RURAL ELECTRIFICATION
An Economic Trigger in the Dormaa District of Ghana

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ABSTRACT

Literature on energy recognizes the electrification of rural areas as an important economic development trigger. As the impact of rural electrification begins to manifest, rural areas begin to look different. The change becomes difficult to recognize in retrospect and also to foresee even before the intervention. The impact of electrification varies among various sectors of the rural economy. This paper examines rural electrification in the Dormaa District of Ghana by highlighting its linkage with small-scale enterprises (SSEs). The paper reports on a survey research that entailed mainly the collection of primary data using key informant interviews and questionnaire administration. Conventional statistical analysis of data obtained was carried out using Statistical Package for Social Scientists (SPSS). The survey revealed that manual power, liquid fuels, electricity from generators, wood fuels and charcoal were being used to run small-scale enterprises in Dormaa District. However, the introduction of grid electrification in 1993 resulted in the reduced usage of the energy sources. Manual power had reduced from 35 – 16%, liquid fuels 42 – 8%, wood fuels and charcoal 8 – 5% and electricity (generator to grid) increased from 15 – 71%. Observed trends in spatial and temporal dimensions of rural electrification and small-scale enterprises failed to confirm significant positive linkages between rural electrification and income, production and employment. The paper recommends the vigorous provision of grid electricity in rural Ghana to expedite development.

KEY WORDS: Grid Electricity, Small-scale Enterprises, Employment Generation, Gross Profit, Rural Electrification.

INTRODUCTION

Energy production and development has been an important part of the post-independence development of Ghana. Its role as the prime mover of industry and as a symbol of modernization continues to place energy development at the center of national development planning (GoG/MoFEP, 2006; GoG.NDPC, 2005, MoME, 1995). The use of energy for production activities, namely in the manufacturing and industrial sector, propelled the initiation and development of the Volta Dam project. The demand for energy by both urban-based industries such as Tema Steel Works and

Aluworks, but also rural or cottage industries were at the center of that project. Yet, the use of energy for domestic purposes and for service industries also has presented their own demands. In recent time, however, political expediency and the energy crisis have become additional prime movers in national and energy development plans. Rural development demands for domestic and cottage industry have also presented political and economic demands for energy development (Munasinghe, 1987). Political campaigns are often filled with promises and/or recounts of achievements in energy delivery. Most critical, however, has been the growing demand for energy to power rural industrialization and modernization of rural communities in schools, hospitals and homes.

The political dimension of electricity presents the additional impetus of bridging development gaps and promoting equitable and sustainable development. At independence, energy, specifically hydroelectric energy, development served as a critical factor for import substitution industrialization but also national sovereignty and self-sufficiency. The massive infrastructural development at the time benefited from the availability of locally-produced and cheap energy in the form of hydro-electricity from the Volta Dam Project at Akosombo. At the onset and for a period after, the newly constructed industrial city of Tema, where the steel, processing and shipping industries were emerging, benefited the most while surrounding communities in the project area were not connected to the grid. Later development, especially under rural and community development efforts of various governments, connection to the national grid served to bridge development gaps and inequalities.

Since independence, energy production has been seen as an important part of growth and poverty reduction efforts (GoG/MoFEP, 2006; GoG.NDPC, 2005). The role of energy in Ghanaian national development has been articulated in the growth and poverty reduction efforts. Growing demand for the availability and supply of affordable energy has been essential in debates and programmes for rural and urban development. Energy for domestic consumption, service delivery and industrial production has been high on the national and community development initiatives.

The Volta Dam Project, but also other initiatives such as the Thermal Energy, Solar Energy and even Atomic Energy projects, have all aimed at improving the energy situation of the country (GoG/MoFEP, 2006). In spite of the various efforts, the Volta Dam project, which generates and supplies the bulk of the country's energy remains the most important one. Hydro-electric power has been the main source of power for Ghana's rural electrification initiations. This has taken the form of a phased and incremental connection of hitherto deprived communities to the national grid. The creation of the Northern Electricity Department (NED) was necessitated by an agenda of improving connectivity to the national grid for communities and industry in the Brong-Ahafo and the three northern regions.

In more recent time, the role of energy in national and rural development has been stressed in growth and poverty reduction efforts. The Growth and Poverty Reduction Strategy (GPRS II) captured this as follows:

To support a growing ago-industrial and services sector, as well as the needs of households, the policy thrust for the sector [energy sector] is set within the context of ensuring a reliable supply of high quality energy services. The broad policy interventions outlined to achieve this overall goal include: ensure increased access to modern forms of energy to the poor and vulnerable; modernize and expand power infrastructure; improve the regulatory environment in the power sector, ensure full cost recovery for power supply and delivery while protecting the poor; and ensure productive and efficient use of energy and minimize the environmental impacts of energy supply ad consumption through increased energy efficient technologies. (GoG/NDPC, 2005: 36)

Clearly, this policy thrust sets domestic and industrial parameters, which are underpinned by equity and efficiency demands, for energy development.

This paper discusses an effort in the Dormaa area of the Brong Ahafo Region of Ghana, where connection to the national grid was used as an important means for community and enterprise development. That rural electrification programme was aimed at serving domestic needs but more importantly to promote small scale enterprises development for enhanced employment and income generation. It was expected that the connection of the area to the national grid would trigger enterprise development in ways that would deliver socio-economic benefits to the people of the area. This paper is a result of an investigation, a field survey that sought to assess the extent to which the initiative had met expectations by delivering it goals. It focuses on the extent to which small scale industrialists have utilized and benefited from the initiative and the inter-sectoral linkages that have resulted from the process. This is done through an analysis of the historical and theoretical underpinnings of the initiative as well as the empirical evidence from the area of study.

CONCEPTUAL FRAMEWORK

Grid Power and Rural Electrification

Rural electrification and its attendant benefits have been found to be considerably responsible for rural development (GoG/NDPC, 2006, Barnes & Foley, 2000; Wolfgang, 1978). Electricity is a prime mover of industrial growth. It generates employment and income for its beneficiaries. Electricity has played tremendous role in various industrial movements worldwide. The nineteenth century industrial revolution in Europe and America and ongoing industrialization of the People's Republic of China and the multi-million dollar electronic industry of the Western world today have been built on electric power (Wolfgang, 1978).

Grid electrification is the most preferred means of providing rural electrification. This is because the grid allows people to use standard electrical equipment and appliances without any practical constraint on the quantities of electricity they consume. However, in remote or difficult to reach areas, batteries, isolated generators, solar energy, micro-hydro, wind, small biomass-fired generators and hybrids of such options had been used to provide rural electrification (Barnes & Foley, 2000; Ciscar, 1997; Munasinghe, 1987; Wolfgang, 1978).

Access to electricity has become a basic human right just as access to clean air, water, shelter, clothing and food (Ciscar, 1997). The lack of it was a manifestation of poverty. It has the power to change the face of rural areas to unimaginable extents, ensure income redistribution, bridge the gap between rich and poor, curtail rural-urban migration if provided with other micro-infrastructure, support employment creation and enhance living standards (Mistry, 2000; Palestinian Energy and Environment Center, 2000; Best et al. 1997; Ardayfio-Schandorf, 1986). In rural Africa, carpenters enjoyed band saws and mechanized equipment, power looms replaced handlooms and electric motors have taken the places of oil powered machines. It availed blacksmiths with power hammers and metal workers with power pressing machines (UN, 1966).

Ghana launched a National electrification Scheme (NES) in 1987 to extend electricity to every nook and cranny of the country by the year 2020 (National Development Planning Commission, 1997). NES was in two folds: the District Capital Electrification Programme (DCEP); and, the Self-Help Electrification Programme (SHEP). DCEP was to electrify the then 110 district capitals while the SHEP targeted communities within 20 km of the national grid (Ministry of Mines and Energy, 1995). In 1991 the Ministry of Energy observed that the newly electrified communities mainly had street lights, few domestic electric users and no commercial users (Ministry of Energy, 1991). By 1995 about 24% of the country had been electrified while the remaining 76% wallowed in darkness (Ministry of Mines and Energy, 1995).

Rural Industrialization and Enterprises

Writing on the use of rural industrialization in community development initiatives in Ghana, Dorvlo (2006: 138) defined rural industries "as 'industries organized, manned(sic) and financed by rural institutions and people and those which produce services of special nature to rural people.' ... The aim was to offer job opportunities to rural people and contribute towards the raising of their living standards. Dorvlo traces the genesis of rural industrialization to the post independence era through the Second Republic to present time. In his analysis, he stresses the imperative of intersectoral linkages at the institutional, management and delivery levels. For him, rural industrialization promotion serves as a critical avenue for the promotion of community development through rural enterprises. He identifies the expected benefits of what he terms allied rural enterprise as increase in the earnings of the rural people,

raise in their living standards and absorption of rural people into gainful employment comparable to jobs in the city.

This study assessed the effects of grid electrification on small-scale enterprises in the Dormaa District of Brong Ahafo Region, Ghana. The study area basically depends on agriculture. SSEs are off-farm activities which serve as entry point for women and the youth into the District's economy. A connection to the national grid was expected to deliver economic and social benefits for the district, communities and vulnerable groups.

The Integrated Development Model

The Integrated Development Model has been pursued in community development as an alternative to development that has been segregatory and one-sided. For instance, it has been introduced as an alternative to the liberal approach, whose strong economic development agenda based on a center-periphery model, has fostered economic growth for already well off members of society or socialist models that prioritize politics without a strong economic base. Thus, the integrated approach originates from a critical perspective that has sought to combine economics and politics to the benefits of all peoples and with special emphasis on deprived groups such as the working class, rural communities and women (Dovlo, 2006; Opare, 1990).

Dovlo's (2006: 133-134) succinct and in-depth explanation of the Integrated Rural Development Approach is worth citing here in detail as follows:

An Integrated Rural Development Approach explicitly presupposes a rural-urban gap and by implication a dangerous widening of the gap in the wealth of individuals and, therefore specifically states it as its purpose establishing linkages between industry and agriculture and between town and village.(...) Whereas a rural development programmes may merely seek to ameliorate some of the appalling conditions in the rural areas, an Integrated Approach to Rural Development makes explicit the fact that not only is a shift from an over-concentration on urban problems necessary, but also that in reality neither the rural nor the urban area can be considered in isolation. "Planning" and "Political Control" as defined, in particular, are key aspects of an integrated approach to rural development. (...). It is the greater social, political and economic equality between the rural and the urban areas and the more effective coordination within and between the various sectors mentioned in 'planning' that are made explicit in an integrated rural development scheme.

Indeed, integrated rural development ascribes to the political agenda of bridging equity gaps and acting in response to histories of discrimination between rural and urban.

The Integrated Development Model analysis was applied to investigate the linkages between rural electrification and small-scale enterprises in the Dormaa District. The

relevance of the model lies in its ability to explain the linkages in production function, resource allocation, capital, technology, land, labor and energy. It further recognizes the importance of external demand, policy decision, foreign exchange and inter-sectoral resource mobility. These concepts of the model are easily adjustable to changes, substantially flexible to alternative policies and assumptions, and increasingly useful in the study of a broad range of problems (Chatterji, 1981).

METHODOLOGY

The study began with a thorough literature search complemented by a survey. Primary data was mainly used. The data was collected through a combination of key informant interviews and questionnaire administration in the year 2000. The survey covered 734 SSEs, which were categorized into manufacturing, commercial and service enterprises. About 27 percent of total SSEs, 200, formed the sample size. Proportionate samples were taken from the three categories. Simple random sampling was used to select individual enterprises. The study purposively used business owners as respondents but in their absence, attendants whose stewardship spanned the two periods, before and after electrification were contacted. Data obtained from SSEs that operated in 1992 and also in 2000 were analyzed through Statistical Package for Social Scientists (SPSS). The year immediately before electrification, that is, 1992 was used to represent (baseline) the situation before electrification. The year 2000, seven years after electrification, was used to represent the impact of rural electrification. In comparing the data from the two periods 1992 and 2000, inflation between the periods was taken care of in order to bring the data in the two periods at par. The 2000 inflation rate of 25.2% was used to deflate values of the year 2000 to arrive at the real values used in the study (Ministry of Finance and Economic Planning, 2002). Two towns (Dormaa Ahenkro and Wamfie) were purposively sampled out of eight that had been connected to the national electricity grid.

RESULTS AND DISCUSSION

Types of Small-Scale Enterprises

Instead of inter-sectoral resource mobility between manufacturing (43%), commercial (37%) and service (20%), they operated with no recognized linkages. Examples of enterprises include printing press, grain and flour mill, sawmill (manufacturing); trading shops, cold store, petrol retail (commercial); and, communication centers and drinking bars (service).

Location and Premises

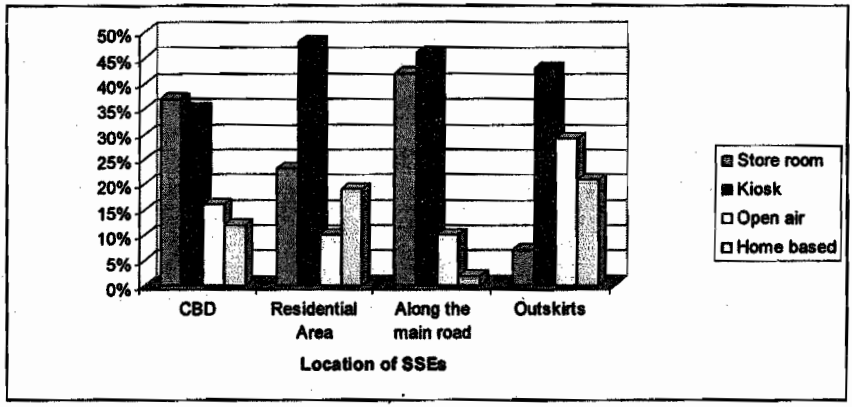
SSEs were widely located in the District. The study organized location of SSEs around the residential area (47%), central business district (CBD) (26%), along the main road (21%) and outskirts (6%). Residential area was most favourite location

because SSEs' owners sited their enterprises close to their residence and some SSEs actually took place in the homes. Kiosk was the most favoured premise in all locations except the CBD as clearly painted in Figure 2.

Sources of Energy

After grid electrification in 1993, manual power had reduced from 35 – 16%, liquid fuels 42 – 8%, wood fuels and charcoal 8 – 5% and electricity (generator to grid) increased from 15 – 71% (See Fig 1 below). A reflection on the shift from other energy sources portrayed the desire of business owners to have access to electricity.

Figure 1: Location of SSEs' Premises



Source: Field Survey (2000)

The owners of SSEs found electricity cheaper and efficiently supportive to their enterprises than the previous energy sources. However, the small reduction in the usage of wood fuel and charcoal expressed their comparative advantage over electricity for food vendors and dressmakers respectively. Inter-sectoral resource mobility as indicated in the conceptual framework would have expected wood fuel and charcoal to have been provided by sawmills. On the contrary, wood fuel were gathered and produced from the forest. About 71% of SSEs in the district availed themselves with electricity, while 29% used the other energy sources. The cost of connection to the grid, monthly electricity bill and disconnection accounted for the continuous reliance on the other energy sources.

Employment

The District witnessed more than proportionate expansion in the number of enterprises after electrification (70%) compared to 30% before electrification. This was indicative of the role of grid electrification. It brought about new enterprises and expansion in the already existing ones. Before electrification, employment constituted

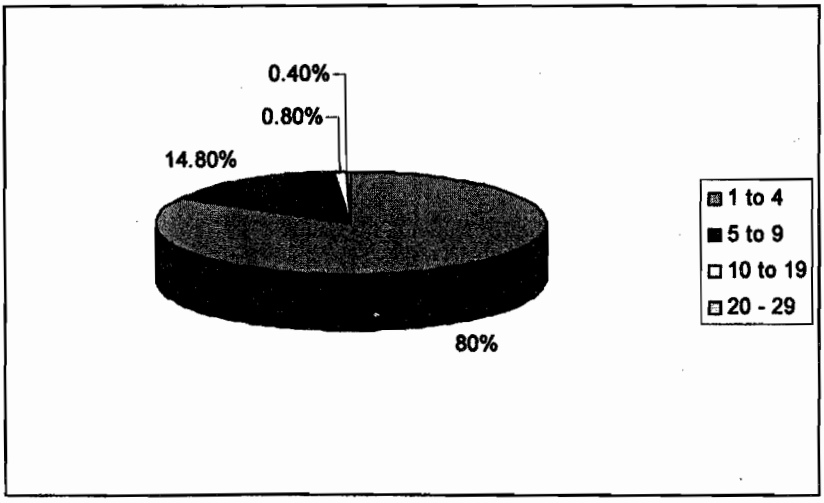
42% of the sampled SSEs. There was a gain in employment after electrification 58%. The gain favored women more than men. Before electrification, 61% of men were engaged in SSEs as against 39% of women. After electrification however, male employment reduced from 61 – 58% while that of women appreciated from 39 – 42%. One would have expected the gains in women's employment to have come from female dominated enterprise such as local food vending. On the contrary, there was no change in percentages for local food vending before and after electrification, 15% male and 85% female. However, women gained in trading shops, dressmaking and drinking bars (Table 1). Also, Table 2 shows that men desirously run their enterprises with electricity however; all dressmaking enterprises without electricity engaged only women. In local food vending and communication centers women used electricity more than men. Figure 2 below illustrates that 80% of employment concentrated in SSEs that engaged 1 to 4 workers. Enterprises that engaged 10 to 19 and 20 to 29 constituted a little over one percent. This accounted for the local use of workers by local food vendors in their firms their prime market target.

Table 1: Employment Levels of SSEs Before and After electrification

SSEs	Before Electrification				After Electrification			
	Male		Female		Male		Female	
	No.	%	No.	%	No.	%	No.	%
Trading shops	21	54	18	46	21	40	31	60
Dressmaking	10	32	36	78	13	20	54	54
Drinking bars	12	75	4	25	10	62	6	38

Source: Field Survey (2000)

Figure 1: Size of enterprises and workers engaged



Source: Author's fieldwork (2000)

Table 2: Employment in SSEs with and without the use of electricity

	SSEs with Electricity				SSEs without Electricity			
	Male		Female		Male		Female	
SSEs	No.	%	No.	%	No.	%	No.	%
Local food vending	0	0	13	100	12	28	31	72
Dressmaking	25	57	19	43	0	0	39	100
Grain milling	14	74	5	26	2	100	0	0
Flour milling	8	67	4	33	0	0	2	100
Electronic repairing	27	93	2	7	5	100	0	0
Trading shops	50	56	39	44	4	29	10	71
Cold stores	11	58	8	42	6	67	3	33
Communication centers	3	21	11	79	0	0	1	100

Source: Field Survey (2000)

Income

From Table 3, SSEs recorded higher production values after than before electrification. Also, gross profits of firms were higher after than before electrification. At 0.05% level of significance, the p value of 0.026 showed the difference in gross profits during the two periods was statistically significant. However, SSEs such as dressmaking, grain milling, petrol retailing and photography printing made losses before and after electrification.

Table 3 Gross profit of SSEs before and after electrification

SSEs	Before Electrification			After Electrification		
	Production in Cedis	Production Cost in Cedis	Gross Profit in Cedis	Production in Cedis	Production Cost in Cedis	Gross Profit in Cedis
Dressmaking	191,500	5,05,500	-5,514,000	719,649	6,821,086	-6,101,437
Tailoring	456,000	25,000	431,000	3,594,249	25,559	3,568,690
Local food vending	23,725,000	153,000	23,572,000	27,695,687	520,767	27,174,920
Shoemaking/ repairs	3,650,000	75,000	3,575,000	36,441,693	87,659	36,353,834
Carpentry	912,000	321,000	591,000	16,517,572	1,062,300	15,455,272

Grain milling	67,000	4,122,000	-4,055,000	269,169	2,410,543	-2,141,374
Blacksmith	735,000	90,000	663,000	1,710,863	165,335	1,545,528
Electronic repairing	720,000	220,000	500,000	958,466	567,092	391,374
Fitting/ welding	22,500	21,000	1,500	323,482	16,773	306,709
Trading shops	29,874,800	6,639,000	23,235,800	123,053,115	11,282,348	111,770,767
Cold stores	2,351,500	1,817,000	534,500	5,614,217	2,940,095	2,674,122
Petrol retail	700,000	1,445,000	-745,000	898,562	2,308,306	-1,409,744
Photography printing	70,000	857,000	-787,000	24,617	577,476	-362,859
Drinking bars	311,700	620,000	-308,300	5,302,715	431,309	4,871,406

Source: Fieldwork (2000)

Inter-sectoral Linkages

On one hand, the study revealed poor linkages among the various components. It found that manufacturing, commercial and service enterprises had not been properly developed to support one another in other to optimize benefits. Thus, the findings did not corroborate the conceptual framework for analysis. The enterprise operated at random and independent of one another. Moreso, SSEs forward and back linkages with large-scale enterprises in the District were not evident. Although such linkages may demand more long term investments policy may consider measures to expedite action and enhance efforts in this regard.

On the other Hand, the study confirmed that production took place in the three sectors of manufacturing, commercial and service enterprises. Owners of SSEs allocated resources to produce a commodity or render service based on a combination of capital, land and labor using technology and energy as captured in the model. Yet, contrary to the analytical model, external demand, foreign exchange and inter-sectoral resource mobility between manufacturing, commercial and service enterprises were virtually absent. From the model, one would expect improved linkages between SSEs and the large-scale sector but there was no evidence to this effect from the case study. Therefore, policy decision may consider improvement in relationship with other larger enterprises in the private and public sectors.

CONCLUSION AND RECOMMENDATIONS

Grid electricity is the most preferred source of energy for SSEs. It has seen the emergence of many enterprises in the District and expansion in already existing ones. Policy implication lies in the vigorous extension of electricity to other areas in the District which may engender likewise results.

In addition, the access to and use of electricity promoted small-scale enterprises by providing employment and training opportunities in the District. In this direction women gained more than men though the latter still use more electricity than the former. Policies to economically empower women in the District may consider increasing women's access to electricity.

SSEs that employ between one and four workers appeared ubiquitous in the District. Policy towards enhancing women and youth employment may give such SSEs a particular attention.

Above all, grid electricity underpins successful operation of SSEs in Dormaa District. It was responsible for increased production and gross profit of enterprises. SSEs, particularly those that employ 1 to 4 and 5 to 9 workers offer employment avenues for new entrants into the District economy. Policy geared towards promotion of SSEs should make access to grid electricity a prime component.

REFERENCES

Ardayfio-Schandorf, E. (1986). The Rural Energy Crisis in Ghana: Its Implications for Women's Work and Household Survival. Geneva: ILO

Barnes D. and Foley G. (2000). Rural Electrification in the Developing World: Lessons from Successful Programs. Washington D. C.: Ozark Electric Cooperatives Inc.

Best G., da Silva M., Dutkiewcz R., Korkor H. E., Malek and Souleyman D. (1997). Energy for Development. Rome: FAO

Chatterji, M. (1986). Energy and Environment in Developing Countries. Chichester: John Wiley and Sons Ltd.

Ciscar, J. C. (1997, November). Photovoltaic Technology and Rural Electrification in Developing Countries: The Socio-economic Dimension. The IPTS Report No. 19 pp. 12-19.

Dorvlo, L. K. T. (2006). Essays on Community Development in Ghana. Accra, Ghana: Maxvin Publicity Enterprise Ltd.

Government of Ghana (GoG)/National Development Planning Commission (NDPC) (2005). Growth and Poverty Reduction Strategy (GPRS II). Vol. 1: Policy Framework. Accra, Ghana: NDPC.

GoG/Ministry of Finance and Economic Planning (MoFEP) (2006). 2007 Budget Statement. Accra, Ghana: MoFEP.

Ministry of Energy (1991). World Programme: Issues, Strategies and Activities for the Sustained Development and Use of Ghana's Energy Resources. Accra, Ghana: Ministry of Energy

Ministry of Finance and Economic Planning (2002). The Budget Statement and Economic Policy. Accra: Government of Ghana.

Ministry of Mines and Energy (1995). Overview of the Energy Sector In Ghana. Accra, Ghana: Ministry of Mines and Energy.

Mistry, P. S. (2000). Electrifying the Developing World. An Alternative, Using Remote Area Power Systems for Villages. Hong Kong: Synergy Power Corporation.

Munasinghe, M. (1987). Rural Electrification for Development Policy Analysis and Application. Boulder Colorado USA: Worldview Press.

National Development Planning Commission (1997) Ghana-Vision 2020 Programme of Action for the First Medium Term Development Plan (1997-2000). Accra, Ghana: Worldwide Press Ltd.

Palestinian Energy and Environment Center (2000). Involvement in Rural Development. Palestine: Palestine Energy and Environment Center.

UN (1966). Industrial Research in Africa. United Nations Economic and Social Council/ Economic Commission for Africa and Centre for Industrial Development. Symposium on Industrial Development in Africa, Cairo 27 January – 10 February 1966.

Wolfgang, P. (1978). Rural Energy and Development: Improving Energy Supplies for Two Billion People. Washington, D. C.: The World Bank.