

# Energy use, poverty and development in the SADC

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## **Abstract**

*The purpose of this paper is to investigate the relationship between economic growth, energy use, poverty alleviation and development in the Southern African Development Community (SADC) countries. Association is drawn between human development indices and energy consumption, economic growth and poverty. It turns out that poverty has a bearing on the types of energy consumed, which in turn, affects health, education and income earning opportunities. Access to reliable and affordable energy remains an essential prerequisite for combating poverty, and available evidence shows that a significant proportion of the population in SADC countries lack access even to the most basic energy supplies and services. Furthermore, inequalities penalize the poor by leaving them with a smaller share of income thus limiting their energy sources and weakening the poverty-reducing power of growth.*

*Keywords: economic growth, poverty alleviation, energy access, development*

## **Introduction**

This paper discusses the relationship between energy use, poverty alleviation and economic development, and explores the nature of energy use and human development for the Southern African Development Community (SADC) countries. The social and economic systems and conditions in these countries are diverse. Similarly the energy needs, income and population distribution and technology associated with production modes vary. While economic growth generally increases energy demand, it is important to establish whether for SADC countries, growth influences the amount and type of energy to be used.

It cannot be disputed that energy plays a crucial role in the production of economic output, and economies would not be able to develop without adequate supplies of energy. Once energy is in

short supply, it becomes more costly and depresses the economy, leading to increases in unemployment and compromising development prospects. Our focus on development takes into account satisfying basic human needs in the economy, access to jobs, and education, and therefore, it is important to reveal evidence on links between energy and human development.

Just as energy is instrumental for socio-economic development, so is the issue of poverty central to this discussion. Of course, the concept of poverty is multi-dimensional, and encompasses both monetary and non-monetary factors. The degree of poverty is expressed using established measures including the income measure, and the text contends that access to better and affordable sources of energy improves the welfare of poor households. For any given growth rate, the extent to which poverty is reduced is a function of how the distribution of income changes with economic growth.

This paper starts by explaining the main variables that form the core of this study. This is followed by an examination of the performance of the SADC economies, and a discussion of links between the following variables: economic growth, energy, development, poverty and energy access.

## **Growth, poverty and development**

Gross domestic product (GDP) or economic growth, and poverty are of central importance in this paper. In developing these for analysis, it is important to be aware of questions that often arise, mainly: is economic growth a meaningful goal, or is human development the real objective? Rather than attempting to deal with these questions head on, it should be noted that growth is generally accepted as the best way of improving people's standard of living and increasing employment. While growth does not provide a clear-cut answer on the quality of life, since even in times of plenty the quality of people's lives can be poor, it is necessary for reducing poverty and for producing resources needed for basic human development.

The concept of poverty and its measurement is very complex. Poverty is a multidimensional con-

cept and includes variables that may be easy to quantify such as income (hence income poverty) and the minimum vital calorie intake, and non-income attributes of poverty, which are difficult to quantify. Accordingly, economic growth is not the only source of poverty reduction: the income measure approach only provides a partial assessment such as the standard of living. Education and health are also important variables since they contribute in improving the welfare and life expectancy of individuals and enhance their income-earning capacity. Better health and education outcomes are expected to contribute to faster economic growth. These variables are important in constructing measures of human development, which are useful in establishing links with energy use. Health is key dimension and can be reflected by life expectancy and infant mortality rates, while more education expands economic opportunities and is expected to lead to improvements in the quality of life. Other important dimensions of poverty include assets, justice, freedom, social exclusion, and the individual's or household's own subjective perception of poverty and quality of life.

A useful measure of development is the Human Development Index (HDI) developed by the UNDP. The HDI is a summary or single statistic measure of human development, and is calculated for each country to allow for inter-country comparisons between the SADC countries. The HDI uses a weighted average of 'choices' or human development – health, education and ability to achieve a decent standard of living. A long and healthy life is measured by life expectancy at birth, and the resulting index is an indicator of longevity, with resulting values for all countries lying between 0 and 1 ( $0 < \text{HDI} < 1$ ). The education or the knowledge index takes into account the adult literacy rate with a 2/3 weight and the gross enrolment ratio (a combination of primary, secondary and tertiary gross enrolment) with a 1/3 weight. The decent standard of living takes into account the income factor, and is measured as GDP per capita (purchasing power parity in US dollars).

There are three important points to note. First, in principle the GDP index should be negatively related to poverty since the incidence of poverty is higher with lower income per capita as households have less income to meet their needs. Second, while values of the HDI index lie between zero (for poorest performance) and one (for ideal performance), setting of the minimum and maximum values for income and life expectancy lead to conceptual problems. Third, HDI is essentially a measure of impoverishment in multiple dimensions.

The UNDP has also developed the Human Poverty Index (HPI-1), a useful measure in determining the incidence of poverty in terms of deprivation rather than lack of income. The three basic

dimensions of human development used in the HDI, but defined using different indicators, are used as measures of deprivation, and relate to 'shortfalls' in each dimension. A long and healthy life or longevity is determined by the probability of people not surviving to the age of forty; knowledge as measured by the adult illiteracy rate; and the standard of living as determined by variables that feature in Millennium Development Goals (MDGs), specifically the percentage of people who lack access to safe water and percentage of children five years old or less who are underweight. As with the HDI, these three indices are calculated to allow for inter-country comparisons, and are combined to form the composite index. The HPI-1, essentially a deprivation measure for developing countries, is different from the HPI-2, which takes into account the long-term unemployment rate as an indicator of social exclusion for developed countries.

Longevity and education have to do with a good life, but are not proxies for all basic capabilities. Per capita income is more of a means to good life. Many important capabilities, such as enjoying a comfortable life, are functions of a person's economic circumstance. It is not surprising, therefore, that the income component of the HDI is used as an indirect indicator of capabilities.

### **Growth, poverty and energy use**

Data shows positive annual population growth for all the SADC countries for the period 1994 to 2003. Growth in population implies that economies must grow faster to generate new employment at a satisfactory pace and to reduce poverty. According to Table 1, by 2003 SADC average GDP growth was around 3.5%. Compared with the 2002 growth performance, only Botswana, The Democratic Republic of Congo (DRC), Malawi, Mauritius and Zambia registered a peak in economic activity, largely because of recovery in the agricultural sector and growth in the manufacturing, construction, tourism and mining sectors. Angola, Lesotho, Mozambique, Namibia, Swaziland and Tanzania experienced a fall in output because of the low growth rate in foreign direct investment, poor performance of the agricultural sector due to unfavourable weather conditions, and a slowdown in manufacturing output. Zimbabwe recorded a negative growth rate (-9.0%) in 2003, and its annual inflation rate accelerated from 113.2% in 2002 to 365% in 2003 because of a range of cost-push factors and underlying supply and demand imbalances. Common problems facing most SADC countries such as inadequate levels of investment (both physical and human capital) persist.

Except for Angola, all the countries are net importers of oil. Given its short-term price inelasticity, a rapid rise in oil prices increases production costs, undermines economic growth (especially if

capital goods imports are affected) and results in firms reducing their demand for labour (worsening poverty), investment and output. The direct effect of the high price of oil is in worsening the balance of payments and (in the absence of sufficient external reserves) in increasing external borrowing to finance budget shortfall, leading to higher debt servicing and constraints in financing social programmes. The extent to which countries are affected depends on the share of oil in their imports and economic activity. All SADC member states experience deficits, with the fiscal deficit to GDP ratio averaging 3.7% (Table 1). In terms of external debt, there are wide disparities between countries, with Malawi, Mozambique and Zambia classified as heavily indebted poor countries. On the whole, SADC countries suffer from economic instability arising from the rising balance of payments deficits, high rates of inflation with a negative impact on incomes and government revenue and investment, and rising budget deficits leading to deficit financing.

**Table 1: Changes in macro-economic variables**  
*Source: Human Development Report (2005)*

Country	Real growth rate (%) 2003	Inflation rate (%) 2003	Budget deficit as % of GDP 2003
Angola	4.3	105.6	-5.1
Botswana	6.7	9.2	-3.8
DRC	5.6	4.4	-4.3
Lesotho	3.3	7.2	-2.9
Malawi	4.5	9.6	-5.7
Madagascar			
Mauritius	4.3	3.9	-6.2
Mozambique	7.1	14.0	-4.0
Namibia	3.1	7.3	-4.0
South Africa	1.9	6.8	-2.6
Swaziland	2.9	7.4	-4.6
Tanzania	5.6	4.4	-3.2
Zambia	5.1	17.2	-4.1
Zimbabwe	-9.0	365	-0.3

There is consensus from a number of empirical studies that growth benefits to the poor, and that poverty reduction is an outcome of economic growth. Epaulard (2003) asserts that poverty reduction is not at the expense of growth, and that countries with higher growth rates are efficient at reducing poverty per percentage growth. The Dollar and Kraay (2000) study concludes that growth increases the average incomes of the poor proportionately with the overall growth, and that income poverty reduces as levels of GDP per capita increase. Ravallion and Chen (1997) provide similar findings, that poverty falls with growth in average living standards and rises when the economy contracts. This

generally leads to a conclusion, as in Roemer and Gugerty (1997), that on average the poor benefit from growth. While this may seem generally so, there is also evidence to the contrary that growth fails to reach the poor where there are large income gaps, and that income growth does not necessarily translate into one-for-one to changes in the welfare of the poor (Balisacan and Pernia, 2002). The later view is consistent with the 'jobless' growth experienced by most SADC economies. Such a situation challenges the trickle-down effect of economic growth, unless growth leads to higher employment or increases the income share of the poor. It can also be argued that poverty adversely affects economic growth by limiting the ability of the poor to invest in human capital. Irrespective of the various approaches above, all of them suffer from two major silences: first, the absence of mechanism for achieving growth and, second, how growth subsequently influences inequality.

### Energy and development

Although the use of GDP per capita is a useful indicator, it is, for many reasons, an inadequate tool for measuring or quantifying human development. While GDP is about output in the economy, it is, however, a weak tool for measuring relative social progress of countries and determining priorities for policy intervention. The HDI, on the other hand, provides a better measure of human development and is a 'catch all' which covers capabilities that are related to persons command over resources (Anand and Sen 2000). For this reason, it is fitting to use the HDI to assess human development.

Human development is about widening people's choices so as to enable them to live a long and healthy life, be educated and enjoy a descent standard of living. Expressed this way, human development involves increases in the quality of life. GDP does not capture this factor. Two competing views describe human development, giving an insight about variables to include for this measure. First is a broad view that is concerned with increases in variables involving sustainable human development such as the quality of life, equity, basic human rights, intra- and intergenerational equity. This is challenged by a rather narrow second view that focuses on basic needs (like minimum requirements in terms of food and shelter) and well-being. Dasgupta (1993) argues that any measure of well-being or quality of life makes health and education relevant arguments since these variables reflect positive freedoms, while income contributes to the enjoyment of this measure. These views reveal complexities in developing a measure of human development, and the first or broad view is the approach taken by the UNDP. But neither GDP nor HDI measure long run human well-being, and have deficiencies as tools for judging economic progress.

**Table 2: Human development index for SADC, 2003**

Source: Human Development Report (2005)

Country	Rank	Decomposition of HDI 2003			HDI, 2003
		LEI	EI	GI	
Angola	160	.25	.38	.51	.45
Botswana	131	.27	.76	.73	.57
Lesotho	149	.19	.76	.53	.50
Malawi	165	.21	.66	.29	.40
DRC	167	.27	.51	.31	.39
Madagascar	146	.47	.60	.33	.50
Mauritius	65	.78	.79	.78	.79
Mozambique	146	.22	.45	.39	.38
Namibia	125	.34	.79	.69	.63
South Africa	120	.40	.83	.77	.66
Swaziland	147	.18	.74	.64	.50
Tanzania	164	.31	.62	.29	.42
Zambia	166	.13	.68	.36	.39
Zimbabwe	145	.15	.79	.53	.51

Notes:

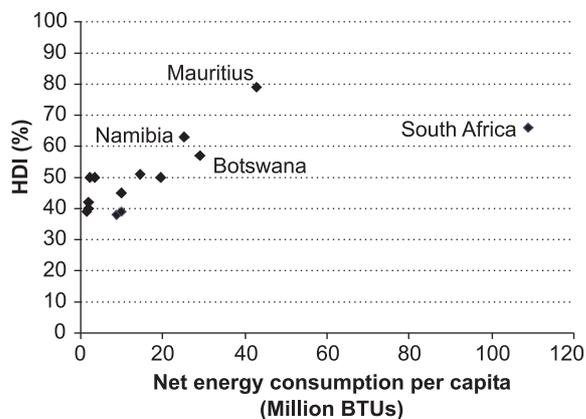
Figures in the table are rounded up to two significant figures.

LEI = life expectancy index, EI = the educational index and GI = the GDP index.

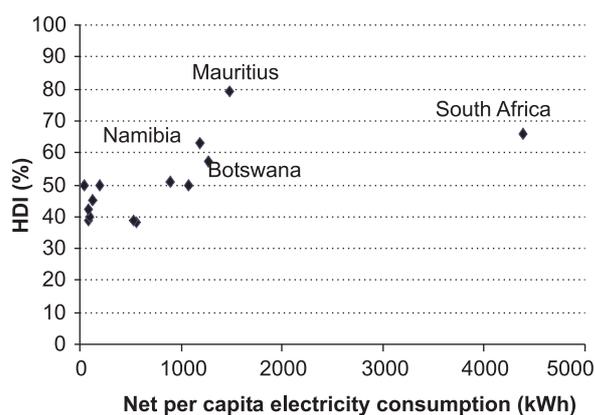
The Human Development Index data for 2003 reveals that Mauritius has the highest HDI (0.79) followed by South Africa (0.66) and Namibia (0.63). At the lower end are Mozambique (0.38), the Democratic Republic of Congo (0.39), and Zambia (0.39), with a shortfall in human development of 61%. An analysis of HDI (Table 2) reveals that for most countries the life expectancy index lies below both the educational and GDP indices, and is significantly less than that of Mauritius, reflecting high levels of the HIV/AIDS pandemic that have eroded the health status. Adult illiteracy rate is highest in Angola (62%), Mozambique (55%) and DRC (49%). This situation is expected to improve with higher primary school enrolment, particularly in pursuit of the MDGs. One can therefore argue that the HDI is a useful tool for directing resources to areas of individual capacity building such as education and health. Thus, it is important to point out that if any of the variables that make up the HDI index are over- or understated, this biases the use of HDI in terms of the way both the level of human poverty and inter-country differences in the level of development can be looked at.

Figure 1 shows the influence of energy consumption on the achievement of certain levels of HDI or quality of life. The different energy consumption levels across the SADC region are mainly due to large disparities in income. Figure 2 shows a similar pattern to that of Figure 1, and reveals that South Africa's per capita electricity consumption is by far above the 4000 kWh threshold correspon-

ding to an HDI of 66%. Annual electricity consumption for the other SADC countries is below 2000 kWh. Except for Mauritius with an HDI of 0.79, the HDI for these countries range from 0.39 (Zambia) to 0.63 (Namibia), countries with lower per capita electricity consumption and lower per capita income being clustered near the y-axis.



**Figure 1: Human development index and net energy consumption per capita, 2003**  
Data extrapolated from the Human Development Report (2005)



**Figure 2: Human development index and net per capita electricity consumption, 2003**  
Data extrapolated from the Human Development Report (2005)

Electricity consumption above 1000 kWh per person per year is associated with increasing GDP per capita. Increases with the HDI imply increases in variables used to construct the HDI (i.e. life expectancy, educational level and the income factor), which, in turn, are positively influenced by energy availability. It is rational to add that increases in the use of energy help reduce poverty through income, health, education and the environment.

Some problems arise with the measures on human development. Firstly, the HDI comparisons give an insight about the levels of achievement within the SADC countries. Such a measure relies on the availability and quality of the data.

Improvement or worsening of data collection can lead to different results and conclusions. Secondly, the level of data aggregation at a country level conceals both spatial and other disparities that exist in different parts of the country. Even though the HDI data given in Table 2 yields useful information that enables inter-country comparisons, it cannot be used to compare individual households or translate it into policy guidelines. Furthermore, by its construction, the data used for the HDI measure does not include qualitative variables (e.g. human rights and freedom, participation, safety and security), which might add more light on country differences.

### Poverty, income and energy access

While economic growth is one of the key drivers for poverty reduction, its influence is weakened by inequality. The Gini Coefficient shows that SADC has varying distributional patterns on human development (Table 3). It is extremely high for most SADC countries, indicating a much skewed distribution of income. As a result, poverty is quite high. There are two issues of importance. First, several studies argue that income inequality is cause for low human development since the poor are denied economic opportunity and have less money. Second, Epaulard (2003) contends that the Gini coefficient and the level of development (measured by the income and consumption per income) predict the actual level of elasticity of poverty to growth. These arguments entail two things. First, since the poor have less money, 'energy poverty', or inability to use modern energy either for cooking or lighting, or for other productive activities, is linked to general poverty. Second, if income distribution does not

change, higher per capita consumption will lead to more growth and therefore reduce poverty. By implication, economic growth and poverty should be positively correlated, so that changes in income inequality together with economic growth affect the rate of poverty reduction. Poverty, on the other hand, has a severe bearing on the types of energy consumed, and it perpetuates the vicious circle of poverty and poor health. The poor pay a high price (in cash or in labour) for the energy they use by spending a greater portion of their income on energy compared to wealthy people and because the fuels they use are less efficient. Furthermore, inequality penalizes the poor by leaving them with a smaller share of income, reducing the potential growth of the economy and by weakening the poverty-reducing power of growth (White and Killick 2001).

The HPI-1 results in the second column of Table 3 indicate the percentage of citizens living in poverty and show the degree of deprivation within SADC. The third column of Table 3 gives an insight of the degree of household income inequality, with the worst levels in Namibia, Lesotho, Botswana and South Africa. These figures reveal that the richest 10% earn roughly the following incomes of the poorest 10%: Namibia 129 times, Lesotho 119 times and South Africa 65 times. This means the richest 10% in Namibia, for example, earn about two-thirds of the country's income, and that the richest 10% in South Africa earn about 47% of the country's income.

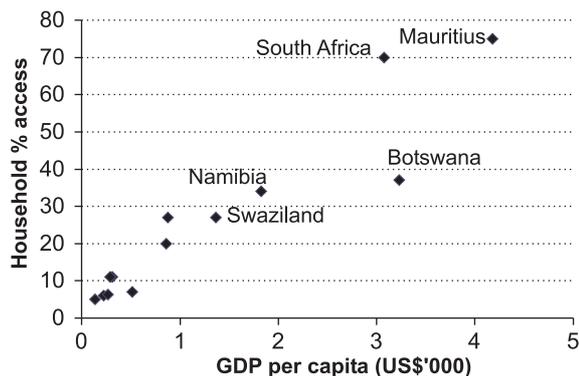
Table 3 reveals a gloomy picture of the poverty rate as well as considerable variation among countries using the international poverty line of US\$1 a

**Table 3: Development indicators, 2003**  
*Figures compiled from the Human Development Report (2005)*

Country	Gini Coefficient (%)	Human Poverty Index (HPI - 1) <sup>2</sup> (%)	Inequality measure: 10% richest to 10% poorest	Population below income poverty line US \$1/day 1990 - 2003
Angola		41.5	-	
Botswana	63.0	48.4	77.6	23.5
Lesotho	63.2	47.6	111.8	36.4
Malawi	50.3	43.4	22.7	41.7
DRC	-	41.4	-	-
Madagascar		35.3		61.0
Mauritius		11.4	-	
Mozambique	39.6	49.1	12.5	37.9
Namibia	70.7	33.0	128.9	434.9
South Africa	57.8	30.9	65.1	10.7
Swaziland	60.9	52.9	49.7	-
Tanzania	38.2	35.8	10.8	19.9
Zambia	52.6	46.4	36.6	63.7
Zimbabwe	56.8	45.9	22	56.1

day to allow absolute judgments about the state of poverty. The poverty line approach is based on some notion of inability to command resources to meet basic minimum needs in food, mainly as a result of lack of employment or insufficient income earning opportunities. The fourth column of Table 3 undoubtedly includes the poorest of the poor who lack access to modern forms of energy, with poverty higher in rural and peri-urban areas. Worst results are for Zambia, Madagascar and Zimbabwe, meaning that for Zambia 64 percent of the population was living with less than US\$1 a day in 2003.

Household access to electricity varies significantly by country, with high rates in Mauritius and South Africa (see Figure 3). From a national growth perspective, there is a strong correlation between energy access and economic income ( $R^2 = 0.88$ ), indicating that economies with higher per capita incomes have higher percentage access, and that as income increases, the percentage access to electricity also increases. As household access to electricity increases, modern energy services can be expected to become an invaluable means of improving social equality. In turn, this helps to drive economic growth by improving productivity and promoting local income generation.



**Figure 3: Household access and GDP per capita, 2003**

*Data extrapolated from the Human Development Report (2005)*

Most studies reveal that most rural poor households are female-headed with hardly any access to means of increasing their incomes. Linked with this are huge gender inequalities in terms of rights, resources, education, cultural norms, taboos, and so forth with slow and uneven progress. The poorest households depend almost entirely on fuelwood and other forms of biomass; sources of energy with a significant health risk as a result of indoor pollution. The UNDP (2000) reports that the low commercial energy use by the poor, is correlated with high infant mortality, illiteracy and with low life expectancy. Providing the poorest households with modern energy can, therefore, yield considerable improvements in these variables as well as other

multiple benefits such as promoting information and communication; improvement in health, education; strengthening of local economies; addressing their basic needs with reference to cooking, heating and lighting; and poverty alleviation. Income constraints for these households limit their choice of other energy sources such as paraffin and charcoal. Where there is access to these sources of energy, typically in urban and peri-urban areas, households tend to use a mixture, using one for cooking or lighting, and another for heating. This, however, is a function of availability of income flows, affordability (based on market price), service levels and reliability of supplies, variables that support the concept of the 'energy ladder', which defines a simple progression from relatively inefficient fuels and end-use equipment to more efficient fuels. Proponents of the energy ladder contend that energy has a determinant influence on the HDI especially in the early stages of development. With increasing availability of income flows, households can be expected to switch to more efficient fuels with prospects of saving needed income for other basic needs. Overcoming lack of access, while supportive of poverty alleviation and other sustainable development issues, requires addressing problems such as the problem of low demand and densities, the implied substantial subsidies for grid-connections, and the development of ancillary services to support the relationship between suppliers and consumers.

The income approach to determine poverty is problematic. The dollar-a-day threshold raises fundamental problems about the precision of this measure of deprivation as pointed out by the following problems. First, the household size varies, so that the degree of deprivation can be expected to be higher and the standard of living lower for larger families. Second, asset holding or the resource base differs by households. Some households may hold their wealth in the form of domestic animals (for example, cattle, goats, etc). Agriculture may be the main source of subsistence for others. It may also be that the informal sector is more liberating for some, and yet still other households may hold a combination of these. Third, household expenditure may serve as a better measure of poverty by providing information about individuals falling below the minimum threshold level of consumption. After all, people in the same income range and in similar circumstances may not consider themselves poor. Fourth, the dollar-a-day threshold conceals information on the transient poor and the chronic poor. Typically, the transient poor have resources slightly above the poverty line and often have little insurance or assets that insulate them against external shocks. The chronic poor, however, suffer from persistent deprivation since their resources are well below established needs. In all, the dollar-a-day

measure lacks an easy interpretation and has worrying conceptual challenges although it throws some light about the depth of poverty and the degree of deprivation.

Some studies (see, for instance Mawafi and Khawaja, 2005) suggest that the 'minimum income question' or MIQ is a potentially more efficient method of determining a poverty line. This approach determines how much people need to make 'ends meet'. The monetary values derived are then compared with the actual household income or resources after allowing some adjustments (such as the household size, its composition, and so forth) to derive a subjective poverty line. Even though this method is not well established, it is more flexible and yields more revealing results on inter-country and intra-country poverty analyses.

Although it can be acknowledged that the roots of poverty are complex, it can also be argued that strengthening variables that affect HDI and HPI-1 indices like entitlements, terms of exchange and building up capabilities associated with health, productive and secure lives, (see, for example, Dreze and Sen (1989) and Kannan (1995 p 705) contribute in improving the welfare of the poor. To this extent, the indices used, although representing an advance over purely economic comparisons, fail to capture the complexity of national development processes across the SADC countries.

## Challenges

SADC countries face several challenges with regard to energy use, poverty and development. The economic growth rates for most countries are not high enough to support the following: higher per capita income, increased standard of living and a higher reduction of poverty alleviation. Access to reliable and affordable energy remains an essential prerequisite for combating poverty. Available evidence shows that a significant proportion of the population in SADC countries lack access even to the most basic energy supplies and services.

Various measures have been used to understand the links between energy use, poverty and development. The database used elicits various responses ranging from the statistical accuracy, the choice of data for the various indices used and the data sources. Essentially, a single index is used to measure human behaviour and to articulate complex social changes. The fact that the data used is obtainable from international agencies rather than from SADC or the SADC individual countries, and used for inter-country comparisons, raises questions as to whether such data tallies with that of individual countries. Even if the data tallies, there are still problems about reconciling the different methodologies used, given an obvious fact that data is drawn from diverse sources. Even if this problem was solved, sharper results on energy use and

human development would accrue from highly disaggregated data at country and industry level.

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