CONTEMPORARY ISSUES IN TRADE NEGOTIATIONS, FINANCE AND DEVELOPMENT

Edited by:
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INTRODUCTION

Adequate and affordable energy supply is a necessary precondition for sustainable development and indeed, the transition from subsistence agricultural economies to modern industrial and service-oriented societies. Energy is central to improving social as well as economic well-being and indispensable to industrial and commercial wealth generation. It is key for relieving poverty, improving human welfare and raising living standards (UNDP, *et al,* 2000). Energy is central to practically all aspects of sustainable development, including access to water, agricultural and industrial productivity, healthcare, educational attainment, job creation and climate change impacts. As argued by Chow *et al. (2003),* life is but a continuous process of energy conversion and transformation as it is seen as the lifeblood of technological and economic development.

Energy services are an essential means to support overall development, rather than an end in itself. The demand for energy services and thus for energy, is derived from the output of other goods and services. Most economic activities are not possible without energy and no country in modern times has substantially reduced poverty without massively increasing its use of energy. It is established that there exists a correlation between commercial energy consumption and national income, such that countries with higher energy consumption are also found to be those with higher income.

The term *energy services* refer to the benefits from using energy supplied. These services can be generated from a variety of primary energy sources such as oil, gas, coal and renewables. Essentially, energy services include lighting, heating, cooking, motive power, mechanical power, transport and telecommunications. From the standpoint of human and economic development, the benefits from providing energy services are the tangible outcomes of its consumption. For example, poor people require affordable, accessible and reliable energy services to support household, economic and social welfare activities. While it is the practice to discuss energy consumption, it is actually transformed rather than consumed. Thus, what is consumed is the ability of oil, gas, coal, biomass or wind to produce useful work (goods and services as end products). In effect, energy resources can bring about improvement in several aspects of life. Electricity, for instance, promotes activities such as pumping water, refrigeration of vaccines and/or welding of metals.

Access to energy as distinct from its availability is fundamental in the process of development and welfare advancement. Energy services such as lighting, heating, cooking, motive power, mechanical power, transport and telecommunications are essential for socio-economic development, since they yield social benefits and support income and employment generation. Against this background, the relationship between energy production and consumption as well as sustainable development must be considered at least from two angles. One is the import of adequate energy services for satisfying basic human needs, improving social welfare and achieving economic development. Put differently, energy resources are conceived as a source of prosperity. The other is that production and use of energy resources need not and indeed should not endanger the quality of life of current and future generations. No energy production or conversion technology is without risk or waste. All energy chains, from the extraction to provision of services are associated with pollutants being produced, emitted or disposed of, often with severe impacts on human health and the environment.

Ultimately, the centrality of energy resources/services for development is good health, high living standard, a sustainable economy and a clean environment. To this end, no form of energy-coal, solar, nuclear, wind or any other- is good or bad in itself and each is only valuable in as far as it can deliver desired ends. Given that energy resources (services) are required directly or indirectly as inputs for fuelling development of any society or economy, the focus of this chapter is to attempt to situate energy resources-development linkages. This is necessary since better understanding of development-energy linkages constitutes an embodiment of knowledge required as operational tool to fine-tune energy resources-development interface. The objective is, therefore, to synthesise the role of energy resources in development process with a view to identifying possible energy challenges to development aspirations of any society and how to confront them.

The chapter is structured into four sections. Section two examines energy resources-development linkages from the theoretical perspective. Section three presents typologies of energy resources. Section four focuses on energy indicators for development. The last, section five examines energy resources-development nexus in Nigeria and presents the paradox of energy shortage in oil-rich Nigeria as the concluding remarks.

ENERGY RESOURCES-DEVELOPMENT LINKAGES: THEORETICAL EXPOSITION

In modern economies, a reliable and adequate energy supply is a prerequisite for industrialisation. In fact, all sectors of the economy: residential, commercial, transport, service and agriculture among others demand modern energy resources/ services. Energy resources serve as inputs in socio-economic activities which in turn lubricate development at the local economy level by raising productivity and enhancing income generation. Energy supply[1], therefore, affects jobs, productivity and development.

The significance of energy resources is rooted in the utilisation since the ancient time till date. For example, oil and gas are the most important energy sources and constitute principal components in producing diverse petrochemical products such as plastics, paints, asphalt, fertiliser, lubricants and insecticides. Diverse energy resources act as the key driver and thereby offer support for national development. Omer (2009) contends that the increased availability of reliable and efficient energy resources stimulates new development alternatives.

Toman and Jemelkova (2003) provide useful and detailed discussion on energy resources-development nexus[2]. Relying on a fundamental tenet of economic theory that more is always more, barring some hypothetical saturation point, any increment to any factor of production implies a *ceteris paribus* increase in output. The theoretical premise goes further to suggest that increased energy availability might somehow *disproportionately* stimulate development. The theory of endogenous economic growth with increasing returns (Barro and Sala-i-Martin, 1995) adds support to this more inputs, higher output postluate.

[1] Electricity stands out as the dominant form of energy for communications, information technology, manufacturing and services.

[2] This section draws substantially from this study.

Toman and Jemelkova (*op. cit*) argue that the linkages among energy, other inputs and economic activity clearly change significantly as an economy moves through different stages of development. Earlier, Barnes and Floor (1996) christen the energy dynamics of energy economic development as an energy ladder, though the ladder concept does not imply a monotonic transition from one type to another. For example, at the lowest levels of income and social development, energy tends to come from harvested or scavenged biological sources (wood, dung, sunshine for drying) and human effort (also biologically powered). At the intermediate stages of development, more processed biofuels (charcoal), animal power and some commercial fossil energy become the dominant energy resources, required to prosecute development aspirations.

Given that the details of energy-development relationships differ considerably along the different stages of development, a simplified model of an economy is used as follows to show the possible ways in which increased energy availability might be especially important to economic development. Let us suppose that:

(1) $Y = F(K_Y, H_Y, E_Y)$
(2) $E = E(K_E, H_E)$
(3) $H = G(K_H, L)$

In equation 1, Y represents output of final goods and services and K_Y, H_Y represent the application of physical capital and human capital services to the production of final goods and services, along with another intermediate good, E_y interpreted as energy services. In equation 2, energy services[3] in turn are produced through the application of other physical and human capital services, $(K_E\ H_E)$. Equation 3 presents the human capital in the economy as dependent on the product of raw labour services/time and the application of other capital services.

With the aid of a standard assumption from economic growth theory that the production functions F, E and G are homogeneous of degree one; that is, if all inputs are increased by some percentage, outputs grow at the same percentage. It follows logically, therefore, that

[3] It is theory consistent to expect that the provision of energy services depends on many other factors as well, notably the availability of the resource base itself. However, for simplicity this reasoning is suppressed in equation 2.

if raw labour and capital services flowing into all production sectors (including human capital) increase by x%, then final output will increase by x% as well. Similarly, if inputs to energy services were increased by x% even when labour and capital services in final output and human capital provision remain constant, final output would still rise but by less than x% because of the law of diminishing marginal productivity of a single input (in this case, energy services).

A potentially more fruitful approach to understand energy resources-development linkages is to modify equation 1 as follows:

(4) $$Y = F(A_K{*}H_Y, A_H{*}H_Y, E)$$

Where: the A_K and A_H are *factor augmentation* terms, that is, multipliers that indicate how the effective flows of these inputs can be enhanced by other factors. One possibility in the economy being modelled is that of increased energy use and with multiplier effects on the productivity of other factors. If this is the case, when energy services supply is increased, there is not just more energy to be used with each skilled worker or machine; the productivity with which every unit of energy is used also rises. If all inputs to final production are increased in some proportion, final output would grow in greater proportion because of the multiplier effect on non-energy inputs.

The significance of equation 4 lies in the fact that an increased quantity of energy services use constitutes a source of multiplier effects. By extension, increased quality and quantity of energy services[4] will be development enhancing as productivity will rise and output will increase. To internalise this condition in the modelled economy, the theoretical framework is modified as follows:

(5) $$Y = F(K_Y, H_Y, E_l, E_n)$$
(6) $$E_i = E_i(K_{Ei}, H_{Ei}),\ i = {}_{l,\ n}$$

E_l and E_n *are* thought of as higher and lower quality forms of energy, respectively, with differing capabilities to contribute to the productivity of other factors in the production of final output. If higher quality energy is more costly to provide (because it requires more capital expenditure) but offers higher overall factor productivity, then society

[4] Schurr (1982, 1984) emphasises increased quality, for example, flexibility of energy services—especially electricity.

can make a trade-off between the two energy forms that favours more advanced but more productive energy forms as development progresses. Increased energy service reliability is another important component of quality, again especially for electricity. Energy availability[5] for cheaper and better lighting (in concert with the appropriate physical capital) can increase the productivity of education inputs generally and lead to a multiplier effect in human capital provision, as well as extend the length of the workday. Increased availability of different kinds of energy services also can directly or indirectly improve health and therefore the productivity of workers. Increased availability of cleaner and modern energy forms can improve indoor air quality (for example, Ezzati and Kammen 2002; Ezzati, *et al.* 2002). It can also help promote access to safer drinking water (for example, in deeper wells). By facilitating refrigeration, greater energy availability can reduce food-borne illness and improve the storage of medicines. By lowering costs of food production, it can make it easier for subsistence households to meet and go beyond basic dietary requirements.

In sum, energy resources-development linkages can be appreciated when the channels through which increased energy availability could disproportionately raise economic development are recognised as follows:

- reallocation of household time (especially by women) from energy provision to improved education and income generation and greater specialisation of economic functions;
- economies of scale in more industrial-type energy provision;
- greater flexibility in time allocation through the day and evening;
- enhanced productivity of education efforts;
- with more flexible and reliable as well as plentiful energy, greater ability to use a more efficient capital stock and take advantage of new technologies;
- lower transportation and communication costs: greater market size and access, more access to information (the combined result of energy and other infrastructure); and

[5] Energy resources are not costless when their services are consumed. Energy services are sometimes associated to negative outcomes such as pollution and deforestation. Thus, the scope of the model as captured by equations one to three can be broadened to account for negative outcomes like pollution as by-products.

health-related benefits: reduced smoke exposure, clean water and refrigeration (yielding direct benefits and higher productivity).

In recent times, attempt to situate the link between energy resources and development has taken the dimension of indicating how it can make or mar the realisation of the Millennium Development Goals (MDGs). Table 17.1 presents the energy-MDGs linkage.

Table 17.1: Energy-MDGs Linkage

MDGs	Energy Linkage
Goal 1: Eradicate extreme poverty and hunger	Access to energy enables income generation, employment, food production
Goal 2: Achieve universal primary education	Lighting and electricity will increase education opportunities
Goal 3: Promote gender equality and empower women	Clean cooking fuels will reduce exposure to indoor air pollution, street lighting
Goal 4: Reduce child mortality	Electricity enables pumped clean water and purification
Goal 5: Improve maternal health	Energy services needed to provide access to better health facilities

Source: Author's construction based on literature.

TYPOLOGY OF ENERGY RESOURCES

There is a range of energy sources. Notably, the way energy resources are used is usually for one of three needs: production of electricity; generation of heat; and energy for transport.

Energy resources are classified into renewable and non-renewable. The former classification can be used to produce electricity, generate heat and transport goods and people. Renewable energy comes from sources that are considered inexhaustible. They include sun, wind, flowing water and heat of the earth; or replaceable fuels such as plants.

Prior to the industrial revolution, renewable energy sources were virtually the only forms of energy used by humans. Then, the practice is to burn biomass (wood) and made use of windmills, watermills and sailing ships. Conversely, post industrial revolution modern civilisation has shown increasing reliance on fossil fuels: oil, coal and natural gas. Fossil fuels form so slowly in comparison with the rate of energy use that they are considered finite or limited resources. In addition, the burning produces greenhouse gases (GHGs) and other pollutants. Greenhouse gases are believed to be responsible for trapping heat in the earth's atmosphere that would normally be radiated back into space. This is being linked to changes in the earth's climate.

Renewable energy generally produces few or no GHGs. The exception, however, is biomass. The carbon dioxide emitted is balanced by the amount of carbon absorbed from the atmosphere while the organic material is produced. If biomass is being used sustainably, there are no net carbon emissions over the time frame of a cycle of biomass production. Biomass is therefore generally considered to be carbon neutral. Using renewable energy can provide many benefits, including: making use of secure, local and replenishable resources; reducing dependence on non-renewable energy; helping to keep the air clean; helping to reduce the production of carbon dioxide and other GHGs; and creating new jobs in renewable energy industries.

In order to extend the philosophy of sustainable development to the utilisation of energy resources, the Enquete Commission (1993) on the *Protection of Man and the Environment*, set up by the German Parliament (Bundestag), formulated four general rules concerning resources in general for implementing sustainable development. In practical terms, the rules can be employed to govern the consumption of energy resources since they capture the renewable and non-renewable dichotomy of energy resources. The rules are as follows:

Rule 1: Use of Renewable Resources. The rate of consumption of renewable resources should not exceed the rate at which they can be regenerated. This rule is, in essence, the same as already formulated by Von Carlowitz, in 1713.

Rule 2: Use of Non-renewable Resources. The consumption of non-renewable resources should not exceed the amount that can be replaced by functionally equivalent renewable resources or by attaining a higher efficiency in the use of renewable or non-renewable resources.

Rule 3: Material and energy inputs into the environment should not exceed the capacity of the environment to absorb them with minimal detrimental effects.

Rule 4: The rate of anthropogenic input and environmental interference should be measured against the time required for natural processes to react to and cope with environmental damage.

Note: Rules 3 and 4 are concerned with the resilience of the environment and the carrying capacity of our earth's systems.

Later, a fifth rule was added concerning health risk, the rule states:

Rule 5: Hazards and unacceptable risks to human health caused by human activities are to be avoided.

From the foregoing, it is clear that energy resources are not only meant to be developed in a sustainable manner, but also that conversion and utilisation must conform with well- spelt out economic rules for reason of intergenerational and intra-generational equity.

ENERGY INDICATORS FOR DEVELOPMENT

The International Atomic Energy Agency (2005) identifies Energy Indicators for Sustainable Development (EISD), the core set of which has 30 indicators, classified along three dimensions of development (social, economic and environmental). The indicators are further classified into seven themes and 19 sub-themes. Table 17.2 presents the item by item of these indicators.

As indicated clearly in Table 17.2, some of the indicators are unequivocal measure of progress. They sometimes clearly distinguish between desirable and undesirable trends. Put together, the indicators provide useful basis for the understanding and interpreting energy resources-development nexus in the context of a given country's economy. For the purpose of policymaking and strategic decisions, the indicators also provide some directions in terms of where to apply pressure and where to initiate changes that can bring about desired results.

Figure 17.1 presents the internal workings of the energy indicators with a view to revealing the flow of the fundamentals driving the dynamics of development as energy resources are consumed and converted in the development process.

Table 17.2: List of Energy Indicators for Sustainable Development

Themes	Sub-themes	Energy Indicators		Components
		SOCIAL		
Equity	Accessibility	SOC 1	Share of households (or population) without electricity or commercial energy, or heavily dependent on non-commercial energy.	-Households (or population) without electricity or commercial energy, or heavily dependent on non-commercial energy. -Total number of households or population
	Affordability	SOC 2	Share of household income spent on fuel and electricity.	-Household income spent on fuel and electricity - Household income (total and poorest 20% of population)
	Disparities	SOC 3	Household energy use for each income group and corresponding fuel mix	-Energy use per household for each income group (quintiles) -Household income for each income group (quintiles) -Corresponding fuel mix for each income group (quintiles)
Health	Safety	SOC 4	Accident fatalities per energy produced by fuel chain	-Annual fatalities by fuel chain -Annual energy produced

Table 17.2 Cont'd

Themes	Sub-themes	ECONOMIC Energy Indicators		Components
	Overall Use	ECO 1	Energy use per capita	-Energy use (total primary energy supply, total final consumption and electricity use) -Total population
	Overall productivity	ECO 2	Energy use per unit of GDP	-Energy use (total primary energy supply, total final consumption and electricity use) -GDP
Use and Production Patterns	Supply efficiency	ECO 3	Efficiency of energy conversion and distribution	-Losses in transformation system including losses in electricity generation, transmission and distribution
	Production	ECO 4	Reserves-to-production ratio	-Proven recoverable reserves -Total energy production
		ECO 5	Resources-to-production ratio	-Total estimated resources -Total energy production
		ECO 6	Industrial energy intensities	-Energy use in industrial sector and by manufacturing branch -Corresponding value added
	End use	ECO 7	Agricultural energy intensities	-Energy use in agricultural sector -Corresponding value added
		ECO 8	Service/commercial energy intensities	-Energy use in service/ commercial sector -Corresponding value added
		ECO 9	Household energy intensities	-Energy use in households and by key end use -Number of households, floor area, persons per

				household, appliance ownership
		ECO 10	Transport energy intensities	-Energy use in passenger travel and freight sectors and by mode -Passenger-km travel and tonne-km freight and by mode
	Diversifi-cation (fuel mix)	ECO 11	Fuel shares in energy and electricity	-Primary energy supply and final consumption, electricity generation and generating capacity by fuel type -Total primary energy supply, total final consumption, total electricity generation and total generating capacity
		ECO 12	Non-carbon energy share in energy and electricity	-Primary supply, electricity generation and generating capacity by non-carbon energy -Total primary energy supply, total electricity generation and total generating capacity
		ECO 13	Renewable energy share in energy and electricity	-Primary energy supply, final consumption and electricity generation and generating capacity by renewable energy -Total primary energy supply, total final consumption, total electricity generation and total generating capacity
	Prices	ECO 14	End-use energy prices by fuel and by sector	-Energy prices (with and without tax/subsidy)
Security	Imports	ECO 15	Net energy import dependency	-Energy imports -Total primary energy supply
	Strategic fuel stocks	ECO 16	Stocks of critical fuels per corresponding consumption	-Stocks of critical fuel (e.g. oil, gas, etc.) -Critical fuel consumption

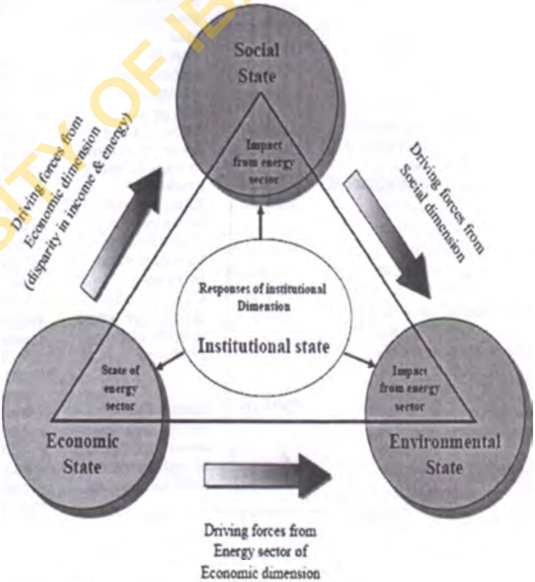
Table 17.2 Cont'd

Themes	Sub-themes	ENVIRONMENTAL Energy Indicators		Components
Atmosphere	Climate change	ENV 1	GHG emissions from energy production and use per capita and per unit of GDP	-GHG emissions from energy production and use -Population and GDP
	Air quality	ENV 2	Ambient concentrations of air pollutants in urban areas	-Concentrations of pollutants in air
		ENV 3	Air pollutant emissions from energy systems	-Air pollutant emissions
Water	Water quality	ENV 4	Contaminant discharges in liquid effluents from energy systems including oil discharges	-Contaminant discharges in liquid effluents
Land	Soil quality	ENV 5	Soil area where acidification exceeds critical load	-Affected soil area -Critical load
	Forest	ENV 6	Rate of deforestation attributed to energy use	-Forest area at two different times -Biomass utilisation
	Solid waste generation and management	ENV 7	Ratio of solid waste generation to units of energy produced	-Amount of solid waste -Energy produced
		ENV 8	Ratio of solid waste properly disposed of to total generated solid waste	-Amount of solid waste properly disposed of -Total amount of solid waste
		ENV 9	Ratio of solid radioactive waste to units of energy produced	-Amount of radioactive waste (cumulative for a selected period of time) -Energy produced
		ENV 10	Ratio of solid radioactive waste awaiting disposal to total generated solid radioactive waste	-Amount of radioactive waste awaiting disposal -Total volume of radioactive waste

Source: IAEA *et al*. (2005).

Figure 17.1 simplifies the interrelationship among the various sustainability dimensions of the energy system. The environmental state associated with the energy system is affected by driving forces originating from the economic and social dimensions. The social state of the energy system is, in turn, influenced by certain driving forces originating from the economic dimension. The institutional dimension can affect all the other three dimensions – social, economic and environmental – through corrective policies that influence the sustainability of the whole energy system. The centrality of the role of policies in influencing the character of energy resources and development linkages remains an arena for continuous academic and scientific enquiry.

Figure 17.1: Interrelationship among Sustainability Dimensions of the Energy Sector



Source: IAEA/IEA (2001)

CONCLUDING REMARKS: THE PARADOX OF ENERGY SHORTAGE IN OIL-RICH NIGERIA

Energy is essential for socio-economic development of any nation since it is an important requirement to power all sectors of the economy. Nigeria is endowed with fossil, nuclear and renewable energy sources. All fossil fuel resources are depletable. Renewable energy is replenisheable through natural processes within a relatively short time. The National Energy Policy (NEP) put in place in 2003 articulated the optimum exploitation of all energy resources in Nigeria. It canvassed for the exploitation of all Nigerian renewable resources in a sustainable manner and with the active participation of the private sector.

Petroleum and electricity are the widely used commercial energy end products in Nigeria. For example, petroleum products accounted for 67.4 per cent of the total primary energy consumed in 2008. Fuelwood, a traditional fuel widely and extensively used by the rural and peri-urban dwellers, is hardly considered commercial, largely due to its non-export status. Although all forms of energy can be transformed into electricity, there is a huge disparity in electricity demand and supply in Nigeria. Though efforts are geared towards reducing the demand and supply imbalance for fuel petroleum products, the supply strategy remains unsustainable because most of it is imported due to inadequate local refining capacity in the country. Also, fuelwood consumption is unsustainable because supply is diminishing as a result of desertification.

Large hydropower has so far contributed only about 2,000MW to the total grid-connected electricity generation capacity in the country. Currently, solar, wind, small hydro and biomass are yet to contribute significantly to electricity supply. However, solar, wind and fuelwood have been traditionally been employed in open-to-sun drying, grinding of grains and cooking, respectively. Biomass and in particular fuelwood, accounts for over 90 per cent of the domestic energy needs of over 70 per cent of the nation's population, who dwell in rural areas and peri-urban centres. Use of coal since its discovery in Nigeria has drastically declined. The following tables provide some insights into the energy-economy interactions in Nigeria.

Table 17.3: Fossil Energy Resources

S/N	Resources	Reserves	Production (2008)
1	Crude Oil	32.2 billion barrels	1.98Mb/day
2	Natural Gas	187 TSCF	2.28BSCF/day
3	Coal	2.7 billion tones	0
4	Tar Sands	31 billion barrels of oil equivalent	0

Source: Sambo, 2010.

Table 17.4: Renewable and Nuclear

S/N	Resources		Reserves	Utilisation Level
1	Large hydro power		11,250MW	1,972MW
2	Small hydro power		3,500MW	64.2MW
3	Solar Energy		$3.5Kw/M^2$/day $7.0Kw/m^2$/day	-10MW solar PV stand-alone -No solar thermal electricity
4	Wind		2-4m/s at 10m height	-2 x 2.5KW electricity generator -10MW wind farm contracted in 2009
5	Biomass	Fuel wood	11 million hectares of forest and woodlands	43.3 million tones of fuel wood/yr
		Municipal waste	-18.3 million tones in 2005	-
		Animal waste	-243 million assorted animals in 2001	-
		Energy Crops and Agric Waste	-28.2 million hectares of Arable land	8.5% cultivated
6	Nuclear		Not yet quantified	30Kw

Source: Same as Table 17.3.

Table 17.5: Energy Production

S/N	Type	2003	2004	2005	2006	2007	2008
1	Coal (million tones)	0	0	0	0	0	0
2	Oil (million barrels/day)	2.3	2.5	2.5	2.2	2.2	1.98
3	Natural gas (billion m^3)	52.75	59.76	58.35	61.80	70.1	63.84
	(% Flared)	(44.1%)	(40.4%)	(39.4%)	(36.1%)	(31.1%)	(26.8%)
4	Electricity Generation (billion kWh)	22.03	23.9	24.22	23.8	23.3	22.21

Source: Same as Table 17.3.

Table 17.6: Energy Consumption

S/N	Type	2003	2004	2005	2006	2007	2008
1	Hydro (%)	14.2	17.39	12.0	17.03	23.90	19.0
2	Natural gas (%)	1.9	4.54	5.50	7.52	8.73	15.2
3	Petroleum products (%)	83.87	78.04	82.50	75.44	67.53	65.7

Source: Same as Table 17.3.

Table 17.7: Energy, Economy and Selected Social Indicators

S/N	Type		2003	2004	2005	2006	2007	2008
1	Real GDP (%)		9.6	6.6	6.5	6.0	6.2	6.4
2	Major contributors to GDP	Agriculture (%)	41.01	40.98	41.19	41.72	42.20	42.07
		Crude Petroleum (%)	26.53	25.72	25.26	21.85	19.35	17.54
	Major contributor to federal revenue (Net): Crude petroleum (%)	75.0	77.0	72.4	76.7	67.7	71.8	
3	Energy intensity (kgoe/$) (Energy consumption/GDP)		0.244	0.186	0.157	0.086	0.063	0.069
4	GDP/Capita (US$)		620.9	673.2	847.4	1036.2	1256.6	1176.1
5	Energy consumption/Capita (kgoe/capita)		151.3	125.5	132.6	87.1	81.4	80.8
6	Electricity consumption/capita (kWh/capita)		174.6	176.4	181.4	167.6	161.2	142.9
7	Electricity access)%)					55.2% from 40% in 1993		
8	Population growth rate (%)		2.8	2.8	2.8	3.2	3.2	3.2
9	Adult literacy rate (%)		57.0	62.0	57.0	64.2	64.2	66.9
10	Incidence of poverty (%)		-	54.4	54.4	54.0	54.0	54.0
11	Life expectancy (yrs)		54	54	54	54	54	54
12	Unemployment rate (%)		-	13.4	11.9	14.6	10.9	

Sources: CBN (2006-2008), NBS (2009).

The chapter examined the linkages between energy resources and development that is sustainable in the long run. The development of the energy sector with a view to guaranteeing self-sufficiency in energy is a precondition for translating energy resources in any economy to development and welfare improvement. At country specific level, a number of policy-related issues will be encountered while trying to develop the energy sector. Some of the issues are:

- Efficiency in energy utilisation;
- Efficiency and reliability of energy supply system;
- Environmental concerns;
- Energy financing;
- Adequate technological capabilities in the energy sector;
- Strong institutional framework for the management of energy resources; and
- Diversification of energy sources.

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