Increased management expertise • Increased research expertise • Improved social services (training/ education) • Increased availability of energy experts • Development of management information systems (MIS)	• Stable political climate • Decision making independent of IMF and WB • Good governance	• Increased energy production • Increased accessibility to energy for general population • High level of technology use • Improved quality of energy services • Improved protection of biodiversity (related to Biomass use)

Many of the barriers and actions listed were interrelated with one or more of the other themes. For instance, the theme of capacity building contains actions such as the development of training and research programs and the development of management information systems, however funding of these programs by government, private firms or international agencies is also mentioned. It is clearly evident that socio-economic issues play a role when considering the development of a specific type of capacity development mechanism. Likewise, the theme of resource utilization specifies the importance of utilizing efficient technologies and the diversification of energy technologies. However, it is also identified that this requires technological training and financial investment, which both fall under the themes of capacity building and socio-economics respectively. In addition, it is recognized that capacity building, training and education are important, but the theme of socio-economics also specifies the need for training in revenue generating activities.

The process of adaptive strategy development will need to consider each major thematic area independently and in relation to each other to establish links (Figure 5.3). As an idea is selected for development, the implications and requirement under each theme need to be identified. Subsequently, linkages may then be considered to establish goals that are feasible. The identification of relevant indicators is also important to this process for the implementation of adaptation strategies and monitoring to determine the long-term effectiveness.

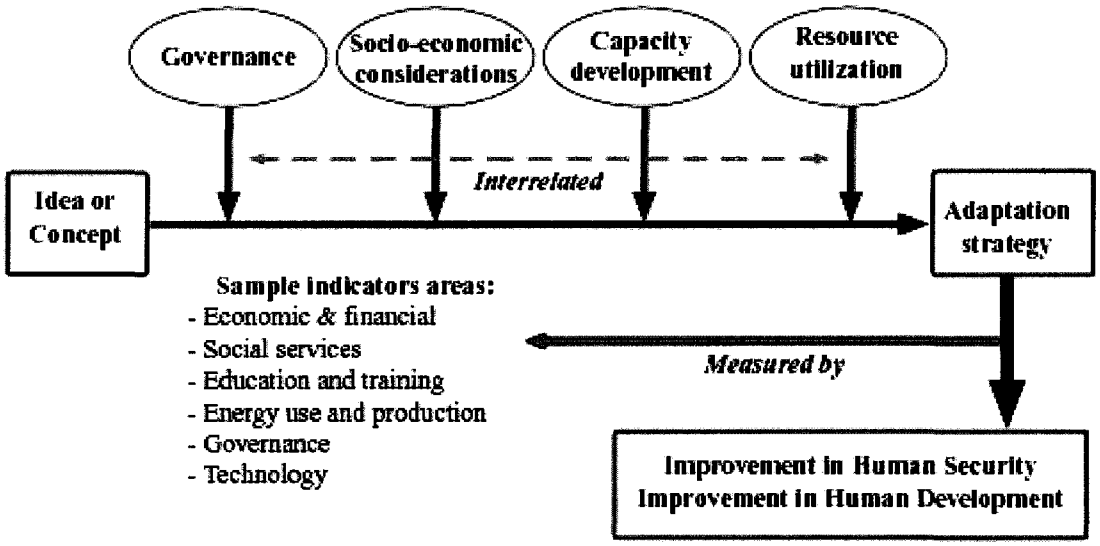

Figure 5.3 Concept to strategy flowchart for energy poverty policy work

To illustrate this process, the concept of "diversification of energy sources" will be utilized as a draft adaptation strategy. The adoption of this idea may require a move towards decentralization of energy systems. Changes will be required at the national policy level, which also is linked to private-public partnerships for traditional large-scale energy projects and any international funding backing this type of approach. At the socio-economic level, access to any new energy sources will require income generating activities and micro-financing. Ultimately, increasing this type of access involves developing capacity in entrepreneurship, the utilization of new technologies and the management of the systems. In order to address the capacity building related activities, partnerships will be required between national and local organizations. In addition, the issue of micro-financing links back to the policy environment where changes may be needed to enhance the breadth of credit systems. Barriers preventing access to credit and the associated risk management will have to be addressed. Links also exist to

international climate change policy, where resource utilization issues play a large role and relate to alternate technologies and the type and availability of local resources.

This example demonstrates the complexity of issues involving one concept for an adaptation strategy. Further considerations include implementation and monitoring to determine the viability and success of the strategy. Key actors will need to be identified, which may include NGOs, international organizations and state and local governments.

5.5 Implications for further analysis

From the complete analysis of the workshop proceedings and the deconstruction of the scenario narratives, many specific barriers and actions were identified (see Table 5.5). The barriers can be related to vulnerabilities and can be directly linked to many of the specific actions suggested in the context of future scenarios under each of the four themes. Some of the actions are general and will require further development; however other actions may serve as a basis for debate and consideration towards adaptation strategies. The development of actions includes the establishing of data collection and research standards, the development of management information systems, and training in revenue generating activities. NEPAD and the topic of regional partnerships both surfaced repetitively throughout the workshop, indicating their perceived relative importance. Some of the suggested actions may serve as focal topics for further research in the context of UEMOA countries, such as the privatization and liberalization of the electricity sector. The quantitative ranking of issues served to provide focus during the workshop and these dominant issues retained their importance as reflected in the development of the four dominant themes.

The validation of the research results may also play a large role in moving towards successful adaptation strategies. Certain topics that were raised during the initial stages of the research did not maintain prominence, including the influences of gender and culture towards the adoption of new energy technologies. The reliance on biomass for energy was raised as an issue during the ranking exercise; however it dropped in importance as the workshop progressed. In turn, the topic of electricity and the related infrastructure issues became prominent discussion issues. These two issues are both related to geographic areas of study, and with a narrowed focus on rural areas, the focus might change. The last major topic to be given consideration is the roles of specific agencies and actors. Issues such as the standardization of policies may involve government ministries, or newly created autonomous organizations, indicating the need for further specificity. Much emphasis and confidence was placed on the government in positive future scenarios. However, many other players may be involved in implementing strategies at the national and regional levels.

5.6 Conclusion

The results presented in this chapter demonstrate the fact that the scenario process yielded a wealth of ideas and information pertaining to energy poverty in Senegal. The process fostered open discussions of ideas between local experts and people with diverse backgrounds and opinions. The method provided a forum where perceptions and visions for change could be documented and presented as a whole to add to the field of research. One of the objectives of the research was to provide input for the development of adaptation strategies for rural energy access and climate change in Senegal. The research succeeded in reaching this objective by identifying major forces influencing energy

poverty, recognizing preconditions that are required to facilitate change, and documenting specific ideas to serve as input for debate and further analysis.

By creating scenarios, the following emerged as desirable goals to work towards: dynamic, long term activity in the energy sector, the creation of regional training centres involving N-S/S-N cooperation and financing/lending mechanisms, the establishment of multi-stakeholder energy policies with the commitment of decision makers, and the optimal exploitation of fossil fuels and renewable resources, including the renovation and improvement of electricity infrastructure. Three forces affecting the future of energy access were recognized: social cooperation, political cohesiveness, and economic development. Four major issues were recognized as key issues to resolve: the weak purchasing power of the population, the lack of communication and technological expertise, the absence of coherent and voluntary energy policies, and the heavy dependence on external energy sources with the persistence of electricity infrastructure problems. A myriad of actions were suggested, including training in revenue generating activities, the restructuring of public finance mechanisms for entrepreneurship opportunities, the establishment of data collection and research standards, and the privatization and liberalization of the electricity sector. The various actions and their related barriers are interrelated, which is why the dominant themes need to be considered in the process of developing strategies and policies.

CHAPTER SIX

EVALUATION OF SCENARIOS AS AN EXPLORATORY TOOL

6.1 Introduction

In order to evaluate the efficacy of the scenario process as an exploratory tool, particularly for discussions regarding energy poverty in Senegal, several aspects of the process need to be considered. Firstly, the opinions of the local participants and who they are representing is critical in realizing the usefulness of the scenario workshops, and determining if goals of the study were understood and met. Secondly, the view of the facilitator is essential for understanding the ease or difficulties with which the tool can be used. Thirdly, an external observer, in this case a colleague who assisted with the research, can provide insight and support to both the participants' and the facilitator's evaluations. In addition, the principal observations from the pilot workshop are presented to explain the reasons behind choosing some of the procedural tools used during the workshop in Senegal. The three forms of evaluations add qualitative rigour to the final conclusions of the tool's effectiveness. This chapter outlines the process and final findings of each of these three evaluations, in addition to providing essential background information about the participants present during the workshop.

6.2 Participant profiles

Since the final scenario results are based upon the ideas voiced by the participants, understanding the background of the people involved and whom they may represent locally is important. For example, if participants are from diverse backgrounds, more diverse responses, values, and therefore, scenarios may be expected, as opposed to

the results expected from a completely homogeneous group. While maintaining anonymity was essential for this study, understanding the types of experiences that participants may have been drawing upon during the scenario process, and providing insight to the types of 'voices' that were heard through this workshop, makes it necessary to document the profiles of the participants. The information about background experiences also provides evidence for the purposeful selection of qualified participants that was described in Chapter Three.

The workshop participants were profiled by means of a one page, 19 question survey (see Chapter Four, section 4.4.3.3, and Appendix IX). The final response rate of the 22-member group was 77%. However, the response rate to specific questions varied, including the education level question and the interval scaled questions. The response rate of the interval scaled questions ranged from 13 respondents (59%) for the question pertaining to the level of energy policy education/teaching involvement, to 16 people (73%) responding to the query on energy policy research involvement. Out of the five participants that did not respond, four were female, which represented 57% of the total number of females (7) present at the workshop.

The adoption of the criteria and the purposeful selection process led to a highly heterogeneous scenario workshop group and diverse representation as measured by such variables as age, upbringing and gender (Table 6.1). Yet, compared to average population demographics in Senegal, homogeneity may be observed in other key features. For example, compared to Senegal's 1999 illiteracy rate of 63.6% (UNDP, 2001), participants had relatively high levels of education, and it may be deduced from the professional positions of employment that all participants were at a certain level of

affluence. However, as outlined in the workshop participant criteria (see Table 4.1, Chapter Four) academic or professional experience in climate change and/or energy poverty was necessary, since the research was policy-oriented and thus required the input of potential policy decision makers. To yield detailed and well grounded results in a timely manner, common knowledge on the central subject matter was essential, yet high group diversity in specific areas, such as gender, organizational representation, depth and breadth of educational and professional background, and upbringing was pivotal in encouraging different perspectives to emerge and create positive group debate.

The key demographic details obtained from the participants (Table 6.1) revealed the varied backgrounds of the workshop group. In the group, 38%, or eight of the participants were female. Equal gender representation was an objective of the research, and a 38% level of representation was considered excellent due to Senegal's extremely low gender-related development index (GDI) value of 0.413, compared to Canada's value of 0.934 (UNDP, 2001), which demonstrates the inequality of gender in the country (based on income, literacy, and life expectancy). The majority of participants were Senegalese (86%), which was appropriate, since the workshop predominantly focused on energy poverty in Senegal, and the remaining 14%, or three participants, were from Chad, Sierra Leone and Germany. The bulk of the participants had less than ten years of experience in their current position of employment (82%); however, 53% of the participants responded to having over ten years of total professional experience. Organizational representation was predominantly split between NGOs and government (46% and 36% respectively), while two participants worked for the private sector, and another two represented a bilateral aid agency affiliate in Senegal. Two distinct age

groups were almost equally represented, 30 to 39 (41%), and 40 to 49 (47%), with two outliers on either end of the spectrum.

Table 6.1 Demographic characteristics of scenario workshop participants

Demographic characteristics	Scenario Group	Respondents (n)[6]
Age (years)		17
20-29	6% (1)	
30-39	41% (7)	
40-49	47% (9)	
60-69	6% (1)	
Gender		22
Women	32% (7)	
Men	68% (15)	
Nationality		17
Senegalese	82% (14)	
Other	18% (3)	
Upbringing		17
Urban	65% (10)	
Rural	35% (6)	
Organization type represented		22
NGO	46% (10)	
Government	36% (8)	
Private	9% (2)	
Bilateral	9% (2)	
Experience in current position (years)		17
0-5	50% (8)	
6-10	32% (5)	
11-15	6% (1)	
16-20	6% (1)	
21 +	6% (1)	
Total professional experience (years)		17
0-5	18% (3)	
6-10	29% (5)	
11-15	35% (6)	
16-20	12% (2)	
21 +	6% (1)	
Highest Educational level		16
Graduate – Doctorate	19% (3)	
Graduate – Master or equivalent	43% (6)	
University – engineering	19% (3)	
Post secondary – technical diploma	19% (3)	

The level of education obtained by group members also exhibited a high degree of diversity, ranging from technical diplomas, to multiple graduate degrees, including three

[6] The response rate varied per question.

participants with doctorates (19%) (Table 6.1). All the participants had formal education above the high school level, and a total 62% of the respondents possessed graduate level degrees, such as the Diploma of specialized higher learning (DESS), and the Diploma of extended studies (DEA) (Table 6.1).

The specific areas of study indicated that a wide range of disciplines was represented in the workshop. A large number of participants possessed science degrees in fields such as biology, geophysics, geography and geology (Table 6.2). Half of the participants had in-depth academic backgrounds in energy and climate change related disciplines, such as photovoltaic energy, energy economics and renewable energy. One participant indicated a doctoral thesis focus on the domestic use of ethanol produced from the fermentation of agricultural residue. The doctoral thesis of another participant was "Energy substitution in a developing economy: the example of butane in Senegal". Furthermore, some participants received their educational training from Senegalese institutions such as l'Ecole Polytechnique de Thies, which is linked to l'Ecole Polytechnique de Montréal, while others indicated to have attended institutions in France, such as l'Université de Franche-Comté, l'Institut National Polytechnique de Lorraine, and l'Université de Bordeaux (Table 6.2).

Table 6.2 Professional experience, job titles and educational subject backgrounds of scenario workshop participants

Job Titles	Socio-economist, Economist, Project manager, Consultant, Researcher, Division director, Professor Technical director, Senior researcher, Manager Division head, Technical assistant, Project assistant Project director
Main areas of expertise	Resource management, Economics & environment, Combustible fuels, Energy, Documentation, Renewable energy, Energy economics, Geological research, Climate change, Photovoltaics, Renewable energy
Area of study	Geography, Political science, Environment, Energy economics, Economic forecasting, Geophysics Physical science, Geology & hydrogeology Electro-mechanics, Renewable energy, Resource management, Biology, Mathematics, Statistics

Table 6.3 Self indicated experience levels by scenario workshop participants

	Degree of involvement			**Respondents**
Area of involvement	Low	Moderate	Extensive	**(n)**
Energy policy – research	37% (6)	13% (2)	50% (8)	16
Energy policy - administration	50% (7)	14% (2)	36% (5)	14
Energy policy – education/teaching	46% (6)	39% (5)	15% (2)	13
Energy policy – consulting	20% (3)	53% (8)	27% (4)	15
Energy policy – international conference	33% (5)	47% (7)	20% (3)	15
Energy policy – local/regional conference	13% (2)	50% (8)	37% (6)	16
Work with other local NGOs/groups	25% (4)	31% (5)	44% (7)	16
Work with international NGOs/groups	43% (6)	21% (3)	36% (5)	14
Field work (e.g. rural or urban site work)	20% (3)	53% (8)	27% (4)	15

The results from the interval scaled questions (Table 6.3) demonstrated high variability with the participants' level of involvement with different aspects of energy policy. The participants' indication of involvement for research and administration dominated at both ends of the scale, with only two responses for "moderate" involvement for each of these two questions. Furthermore, the responses to involvement in energy policy research indicated an inverse relationship with administration experience. Four out of the five "extensive" involvement respondents for the administration question,

indicated to have "low" involvement with research. Likewise, out of the eight participants indicating to have "extensive" research involvement, five claimed to have "low" or "moderate" administration involvement (Table 6.3). This is an indication of a split between research and administration professionals in the workshop group. This finding is further supported by the array of job titles provided by the participants (Table 6.2). The titles such as technical assistant, project assistant, and senior researcher can all be associated with research activities, while the titles of project manager, technical director, and division head imply administrative duties. The workshop group did not demonstrate high levels of involvement in energy policy education or teaching, as 80% of the respondents responded with "low" or "moderate" involvement (Table 6.3). The majority (87%) of the respondents indicated "extensive" or "moderate" involvement in local or regional energy policy conferences (Table 6.3). Most surprising, is the variety of responses to the queries pertaining to work involvement with local or international NGOs. No specific end of the involvement scale was significantly favoured for either of the two questions (Table 6.3). A further testament to the diverse backgrounds of the workshop participants is the self reported main areas of expertise, which included combustible fuels, energy economics, and resource management (Table 6.2).

The responses to the questions pertaining to cooperation and collaborations with local or international NGOs may indicate that the organizations represented at the workshop may typically share a low degree of networking, particularly in energy policy discussions. The comments of one participant support this possibility: "this workshop contributed to pulling together people and developing relations and encouraged needed collaboration between the diverse participants…(*sic*)".

In order to protect the anonymity of the participants, the specific organizations involved in the workshop will remain unnamed. However, an extremely important point to note is that the participants and the organizations involved represented a critical position, in that they had linkages to national and international policy development, but also were directly connected to the people affected by energy poverty. Therefore, implications of energy poverty were well understood by the participants at local, regional, and national scales. However, similar workshops conducted at any one specific level may yield an emphasis on different priorities.

6.3 Participant workshop evaluation survey results

From the results of the survey it was evident that participants found the scenario exercise to be a positive experience, demonstrated by the fact that on average the workshop was rated as highly interesting (4.4 out of a maximum rating of 5). Participants were also satisfied with content, level of input, and facilitation quality on average, with results ranging from 3.9 to 4.3 out of 5 (Table 6.4). Some of the written comments on the evaluations also reflected the high level of satisfaction with the process, including "the methodology is appropriate and well suited to this sort of reflective exercise", and "we can say that this workshop was useful and worth the time...it brought attention to possible ways to approach problems of our time."

When considering the average values, all the participants indicated a relatively high degree of interest, suitability, clarity and satisfaction of the workshop (3.7 to 4.4 out of 5). However, a closer examination of the individual participant responses reveals a fairly large range for many of the questions. Out of all the questions measuring the degree of interest, suitability, and satisfaction with the scenario workshop, only two

questions had participant responses that were below the rank of "medium". Interesting to note however, is the fact that the "relationship to institutional interests" factor was given a value of 2 by two participants, yet also a value of 5 by ten participants. No other question received as many high (value of 5) responses (Table 6.4).

The participants' perception of the function of the scenarios, or how they could or would be used, ranked the lowest on average (Table 6.4). The low ranking indicates that the distribution of more contextual and background information prior to the workshop may have helped increase the participants' understanding of the history and possible benefits of scenario planning. This possibility is supported by written comments on the evaluations of three participants, which indicated their dissatisfaction with the lack of pre-workshop briefing and materials (Figure 6.6). Moreover, one participant specifically recommended the "provision of background paper prior to workshop explaining context".

Table 6.4 Participants' evaluation scenario process (responses, n=17)

Factor	**Degree of interest, suitability, satisfaction (V)**					
	Low		**Med.**		**High**	**Average ***
(number of respondents) (R)	1	2	3	4	5	(out of 5)
Interest generated by workshop			2 (11%)	7 (41%)	8 (47%)	4.4
Relationship to personal/professional interests			4 (23%)	5 (29%)	8 (47%)	4.2
Relationship to institutional interests		2 (11%)	3 (18%)	2 (11%)	10 (59%)	4.2
Suitability of scenarios for energy poverty research			4 (23%)	9 (53%)	4 (23%)	4.0
Clarity generated on function of scenarios		2 (11%)	5 (29%)	7 (41%)	3 (18%)	3.7
Satisfaction with content			4 (23%)	10 (59%)	3 (18%)	3.9
Satisfaction with level of input			4 (23%)	7 (41%)	6 (35%)	4.1
Satisfaction with facilitation			1 (6%)	10 (59%)	6 (35%)	4.3

* Indicates the averaged degree of interest, suitability, or satisfaction by a weighed calculation ($A = \Sigma(R \times V)/5$), A = average value, R = number of responses for level, V = value for response level.

In terms of the perceived importance of the individual stages of the workshop, stage 3 (identification of barriers) and stage 6 (scenario narrative drafting) were, on average, considered to be the most important by the participants (Table 6.5). Conversely, the brainstorming session (stage 1) was not viewed as being highly important to reaching the final outcome. The participants ranked this stage, on average, lowest amongst the six stages (Table 6.5). The lower level of importance placed on this stage could be due to the fact that participants were already familiar with the key issues and problems related to energy poverty in Senegal and therefore believed this step did not warrant a high degree of attention. However, the brainstorming stage was critical to the entire scenario process as it formed the foundation of the ideas that were carried throughout the workshop. Regardless, every stage received a ranking on average above medium (Table 6.5), indicating that participants understood the constructive nature of the scenario process.

Table 6.5 Perceived importance of respective workshop stages in reaching the final outcome (responses, n=17)

Factor	**Level of importance (V)**					
	Low		**Med.**		**High**	**Average ***
(number of respondents) (R)	1	2	3	4	5	(out of 5)
Stage 1 (brainstorming important issues)		1 (6%)	7 (41%)	4 (23%)	5 (29%)	3.8
Stage 2 (ranking of issues)			4 (23%)	8 (47%)	5 (29%)	4.1
Stage 3 (identification of barriers)			5 (29%)	4 (23%)	8 (47%)	4.3
Stage 4 (exploring possible future outcomes to the barriers)			7 (41%)	7 (41%)	3 (18%)	3.9
Stage 5 (Identifying drivers of change and scenario outlines)			3 (18%)	10 (59%)	4 (23%)	4.1
Stage 6 (scenario narrative drafting)			3 (18%)	6 (35%)	8 (47%)	4.3

* Indicates the averaged degree of interest, suitability, or satisfaction by a weighed calculation ($A = \Sigma(R \times V)/5$), A = average value, R = number of responses for level, V = value for response level.

Many of the written comments about the workshop were concerned with the length of the workshop and the time allotted to individual stages (Table 6.6). While nearly 60% of the participants were content with the two day time period for the workshop, the remaining 40% indicated that more time was necessary (Table 6.7). The length of the workshop is a trade-off, since participants are taking time away from their regular work schedules and participation could possibly decrease if workshop length was increased. It is worthwhile to note that the workshop time was tightly scheduled, and more time certainly would have enabled greater elaboration of ideas, but due to logistical and organizational constraints was not possible. In addition to concerns with the overall length of time given to the workshop, many participants recommended increased time for group work and plenary discussions, and specific stages of the workshop, including the examination and categorization of variables and the scenario elaboration and construction (Table 6.6). When surveyed for recommendations of which stage required more time, 53% of the participants indicated stage 3 (expansion of barriers), and 47% indicated stage 6 (scenario narrative drafting) (Figure 6.7). The latter recommendation matches the perception of the importance of elaboration of the scenarios (stage 6) in reaching the final outcome of the workshop. In fact, one participant wrote, "finish each scenario..." in the comments section of the evaluation. This indicates that even though 3 hours were allocated to this last stage, the time was insufficient.

Table 6.6 Highlights, drawbacks and comments about the scenario process

Highlights	Scenario construction & elaboration (x6), scenario process as a tool (x4), exchange/sharing of ideas (x3), group discussions (x2), identification of barriers (x2), exploration of dominant issues & problems, opportunity to develop partnerships, participant cooperation, relaxed and informal atmosphere, presentation of "Shining Senegal", originality of scenario approach
Drawbacks	Time constrictions (x3), lack of pre-workshop briefing and materials (x3), time allotment between workshop stages (x2), size of facilities (x2), Saturday work (x2), use of English
Suggested improvements	Increase group work and discussion time (x3), provision of background materials on the University of Victoria's research work, increased time examining and categorizing variables, increased time for explanations in both French and English, provision of background paper prior to workshop explaining context, increased time to discuss various scenarios, concentrate on implicating actors
Comments	"Continue to involve all participants in the process [future steps]", "The methodology is appropriate and well suited to this sort of reflective exercise", "We can say that this workshop was useful and worth the time...it brought attention to possible ways to approach problems of our time.", "Congratulations...the method is original.". "I think ENDA and UVic got free of charge an excellent work...that's why ENDA has the obligation to keep contact with all the members of the group and inform them of the outcome.", "At the end of this project, organize a reunion with the same participants.", "Get together again...produce something concrete.", "The final product of the workshop and the results produced should be shared with the participants.", "Finish each scenario and try to implement them.", "Publication of the scenarios.", "This workshop contributed to pulling together people and developing relations and encouraged needed collaboration between the diverse participants...all workshops stemming from this will be of benefit due to the participants and the structure." *Note – participation in the future research was noted by 11 of the participants*

Table 6.7 Participant's recommendations on scenario workshop process

Factor (number of respondents, R)	**Variable**					
Duration of workshop (recommended length)	1 days	2 days	3 days	4 + days		
		10 (59%)	3 (18%)	4 (23%)		
Time allocation per stage (increase in time recommended)	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
	3 (18%)	4 (23%)	9 (53%)	1 (6%)	3 (18%)	8 (47%)

One of the most encouraging findings from the evaluation survey was that the scenario workshop afforded a positive cooperation and networking experience for the

participants. Three participants indicated the highlight of the workshop was the opportunity to exchange and share ideas. Further highlights included the opportunity to develop partnerships, and discuss issues in a relaxed and informal atmosphere. One participant commented, "this workshop contributed to pulling together people and developing relations and encouraged needed collaboration between the diverse participants...". From these comments, it appears that participatory and exploratory workshops may not be common in Senegal, particularly for energy poverty discussions. Furthermore, many participants also indicated a desire to be included in future uses of the scenario research, which supports the claim that the construction of scenarios may be beneficial as a learning tool for organizations, networks and industries (Heugens and Oosterhout, 2001).

Some of the remaining recommendations for improvement could be easily addressed in the future and are not directly connected with the use of the scenario process. These include complaints about the size of the facilities, the scheduling of work on a Saturday, and the use of English (Table 6.6). Regardless, these types of concerns are important to consider in the organization of any workshop.

6.4 Facilitator evaluation of workshop process and results

The following evaluation represents the perspective of the facilitator, and while concrete evidence supports the majority of claims and ideas, the final conclusions should still be considered subjective. The evaluation criteria consisted of the following considerations:

1. Ability to analyze;
2. Ease of facilitation;

3. Time effectiveness;
4. Cost effectiveness;
5. Ability to remove hierarchical barriers;
6. Suitability for promoting learning; and
7. Richness/depth of the data.

6.4.1 Ability to analyze

Scenario outlines may be constructed in two days, however the analysis process commonly takes over a month of dedicated time (Ringland, 2002). After the scenario workshop, the products from each stage and draft scenarios were compiled and distributed to the participants within 24 hours. The draft results were also presented at a West African regional energy and climate change conference, which enabled better understanding of the links between the various factors, barriers and possible outcomes. The materials produced during the two days of the workshop were rough in many ways. The workshop proceedings were understandable to most participants, yet much explanation was required for external readers, and therefore, further analysis, interpretation, and summarization was required. The participants themselves even recognized the "draft" status of the work in their workshop evaluations, by making such comments as, "finish each scenario", and "produce something concrete [from the results]".

An abundance of ideas were generated and creative future outcomes were imagined. However, the results and conclusions achieved from the workshop were not explicit. The data from each stage of the workshop was organized into spreadsheets and analyzed from various angles to determine implicit links, and then the components

reassembled to ensure clarity and logic for people outside of the process. The reality was that the internal components of some scenarios initially were confusing, since the links were not fully explained by the participants in the narratives. These factors had to be considered when analyzing the data, and only by using the data from all stages of the workshop could the analysis produce meaningful results.

It was recognized prior to the workshop that the scenario process is not intended to produce "ready-made" proposals for actions or strategies. However, with an approximate 1:75 day ratio for data collection to analytical time required, the scenario process is analytically intensive. Furthermore, the products from the workshop must be placed in context to avoid the products being discounted as merely a creative exercise.

6.4.2 Ease of facilitation

Facilitators outside of the particular organization or network involved in the workshop are often chosen for scenario planning exercises (Ringland, 2002). Specific challenges such as gaining trust and respect must be surmounted by outside facilitators (Ringland, 2002). In this study, and as an outsider from a different country and culture, these challenges were even greater. In preparation for the facilitator role, I recognized that establishing links with the energy policy community was critical, and a base knowledge of dominant energy problems in Senegal was needed. The exploratory field season conducted prior to the workshop enabled me to familiarize myself with the culture, organizational "norms", and hierarchy present in typical organizations. In addition, the trip enabled me to make contacts and links with the host organization, some of whom later participated in the workshop. The time spent developing relationships during this preliminary trip helped build trust and respect, which was later important

during the workshop. Organizational support for the workshop was evident due to the enthusiastic assistance received from the ENDA staff. My familiarity and connection with some of the participants helped put others at ease and seemed to contribute to developing credibility as a facilitator. This initial degree of mutual comfort helped create an open environment, which was essential to enabling the rich discussions for this study. In reality, the fact that I was an outsider may have actually helped create an environment open to diverse discussion, as I did not have any influence over job security and was in no position of authority. Thus the forum allowed honest discussion and allowed the participants to convey their thoughts and opinions without fear of repercussions.

After the initial introductions, a brainstorming session was the first stage in the workshop, which required people to immediately share opinions and ideas. Fortunately, the group was more than willing to participate so concerns over "warming up" the group were not an issue. This finding was similar to the pilot workshop. However, at times it was difficult to ensure that the process of brainstorming was constructive and did not develop into a venting session for select participants.

Having a research colleague, who had also helped with the pilot workshop, proved to be very valuable in helping with the recording of ideas. Yet it was still difficult to moderate the intense discussions and record all the ideas. The concept originally proposed at the pilot workshop, which involved the participants writing their ideas on the flash cards may have been beneficial to ensure some ideas did not get "lost". The grouping task after the factor brainstorming was exhausted also presented some challenges. Animated discussion arose about the placement of some factors, but by agreeing to place the same factor in duplicate categories the process was able to continue

flowing. Even choosing a name for one of the categories created some friction, but this was solved by agreeing to temporarily call the category "?" until separate group discussion could decide upon a better name.

Group work was a key component to the scenario workshop. For the majority of the workshop, groups of 4-6 participants worked together on developing each of the key issues identified during the brainstorming session. I chose to use my colleague from Victoria and two Senegalese assistants to help moderate the group sessions. However, due to logistics such as severe unexpected time constraints, the debriefing session with the assistants was limited to one hour prior to the commencement of the workshop. Thus, the assistants were not overly familiar with the workshop format and I had to move quickly between the groups to confirm that moderators were consistent in their structure and instructions to the groups. The moderation process used by my colleague from Victoria complemented the intended workshop format very well. However the lack of time to work more extensively with the Senegalese moderators during the planning stages did make some of the initial group work slightly disorganized. As time progressed, and familiarity with the process grew, the ease of group moderation also increased, and overall did not seem to have a negative effect on the ability to gather the necessary information.

Facilitating a scenario workshop was for the most part a smooth process, with one exception worth noting–outlining the four scenarios and drafting the narratives. Difficulties did not arise when explaining the analytical components or stages of the workshop (brainstorming, ranking, determining barriers and possible outcomes), and participants seemed to understand the products required. Arguments and heated debate

among some groups did occur, but by the end of the allotted time for each stage, the products were ready for presentation.

The transition to outlining scenario narratives was slightly more difficult since it required people to think in an abstract manner and rely on creativity, rather than just document their perspectives and concrete experiences. Based on previous documented scenario experiences, it was recognized prior to the workshop that there was great potential for the facilitator to bias the results by influential comments (Schwartz, 1996). Thus I decided against using a sample scenario narrative, as such an example may have influenced or biased the format or content of what the participants produced. As a means to provide unbiased direction, a template was distributed to all groups, which indicated the basic components to include in the scenario draft. However the process still required a large amount of explanation and some groups needed a high degree of direction on how to assemble the various components of information collected during the workshop.

By witnessing some of the group work, it was evident that some of the groups worked well together, likely due to personalities or natural leadership qualities within the group. These groups required very little external moderation, were very results-focused and produced their results in the time allotted. Other groups were less productive and tended to engage in lengthy debates about the direction or quality of ideas, rather than documenting the issues as expected. From a facilitator's perspective, it proved difficult to deal with the range of results and discussions that were produced in the different stages. Since each group was working on one "theme" such as *Socio-economic* or *Technology*, the inconsistency of group productivity may affect the consistency of results among the different themes. While this may be supporting evidence for the concept of

having a team of experienced "friends", as suggested by Ringland (1998), it also highlights the inherent difficulty of using several small groups to produce components of an assembled product. This multi-group approach was chosen as focus group research is best achieved with small groups (Fern, 2001), and time was a limiting factor. Maximum consistency may be achieved by using the same group to examine all the issues involved with each stage; however this may substantially increase the time needed for the workshop. Alternatively, a smaller group could be used for the entire process, but this may drastically affect the diversity of perspectives documented, which was a key goal of the research.

6.4.3 Time effectiveness

As discussed in the both the pilot and final workshop results, time management proved to be a very important component of the scenario method. A principal goal of the scenario workshop is to produce scenario narratives, and this component requires the longer length of all the stages. Thus mismanagement of time during earlier workshop phases may shorten the time available to prepare the narratives. With this factor in mind, a very structured agenda was developed for the scenario workshop in Senegal. However, upon the commencement of the workshop, changes to the agenda were immediately required due to personal schedules of many of the participants. Furthermore, despite every effort to keep the workshop on schedule, some stages required substantially more instruction time than originally anticipated, such as the ranking of the factors (stage 2), and the outlining of the scenarios (stage 5). These modifications were managed by extending each workday by approximately one hour. However, this solution was only possible due to the group of very enthusiastic participants, who were willing to work late,

especially on a Saturday. It is interesting to note that one participant did indicate that working on a Saturday was a drawback of the method (see Table 6.6); however all participants showed up for the second workday. This method to ensure an adequate amount of time was available to complete the whole agenda could not be assured in all cases. Completing the scenario process in two days requires a very tight and disciplined schedule, and it should not be expected that the scenarios would always be fully complete. One-day workshops have been conducted before, but typically do not involve constructing scenarios from original ideas discussed in the workshop, but use existing scenarios as a baseline (Ringland, 2002). Two-day workshops are most commonly used, yet it is recognized that they usually only permit outline scenarios to be constructed (Ringland, 2002). The extent and detail of results from this workshop are comparable to other two-day workshops (e.g. Lemhuis, 2002; Erskine and Ogilvy, 2002).

6.4.4 Cost effectiveness

With any type of stakeholder consultation or planning research the costs involved with using a specific tool are most likely always a concern. Scenarios are now in use by private companies, government agencies, non-profit organizations, and research institutions (van der Heijden, 2003). Research and consultation exercises examining energy poverty would be especially budget conscious, since often the research is occurring in areas and countries with limited amounts of capital for any type of research. Governments in economically poor countries are typically struggling with foreign debt, and local NGOs may have very limited resources for research and consulting activities; Senegal is no exception (Lubatkin *et al.*, 1999). Furthermore, funding from bilateral and multilateral agencies, which normally could be used to support these types of activities,

witnessed a steady decline in Africa since 1991, with net foreign aid in Senegal dropping from US$501 million in 1998 to US$424 million in 2000 (OECD, 2002; World Bank 2002). While many development aid agencies, such as the Canadian International Development Agency (CIDA), and the German Agency for Technical Cooperation (GTZ) continue to support research work and participatory research in West Africa (see for example Käser, 2003), increased demands for accountability and transparency have made project financial management a high priority.

The scenario workshop proved to be a very cost effective participatory method for facilitating well rounded discussions that helped identify dominant priorities and perspectives on energy poverty, and provided an opportunity for various research and policy professionals to share ideas and learn from each other. The principal advantage of this type of workshop is that expenses were kept to a minimum. As the workshop was hosted in the capital city of Senegal, energy research and policy professionals were easily accessible since it is the location of the head offices for many organizations and government agencies. Thus, no major travel or hotel expenses were incurred for the participants. The participants were provided with meals for the two days of the workshop and a dinner was held upon completion to thank the participants and celebrate the collective efforts. Another major factor reducing costs was that participants were not paid to participate in the workshop, and many considered their involvement to be an extension of their regular work activities. It must be noted that this value was even recognized by one of the participants, who stated in their workshop evaluation, "I think ENDA and UVic got free of charge an excellent work". A meeting room in the host organization's office building (ENDA-TM) was also made available at a fraction of the

cost of a hotel conference room. Direct costs for the facilitation included the travel expenses for my colleague and me, which included round trip economy fare tickets, hotel accommodation for five days in Dakar, and meal expenses. Material expenses were also minimal and were limited to clip boards, note paper, poster paper, flash cards, stickers, pens and markers. The total workshop expenditures were limited to under CDN$10,000.

The costs involved with the workshop are relative and financial records of other similar research projects, especially in the Dakar region, are difficult to find for comparison. Thus, the judgment of the cost effectiveness of the tool is subjective and directly relates to the value of the materials produced with the resources expended. The types of results obtained from the workshop are contingent upon the interaction between the various participants, thus other data collection methods, such as individual interviews, could not produce the same type of results. The scenario workshop was able to produce a high volume of rich data in a relatively short period and costs were kept to essential items. Hence, the scenario method on its own may be considered cost effective since it concentrates a high amount of data production and collection into a small period of time.

6.4.5 Ability to remove hierarchical barriers

There is an increasing body of literature examining the applicability and effectiveness of "Western" project management and research techniques used in development work in economically poor countries (see Repetti, 2002; Muriithi and Crawford, 2003; Lubatkin *et al.*, 1999; Ndiaye *et al.*, 1996; Arnould, 1990). Cultural differences and societal norms may greatly influence the effectiveness of any tool utilized. During the 1970s, 1980s and the early 1990s, the dominant belief among international development organizations, including the Canadian International

Development Agency, was that management techniques are universally applicable, regardless of the culture (Lubatkin *et al.*, 1999). While support still exists for the universality theory, applied case study research has indicated that entrenched local organizational norms may not be compatible with some of the management and research practices currently used by international and local organizations in both the private and public sector (Muriithi and Crawford, 2003).

While Senegal is ranked very low on the UNDP Human Development Index (154^{th}) (UNDP, 2002), the country is considered to have a large cadre of professionals with considerable experience in public and private organizations (Lubatkin *et al.*, 1999). However, the organizational culture exhibits a high acceptance of unequal power distribution and a high degree of uncertainty avoidance (see Hofstede, 2003), that is, risk taking is considered minimal (Muriithi and Crawford, 2003; Lubatkin *et al.*, 1999). Exemplifying traits include resistance to delegating authority, a lack of consultation activities, expectations that orders will be followed without question, and an expectation that "proper" superior-subordinate behaviour will be followed (Lubatkin *et al.*, 1999). Hence, the culture is accustomed to a high degree of hierarchy in the local organizational environment. Since scenario building is a participatory research tool and involves techniques such as brainstorming, it may seem incompatible with Senegalese culture. However, as discussed in Chapter Two, local consultation and involvement with energy poverty research is crucial for project success.

This scenario-based research did not attempt to impose an incompatible tool on a group of Senegalese policy and research professionals. Rather, the dominant traits discussed above, and witnessed first hand during the exploratory field season, were

considered and careful attention was given to selecting participants. As suggested by Muriithi and Crawford (2003), supervisor-subordinate combinations were purposely avoided as they may have stifled open and honest information sharing. This helped reduce power-distance relationship. Furthermore, the exploratory nature of the activity was emphasized throughout the workshop, and creativity was encouraged as a means to reduce any tendencies to avoid risk while constructing the scenarios. Lastly, as an external facilitator I had no influence over the participants' professional status, thus was viewed to be a neutral body.

The efforts to create an environment conducive to scenario building proved fruitful, and the workshop environment did not demonstrate hierarchal qualities. As discussed earlier in this chapter, the participants were very diverse in terms of age, gender, education, experience, and specialization (see Tables 6.1 and 6.2). However, the participants indicated a medium to high degree of satisfaction with the opportunity for their ideas to be considered and included throughout the workshop (Table 6.4), and a freely flowing exchange of ideas between the diverse participants occurred throughout the group work. The workshop evaluation survey also demonstrated that the information environment and ability to share ideas were highly valued by the participants. Thus, the use of scenario building, coupled with careful participant selection, helped reduce potential hierarchical barriers.

6.4.6 Suitability for promoting learning

Claims have recently been made that scenario planning has potential as a tool for organizational learning (e.g. Chermack and van der Merwe, 2003; Heugens and Oosterhout, 2001; Bunn and Salo, 1993). The workshop conducted in Senegal

demonstrated great promise in this field. While the participants present were not all from the same organization, they all had common professional interests in energy poverty. The exploratory scenarios were created for the purpose of better understanding the interactions of various factors and forces (Alcamo, 2001). With their diverse backgrounds but equal interest in the subject matter, the participants each brought different perspectives to the workshop, which helped create the rich array of ideas documented throughout each stage of the workshop. Each participant was exposed to varying perspectives that may not have been experienced before in their own organizational environment. For instance, while some of the older participants had over 15 years of professional experience and doctoral degrees, they were interacting with much younger participants who were relatively new to the research field and just beginning their professional careers. The interactions between these two groups may be a mutually beneficial experience. The participants new to the energy poverty field had the opportunity to learn a perspective associated with years of experience, while the more experienced participants were exposed to ideas that may be attributed to generational differences and "fresh" perspectives.

The actual "learning potential" of the scenario tool is difficult to measure. Tests could be administered to test knowledge and awareness of issues both before and after the workshop to help quantify the learning process. However, through my own perspective, and the feedback received from the participants in the evaluation surveys, it was evident that the participants benefited from the scenario building process. The fact that many participants were keen to be involved in future research on this topic, and very satisfied with the product of the collaborative exercise supports this claim. The potential created

for open discussion in a risk free environment may also have learning benefits, as it could help individuals learn how to manage diverse input and help propose solutions that satisfy a range of stakeholders.

6.4.7 Richness/depth of the data

To evaluate scenario planning as a tool based on the richness or depth of data is loaded with conceptual problems. Given that scenarios are not accurate descriptions of future situations, but rather imagined possibilities, baselines for comparison cannot be found or created (List, 2004). Likewise, the perspectives offered by the participants cannot be said to be right or wrong, but only documented and compared to other perspectives. Through a thorough review of energy poverty literature from the past ten years, the dominant perceived problems and strategy recommendations could be documented and subsequently compared to the results generated from the workshop. As discussed in Chapter Five, with only a few exceptions, there was a high degree of synergy between the two sources of data. Therefore, it can be concluded that the group of participants was able to produce an equal, if not more elaborate, set of data compared to the ideas previously published by leading academics.

6.5 Colleague's evaluation of scenario tool

The presence of a colleague from the University of Victoria for the scenario workshop was beneficial for many reasons. Consultation throughout the workshop sessions enabled me to have access to a second opinion about potential changes or modifications needed to the agenda, process or specific tools used during each stage. Her French language abilities were also an asset, since some technical and detailed sections

had to be presented in English, and translations helped ensure understanding by the participants. Most importantly to the evaluation of the scenario process, my colleague's presence was useful in providing another perspective to offer judgment on the scenario tool.

Information on perceived strengths and weaknesses of the process was collected by means of an informal interview. Due to my colleague's close involvement with the development and facilitation of the workshop, and the potential for bias, the questionnaire utilized to survey the workshop participants could not be used. It is recognized that the information collected through an informal interview also has the potential to lack in objectivity. Therefore, to minimize my influence on the answers, I did not share any of my conclusions as documented in section 6.6, nor engage in discussions regarding the opinions presented. The same seven categories of evaluation as used in section 6.6 were used to solicit feedback. The major points of feedback are presented below (Table 6.8):

Table 6.8 Feedback on scenario process received from research colleague

Evaluation factor	Major points
Analyzability of the data	• several "filters" may be present that could distort the data – presentation of scenarios and materials (who is presenting), workshop coordination, and the materials recorded on paper • to overcome this potential for distortion, all data produced must be taken into account – "revisit all data sets"
Ease of facilitation	• pilot workshop was essential to refining the process • simple terminology and explanation helped keep the focus on "producing" materials rather than learning the "tool" • institutional/organizational willingness and backing were crucial for success and establishing trust with the participants • more collaboration prior to the workshop and material sharing required • host organization and workshop aids would benefit from shared "ownership" of process • high skill/experience level of the participants allowed groups to "self-facilitate"
Time effectiveness	• flexibility of the tool was helpful in managing delays and scheduling changes • the facilitator's familiarity with scenario methods helped to make changes in activities to compensate for lost time, yet still accomplish each workshop stage
Cost effectiveness	• the informal environment and "barrier breaking" activities avoided the need to distribute expensive workshop materials to the participants • it appeared that participation was largely due to interest in the topic and process rather than seeking financial gain
Ability to remove hierarchical barriers	• while all participants were able to participate, the influence of hierarchy was still present during the presentations of the scenarios • Influence of hierarchy, age, experience and masculinity were especially evident during some plenary discussions
Suitability for promoting learning	• method helps breaks typical paradigms • process enables people to move beyond content and "learn how to learn" • helps break personal barriers and enable other perspectives to be considered • ability to project and imagine futures is likely very different from regular work environment and may help change mental maps • promotes changes in analytical approaches
Richness/depth of the data	• selection of participants is key to the richness and depth of materials produced • qualifications, experience, as well as gender representation, all will influence the quality of materials produced • The knowledge of materials, ability to use the materials, and the ability to break mental maps must all be present to yield high quality results

Through the feedback received from the informal interview, it was evident that the conclusions reached on the efficacy of the scenario tool by my colleague were very similar to my own. The need to consider all the materials produced during the workshop was expressed as being important during the analysis of the data. The importance of organizational support and the establishment of trust with the participant were mentioned

in relation to the ease of facilitation. The advantage of flexibility with the scenario process was highlighted and cited as a critical necessity for any consultation type of workshop. The merits of the tool in breaking barriers and redefining mental maps were emphasized in relation to the tool's effectiveness in promoting learning. Lastly, the materials produced were viewed as being very rich due to the highly diverse and well qualified participants at the workshop.

While my colleague's opinions were similar to many of my own conclusions, some additional perspectives of substantial merit were offered. In section 6.6, I discussed the tool's ability to minimize the influence of hierarchy through careful participant selection. When queried on the issue of hierarchy, my colleague expressed concerns that while most of the workshop discussions and group sessions were inclusive, the final scenario presentations demonstrated that elements of hierarchy still prevailed. Specifically, those participants that were oldest, had the most years of experience, and were male seemed to dominate during the final stages of the workshop involving the presentation of the scenarios and fielding of questions during the plenary session. It was viewed that this created a potential for personal opinions to prevail at the expense of neglecting information discussed during the group exercises.

A dominant concern expressed by my colleague was the gender imbalance and lack of inclusion of gender related issues during the workshop and in the final scenario narratives. The fact that gender was not a dominant factor during the workshop was discussed in Chapter Five. Furthermore, the efforts to strive for equal gender representation were documented in Chapter Four. Although 37% of the workshop participants were female (Table 6.1), the lack of inclusion of gender related concerns is

indeed an area of concern. My colleague expressed the view that while the women present at the workshop were very strong and well qualified, since they were fewer in number, their "voices" could not overcome the cultural barriers, such as male dominance. It was suggested that a similar workshop in the future should impose a requirement of equal representation. However, it is unknown if equal numerical representation would have led to the inclusion of gender-related energy poverty concerns, as have been documented in the literature (see Cecelski, 2000a, 2000b).

6.6 Conclusion

A detailed analysis of the participants' profiles was presented in this chapter and demonstrated that the voices portrayed in the final scenario results are those of local representatives that were familiar with the problems of energy poverty. The participants were considered ideal for this study, due to the fact that they worked within various organizations with direct links to both the policy creators and the people who are directly affected by energy poverty. As is the case in any scenario research, it must be recognized that workshops involving different participants in this same country may yield different priority issues.

This chapter summarizes the feedback from the participants' evaluation surveys, the facilitator's perspectives and the insights proffered by the research colleague, concluding that overall, the scenario tool was effective in capturing local perspectives on energy poverty and achieving the objectives of this research. The scenario tool proved useful in overcoming ingrained worldviews, and fostering communication and cooperation between participants. Furthermore, the chapter explains that the success of the tool is contingent upon the participants and facilitator(s) understanding that the

scenario process is a tool to collect data only. Also, scenario results require extensive analysis and interpretation, and do not stand alone as recommendations for policy, but rather serve as input for the development of policy.

CHAPTER SEVEN

CONCLUSIONS, IMPLICATIONS, AND FUTURE RESEARCH

7.1 Background

With population growth and declining traditional sources of energy worldwide, the need to develop adaptation strategies and improve access to energy sources has never been more apparent. Energy poverty currently affects the social, environmental, and economic well-being of billions of people in economically poor countries across the globe, with sub-Saharan Africa facing some of the biggest challenges to date. While energy development projects have been well supported in the past by aid agencies and funding institutions such as the World Bank, transitions or movement up the 'energy ladder' to cleaner, efficient, and more sustainable energy sources have been limited in sub-Saharan Africa. Access improvement and energy resource development project goals have historically been misguided in sub-Saharan Africa, with project goals including little consideration for the socio-economic infrastructure, the civil conflict and political instability, and the true environmental and technological needs of the area. Of all sub-Saharan African countries, the nations with limited natural resources, heavy reliance on biomass fuels, and underdeveloped resource-sharing infrastructure (e.g. pipelines, hydroelectricity grids) are most vulnerable to the implications of energy poverty. One such country is Senegal, which also represents an area conducive to research due to its relative stability and the existence of energy professionals working to address many facets of development. For these reasons, Senegal was selected as the focus area of study.

Local governments in countries such as Senegal have recognized energy poverty concerns and have collaborated with bilateral and multilateral organizations in attempts to increase energy access. However, policies and strategies have to date not had a significant impact on decreasing energy poverty, mainly due to the lack of implementation, which is strongly connected to the country's limited economic resources. The energy access improvement and development projects that have been undertaken have been analyzed through many perspectives, such as those of local NGOs, academic research institutes, and international development agencies. The inclusion of local participants and the recognition of local needs are frequently recommended to improve energy project success.

One method that has been advocated as a tool to augment the participatory process in a multitude of settings is the use of scenarios. The use of scenarios originated as a military planning tool, but soon evolved as a strategy building exercise for many business and industry stakeholders. Scenarios have been useful in developing and testing strategies, making sense of complex details and circumstances, enhancing organizational learning, and organizing new ideas in business, military and public policy settings. Given the benefits outlined, the tool held great potential to identify key perceived problems, factors, and alternatives of energy poverty in Senegal. Current literature provides little documentation of local stakeholder perspectives on the issues of energy poverty, and the use of scenarios in this context. However, the few accounts that are available demonstrate that scenario creation exercises may be a successful means to include local "voices" and perspectives in policy development. While an abundance of literature exists listing the benefits and weaknesses of the use of scenarios, a systematic analysis of the

effectiveness of each stage of the tool's methodology is not readily available. Such an analysis would benefit future users and scenario participants, by ensuring the process is refined and common issues are addressed.

The motivations of this project arose from the apparent lack of inclusion of local needs and perspectives in energy project development. By capturing local perspectives on energy poverty, it was hoped that a significant contribution could be made to benefit future governments, NGOs and research agencies while planning energy access and improvement projects. At the same time, while the use of scenarios appeared to have many benefits for this type of research, this study tested that theory in order to confirm the effectiveness of this low cost tool.

7.2 Key findings of the research

The main research objective of this study was to evaluate scenarios as a tool for documenting local perspectives on the issues, barriers, and possible future strategies for reducing energy poverty and ensuring long term access to safe, clean and efficient energy sources. To accomplish this, the barriers to energy access and development, and the methodology of scenarios were reviewed. The perspectives of local policy professionals were then documented during a two-day workshop that ultimately led to four scenario narratives. The ideas and insights captured during the workshop were then compared and contrasted to the literature. Similarly, the procedural details of the workshop for each stage of the scenario process were documented, and an analysis of the methodology was conducted based on the feedback and perspectives of the participants, participant observation by the researcher/facilitator, and a third party—a research colleague who assisted with the workshop facilitation.

7.2.1 Energy poverty perspectives

The main findings of this study include the following:

- The four most highly prioritized issues limiting access to energy in Senegal according to a highly qualified group of energy professionals included: the weak purchasing power of the population, the lack of communication and technological expertise, the absence of coherent and voluntary energy policies, and the heavy dependence on external energy sources coupled with persistence of electricity infrastructure problems;
- The three most influential forces that may influence future progress in improving energy access in Senegal were: political cohesiveness, social cooperation and economic development;
- Four thematic areas from which strategy and policy efforts should focus include:
    i. governance (stabilization of political climate, enhancement of policy efforts, institutional transparency and accountability)
    ii. socio-economics (finance mechanisms, local business facilitation, debt reduction, private investment)
    iii. capacity building (research capabilities, data collection and analytical standards, organizational management, regional/international cooperation)
    iv. resource utilization (local resource management improvement, diversification of energy fuel sources, infrastructure support);
- Although not highlighted in the literature, problems contributing to energy poverty in Senegal that were discussed by the participants included: wasteful energy practices, the influence of culture on project success, the potential negative effects of climate

change policy on energy development and progress, the lack of renewable energy project information for end-users, and the weak development of local fuel resources;

- Widely recognized problems in the energy poverty literature that were not addressed during the workshop included: the influence of climate variability, civil conflict and corruption, insufficient local financial ownership in locally based energy projects, and the importance of gender consideration for all aspects of energy project development;
- Although many agencies and research institutions are placing an emphasis on gender balanced research in relation to local resource development issues, such as energy poverty in Senegal, this did not surface as being a prominent concern of the participants in this study.
- Through the process of imagining future scenarios, several goals emerged, including: dynamic and long term focused activity in the energy sector, the creation of regional training centres involving North-South and South-North cooperation, the creation of financial lending institutions for energy sector research, the establishment of energy policies involving multi-stakeholder consultation, optimal exploitation of fossil fuels and renewable resources, and the improvement and renovation of electricity infrastructure.

7.2.2 Scenario process

The scenario process is not intended to produce direct strategies, but rather input to the strategy and policy development process. The creation of scenarios through a participatory and exploratory workshop in Senegal provided some valuable insight on the potential benefits and efficacy of the tool. The most notable include:

i. the provision of an opportunity for an open, risk free environment to promote lively discussions that may not be common in many hierarchically organized environments, thereby enabling local voices to be heard;

ii. the ability to break individual and collective mental barriers and promote changes to typical problem-solving approaches;

iii. the relatively low costs involved with the workshop;

iv. the ability to produce and document a large amount of valuable information and perspectives of local participants within a short time frame.

To address the gap in the literature on the efficacy of the scenario process, each stage of the scenario exercise was evaluated. From these results, the following are considerations that are critical to the success of a scenario workshop:

- The participants need to understand the scenario method; however the facilitator must balance explaining the process and advancing with the workshop goals. During this research, several participants indicated they would have benefited from more background materials. The provision of detailed background information on scenarios methods may appear to be an easy way to inform participants and avoid confusion. Yet, the reality is that documents may not be reviewed in detail prior to any workshop, thus this cannot be relied upon as the only method to inform participants of the process. Explanations in simple language are recommended, in addition to the provision of background materials.

- Future users of the scenario tool must be aware of the potential for bias during explanatory stages, depending on how the key questions and background materials are presented. The presentation of scenario examples may greatly help people understand the process, but would most likely influence how people shape and construct their scenarios. The recommendation is that the facilitator must be acutely aware of the potential to influence the participants' responses and concentrate on guiding the process, rather than the ideas.
- Throughout the scenario process several sets of data and several scenario narratives are produced. The facilitator, and other involved agencies, must recognize that data are a reflection on the perspectives of a collective and not all of the information and linkages present will "make sense" to people outside of the process reading the results. Seeking clarification from participants after the workshop is difficult since individual opinions may not reflect those generated during group sessions. Thus, adequate time must be available during the scenario presentations to discuss the results in plenary and record any additional information.
- The results created during the scenario process should not be considered input that directly creates strategy or policy development activities. The results and process are not prescriptive; rather the creation of scenarios helps explore what could happen and identifies influential factors and forces that shape the future. The information requires analysis by the facilitator to identify links and areas for further focus, and external validation is needed to limit the bias introduced by this process.
- The scenario process has many benefits and is not limited to the exploration of the focal question and recording the information produced. This research supported

claims that the tool is beneficial for learning and breaking mental barriers. The scenario exploration and creation process allowed people from diverse organizations to network and learn from each other. The process showed promise in helping individuals learn different approaches to examining problems. This research demonstrates that future scenario building has the potential to increase cohesion between people focusing on similar problems and may be instrumental in helping dissolve cultural and hierarchical barriers.

- The scenario narratives and results produced during the workshop can be considered a direct reflection on the knowledge, experience, skills and willingness of the participants. Careful participant selection is important to ensure that an adequate knowledge base is present. Facilitators must then ensure equal participation and an environment is created that is conducive to open exploration and group reflection. This may be accomplished by avoiding supervisor/subordinate pairs, and by involving a multitude of players from different organizations to minimize the influence of power relations.
- A "practice run" is highly important. As a wide array of different tools may be used during a scenario workshop, familiarity with the execution of the various tools is critical. The facilitator should be trained prior to the workshop and modify specific procedural details to fit the topic of research. Furthermore, assistants should also be involved in training activities.
- Time management is extremely important since the scenario process allows a high degree of informal discussion within a structured process, the potential for deviations from a set agenda is large. Facilitation must be assertive, yet also flexible to allow

small changes. However, as the process is constructive and the results from each stage are important to reaching the final outcome, no step can be omitted. In addition, the final phase involving the creation of the scenario narratives must be given ample time. The scenario presentations help further refine and clarify ideas and change to the scenarios must be made while the group dynamics are retained.

- The scenario-building process should be included as part of a larger strategy or policy creation project. The process enables participants to help identify forces that may affect the future, concerns that must be addressed, and directions for approaching problems. The efforts of all the people included in the scenario process will be maximized if the information created and documented is shared with other agencies and organizations from various sectors to enact positive change.

7.3 Key implications of the research

The results produced through this scenario exercise should be particularly useful to development agencies, local NGOs, government bodies, and research institutions. The information produced, including the influential forces, prioritized issues, areas for policy focus, and long term energy sector goals represent the perspectives of a highly diverse and experienced group of policy and research professionals which was not previously available. This data could be used by those agencies involved in the various aspects of energy policy aimed at reducing energy poverty.

The research findings revealed that the people directly involved with local energy policy development must grapple with many unanswered questions and face a distinct lack of solutions available to answer these questions. These questions highlight the key

issues and actions that need to be addressed by future research and strategic adaptations, and include:

- What will facilitate and motivate change, or what incentives currently exist to drive change? For example, if people like the results of scenario #1, Shining Senegal, how can this be achieved?
- The role of specific agencies and organizations remains unclear – who needs to be involved to make 'things' work?
- Energy is not an isolated sector, and unfortunately, is often low on the priority list of development issues. Political action is not always logical and is linked to dominant national and international issues and crises. Dramatic shifts in government direction may be needed. How could this shift be achieved?
- The research also highlighted the need for developing strategies to facilitate change within the three dominant forces:
    i. Economic development - financial support and stability, development of markets
    ii. Social cooperation – power sharing and trust
    iii. Political cohesiveness – developing 'will' and strengthening capacity
- While economic problems and the lack of capital were widely recognized in the literature and by participants as being a limiting factor for many development issues, including improving energy access, realistic solutions must involve more than demands for increased access to money. Private sector involvement usually is only possible if potential for profits is demonstrated, which means that markets must be developed. Yet, if income-generating activities are scarce, the process cannot begin.

The results from the scenario workshop included references to developing income generating activities and facilitating the legal and regulatory environment for private sector investment. These types of ideas need to be further developed.

The detailed account of the procedures followed during the two-day scenario building exercise contributes to a much needed realm of literature. The evaluation of the tool based on structured criteria, which also included the voice of participants, should benefit future scenario practitioners through the provision of clear recommendations. The scenario tool, as evaluated in this specific context in Senegal, proved to be an effective and low cost means to engage policy and research professionals in a participatory process. The process reduced the influence of hierarchy in potentially stifling open communications, and encouraged cooperative learning. Individually and collectively, mental barriers were reduced and previously unconsidered ideas were contemplated. The use of this tool in development projects can help include and consolidate local concerns and perspectives through a structured and replicable format. By utilizing a structured, replicable, and transparent process, the output has an ensured element of credibility.

The majority of the issues and barriers affecting the accessibility to clean, efficient and sustainable sources of energy in Senegal today are the same concerns that have been present for the past several decades. While many aid and development agencies and private investors have attempted to improve access to energy resources, the work was typically done prior to actually determining the needs of local people and realities of the region, whether due to culture, geography, technological capacity, or economical and political stability. Future research will need to continue the involvement

of local participants in identifying key issues and barriers, and in the consideration of possible future outcomes. The scenario process is a useful tool in gathering the local perspectives on these topics, when proposing developments, or actions for solutions.

7.4 Limitations and considerations for future research

Due to logistical constraints (e.g. time, funding), certain limitations to the project existed, which can be summarized in five main concerns. Firstly, the focus of the participants in terms of key issues, barriers, and possible futures would have been influenced by their demographic backgrounds. Different results would be expected if the scenario workshop involved rural, energy user groups, or possibly individuals with greater power in terms of policy decision making. However, logistics did limit the participant selection process from including civil society groups from rural and peri-urban areas in Senegal. Thus, it is recognized that the group formed only represents certain segments of the population. Future studies may consider focusing on different segments of the population, such as user groups, to determine if their perspectives on energy needs, barriers, and possible solutions vary from those involved at the policy level. It is also suggested that future studies include greater civil society representation to strengthen the legitimacy of the process of creating strategies designed to benefit the urban and rural poor. The most effective strategies and policies would likely result as a result of input from a wide array of groups. Therefore, groups need to be selected based on the objectives of a study and the research should be presented according to the context. The objective of this study included working with policy and research professionals from government agencies, NGOs, and research institutes.

Secondly, the experiences of participants in using scenarios, or engaging in future thinking methods, would have influenced the results. The method proved difficult for some individuals as time was required to "break" mental barriers and understand the purpose of this type of thinking, and become comfortable enough to openly share and discuss ideas. However, given enough time and proper facilitation, the lack of experience should not pose a threat to the obtaining complete results. Those participants with scenario experience may strategically be placed in various sub-groups to help guide the process.

Thirdly, the process and results of this study would have undoubtedly been influenced by the fact that the facilitator and research colleague had "Western" backgrounds. The influence may have been present in one of two forms. One, the facilitator and colleague would not be seen to be directly familiar or have experience with the issues at stake to locals, and two, the possibility exists that local problems may be "downplayed" and information sharing may be reserved for reasons of pride.

Fourthly, as aforementioned, time management was critical to the success of the scenario methodology. The opportunity for a third day, or half day to refine the scenarios may be beneficial for future studies. The reality in this case is that it is unlikely that the entire group would have been available to attend an extra session.

Lastly, the data and perspectives documented though the use of the scenario tool demonstrated that the participants had a very good grasp on local problems, causal factors, and ideas for effecting change. Much literature exists dedicated to discussing energy poverty in economically poor countries. The materials produced provide further validation, support, and recognition of the problems and identifies perspectives that are

unique to Senegal. Future research in Senegal, and also other UEMOA countries, can now use the research as a building block in the process of identifying prescriptions for change to improve energy access for the people of the region.

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APPENDIX I

PILOT WORKSHOP AGENDA

AN EXERCISE IN SCENARIO MODELING
Halpern Centre for Graduate Studies, University of Victoria, May 8, 2002

Focal question: What are the factors, key issues and problems (local, national and international) that will influence Western Canada meeting its energy needs in the future?

INTRODUCTION

3:00 Welcome
3:05 Introduction
3:10 Slide show
3:15 The workshop and its methodology

FACTORS

3:25 Individual brainstorming on factors :
- Write down 5-10 factors

3:30 Groupwork on factors :
- Compare individual factor lists and discuss
- Compile full list of all relevant factors
- Write each factor on flash card (bold letters with marker)

3:45 Plenary on factors

RANKING

4:00 Individual work :
- Rank top ten factors from all the factors on the wall

4:05 Groupwork – Ranking/Matrix :
- consensus ranking of factors
- Write top 10 on flash cards
- placement of top ten on matrix (full size poster paper)

4:20 Plenary identifying driving forces/scenario drivers

SCENARIO SHAPING

4:40 Groupwork :
- Scenario shaping:
  - Name the scenario carefully (vivid and memorable)
  - Look at the key factors again, consider their incorporation
  - Look for connections and mutual implications between them
  - Weave the pieces together
  - Make a story

5:00 Presentation of scenarios (5 minutes each)

EVALUATION / CONCLUSION

5:15 Evaluation of workshop methodology

APPENDIX II

SCENARIO WORKSHOP AGENDA

Friday May 23 – 'DAY 1'

08h30 **Overview of the project and participant introductions**

09h00 **Workshop format and objectives**

Workshop objectives

1) How can energy needs be met in Senegal and other UEMOA countries?
2) What are the barriers to meeting these needs?
3) What are the barriers composed of, and how complex are they?
4) What are alternative paths and solutions?

- STAGE 1 -

09h30 **"What is at stake?"**

Brainstorm on key problems with respect to energy in Senegal (& UEMOA)
Organize and cluster outputs from brainstorming

10h30 **Coffee Break**

- STAGE 2 -

11h45 **"What are the most important problems?"**

Rank problems to determine the top 2 of each cluster

- STAGE 3 -

11h30 **"What are the barriers to solving the problems?"**

Discover embedded barriers within each identified problem

12h45 **Lunch**

13h25 **Prepare for "barriers" presentations**

Explain what barriers were discussed

13h55 **Coffee break and prayer**

14h45 **"Barriers" presentations**

10 minutes for each group, followed by question/answer period

- STAGE 4 -

15h45 **"What might happen in the future?"**

Individual feedback on different possibilities of the future (on worksheets)
Hand in worksheets to facilitators
Groups use written input from worksheets to identify diverse possibilities for issues Formulate two opposite possibilities

16h45 **End of Day 1**

Overview of progress, relation to tomorrow's agenda

Saturday May 24 – 'DAY 2'

08h30	**Start of Day 2** Opening remarks, review of previous day's accomplishments
	- STAGE 4 - *(Continued)*
09h00	**"What might happen in the future?"** Groups re-convene and confirm their "opposite possibilities"
	- STAGE 5 -
09h30	**"What scenarios can we explore?"** Identify specific scenarios
	- STAGE 6 -
10h30	**"What will your scenario look like?"** Group work on scenario modeling
12h00	**Lunch**
13h00	**"What will your scenario look like?"** *(continued)* Continue group work on scenario modeling Prepare for "scenario" presentations – follow the hand-out for the format
13h55	**Coffee break and prayer**
14h45	**Scenario presentations** ½ hour for each group, including time for question/answer period
16h30	**Workshop conclusion**

- END -

APPENDIX III

SCENARIO WORKSHOP 'PROBLEM RANKING WORKSHEET"

STAGE 2: "What are the most important problems?

	Grouping		***Grouping***		***Grouping***
1		1		1	
2		2		2	
3		3		3	
4		4		4	
5		5		5	
6		6		6	
7		7		7	
8		8		8	
9		9		9	
10		10		10	
11		11		11	
12		12		12	
13		13		13	
14		14		14	
15		15		15	
16		16		16	
17		17		17	
18		18		18	
19		19		19	
20		20		20	
21		21		21	
22		22		22	
23		23		23	
24		24		24	
25		25		25	
26		26		26	
27		27		27	
28		28		28	
29		29		29	
30		30		30	

APPENDIX IV

SCENARIO WORKSHOP "BARRIERS TEMPLATE"

STAGE 3: "What are the barriers to solving the problems?"

Presentation Template

Group/Category: _____

Problem: _____

Barrier #1: _____

Barrier #2: _____

- Explain what barriers for this problem were brought up in your group:

- How did you reach your decision on the top 2?

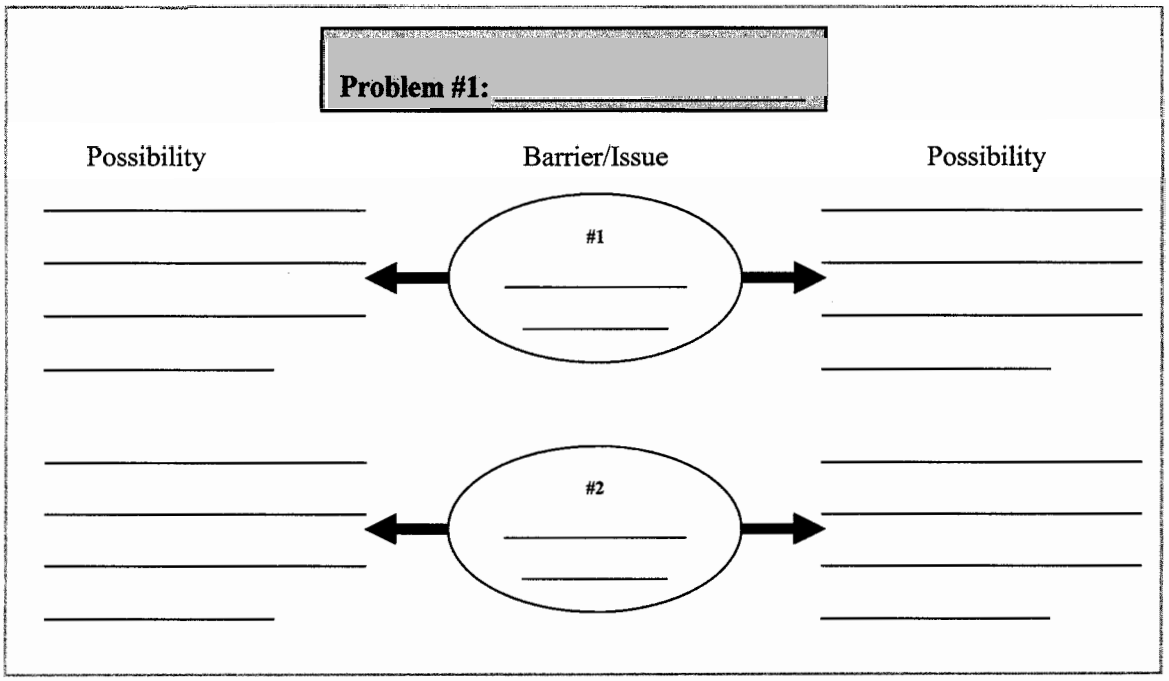
- What were the contentious issues?

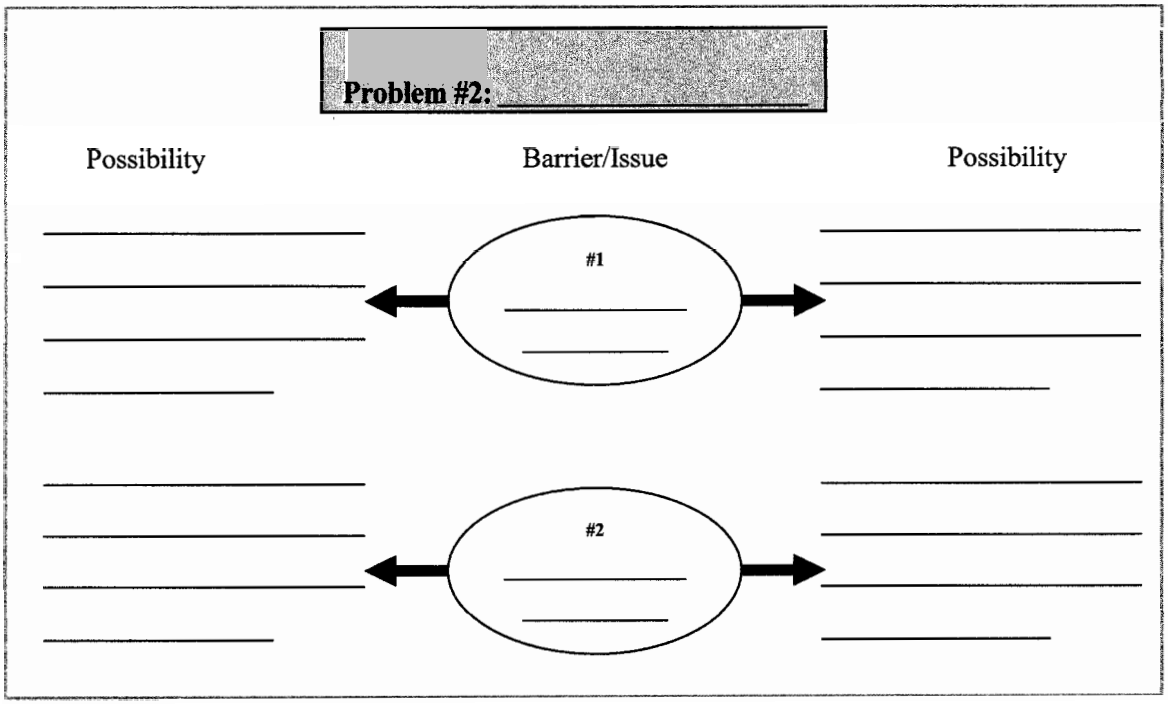
APPENDIX V

SCENARIO WORKSHOP "POSSIBILITY WORKSHEET"

STAGE 4: "What might happen in the future?"

Grouping: _____





APPENDIX VI

SCENARIO WORKSHOP "SCENARIO FORMAT TEMPLATE"

STAGE 6: "What will your scenario look like?"

Scenario Format

Title of Scenario: _____

- 2-3 Attributes that will be present in your scenario
- Additional major and related attributes (utilize other possibilities)
- Explanation of how these attributes will interact and affect the future of energy needs in the following categories:
    1. Economic
    2. Social
    3. Environmental
    4. Institutional
- Outline key players (e.g. governments, international players, corporations, grassroots organizations and NGOs, etc.)
- Most notable impacts
- Diagrams: e.g. time versus specific variable (key attribute)
  (over time what happens to a specific variable?)

Things to consider:

- *What happens? What problems persist? What changes?*
- *How would, or are energy needs met in such a context?*
- *Your story should be plausible*
- *Use detail*
- *Format: 4-6 pages, double spaced*
- *Make sure it makes sense to a person outside of this workshop*

APPENDIX VII

SCENARIO WORKSHOP EVALUATION SURVEY

1) Were you familiar with scenario modeling prior to this workshop? Y N

2) If yes, have you had experience utilizing this type of methodology? Y N

	Low		Medium		High
3) How interesting did you find the scenario workshop?	1	2	3	4	5
4) How did the workshop relate to your personal and professional interests?	1	2	3	4	5
5) How did the workshop relate to your institutional interests?	1	2	3	4	5
6) How suitable did you find the scenario modeling method for exploring the focal subject (energy access in Senegal)?	1	2	3	4	5
7) How clear was your vision of how scenario building can work at the end of the workshop?	1	2	3	4	5
8) Has the content of the workshop fulfilled your expectations?	1	2	3	4	5
9) Were your interests taken into account through the workshop process?	1	2	3	4	5

Please grade each stage based on importance to reaching the final outcome of the workshop:

	Not important				Very important
10) Stage 1 ("What is at stake?")	1	2	3	4	5
11) Stage 2 ("What are the most important problems?")	1	2	3	4	5
12) Stage 3 ("What are the barriers to solving the problems?")	1	2	3	4	5
13) Stage 4 ("What might happen in the future?")	1	2	3	4	5
14) Stage 5 ("What scenarios can we explore?")	1	2	3	4	5
15) Stage 6 ("What will your scenario look like?")	1	2	3	4	5

16) What stage or stages would you recommend be given more time?

17) What do you consider to be the highlights of the workshop?

18) What were some of the drawbacks of the workshop?

19) What would you suggest improving in the methods?

20) Do you have any additional comments?

21) Facilitation of workshop (5 = very good, 3 = medium, 1 = weak) (circle)

1 2 3 4 5

22) Recommended length for future workshops (circle):

1 day 2 days 3 days More than 3 days

23) What additional input would you like to add to the workshop?

APPENDIX VIII

PARTICIPANT PROFILE SURVEY

General
Age: ( ) 20s ( ) 30s ( ) 40s ( )50s ( )60s ( ) 70+

What is your nationality: ( ) Senegalese ( ) Other: _____

Were you raised in an area that is: ( ) rural ( )urban

Professional
Where do you work: _____

Type of organization: ( ) Government ( ) NGO ( ) Private ( ) Bilateral

What is your position: _____

How many years have you been in the current position:
( ) 0-5 ( ) 6-10 ( ) 11-15 ( ) 16-20 ( ) 21 +

What is your major field of expertise: _____

What is your total number of years of professional work experience:
( ) 0-5 ( ) 6-10 ( ) 11-15 ( ) 16-20 ( ) 21 +

Educational
Describe your education background:

_____

_____

Involvement:
Prior to this scenario workshop, what best describes your involvement in the following areas: (check one box for each line)

	Extensive	Moderate	Low
Energy policy - research	( )	( )	( )
Energy policy - administration	( )	( )	( )
Energy policy – education/teaching	( )	( )	( )
Energy policy – consulting	( )	( )	( )
Energy policy – international conference	( )	( )	( )
Energy policy – local/regional conference	( )	( )	( )
Work with other local NGOs/groups	( )	( )	( )
Work with international NGOs/groups	( )	( )	( )
Field work (e.g. rural or urban site work)	( )	( )	( )

APPENDIX IX

SCENARIO #1 – "SHINING SENEGAL" – GROUP NOTES

(English translation)

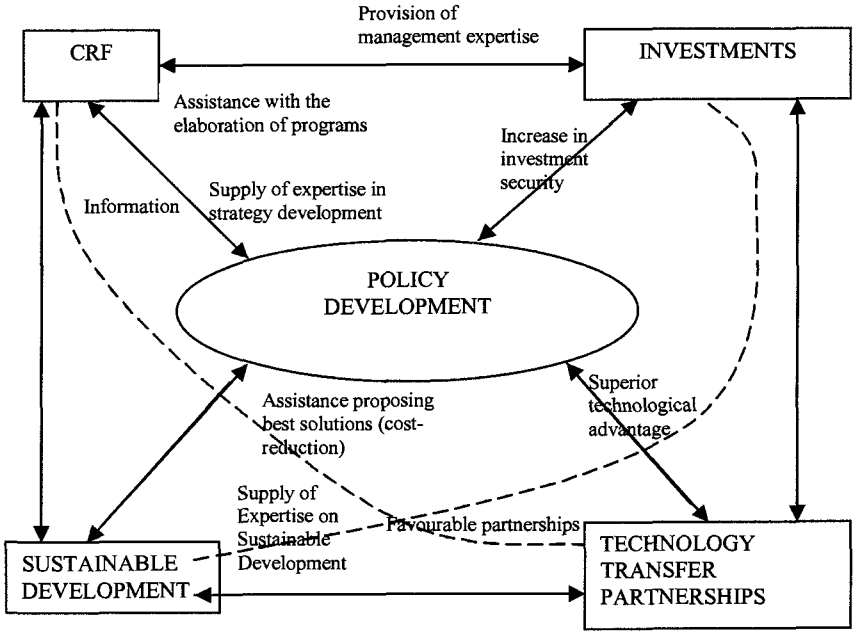
Scenario Attributes:

- Private sector investment
- Regional training centres
- Elaborated policies by all involved parties and agreement on the importance of the energy sector – consistent and stable (evaluation)
- Optimal exploitation of fossil fuel and renewable resources leading to lowered costs at the sub-regional and regional levels conforming with NEPAD objectives
- North-South/South-North partnerships (capacity and technology transfer

Analysis methods adopted by the group:
We utilized the terms of reference, and the outlined attributes (five were noted on the poster). Subsequently, we outlined a plan: 1) the interactions between the attributes and a schematic diagram outlining the interactions between the attributes; 2) economic, social, environmental and institution consequences; 3) key players; and 4) the impacts, and 5) conclusion.

1) The interactions between the various attributes
Senegal, in dialogue with neighbouring countries (UEMOA/NEPAD) formulates coherent policies that involve all parties involved with the energy sector. This policy direction is based on the optimal exploitation of fossil fuel and renewable energy resources. Private investment is secured due to increased confidence in the economic climate. A training centre is created based on national and sub-regional capacity building.

Figure 1. Schematic diagram of the interrelations between the various attributes



The schematic diagram demonstrates the interrelations between the attributes. Moreover, the partnership contributes to the transfer of technology through an increase in volume and quality of investments and good governance. The regional training centre participates in capacity building in all sectors (policy evaluation, sustainable development of resources, good management, etc.) to satisfy needs. Costs are reduced due to the diversification of energy sources and the efficiency of investments, which are also the product of sound partnerships. The investments contribute to the augmentation of the GDP and the increase in competitiveness through lowered costs.

2) Interactions and effects in different sectors

Economic - reforms of public and private enterprises and a stable political climate permit Senegal to considerably increase its GDP by 4% to 10% in one generation! Senegalese enterprises become more profitable due to internal restructuring, international influences, lowered energy costs and higher quality energy services. Senegal experiences an economic boom which is linked to a situation of interconnected energy services in the UEMOA countries. Government partners and backers consider Senegal to be an emerging country during the past decade.

Social - by satisfying energy needs (various mix) a social equilibrium is achieved. In effect, social wellbeing is assured due to improved accessibility to energy in both rural and urban areas. Vulnerable groups are also taken into account. Conforming to the objectives of the MDG, and the implementation of the PRSP, poverty is reduced by 50% by 2015.

Environmental - sound policies permit Senegal to reduce its impact on natural resources and preserve biodiversity in conformation with various international conventions on biodiversity and sustainable development. Further work is done to reforest the country, utilize clean energy sources and develop an environmental consciousness. The country's vulnerability to the adverse effects of climate change is reduced considerably.

Institutional - the legal and regulatory framework in the energy sector in Senegal is favourable for the development of private enterprise._Senegalese institutions perfectly coordinate their development strategies. Work in isolation ends. Collaboration between sectors permits an effective and efficient political situation. Planning becomes a driving force in national energy policies. The information systems are cited and recognized by experts and the statistics are regularly published.

3) Key Players

Government

- Implementation of sound energy policies
- Creation of an institutional/legal framework favourable to investment
- Increased security for investments
- Assured redistribution of economic growth

Non-governmental organizations

- Participation in the formulation of policies to better include the needs of the citizens

- Sensibility
- Contribution to the implementation of policies to ensure smooth integration

Community based organizations/civil society
- Clear formulation and identification of needs
- Participation in the implementation of projects and programs

Development partnerships
- Technical support
- Financing

4) Impacts
- Good governance
- Effective and sufficient amount of expertise in the energy sector
- Competitive enterprises
- Mastery of technology related to the production of renewable energy
- Reduction of energy costs and prices
- Improved access to energy for rural and urban populations (90%)
- Positive competition
- Development and growth of AGR

5) Conclusion:
Senegal has become a strong country. Economic miracles occurred reminiscent of South-East Asia. The situation is due to brilliant energy sector changes.

APPENDIX X

SCENARIO #2 – "BROKEN DREAM" – GROUP NOTES

(English translation)

Scenario attributes:

- Diversification of financing sources and mechanisms
- Degradation of infrastructure
- Bankruptcy of private and public enterprises
- Recognized expertise in the field of research
- Stable national politics
- NEPAD not implemented

Analysis methods adopted by the group:

The group started out by separating the positive and negative points. An analysis of the interaction between the positive attributes was done, and subsequently the negative points were examined. During this stage, the team searched for the cause and effect relationship between the interrelated attributes, followed by the identification of the impacts. Finally, the same analysis was done between the group of positive points and the group of negative points.

Analysis:

1) Grouping of negative attributes:

- The degradation of energy infrastructure - leading to the bankruptcy of private and public enterprises, which formed the base of economic activity.
- Economic – a drop in purchasing power, increases to the unemployment rate, deterioration of social services (sanitary systems, social benefits), and increases in the divide for access to energy sources and services.
- Environment- over exploitation of wood fuel resources (biomass), increased deforestation, which accelerates climate change (warming of soil, changes in rainfall, desertification, and human insecurity (dilapidation of power transmission lines).
- Institutional - social tension, leading to political instability, NEPAD not implemented, sub-regional resources not interconnected, markets reduced (lack of market prospects, limited trading), and the status quo maintained.

Key actors:

The State, private enterprises, citizens, international cooperation

2) Grouping of positive attributes:

The establishment of good national policies permits the diversification of sources and mechanisms for financing, especially for research centres, resulting in recognized and applied national expertise (in addition to implementation).

- Economic – growth, development of local products, favourable economic environment

- Social - poverty reduction, calm social climate
- Environment - reduction in greenhouse gas emissions
- Institutional - coherence in applied policies, improved outlook

Key actors:
Private enterprises, government, international cooperation, NGOs, research institutions, local collectives

3) Scenario taking into account the positive and negative attributes:

Link: Alleviation of harmful effects by the establishment of good policies
Image: Relief from the harm, but not total recovery
Negative impacts: - Economic, social, environmental
Positive Impacts: - Reduction of poverty and effective research
- Diversification of energy sources, but with persistent problems of insufficient production

4) Summary scenario:

- Alleviation of harmful impacts by the establishment of good policies
- Insufficient energy production
- Diversification of energy sources

APPENDIX XI

SCENARIO #3 – "SWEET AND SOUR" – GROUP NOTES

(English translation)

Scenario attributes:

- Withdrawal of private investment, especially in rural areas
- Energy dependence
- Senegal becomes a regional resource in training in the field of energy and communication
- Good degree of diversification in alternative technologies
- Private energy information systems relied upon

Analysis methods adopted by the group:
Relations between the attributes, interactions and impacts.

Analysis:
An absence of investment in rural areas will contribute to the development of poverty in the countryside and a disparity between development in cities and the countryside. This will create the following consequences: 1) the development of rural capital flight, overpopulation of cities, the creation of shanty towns with hygiene problems, public health, and crime; 2) an augmentation of pressure on forestry resources and desertification; and 3) the collapse of state politics.

The energy dependence will produce as a first consequence a commercial imbalance, vulnerability to changes at an international context and a strain on the state budget. The state will no longer have the means to fund priority sectors such as education, health and security. The level of education will be reduced. Crime and mortality rates are at risk of increasing. The state will be increasingly dependent vis-à-vis sponsors for the development of energy policies.

This situation could have as a consequence the development of poverty, economic collapse and socio-economic instability. However, the availability of experts in the energy domain and the existence of a reliable information system will create favourable conditions for the development of policies and strategies in the energy sector and will attract investors. With these conditions, diversification of alternative technologies will permit the pressure to be relieved from crucial resources and the dependence on the exterior will decrease, which is in line with the development of an alternative energy sector to curb or alleviate the negative effects of the absence of investment and the dependence on the exterior.

Table 1. Relationships between key factors and variables

	Poverty	Economic Collapse	Social and economic instability	Development of policies	Pressure on crutial resources	Lack of investment	Dependence on the exterior	Training	Diversification
Lack of investment	+	+	+	0	+	+	0	0	-
Dependence on the exterior	+	+	+	-	+	-	+	0	-
Training	0	0	0	+	0	-	-	+	+
Diversification	-	-	-	+	-	-	-	0	+

Explanation of the figure:

- The four variables in the rows have an effect on the variables in the columns
- + signifies "leads to"
- - signifies "alleviates" or "eases"

APPENDIX XII

SCENARIO #4 – ADRIFT (or BLACK-OUT) – GROUP NOTES

(English translation)

Scenario attributes:

- Middle East monopoly on petroleum
- State with reactive planning lacking long term vision ("flying by the seat of its pants")
- Sub-regional organizations disappear
- Bankruptcy of private and public enterprises and total external dependence
- Anarchy
- Poverty and conflict
- Energy wastage

Analysis methods adopted by the group:
The group organized the attributes into causes and consequences.

Analysis:
The key causes included:

- The total dependence on the exterior for Senegal's energy plans;
- Reactive planning lacking long term vision;
- Bankruptcy of private and public enterprises

The following are consequences:

- Anarchy and the disappearance of sub-regional organizations;
- The outbreak of conflict and poverty;
- Energy waste

<u>How will these causes affect the future energy needs in the economic plans:</u>
The total energy dependence will create an increase in the price of petroleum, up until the cost per barrel is so high it creates a monopoly situation. This creates a debt to the State, or a limitation or heavy reduction in the functional budget of the State. The State can no longer make investments. A total disequilibrium of the commercial balance exists in Senegal. This leads to increases in prices, elevated inflation and the bankruptcy of private and public enterprises. The unemployment rate increases, and new employment opportunities are not created.

Such a scenario provokes an increase in urbanization, the impoverishment of cities and villages, generation of conflicts, creating a sense of insecurity in Dakar, and an instable government that creates and maintains knee jerk reactions. All these problems provoke the flight of investors. Anarchy is here. The basic needs of the population are not satisfied: no energy (electricity); no health care; no education; no water (→water programs in recession).

Regarding the environmental plan, the described situation will create strong pressure on the remaining natural resources, leading to further deforestation and increased desertification. Problems of sanitation will occur in cities (overpopulation, lack of energy), in addition to increased pollution and a decline in public health.

At the institutional level, political instability is present, the missions and goals of various organizations become ambiguous, political decisions become strongly influenced by external organizations such as the World Bank, IMF and various bilateral aid agencies. Political order is disrupted and the State can no longer pay its staff.

The roles of key players:

The government:

- Try to find funds to combat the deficit;
- Develop new and renewable energy sources (solar, hydroelectric, wind...);
- Define a coherent program to address economic and social problems taking into account energy issues;
- Utilize local resources, specifically small and medium size enterprises, such as local artisans;
- Appeal to regional and sub-regional cooperation.

International players:

- Revisit their intervention methods in the realm of bilateral and multilateral cooperation;
- Impose specific authorities and politicians;
- Cancel or reduce national debt.

NGOs and grass roots organizations:

- Sensibility of sponsors;
- Train populations in activities that generate revenue
- Train in the diversification of energy sources, especially the development of renewable energy;
- Denounce the management methods of financial institutions and their impact on the population.

Impacts:

- Economic recession
- Devaluation of local currency
- Restructuring of the economy
- Development of human resources and local talent
- The assumption of responsibility, establishment of local enterprises, development of the informal sector
- State services are neglected
- Disengagement of the Sate for the provision of public services
- Political and social instability with repercussions on institutions

- Reorientation of energy policies and other policies, reinforcement of capacities and training in the alternative and renewable energy sectors.

Conclusion:
This scenario may have negative effects, but it also has positive benefits due to the resilience of civil society and the optimization of the existing resources.