

Poor Energy Infrastructure Hobbles Export Diversification

It is evident from the previous chapter that most African economies are still some distance from providing a competitive trade environment. Many countries are saddled with a commodity-dependent and largely static export base, which has tended to decline in relation to the growth in global trade. Only a very few African countries have managed to increase their market share of the Organization of Economic Co-operation and Development (OECD) imports since the 1960s. If more countries are to achieve continuing diversification of their exports they will need to improve local conditions for business and to identify the major obstacles to business development and remove them.

Countries that want to compete effectively in the international market have to keep investing in improving their physical and communications infrastructure on all fronts. In particular, and highlighted in this chapter, African countries vitally need good and efficient electrical power infrastructure; this will help them move more rapidly into resource-based manufacturing and commodity processing, as well as trade in services. Even the efficiency of the agricultural sector will be greatly enhanced by the provision of reliable energy supplies, both at the local and national levels.

Nature has endowed the African continent with the widest-possible range of energy resources and yet its power sector remains severely underdeveloped in all countries. According to the International Energy Agency, sub-Saharan Africa has the lowest electrification of any major world region: in terms of world electricity production, Africa's power generation represents a mere 3.1%. Only 23% of Africa's population have access to electricity, and much of the available supply is unreliable and subject to power rationing and/or unscheduled power cuts. With the conditions prevailing in many countries, it is clear that Africa's export diversification drive is simply being hobbled by poorly functioning energy infrastructure. Much needs to be done to address the backlog of problems in the power sector, including its poor technical and financial performance. Although reforms undertaken in some countries have managed to reduce technical losses and power outages, such measures have not yet begun to increase the general level of electrification. New investment is urgently required.

Solving Africa's power sector problems requires not only greater energy efficiency and sustainability, but also a reduction in the dominant role of the State in its management. A significant step towards freeing up the sector is the transformation of power companies into independent and self-reliant corporations where feasible. What determines the success and efficiency of power companies is the extent to which they incorporate economic decisions in their operations.

“Africa's power generation represents 3.1% of world production”

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South Africa,
Morocco, Tunisia,
Egypt and Zimbabwe
have managed to
diversify their export
structures
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Ensuring and sustaining private participation in the provision of electricity services in Africa will require concrete national strategies aimed at addressing problems affecting domestic business development. Good and credible regulation is necessary to address any ill effects associated with private sector participation and to prevent any abuse of monopoly power. For effective performance, it is essential that regulatory bodies are independent, and distanced from political, corporate, and other pressures.

Energy efficiency is vital, both to reduce operating costs and to improve the productivity and international competitiveness of energy-consuming companies. Efficient pricing of electricity is also important for the power sector's own development. To ensure economic efficiency, price distortions must be minimized, and the principles of consistency, transparency, clarity and cost-effectiveness must be promoted.

Finally, the promotion of regional and subregional integration in energy services would help promote the development of Africa's power sector. This integration can enhance the sector's development by reducing power costs and by minimizing the operating costs of existing subregional networks. The development of regional and subregional markets in energy would require common regulations for all international exchanges.

Diversification is the way forward

Many African countries continue to depend on very few export commodities for a large proportion of their export earnings. Between 1996 and 2000, broad primary commodities accounted for about 85% of total exports from Africa. Primary commodity dependence can have three impacts on economic development (Collier, 2002):

- First, because primary commodity prices are highly volatile, countries have had to cope with large shocks. Evidence suggests that the largest of these shocks were poorly managed, with negative shocks causing substantial reduction in economic growth.
- Secondly, the rents generated by primary commodities have been associated with poor governance for various reasons (Sachs and Warner, 1995; Pritchett et al., 2002).
- Thirdly, primary commodity dependence has been associated with a substantially higher risk of civil war (Collier and Hoffer, 2002; Yartey, 2004).

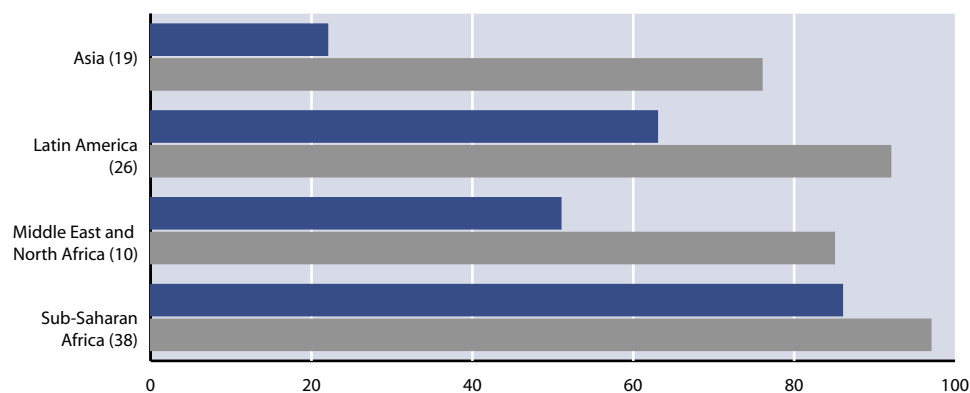
Given these problems, export diversification is desirable and on the average most developing regions of the world have massively diversified their export structures over the past few decades. Africa, however, has experienced very little diversification and remains heavily dependent on primary commodities.

In comparing the export structures of developing countries by region, certain important features are worth mentioning (see figure 4.1). Commodity dependence was widespread in all regions between 1966 and 1970. Thirty years later, primary commodities

still represented a significant component of the merchandise export of all regions with the exception of Asia. Africa alone still depended on these commodities for about 85% of total exports, falling from about 93% 30 years before. This suggests that very little change has taken place in the export structure of African countries (Bonaglia and Fukasaku, 2003).

Figure 4.1

Commodity dependence by world regions, 1966-1970 and 1996-2000 (average percentage share of broad primary products in total exports)



Notes: The number of countries in parenthesis. Broad primary products include both processed primary products and unprocessed primary products.

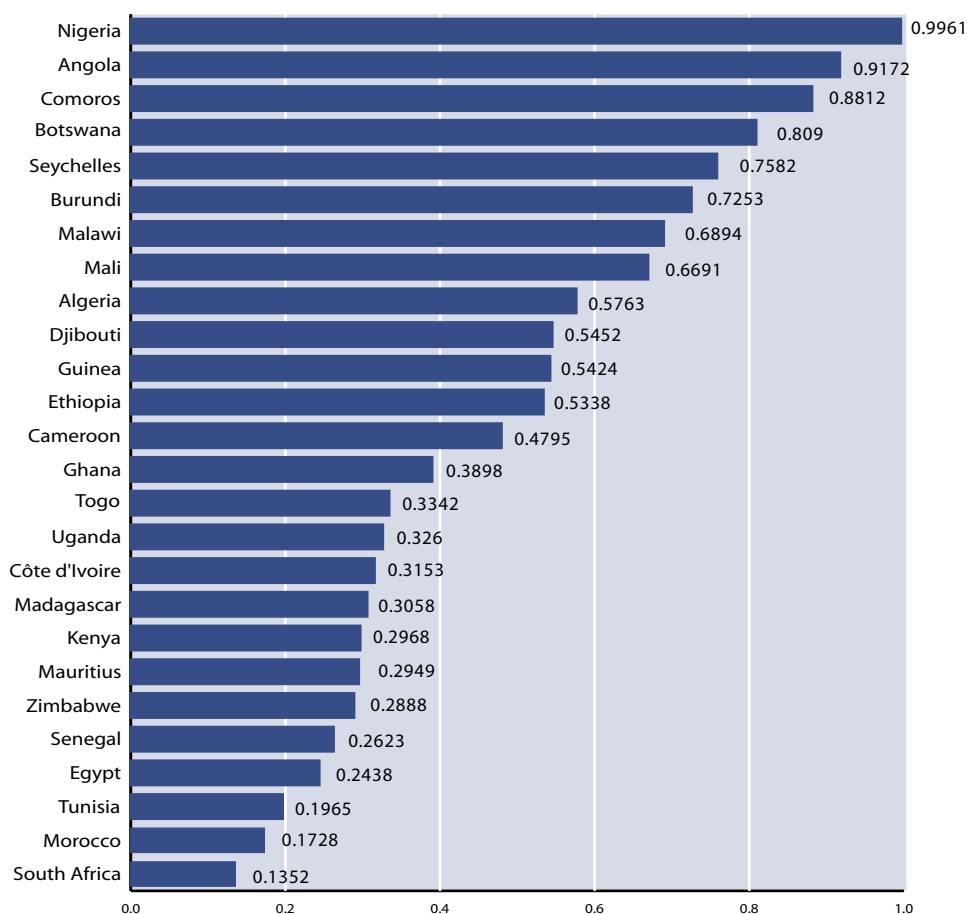
Source: Bonaglia and Fukasaku, 2003

Figure 4.2 uses the Hirschman-Herfindahl index (HHI) to examine the extent of export concentration in Africa. Accordingly, export concentration is lowest in countries such as South Africa, Morocco, Tunisia, Egypt and Senegal, implying that these countries export a wide range of products. On the other hand, countries such as Nigeria, Angola, Comoros and Botswana have the highest degree of export concentration and are dependent primarily on a single commodity for their export revenues.

The table in annex A4.1 uses OECD ‘mirror’ data to summarize the degree of commodity export diversification in selected African countries for two five-year periods, 1966-1970 and 1996-2000. (It is called mirror data because it uses OECD import trade statistics to look at the export performances of developing countries for the sake of data reliability.) There are 98 countries in the OECD mirror data. The countries currently consist of 52 low-income countries and another 46 countries classified as developing at the beginning of the 1970s for the sake of comparison. To make the exercise consistent throughout the period, the aggregate import value of 23 high-income OECD countries is taken to represent total merchandise exports of the individual countries under consideration. The 23 high-income OECD countries received in total roughly 60% of total merchandise exports of these 98 countries in the OECD mirror data between 1996-2000 (IMF, 2002).

Figure 4.2

Export concentration in selected African countries: the Hirschman-Herfindahl Index for exports (HHI), 2000



Notes: The index ranges from 0 to 1, with the most diversified countries nearer to 0, and the countries most dependent on single commodities nearer to 1. When a single export product produces all the revenues, HHI is equal to 1 and when export revenues are evenly distributed over a large number of products, HHI approaches zero. 1990 values for Angola, Egypt, Madagascar, Mali, Malawi, and Seychelles.

Source: UNCTAD, 2003

Africa starts from a low base...

Analysis of the OECD mirror data confirm that the degree of export diversification in most of SSA is low. Only a limited number of African countries (Botswana, Lesotho, Mauritius, Tunisia and Zimbabwe) managed to increase their market shares of high-income OECD imports between 1966 and 2000. Thirty-four out of 46 African countries in the data account for about 1.37% of high-income OECD imports, falling from 3.21%

30 years ago. The OECD market constitutes the single most important export market for all developing countries so that a rise in market shares can be seen as an important indicator of policy success. More specifically, a rise in the market share of high-income OECD countries imports is taken to represent diversification into manufacturing. In fact, almost all countries that were able to increase their OECD market shares were also able to reduce substantially their dependence on primary commodity exports and have moved into manufacturing. The OECD mirror trade data suggest that many different routes to diversification exist, including resource-based manufacturing and primary processing.

Most of the diversification that has taken place in Africa involves primary commodity processing and the identification of new products such as fish, salt and cut flowers. Diversification toward manufacturing is not the only possibility. African countries could also pursue a different route to diversification by developing of resource-based manufacturing and commodity processing, as well as trade in services. Examples are provided by Ghana and Uganda, which have adopted a modest but generally successful approach to the diversification of their exports. Ghana is now operating “Presidential initiatives” to develop local production of garments, starch, palm oil and salt for export (ECA, 2003). In Uganda, the development of flower and fish exports has helped to boost non-traditional activities and to reduce dependence on coffee, although there are still fluctuations in export revenues (Dijkstra, 2001).

“Only 5 African countries managed to increase their market shares in high-income OECD countries”

...but there's evidence of progress

At the end of 2000, nine of the 46 countries in the data were deriving more than 25% of their exports from the manufacturing sector. Among the countries that are less dependent on primary commodity exports, the efforts of Mauritius, Lesotho, Madagascar and Tunisia are worth mentioning.

Mauritius has managed to build a thriving export-oriented manufacturing sector starting from a sugar-dependent economy. Mauritius' success has been built on the development of good infrastructure. The country has one of the highest levels of telephone penetration in Africa. In 2000, there were 280,900 connected lines giving a telephone density of 23.53 per hundred people. Mauritius also has well-developed energy infrastructure. Per capita electricity consumption in 2000 was 995.83 kWh representing one of the highest in Africa. The Export Processing Zone (EPZ) is based on a set of statutory and tax provisions that have enabled Mauritius to diversify its economy by exploiting its political stability, good infrastructure, flexible labour force and attractive investment climate. The EPZ presently contributes about 85% of total export earnings and about 13% of GDP.

Lesotho offers another example. By exploiting its geographical location to transport South African products during the apartheid era, the country made a significant move into manufacturing and since then has been a focus of FDI in the clothing sector. Lesotho has also taken advantage of the trade privileges and the duty-free access to the US market offered under the AGOA. Lesotho is one of the few countries in the region to attract significant FDI in export-oriented manufacturing for OECD markets. As a result, Lesotho now derives some 70% of its exports from manufactures.

“Infrastructure costs and problems of unreliability rank high among issues of concern to businesses in Africa”

In the case of Madagascar, manufacturing exports grew by 233% between 1980 and 1993, and by 109% between 1992 and 1999. There has been a transformation of exports structures at the expense of primary commodities such as vanilla, spices, cotton and tea (UNDP, 2002). The liberalization of the economy has further enhanced Madagascar's export competitiveness. Over 200 investors, particularly garment manufactures, have located in the country's free-trade zone since it was established in 1991. In 1999 entrepreneurs invested about \$51 million in textile firms, while agro-processing amounted to approximately \$9 million (Cadot and Nasir, 2002).

Tunisia has also managed to build a thriving export sector. Its rise as a garment exporter started when the 1972 investment code opened the country to FDI. Since then, hundreds of foreign companies have established wholly or partly owned garment factories in Tunisia. Its export success has been built on its outward processing trade with the EU, under which companies in developed countries can export fabrics or parts of garments, and then re-import them as finished garments. The EU's outward processing arrangements have brought Tunisia considerable foreign investment. Today the textile industry accounts for about 50% of all industrial jobs and 46% of national exports.

These examples provide some useful lessons for African countries in their export diversification drive. First, export diversification does not come about by itself. As discussed in chapter 2, it requires concrete national, sector-level and enterprise-level strategies based on a realistic assessment of supply capacities and international demand, as shown by the cases of Tunisia and Madagascar. Secondly, diversification does not necessarily deliver success in exports in terms of either higher share of OECD markets or reduced volatility. Finally, a well-developed and reliable infrastructure, particularly energy services, is critical for export development, as shown by the case of Mauritius.

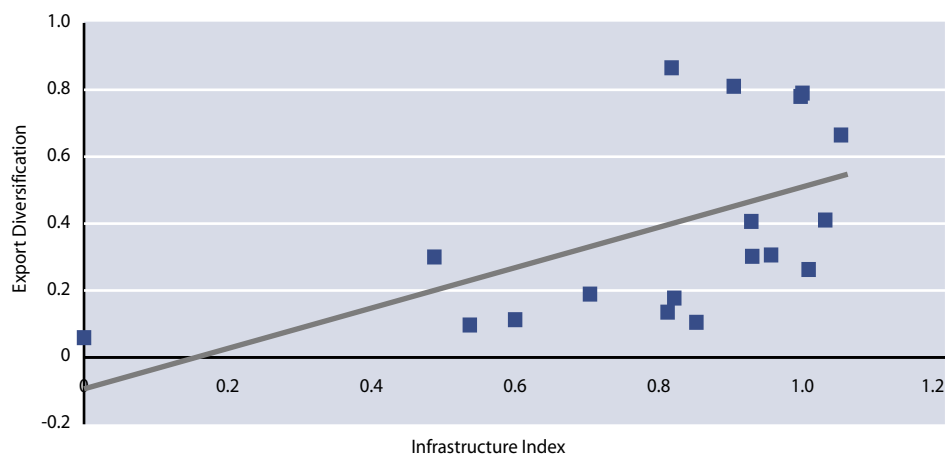
Export diversification depends on good infrastructure...

The low competitiveness of African products in global markets can be attributed in part to the continent's inadequate infrastructure development. Adding value to exported commodities through manufacturing is important for export diversification and sustained export growth, but depends vitally on the available infrastructure. figure 4.3 indicates the positive correlation between the Infrastructure Index (as introduced in chapter 3) and export diversification in 2000.

Infrastructure quality has been identified as the dominant explanatory factor in both manufacturing and competitiveness. Enterprise-level surveys conducted in several countries show that infrastructure costs and problems of unreliability rank high among issues of concern to businesses (Reinikka and Svensson, 1999). Table 4.1 provides an overview of the state of infrastructure in Africa and other developing countries. The table clearly shows that in all categories, sub-Saharan Africa (SSA) has relatively less infrastructure than other developing regions. In 2000, per capita electricity consumption in SSA was 432 kWh. The Middle East and North Africa, Latin America and the Caribbean consumed three times more per capita than SSA.

Figure 4.3

Correlation between infrastructure and export diversification, 2000



Notes: Export diversification is measured as 1 minus the HHI index. The Infrastructure Index is made up of transport, energy, telecommunication, and access to information. Data are available for 18 countries in the Trade Competitiveness Index database. The countries are Algeria, Argentina, Bolivia, Brazil, Cameroon, Chile, Ethiopia, Ghana, Indonesia, Kenya, Malaysia, Morocco, Nigeria, Senegal, South Africa, Thailand, Tunisia, and Zimbabwe. The correlation is significant at the 5% level of significance – with a correlation coefficient of 0.405 and a p-value of 0.05.

Source: ECA Trade Competitiveness Index data

There is an especially sharp contrast between Africa and East Asia. In a little over three decades, a number of East Asian countries have invested heavily in their infrastructure – between 6-8% of GDP per year, compared to 4% for the average developing country. In Taiwan, the rate of investment has sometimes been above 10% of GDP a year. Thailand developed its automotive industry on its eastern seaboard by investing in good rail and road networks and port facilities, supported by electricity, water and communications (Mody and Walton, 1998).

Table 4.1

Infrastructure indicators in Sub-Saharan Africa and other developing regions, 1995-2001

	Sub-Saharan Africa	Middle East & North Africa	Latin America & Caribbean	East Asia & Pacific
Electricity consumption per capita (kWh) in 2000	432	1,346	1,528	760
Paved roads (percentage of total road network) 1995-2000	12.9	66.3	26.9	21.2
Telephone mainlines (per 1,000 people) 2001	14	100	165	110

Source: World Bank, 2003a

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Expenditure on
standby generators
represented 25% of
total firm investment
in equipment and
machinery in Uganda
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Because quality is not taken into account, the numbers shown in table 4.1 do not indicate the real extent of the infrastructure gap between Africa and other developing economies. For instance, electric power failures are frequent in many parts of SSA, and paved as well as unpaved roads are often in poor condition. For example, the Ethiopian Minister of Trade and Industry has pointed out that “about 65% of the population lives half a day away from roads and basic infrastructure” (World Bank, 2003b).

Unreliable power hobbles diversification

Good and reliable energy infrastructure is a prerequisite for export diversification and sustained growth. It is vital for resource-based manufacturing and commodity processing, as well as trade in services. Reliable energy is also needed to increase efficiency in the agricultural sector and to develop non-traditional exports. That reliable energy infrastructure is important for diversification is further supported by the fact that most African countries that have moved into manufacturing started with the manufacturing of garments (e.g. Lesotho, Mauritius and Tunisia). The available evidence shows that textile production is a highly energy-consuming process. Average consumption lies between 54 and 72 MJ/kg (Megajoules per kg). Energy consumption increases with the switch from yarn to fabric finishing and from synthetic to natural fibres (Schmidt, 1999).

ECA independently verified the correlation between export diversification and per capita electricity consumption and electricity production per worker. Per capita electricity consumption was used as a proxy for energy cost (both direct and indirect costs). Countries with high per capita electricity consumption are expected to have lower energy costs and vice versa. The exercise found that export diversification is positively associated with per capita electricity consumption and electricity production per worker with correlation coefficients of 0.39 and 0.43 respectively. Both correlations are significant (at the 5 per cent level) implying that countries that have more access to electricity tend to have a relatively lower cost of energy and are more diversified.

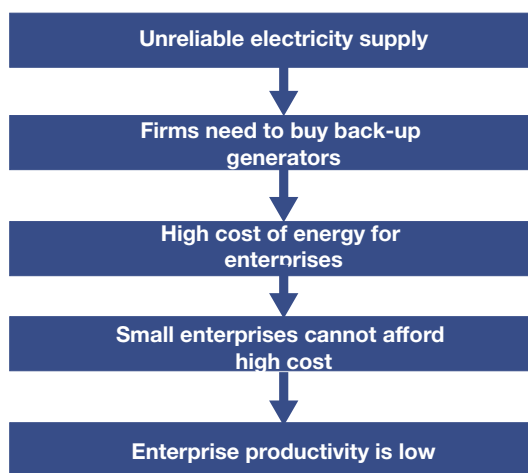
The inability of many African countries to provide good and adequate energy services has been a major constraint to their export diversification. Under protectionist regimes, firms can actually absorb and even pass on higher costs they incur when they are forced to provide their own energy services. As a result, the inability of government to provide energy services may not be an important barrier to trade promotion but, when some form of trade liberalization takes place, firms with export potential will be unable to compete because they are saddled with inefficient production structures that were created as they attempted to substitute the private provision of energy in response to the failure of the public sector (Gugerty and Stern, 1997).

The poor energy services that characterize most of SSA also reduce the overall level of private sector investment. The links between energy provision and export diversification are illustrated in figure 4.4. A 1999 survey of firms in Senegal cited power failures, transport costs and other infrastructure problems among the top four operational problems, with the strongest impact on small-and medium-sized firms (SMEs). Three of the largest companies assessed the resulting costs from the power outages (electric generators, operating

costs, loss of production and material deterioration) at approximately 10% of their total sales. A similar study by the World Bank's Regional Programme on Enterprise Development (RPED) in Madagascar in 2002 found power supply to be a major burden on enterprise development. Whereas electric power appeared to be adequate in the capital city, firms reported that voltage fluctuations and outages were increasing and that they planned to buy standby generating plants. Outside Antananarivo, the study found that the electricity infrastructure was in an even worse condition.

Figure 4.4

Energy-diversification linkages: the micro picture



Further evidence points to inadequate electricity supply, increasing business costs and dissuading potential investment. For instance in Uganda, a survey of 243 firms conducted in 1998 showed that they did not receive electricity from the public grid for 89 operating days a year, on average, resulting in 77% of large firms (in addition to 44% of medium-sized and 16% of small-sized firms) purchasing generators, representing 25% of their total investment in equipment and machinery (Reinikka and Svensson, 1999). In Tanzania and Malawi, firms that took the initiative to buy generators, to compensate for the faulty public power supply, have been affected by high costs of fuel (Confederation of Tanzania Industries, 2002; Privatization Commission of Malawi, 2000). Finally, in Ghana as many as 75% of the exporters surveyed said that they had suffered financial losses due to power fluctuations (Edjekumhene et al., 2001).

Small firms are worst hit

Public utility companies provide most of the electric power in SSA. Public utilities supply electric power inefficiently, at high costs, and with a low degree of reliability. The resulting high costs reduce export competitiveness. While it is possible to substitute private power for public power, this is often achieved at a cost that reduces profitability.

Further, there is evidence that the effort to substitute private power for public power have differential effects on SMEs and large firms. Lee and Anas (1992) examined the cost to Nigerian firms of providing their own power needs. They found that small firms cannot afford to make costly capital investments to meet their power needs. Given that SMEs are greatly affected by unreliable power supply, the growth of these firms and the generation of employment are negatively impacted. The high dependence on electricity supply of Ghana's new data processing sector is discussed in box 4.1.

Box 4.1

Data processing in Ghana: electricity is a critical factor

A new area where Ghana's low-cost labour force and investment incentives have attracted investors is labour-intensive data processing. For example, one foreign company, Affiliated Computer Services, has been set up to process data by satellite to service such US companies such as UPS, Aetna and American Express. The company employs about 220 workers and is planning in its initial phase to grow to 1,000. If things go well, the firm may expand to other areas of the country and employ up to 4,000 processors and perhaps even move into software programming.

For data processing, electricity supply is critical. The industry depends on turnaround times; batches of data received have to be turned around in three hours. If these turnaround times cannot be met, the data processing businesses in Ghana will be in jeopardy. An erratic electricity supply, with four or five cuts a day, also leads to power surges, which damage critical equipment.

Source: World Bank, 2001c

There is evidence that SMEs can make a significant contribution to export development and job creation. Lee (1989) finds that SMEs generated about 60-80% of new jobs created in Asia and Latin America. Berry (1992) finds that the export potential of SMEs is limited to the processing of primary products, the manufacture of traditional products using labour-intensive indigenous technology, products which cannot be standardized and specialized products with small total market. Thus, while most SMEs may not be important exporters of manufactured products, they can serve as suppliers of "indirect exports", that is, as producers of parts used by major exporters (Gugerty and Stern, 1997). Lack of adequate and reliable energy prevents such developments. Kessides (1993) finds that small firms tend to start up near urban centres with easy access to good utilities. Cities with poor infrastructure are unable to offer this "incubator" function to new small firms. As a result, the potential links between SMEs and larger firms, including exporters, fail to develop.

Africa's power sector today – untapped potential and challenges

Africa possesses an abundant and wide range of energy resources. As table 4.2 indicates, the exploitable hydropower capacity in Africa is massive, with over 1,888 Terawatt-hours per year (TWh/yr). The region has an estimated 10,122 million tons of petroleum, 11.4 trillion cubic metres of proven natural gas reserves, and over 55 billion tons of bituminous coal (WEC, 2003). However, the distribution of the energy potential across the continent is highly uneven. Conventional resources such as oil and gas are concentrated in North and West Africa while hydroelectric potential is mainly located in Central and East Africa and coal in Southern Africa.

“Only 23% of Africa's population have access to electricity”

Table 4.2

Africa's vast energy potential

Energy resources	Total	% of global reserves
Oil reserves	10,122 millions of tons	7.1
Gas reserves	11.4 trillion m ³	7.5
Bituminous coal reserves	55,000 millions of tons	10.6
Uranium reserves	613 kilotons	18.7
Hydroelectric capacity (Technically exploitable)	Over 1,888 TWh/yr	33 (13)

Note: 1 Terawatt = 1 million Megawatts

Source: World Energy Council, 2003

Despite the abundance of substantial energy resources, less than 30% of sub-Saharan Africans have access to electricity. This is a very low figure, when compared to other developing countries in Asia and Latin America, which are able to supply more than 70% of their population with electricity (Karekezi, 2002). Africa's electricity generation was 479.8 TWh in 2001, representing about 3.1% of the world's electric production (see figure 4.5). The Middle East has approximately the same share with a population almost five times smaller (IEA, 2003).

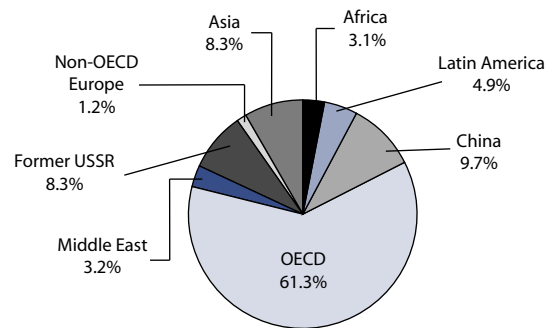
Africa's electricity generation capacity is mainly concentrated in two regions, subregions, North Africa and Southern Africa. Combined, these two regions alone account for 82% of total power generating capacity in Africa. The DRC (Central), Kenya (East), and Nigeria (West) are the leaders in power-generating capacity for Africa's other subregions. Most countries have an installed capacity below 1,000 Megawatts (MW). The largest producers are Egypt, with installed generating capacity of 17,000 MW, and South Africa, where the utility company, Eskom, has installed capacity of about 40,000 MW (EIA, 1999).

“ Africa’s per capita electricity consumption is the lowest in the world ”

Electricity is largely generated from thermal stations such as large coal-fired power stations in South Africa and oil-fired units in North Africa and Nigeria. For the rest of the continent, hydroelectricity represents the primary source of electricity. The major hydropower stations are situated on Africa’s great rivers (Congo, Niger, Nile, and Zambezi). Reliance on hydropower is 80% or greater in Cameroon, the DRC, Mozambique, Rwanda, Uganda, and Zambia. (EIA, 1999).

Figure 4.5

World regional shares of electricity generation in 2001



Notes: Electricity generation excludes pumped storage; Asia excludes China, Japan and Korea
Source: International Energy Agency, 2003

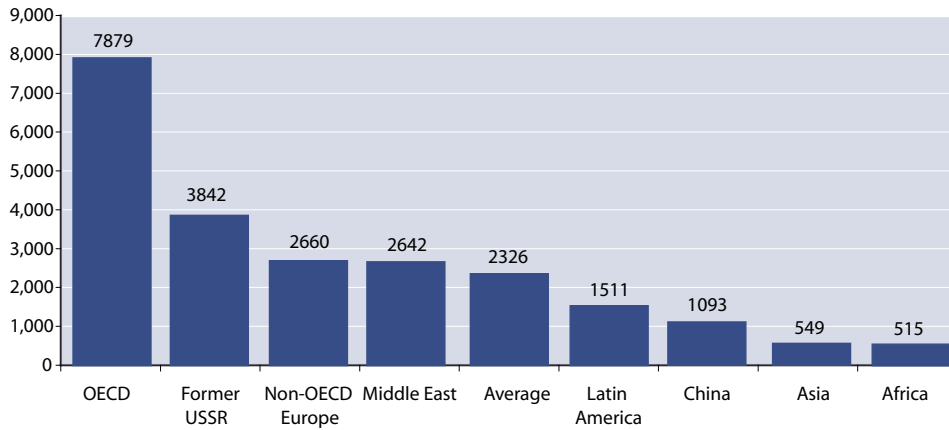
Access to a central power grid is a major challenge for Africa. Outside of Southern Africa (and to a lesser extent, North Africa), electricity demand on a per capita basis is very low, especially in Central, East, and West Africa. As figure 4.6 indicates, the average electricity consumption per capita in Africa is estimated to be about 515 kilowatt-hours (kWh). This is the lowest figure in the world, compared to other regions. Excluding South Africa and North Africa, this figure would drop to 126 kWh per capita (World Bank 2001a, Karekezi 2002). Africa’s consumption per capita is about three times less than the per capita consumption in Latin America and five times less than per capita consumption in the Middle East.

A number of problems have limited the ability of the sector to power Africa’s export diversification drive. These include:

- High system losses, in transmission and distribution;
- Unsustainable tariffs;
- Climatic fluctuations ;
- Poor technical and financial performance;
- Low level of private investment; and
- Failure to supply rural areas.

Figure 4.6

World regional shares of electricity consumption, 2001 (kWh p/capita)



Notes: Electricity consumption for Asia excludes China, Japan and Korea

Source: International Energy Agency, 2003

“ Power losses at transmission and distribution levels exceed 30% in many African countries ”

High system losses

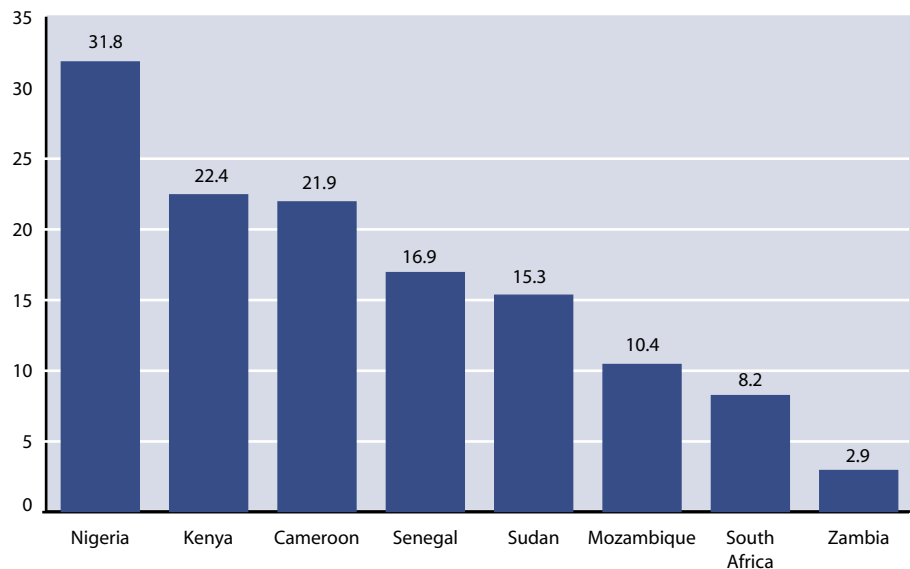
Power transmission and distribution losses are those that occur in transmission between sources of supply and points of distribution to consumers. As figure 4.7 shows, some of the power systems in Africa record total system losses sometimes exceeding 30%, while the international standard is between 10-12% (World Bank, 2003a; Karekezi, 2002). In South Africa, system losses are close to international standards (8.2%). When a line is too thin, energy is lost in terms of heat because of high pressure, and this is referred to as a technical loss. But the bulk of losses at transmission and distribution level in Africa are non-technical, usually because of illicit connections, theft of equipment, metre tampering and old/faulty meters. Large investments in upgrading and reinforcement of transmission and distribution networks and retrofitting of plants with more efficient auxiliary devices are the keys to reducing these inefficiencies.

Unsustainable tariffs

Most African governments have subscribed to the view that low-priced electricity can contribute to achieving economic and social development. Consequently, electricity tariffs in some African countries can tend to reflect a political agenda rather than an economically sound management policy. As a result, tariffs are often below marginal costs, requiring high levels of subsidies to keep the utilities afloat. On the other hand, countries in West Africa, particularly the francophone countries, seem to record very high tariffs that could have a detrimental impact on low-income consumers (Karekezi and Kimani, 2002). One promising solution to tariff problems is the pricing of electricity through a regulatory process. Indeed such a process can seek to eliminate monopoly pricing to protect the interests of end-users, as well as provide a fair return to network owners.

Figure 4.7

Electric power transmission and distribution losses, selected sub-saharan Africa countries in 2000 (percentage of output)



Source: World Bank, 2003a

Climatic factors

Hydroelectricity represents the primary source of electricity for SSA countries, especially those not endowed with fossil fuels. During times of drought, however, some countries experience power shortages because of insufficient hydropower generation. Climatic fluctuations can thus have a direct impact on electricity supply and generation costs, and the overall economy. For instance, Zimbabwe's 1992 drought caused electricity shortages that cost it \$235 million in lost export earnings, equivalent to nearly 3.5% of GDP (EAGER 1998; World Bank, 2003a). In Kenya, where hydropower accounts for approximately 80% of power production, low dam reservoir levels led to reductions in generation; water and power rationing devastated the country's economy in 1999 and 2000. The cost of unmet electricity demand was equal to 3.8-6.5% of GDP (World Bank, 2000). In Ghana, sustained low rainfall over 18 months in 1997-1998 resulted in power rationing and power cuts affecting domestic and industrial consumers alike. The level of GDP growth for 1998 was estimated to have been cut by three percentage points as a result (Edjekumhene et al., 2001). In vulnerable countries, electricity generation sources need to be diversified to include thermal stations.

Poor financial and technical performance

Financially, debt owed by customers is often a sizeable amount, leading to deterioration of the cash flow situation and company losses (Karekezi, 2002; AFREPREN, 2001). In

many cases, customers (particularly governments) fail to pay their bills on time. In Tanzania the debt collection period, standing at 64 days in 1990, reached 315 days in 1998 (AFREPREN, 2001). In 1997, the Tanzanian Government owed its national utility, TANESCO, about \$47.62 million, representing 26% of the company's annual turnover (Kibanga, 1997). At the beginning of 2002, the Kenyan Government owed Kenya Power and Lighting Company (KPLC) about 2.5 billion Kenyan shillings (Wamukonya, 2003), equivalent to nearly 9% of its annual turnover. Further, throughout SSA, energy theft, ineffective metering and billing practices all contribute to low revenue collection.

Technical and managerial performance of African utilities is often poor, resulting in a low quality of supply and services and an inability to meet growing electricity demand. Little improvement in refurbishment and maintenance has taken place in SSA's power plants over the last ten years. Fuel and lubricant consumption tends to be high in diesel power plants, partly because of poor maintenance. In many instances, engines last only a fraction of their normal lifetime, greatly increasing capital costs per unit of production. In several countries, average engine lifetimes are as low as five to ten years (World Bank, 1992).

“Private investment in electricity in sub-Saharan Africa was less than 2% of all private electricity projects in developing countries”

Low levels of private investment

African governments have been able neither to finance the expansion or refurbishment in the power sector nor to attract private sector investment. The International Finance Corporation (IFC) estimated that FDI in the power sector in SSA was only 6% of all infrastructure FDI inflows into the region between 1990 and 1998. In comparison, telecommunications accounted for 89% of all FDI inflows in this period. Far more popular destinations for the electric sector are East Asia and the Pacific, and Latin America and the Caribbean.

Between 1990 and 1999, private investment in electricity in SSA was \$2.9 billion, representing less than 2% of all private electricity projects in developing countries (see table 4.3). The bulk of private investment in electricity was in Latin America and Caribbean, with almost 40% of the total. More private investment is essential to mobilize resources for the development of the sector and, more importantly, alleviate the budgetary burden on African state-owned power utilities.

Failure to supply rural areas

In most African countries, the provision of electricity is largely confined to the urban areas. Urban electrification levels are still well below 50% (AFREPREN, 2001). Statistics show that even in urban areas, with the exception of Zimbabwe and South Africa, the percentage of households served with electricity is still small. Household electrification is especially low in the rural areas of SSA, and yet the majority of the population in Africa (80%) resides in the rural areas. For instance, rural electrification levels in Malawi, Mozambique, and Kenya are just 0.05%, 0.7%, and 2.0% respectively (AFREPREN, 2001). The agricultural sector in Africa accounts for a large proportion of the GDP. This heavy dependence on agriculture is likely to continue being the norm for most of SSA.

Table 4.3**Private investments in electricity projects in developing countries, 1990-1999**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Total
Sub-Saharan Africa	49	0	27	1	84	42	1,014	503	709	455	2,884
Middle East and North Africa	0	0	0	0	225	0	217	4,679	0	715	5,837
Europe and Central Asia	85	0	1,041	0	1,332	3,369	3,507	2,128	504	688	12,655
South Asia	169	735	37	1,186	3,081	3,193	4,934	2,319	926	2,227	18,805
East Asia and the Pacific	55	454	4,622	5,592	7,291	7,492	11,677	12,437	4,833	1,945	56,398
Latin America and the Caribbean	1,204	23	2,497	3,298	2,924	5,788	8,750	20,629	12,720	6,287	64,120
Total	1,562	1,212	8,225	10,077	14,936	19,884	30,100	42,694	19,692	12,317	160,698

Source: World Bank Private Participation in Infrastructure (PPI) database

With low levels of electrification in rural areas, the increase in productivity in large farms as well as in the agro-industry for export diversification will be very limited. Secure and low-cost supplies of electricity and other forms of energy are crucial if economic development, and social progress are to be realized. Furthermore there are gender implications in the failure to supply rural areas. Box 4.2 shows that women rely on the use of biomass because they have very limited access to modern sources of energy such as electricity and this affects competitiveness.

Reforming the sector through restructuring and competition

Power sector reforms are designed to introduce competition, where feasible, in the upstream production and downstream supply functions of the industry structure, and to use economic regulation of the wholesale and retail power markets to promote competition and protect consumer interests (AFREPREN, 2001). Reforms broadly consist of the following elements:

Box 4.2

Energy, gender and competitiveness

African women are engaged in a number of energy-demanding economic activities that can generate income through national, regional and international trade. In their contributions to the economy, women are the major producers of food and most of them are involved in income- or potential income-generating activities such as sewing, knitting, making handcrafts, food preservation, processing and retailing. In Zambia, for instance, women are also engaged in bakery, pottery, fish smoking, oilseed processing, beer brewing, soap making and maize milling, all of which have great export potentials. Experience in countries such as Uganda and Ghana shows that these types of commodities can become exports under the US Africa Growth and Opportunity Act (AGOA) system. However, in order to increase production and to exploit the full trade potential presented by trade liberalization, adequate and reliable sources of energy are necessary. Most of these industries owned by women depend on the use of biomass, especially firewood. With the provision of other forms of energy such as electricity, women can become more productive because they would spend less time searching for wood.

The table below shows how the use of wood fire by Zambian female entrepreneurs is still very important, accounting for a high percentage of output. For example it takes 9 kilograms of wood to produce 1 kilogram of flour!

Enterprises	Energy Use
Beer brewing	2 kg wood/1 litre of brew
Pottery	1.4 kg wood/1 kg of clay
Oil seed processing	0.24kg wood/1 kg seed
Bakery (Dover)	2.6 kg wood/1 kg of flour
Bakery (Dug out kiln)	9 kg wood/1kg of flour

The cost of producing potentially tradable goods is high in Africa and will translate into higher prices on the world market, creating a competitive disadvantage for many goods sold by African women. Heavy reliance on biomass as the only or major source of fuel cannot be sustained. Traditional energy sources not only have lower energy efficiency when compared to modern energy sources such as electricity and solar energy but they engage women in a downward spiral of environmental degradation. Women's access to new and affordable sources of energy such as electricity is crucial to improving their competitiveness and their contribution to economic development and social progress.

Sources: ECA, from official sources; ZERO, 1998

- Obliging electricity enterprises to operate according to commercial principles;
- Introducing of competition to improve sector performance in terms of efficiency, customer responsiveness, innovation and viability;
- Restructuring the electric power supply chain to enable the introduction of competition;
- Privatizing of unbundled electricity generators and distributors under dispersed ownership, as competition is unlikely to develop properly among entities that are under common ownership – whether State or private;

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Power outages in Côte d'Ivoire decreased from 50 hours to 19 hours per month over four years due to reforms
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- Applying economic regulation of the power market transparently, through an agency that operates independently from influence by government, electricity suppliers or users; and
- Focusing the government's role on policy formation and execution, with divestiture of state ownership in generation and distribution.

Power sector reform in most of Africa has been recommended by the international financial institutions, which have been the traditional sources of finance for the sector. In Ghana, for instance, the national power company used to rely almost exclusively on guaranteed loans from foreign governments and donor agencies to finance generation and transmission projects (Edjekumhene et al., 2001). Since 1993, power sector reform has been a condition for lending to the power sector (World Bank, 1993). Mismanagement, poor operational performance, distorted tariffs resulting in poor economic efficiency and low returns on investment have been cited by the international financial institutions as essential reasons for the reform.

Compared to the other regions of the world, Africa's power sector reforms have been very slow to materialize, especially those reforms designed to minimize or reduce government control of the power sector, whether through establishing independent regulatory agencies, amendments to the electricity law, restructuring, or fully privatizing the generation and transmission sub-sectors. The Energy Sector Management Assistance Programme (ESMAP) of the World Bank surveyed 115 countries in 1998 to see how many of them had taken key reform steps in the power sector and whether there were important differences between regions (see table 4.4). Most countries in Latin America and the Caribbean appeared to have reformed their power sectors by 1998. South Asia was the next most reformed region. SSA appeared to have the least number of countries undertaking reforms, and the least reform measures – in fact only 15% of them. Only two countries in SSA had privatized their existing assets and only four had restructured the sector. It was clear that very little reform has taken place in the power sector in SSA, with the exception of the corporatization of the state utilities, and to a lesser extent the introduction of independent power producers (IPPs) in 19% of countries as opposed to the global figure of 40% of countries (AFREPREN, 2001).

An important factor for the acceptance of power reform processes in Africa is public education, whether through consultations or the use of the electronic and print media. For instance, Uganda's success in its privatization drive is based on regular consultation with consumers to ensure public awareness and support (Redwood-Sawyerr, 2002). Privatization is always likely to result in increases in electricity tariffs, and it is important that the rationale for increases is always well explained and discussed, if the support of the public is to be gained.

Mixed progress so far

A review of the impact of the few power sector reforms undertaken in Africa shows mixed results. Power sector reform has resulted in a reduction in technical losses among many reformers in Africa because of improvements in management and maintenance. Power losses in Côte d'Ivoire decreased from 19.8% to 17.4% between 1990 and 1998 (Bacon and Gutierrez, 1996). Curtailing of theft and illegal connections by using technical devices that

Table 4.4

Developing countries' power sector reform measures as of 1998, by number of countries per region

Reform Step	Region (number of countries)					
	Africa (48)	East Asia and the Pacific (9)	Europe and Central Asia (27)	Latin America and the Caribbean (18)	Middle East and North Africa (8)	South Asia (5)
Corporatization	15 (31%)	4 (44%)	17 (63%)	11 (61%)	2 (25%)	2 (40%)
Amendments to electricity law	7 (15%)	3 (33%)	11 (41%)	14 (78%)	1 (13%)	2 (40%)
Establishment of independent regulatory agencies	4 (8%)	1 (11%)	11 (41%)	15 (83%)	0 (0%)	2 (40%)
Introduction of independent power producers (IPPs)	9 (19%)	7 (78%)	9 (33%)	15 (83%)	1 (13%)	5 (100%)
Restructuring	4 (8%)	4 (44%)	14 (52%)	13 (72%)	3 (38%)	2 (40%)
Privatization of electricity generation	2 (4%)	2 (22%)	10 (37%)	7 (39%)	1 (13%)	2 (40%)
Privatization of electricity distribution	2 (4%)	1 (11%)	8 (30%)	8 (44%)	1 (13%)	1 (20%)
Reform indicator	0.88 (15%)	2.44 (41%)	2.70 (45%)	4.28 (71%)	1.00 (17%)	3.00 (50%)

Source: AFREPREN, 2001

prevent such tampering contributed significantly to the loss reduction. Power outages in Côte d'Ivoire decreased from 50 hours to 19 hours per month over four years, but at higher consumer prices (Girod and Percebois, 1996). In Kenya and Senegal, power rationing was an acute problem in 2001 because of drought, but also as a result of reform-associated factors (Wamukonya, 2003). One study in Kenya showed that electricity supply no longer ranked as such a major concern as in the past among multinational corporations, mainly because 60% of them had invested in full standby generators (*Daily Nation*, 2002).

Despite the successes attributed to the reforms in some countries, overall they have had very little impact on improved electrification levels, especially among the rural and urban poor.

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Reforms have been unable to improve the level of electrification among the rural and urban poor
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This is partially due to the limited attention given to the distribution end. The rural electrification programmes initiated by governments have not been able to mobilize adequate funds or to ensure a timely release of rural electrification funds collected from electricity customers. Rural electrification programmes in the majority of East and Southern African countries appear to have stagnated, with the exceptions of those in South Africa and Zimbabwe.

Political and economic interests still have control over the power sector in many African countries. It is a situation that has generally resulted in high inefficiency and bad management. It is, however, important to note that no single model of reform appears to provide a panacea for the range of problems faced by African countries. African governments have done little so far to monitor the impact of the reforms they have already undertaken in order to ensure that they are working well and that consumers are starting to benefit from them. Power sector reform in SSA countries appears to have been concentrated more on alleviating the generation capacity shortfalls than on the serious deficiencies in distribution (AFREPREN, 2001). For the reforms to have a greater impact on the power sector, they need to concentrate on improving the technical and financial performance of power companies, as well as promoting access to electricity by rural dwellers and the urban poor.

A new agenda for Africa's power sector

The potential for African countries to achieve energy sustainability is enormous, provided the problems affecting the power sector are effectively addressed. The success of any strategy to develop the energy sector depends on solutions originating from governments and the private sector across the continent. This section explores key elements of a strategy to remedy the imbalance in energy supply and demand, including the promotion of energy efficiency; making power companies more efficient; promoting rural electrification; encouraging private participation in the power sector; effective regulation; realistic pricing; and undertaking subregional integration in energy services.

Energy efficiency

Energy efficiency seeks to cut operating costs, enhance economic efficiency and improve the productivity and international competitiveness of energy-consuming companies. Energy use in the modern sector in Africa is extremely inefficient, offering large, unused energy conservation potential (World Bank, 1992). Experience from other developing countries has demonstrated that technically proven, cost-effective energy conservation and efficiency measures can save between 10% and 30% of energy consumption. In Ghana, for example, the low energy efficiency of the manufacturing sector could be increased by at least 15% through “housekeeping” measures alone, for instance, changing the way equipment is used (World Bank, 1993).

Energy efficiency measures the amount of GDP generated by one unit of energy use. Indeed, most African countries lag behind in terms of energy efficiency when compared to the rest of the world. Figure 4.8 indicates that for the year 2000, Tanzania, Zambia,

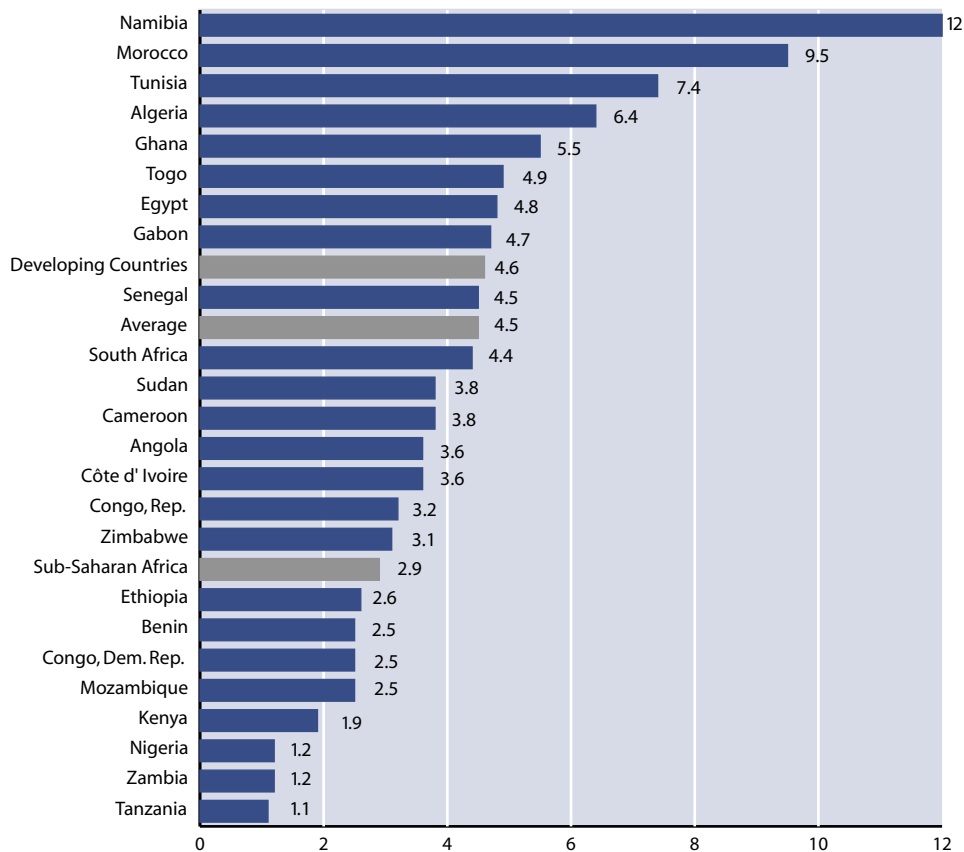
Nigeria and had the lowest level of energy efficiency in Africa, with respectively \$1.3, \$1.2 and \$1.1 for one unit of energy use. By contrast, Namibia and Morocco recorded one of the highest levels of energy efficiency in the world, with respectively \$12 and \$9.5 for one unit of energy use. Low energy-efficiency levels in countries such as Nigeria and Zambia are due in large part to the virtual absence of energy conservation measures in their industrial sectors (Nilecom Technology, 2003).

Although the average African uses far less energy than the world average, producing a dollar's worth of GDP uses more energy in Africa on the average than the rest of the world. Increasing the efficiency of current supply and utilization should be the top-most priority of strategies for power sector development. Power sector reform to increase the efficiency and reliability of energy supplies and promote efficient use of energy is the cheapest solution with the greatest short-term benefits. This is particularly relevant in large parts of Africa where installed capacity is lagging behind demand.

“Producing a dollar's worth of GDP uses more energy in Africa than in the rest of the world”

Figure 4.8

GDP per unit of energy use selected African countries, 2000 (PPP US\$ per kg of oil equivalent)



Source: UNDP, 2003

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Promoting energy efficiency is the cheapest solution with the greatest short-term benefits
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An energy efficiency programme needs to include:

- Promotional and information dissemination activities to increase energy conservation awareness;
- Technical support for industry and commerce through the provision of diagnostic energy services, energy conservation installations and retrofits;
- Promotion of energy-efficient technologies such as electric motors, heating and lighting systems;
- Financial interventions to assist energy users in acquiring energy efficient technologies;
- Development and promotion of alternative energy sources such as solar, water heaters, mini-hydro for local grids, biomass powered plants, etc.; and
- Establishment of a body to advocate and implement energy conservation measures.

The success of any energy-efficiency initiatives depends on how information on the latest technologies and methods, as well as the benefits of energy efficiency, gets to energy consumers. The Ghana Energy Foundation, for instance, has an elaborate programme of action to educate the public through seminars and workshops, electronic media campaigns and billboards. The results of such campaigns confirm that given the right information at the right time, Ghanaian consumers could reduce their electricity consumption by between 25-75% (Ofosu-Ahenkorah, 2003).

Better-managed power companies

It is increasingly being argued that power sector reforms should concentrate on distancing the sector from the interests of political leaders and the State bureaucracy and on introducing incentives, to both managers and workers, to provide the most efficient electricity services to the consumer. A significant step is to transform power companies that are under government ownership into independent and self-reliant corporations, where feasible. As the corporate culture gains root, some form of commercialization can be introduced to impose the discipline of corporate law and the expectations of the market (Chiwaya et al., 1996).

Public ownership does not necessarily mean inefficiency; neither does private ownership guarantee economic efficiency. Continued public ownership may be justified where state-owned power companies are working well and governments can mobilize the financing for their investments without crowding out other priorities. For example, South Africa's State utility, Eskom, has provided a good quality of electricity supply in recent years and will maintain a dominant role in the generation sector for the foreseeable future, while independent power producers will be licensed so that greater competition in generation can be encouraged (Clark, 2001). However, in some other countries, where private investment is badly needed, because of both management and funding problems, continued government ownership of electric power companies may hamper progress. Mauritius provides an example of the potential of local private participation in the power sector. Close

to 25% of annual electricity generation comes from local privately owned and operated cogeneration plants within the sugar industry (Deepchand, 2001).

The success and efficiency of power companies will depend to a large extent on how they incorporate economic considerations into their operations. This may require tariffs based on real cost, effective and efficient collection of revenues, minimization of loss and waste in the delivery of energy services, internally generated reinvestment in technological upgrading and new capacity creation (Mkhwanazi, 2003). An example of successful transformation has been provided by Uganda, which essentially addressed the separation of generation, transmission and distribution before the unbundling of its operations. By the end of 1999, it had seen a remarkable increase in most performance indicators, such as increased revenue collection (from 83% to 94 % in 1998), increased billing for consumption of about 12%, a better debt collection rate and a more attractive business profile (Bidasala-Igaga, 2001).

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In Cape Verde wind
energy represents
10 to 15% of all
electricity produced
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The challenge of rural electrification

Rural electrification has great potential to enhance Africa's export diversification and to promote economic growth through the processing of agricultural products for export. Direct economic benefits would be expected to flow from the use of electricity in productive applications, such as irrigation, crop processing and food preservation, as well as greatly improved social services (WEC, 1999). The ongoing restructuring of the power sector in Africa has not really taken into account the realities in rural areas where the extension of energy services does not keep pace with population growth. Private companies will probably be reluctant to invest in rural electrification because of the limited financial benefits, and so there is a need for public investment. This can be done if governments play a more aggressive and transparent role of promoting smaller village-based energy systems. Recent solar and wind power developments in Kenya and Cape Verde have, however, shown that there is also an important role for commercial initiatives in forms of electrification beyond the scope of national grid systems (see boxes 4.3 and 4.4).

Empirical evidence shows that some rural electrification programmes have been an economic success when measured by returns on investment. Diesel generators for local supplies or diesel engines for pumping may in some cases be more viable than universal grid coverage. In general, rural electrification is more likely to succeed when it is based on, or accompanied by, complementary social and economic infrastructure development (e.g. rural water supplies, health programmes, primary and secondary education, and regional and feeder roads).

Rural electrification, especially where it can support export expansion and diversification, is important in any full power sector development strategy. Emphasis should be placed on decentralized power generation and renewable energies. Small or micro power generation systems are viable alternatives to over-reliance on the centralized national grid, which rarely serves rural areas. There is, however, a need for more financing from the international development institutions for such projects (Bamenjo, 2002).

Box 4.3

Solar power in Kenya

Photovoltaic (PV) technology converts sunlight directly into electricity. In such a system, power is produced when sunlight strikes the semiconductor material and creates an electric current. The Kenya PV industry provides a model of sustainable, commercially driven and off-grid rural electrification, worthy of consideration by other countries in Africa. It is estimated that some 200,000 PV solar home systems have been installed since the early 1990s totalling more than 3.5 MW of installed capacity. Since the 1990s, sales of solar modules have remained over 20,000 systems per year, representing a PV market worth more than \$6 million a year.

Currently the PV industry in Kenya has a number of players including importers, installers, battery charging stations and appliance sellers, many of whom have an annual turnover of more than \$500,000. Most people who purchase PV systems are members of the rural middle class who have little hope of gaining access to the national grid. People who purchase PV systems are interested in gaining power for TV, lighting and music systems. Even though low-cost provision of PV solar home systems has been successfully developed by the private sector in Kenya, a number of problems (such as lack of awareness and affordability) have prevented PV systems from reaching the rural poor.

Source: Hankins, 2001

Box 4.4

Wind power in the Cape Verde Islands

The ten islands that constitute the Republic of Cape Verde rely heavily on imported fuel for their electricity needs. ELECTRA, the State-owned utility, is facing serious difficulties in meeting growing demand for electricity in the archipelago, which has no primary energy resources except firewood, which meets 57% of household energy needs; wood is increasingly scarce as forests are depleted. The country, however, has an excellent wind energy potential, which is a suitable and technically viable substitute for high-cost diesel generation. Wind energy has always been used in Cape Verde Islands for water pumping, but it is only since 1994, when wind farms with a total capacity of 2.6 MW were installed, that wind energy has come to represent 10-15 % of all electricity produced.

The World Bank/GEF (Global Environment Facility) project added an additional 7.8 MW at a cost of \$9 million. The project's objective is to mitigate carbon emissions resulting from power generation. By making it possible for ELECTRA's strategic private partner to develop the first commercial wind farms, the project allows wind energy projects to be implemented on a fully commercial basis. Promoting renewable energy with the help of the private sector will save foreign exchange otherwise spent on imported fuel. Wind power also facilitates activities in agriculture and tourism. For a country with such a dry environment and scarce vegetation, preservation has a real meaning.

Sources: World Bank, 2001b; Monteiro Alves et al., 2000

Attracting the private sector

Power sector development in Africa has been constrained by a lack of public resources and by the difficulty of attracting bilateral and multilateral development assistance or FDI for investment in the sector. Private sector participation in the power sector can potentially bring substantial benefits to African governments. It offers new skills, technology and management techniques to the power sector, resulting in more efficient operations and management of resources and, most importantly, continued funding for renewal and expansion.

The main forms of private sector participation in the development of the energy sector include:

- Service contracts to contract out responsibility for delivering particular services;
- Management contracts to transfer responsibility for certain operations;
- Build Own and Operate (BOO)/Build Operate and Transfer (BOT) and other concessions for financing new investments; and
- Divestiture and sale of existing electricity businesses.

Table 4.5

Options for private participation in the energy sector

Option	Asset ownership	Operation and maintenance	Capital investment	Commercial risk	Typical duration
Service contract	Public	Shared	Public	Public	1-2 years
Management contract	Public	Private	Public	Public	3-5 years
Lease	Public	Private	Public	Shared	8-15 years
Concession	Public	Private	Private	Private	25-30 years
BOO/BOT scheme	Shared	Private	Private	Private	20-30 years
Divestiture	Private	Private	Private	Private	++

Source: World Bank, 2002

The range of options for private participation in the energy sector is outlined in table 4.5. Most of these forms of involvement are already taking place in most African countries. At the individual country level, the best strategy to encourage private sector participation in the power sector is the provision of a good business environment, in which private firms can operate with less uncertainty and instability. Governments should commit themselves to implementing energy reforms and restructuring in order to allow more competition and private entry into the market. The potential role of local stock markets is discussed in box 4.5. At the regional and subregional level, African countries should aim for greater integration by organizing subregional markets and strengthening cooperation in energy.

Box 4.5

Financing the power sector in Africa: the role of stock markets

Perhaps the greatest problem facing the power sector in Africa is the inability to meet capital requirements. The increased use of energy will require capital – a factor that is very scarce in most African countries. For electric power alone, the average annual investment cost for an African country lies between \$60-100 million, depending on assumptions regarding the rates of growth, improvement in end-use energy efficiency, and pricing.

The prospect for any significant increase in aid for power sector development is very slim. In addition to the constraint on international concessionary credit and commercial bank finance, the resources of the public sector are limited. In fact, the public sector in Africa is already overburdened with the need to meet investment in health and social services, and cannot find the billions needed to finance the power sector. This leaves domestic and international capital markets as the main sources of finance for the power sector. However, domestic capital markets are either non-existent or underdeveloped in Africa. Africa's stock markets are generally very small, illiquid and poorly regulated.

The development of local capital markets can, nevertheless, lead to a boost in finance for the power sector. In many advanced countries the financing of infrastructure by attracting private savings helped stimulate their capital markets. The history of European and North American stock markets reveals that the issuing of securities by large public companies, many of which can be classified today as utility companies, was a foundation of the capital markets' growth. Local capital markets can offer substantial benefits. For the government, the existence of a local interest in power finance can ease many political problems, as well as act as a springboard for attracting FDI.

Sources: World Bank, 1989; Yartey, 2002

A critical role for good regulation

Good, credible and consistent regulation of the power sector is a necessary condition for effective service delivery. In general, a regulatory body is expected to provide mechanisms for monitoring, supervision, areas of intervention, objectives and targets for development of the sector and financial and best business/industrial practice. Adequate regulation will be able to reduce the ill effects associated with monopolistic elements in the power sector. The possibility of regulating prices by applying price cap-type measures, as well as the progressive introduction of competition, would help prevent any abuse of monopoly power and limit price increases. To perform effectively, it is essential that regulatory bodies are independent, and distanced from political, corporate and other pressures. This is not an easy matter, however, and the kinds of problems that may arise before independent regulation is achieved are illustrated in box 4.6.

The autonomy of regulatory bodies depends on the expertise of its membership in legal and technical issues as well as the government's commitment to recognize the authority of this body. However, many of the regulatory agencies in Africa have to report to their respective Ministers of energy, and most lack independent sources of finance.

The regulators' decisions, particularly on tariffs, have not always been adhered to and this is a further indicator of the constraints on their power. For example, after the Uganda Electricity Board raised tariffs by as much as 158%, consumer outrage forced the country's President to seek tariff reductions (*East African Standard*, 2001).

Box 4.6

Autonomous regulation in Kenya?

Kenya's Electricity Power Act of 1997 established the Electricity Regulatory Board (ERB) to regulate the power industry. However, another statute, the State Corporation Act, effectively placed the Electricity Regulatory Board under the Ministry of Energy and provided for its dissolution. ERB has been defined as a State corporation and therefore its autonomy is suspect. For instance, although the ERB is supposed to provide licences for the construction of electrical works, the Ministry of Energy has continued to do so. Moreover, the ERB can only advise the Minister of Energy on matters relating to granting, suspension and revocation of licences. It is the Minister rather the ERB that has the power to fine a licensee in breach of conduct. In 2001, the entire board of ERB was replaced under State Corporation Act provisions. The main source of finance for the ERB is a levy imposed by the Ministry of Energy on electricity sales. While so far this funding has been sufficient, there is no provision for ERB to seek external funding in the case of any shortfall.

Source: Nyoike and Okech, 2002

“Regulatory bodies should be independent, and distanced from political, corporate and other pressures”

The example of India shows that regulators can succeed in keeping control over tariffs (Balakrishna, 2000). In some states, notably Orissa and Maharashtra, regulators have been reluctant to allow increases in tariffs without evidence of reduced losses. Regulatory decisions on tariffs have not gone unchallenged. In Orissa, the World Bank explicitly urged the Regulatory Commission to approve tariff increases to provide comfort to investors just before privatization, a request that they rejected. In Madhya Pradesh, the regulatory agency refused to allow tariff increases, a decision that was challenged by the state government (Indiapoweronline.com, 2000).

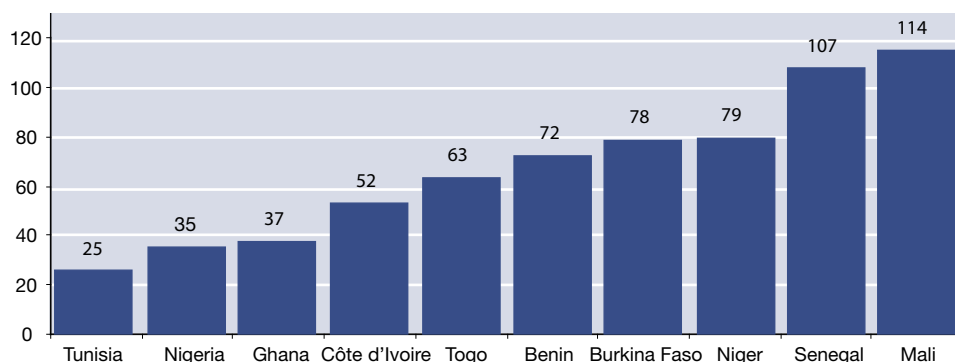
Regulation in Africa should at first be limited to correcting market imperfections that arise from unregulated markets, and it should not impede the development of the power sector itself. Considering that rules and regulations can become so stringent that they stifle private initiative, there is a need for a balanced approach.

Ways to make pricing realistic

The essential nature of the service that electricity provides to all sectors of the economy requires that its prices be set prudently and efficiently. If electricity prices are held below the cost of production, it can result in negative results in terms of over-consumption, environmental degradation and wasted natural resources. On the other hand, if prices are held artificially high, industrial competitiveness will suffer and some consumers may be deprived of an essential service.

Figure 4.9

Cost of 1 kWh in Tunisia compared to selected ECOWAS countries (in CFA francs)



Source: ECA, from official sources

“Producing 1 kilowatt hour of electricity in Mali and Senegal is four times more expensive than in Tunisia”

Within Africa, there are wide variations in the cost of producing electricity, as figure 4.9 shows, and these variations inevitably pose problems in achieving efficient pricing systems. In essence, efficient pricing of electricity allows for economically optimal behaviour by each consumer and avoids system overload without having to resort to rationing because the price of electricity changes as system conditions change. Joskow and Schmalensee (1983) argued that wholesale and retail power prices are not generally based on marginal cost-pricing principles, even in advanced economies. Hourly, daily and seasonal variations in marginal costs are lost in the fixed annual rates. The variability of system marginal costs over time means that the rate of return will fail to transmit to consumers the true marginal cost of the power they consume at any time. In most of Africa, it will not be possible to introduce more efficient marginal cost-pricing mechanisms until ongoing reforms become sufficiently established.

Electricity pricing mechanisms are typically complex and vary across countries and regions. Different countries have different regulatory regimes and policy frameworks, as well as different energy policy goals and objectives. In African countries, energy policies commonly subsidize, cross-subsidize and impose import tariffs, taxes and levies as well as prescribe required standards and other regulations. The subsidies on energy products results in market distortions, leading to lower economic efficiency and misallocation of resources. To ensure economic efficiency, it is important that price distortions are minimized and that the principles of consistency, transparency, clarity, and cost effectiveness are promoted. A balanced approach is needed in most African countries, by staged phasing-out of subsidies over a period of time, as new privately-funded plants are put in place. An interesting example of electricity pricing in the context of private investment in energy supply is provided by Malaysia, as discussed in box 4.7.

Given that monopolistic tendencies still dominate the African power sector, competition is not perfect, and information is asymmetric, marginal cost pricing cannot deliver the necessary benefits. In the short term, African governments should keep electricity prices

regulated. However, as power sector reforms intensify, and competition is fully introduced, marginal cost pricing should be the ultimate objective.

Box 4.7

Pricing of electricity in Malaysia

Malaysia has developed a very successful independent power producer (IPP) programme. It is based on a bankable Power Purchase Agreement (PPA), backed by an indigenous fuel supply arrangement, making it possible for project financing in local currency. By 2000, the total installed generating capacity of the IPPs reached 4,149 MW, all in gas-fueled gas turbine plants. Tenaga Nasional Berhad (TNB), the national utility, continues to maintain dominance through its control of most of the generating capacity, the transmission network and distribution system. Under the current tariff structure, 100% of the peninsular population is supplied with electricity. This is achieved by having a tariff structure that allows TNB to cross-subsidize the electricity price. The determination of the tariff is subject to the approval of the government, based on the following considerations:

- Energy prices that reflect the economic or true cost of supply;
- Adequate revenues that allow for the development of the power sector;
- Competitiveness of Malaysia's industries and services;
- Diversification of energy resources, with greater use of indigenous resources; and
- Alignment with the social and economic objectives of the government.

Source: *Onn, 2000*

Regional and subregional energy integration

Africa has a rich abundance of commercial energy resources, but they are distributed unevenly. Inadequate energy transportation facilities, such as pipelines and transmission lines to move energy from abundant regions to deficient ones, have been cited as a major constraint to energy sector development in Africa. Regional and subregional cooperation and integration in energy services can help to create a viable export sector and promote economic growth. Simply because of the small size of national markets, many projects are only feasible and profitable in more regional and subregional dimensions. Subregional economic communities are, however, now beginning to encourage and strengthen cooperation in the energy trade through the joint interconnections of electricity grids, and collective oil and gas pipeline projects.

If well managed, regional cooperation should reduce power costs, minimize the operating costs and reduce system expansion costs through regional planning. The Southern African Power Pool (SAPP) is already in operation and there are bilateral pooling arrangements between some countries of East and Central Africa. The development of regional markets in energy services requires mechanisms for the use of interconnections,

for operational security and for power purchase operations. This constitutes a major challenge for African energy authorities to take up.

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1.6 billion dollars
could be saved
through optimal use
of regional electricity
resources in Southern
Africa
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A stronger commitment from African countries is needed to develop regionally integrated solutions. A study by the Southern African Development community (SADC) and the World Bank suggested that an estimated saving of \$1.6 billion over ten years could be realized through optimal use of regional electricity resources and installation in Southern Africa. The SAPP, for instance, has recorded reductions in both capital and operating costs through the cooperation of its members, who have been able to recover their costs and share equitably in the resulting benefits (ECA, 2003). There has also been a reduction in the operating reserve requirement. Before the pooling arrangements, members carried a 30% reserve margin; currently, SAPP requires members to carry reserves of 10.2% for hydro and 7.6% for thermal. The power pool has also provided a forum for regional solutions to electricity problems in individual SADC countries.

Conclusions

This chapter has focused on the need for Africa's energy sector managers and policy makers to work towards harnessing the continent's massive energy resources. Good energy management can be a basis for broader economic development as well as for export diversification. The greatest challenge is to make the development and utilization of energy as efficient as possible, in addition to ensuring that it is socially and economically beneficial. Governments have to commit themselves to restructuring their domestic energy sectors, both by allowing more competition and private investment into the market, and by strengthening subregional and regional cooperation in energy.

The key policy issue for Africa is how to provide adequate and reliable energy to meet the growing population in an efficient and affordable manner. The current energy infrastructure in many African countries is simply insufficient to support export diversification or ultimately to promote sustainable economic development. Growing demand for power supply needs to be met promptly and in a well-regulated manner. Pricing mechanisms must be effective and fair. If countries are to compete in the global marketplace, then governments and private investors must keep investing in expansion and renewal of the energy sector. To maintain this momentum, however, the role of the State will almost certainly have to be reduced.

The substantially higher cost of electric power in Africa compared to other regions has negatively affected the region's competitiveness in international markets. The relatively small size of many African countries suggests that more aggressive regional integration initiatives merit greater attention. Stronger emphasis should be placed on integrated energy supply networks based on regional initiatives, and especially in gas and electricity.

Annexes

A4.1 The Structure of Exports in Selected African Countries, 1966-2000

Countries	1966-1970		1996-2000		Diversification with Growth	Primary Processing
	PC Share	OECD Share	PC Share	OECD Share		
Algeria	98	0.5	88	0.31	D	A
Angola	99	0.17	100	0.1	C	C
Benin	99	0.01	83	0	D	D
Botswana ^a	99	0	86	0.01	A	A
Burkina Faso	99	0	77	0	D	D
Burundi	100	0.02	99	0	D	D
Cameroon	99	0.11	97	0.05	D	A
Central African Rep. ^b	99	0.01	97	0	C	C
Chad	100	0.01	94	0	D	D
Comoros	68	0	65	0	D	A
Congo, Rep.	88	0.03	96	0.03	B	C
Congo, Dem. Rep.	99	0.37	95	0.03	D	D
Côte d'Ivoire	99	0.24	94	0.08	D	A
Djibouti	83	0	51	0	D	D
Egypt	89	0.13	58	0.1	D	A
Equatorial Guinea	99	0.01	97	0.01	D	D
Ethiopia	97	0.06	86	0.01	D	D
Gabon	94	0.12	97	0.06	C	C
Gambia	99	0.01	97	0	D	D
Ghana	98	0.17	88	0.04	D	A
Guinea ^a	98	0.02	99	0.02	B	C
Guinea-Bissau ^a	97	0.01	94	0	D	A
Kenya	90	0.09	88	0.03	D	D
Lesotho ^c	28	0	20	0	A	D
Liberia	93	0.15	47	0.02	D	A
Madagascar	93	0.05	55	0.02	D	D
Malawi	99	0.02	98	0.01	D	A
Mali	96	0	83	0	D	D
Mauritania	99	0.05	98	0.01	D	A
Mauritius ^a	97	0.03	29	0.04	A	D
Mozambique	96	0.09	93	0	D	D
Morocco	95	0.26	38	0.17	D	D
Niger	100	0.02	91	0	D	A

A4.1 The Structure of Exports in Selected African Countries (continued)

Countries	1966-1970		1996-2000		Diversification With Growth	Primary Processing
	PC Share	OECD Share	PC Share	OECD Share		
Nigeria	98	0.42	98	0.31	C	C
Rwanda ^a	99	0.01	98	0	D	A
Senegal	98	0.08	92	0.01	D	D
Sierra Leone	99	0.06	69	0	D	A
Somalia	97	0.01	73	0	D	A
South Africa ^a	86	0.73	67	0.47	D	D
Sudan	99	0.09	93	0.01	D	A
Tanzania ^a	94	0.05	91	0.01	D	D
Togo	99	0.03	90	0	D	D
Tunisia	89	0.08	18	0.14	A	D
Uganda	100	0.09	98	0.01	D	D
Zambia	99	0.43	83	0.01	D	D
Zimbabwe	93	0.02	73	0.03	A	A

Notes: PC share is the share of primary commodities in total export. OECD share indicates the country's share in OECD imports. Data cover the period 1966-2000 except few countries for which data are only available from (a) 1970, (b) 1975, (c) 1976 and (d) 1978. Countries for which data are available after 1975 are excluded from figure 4.1. The 23 high-income OECD countries are Australia, Canada, EU (15), Iceland, Japan, New Zealand, Norway, Switzerland, and the United States. Columns 1 and 3 provide information on the share of primary commodities in total exports over the relevant period. Columns 2 and 4 summarize information on the share of total exports in OECD imports.

Column five summarizes the direction of change in both export diversification and market share. Countries that managed to increase both the share of manufactures and their weight in OECD imports are classified as A. A smaller share of manufactures coupled with bigger weight in OECD imports is classified as B. A lower share of manufactures coupled with a smaller weight in OECD imports is designated as C. Countries that were able to diversify away from primary products but had their share in OECD imports decreased are designated as D.

Column six summarizes the change in share of manufactures exports in total exports and processed primary products in total exports. Countries that both increased these shares are classified as A. B represents lower manufactures exports combined with higher processed primary exports. Countries that experienced a reduction in both are designated as C. D represents higher manufactures exports combined with lower processed primary products.

Source: Bonaglia and Fukasaku (2003), based on OECD Foreign Trade Statistics Database, 2002

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