

Environmental sustainability

►Indicator 1: Per Capita Energy Sector Carbon Dioxide Emissions

The country emits considerable carbon dioxide from its energy sector given that 48% of its final energy consumption is from biomass while 39.4% is from fossil fuels which are coal, coke and petroleum products. Liquid fuel consumption in the country has risen from 39,600 TJ in 1990 to 63,700 TJ in 1998 [Min. of Mines & Energy, Energy Balances 1990 & 1998]. This increase has been largely due to increased volume of road traffic in the country whose density per 1000 people rose from 30 in 1990 to 62 in 1998 [CSO, CSO National Statistics Bulletin, 2001]. Although the use of liquid fuels has increased significantly, the use of coal, which is a major source of carbon dioxide, has modestly decreased from coal with energy value of 138 PJ in 1990 to 134 PJ in 1998. Per capita energy sector carbon dioxide emissions has declined modestly since 1985 [www.IEA.org] due to the rapid population growth caused by the widespread availability of social services like health and education soon after attainment of independence in 1980. The population of the country has continued to increase at an annual average rate of 2,6% [World Bank, 2001, World Bank Atlas].

Calculation of the vector:

Zimbabwe's fuel combustion carbon dioxide emissions per capita dropped from 1.49 tonnes in 1990 to 1.2 tonnes in 1998 [IEA, CO₂ emissions from fuel combustion 1971-1998, 2000 Edition]. These figures translate to a change from 406.4 kgC/cap in 1990 to 327.3 kgC/cap in 1998 and 1999 of 313.6 kgC/cap.

- 1990 vector = $(406-339)/791 = 0.09$.
- 1998 vector = $(372.3-339)/791 = 0.042$
- 1999 vector = $(313.6-339)/791 = -0.032$

Discussion:

From 1990 to 1999, the vector has moved close 0 and even became negative in 1999. This indicates at one hand some aspect of sustainability and on the other hand it indicates lack of development. Industrial development that comes with increased carbon emissions from energy consumption has been very minimal in the country. These low figures are attributed to a significant component of hydroelectricity in the national energy mix that meets 17% of electricity demand. The situation is however bound to change remarkably in the near future as ZESA's system development plan shows that between 2005 and 2010 the utility will build coal-fired power plants with a capacity of 1884 MW.

►Indicator 2: Most Significant Energy-Related Local Pollutant – SO₂

Coal is the major fossil fuel used in the country. 46% of the country's estimated total annual sulphur emissions of over 120 000 tonnes comes from the power production sector while another 48% also comes from the industrial sector. 42% of the electricity supplied in the country, amounting to 10 TWh [Zimbabwe Energy Bulletin 2001 – 1998

Energy Balance], is generated from coal-fired thermal power stations located in the west of the country. Coal is also used as a fuel and raw material in local industries that include iron & steel, cement manufacture, brick making, sugar mills & refineries and foundries. Technological advances that reduce particulate emissions are used in most power plants in the country and they are also located in areas that are not inhabited, thus particulate emissions tend to affect only the vegetation around these plants. Therefore, besides other minute emissions spread around the country, sulphur emissions from coal burning is the most significant pollutant. On average 5,3 million tonnes of coal are supplied in the country per year. In Zimbabwe, coal is mined from three main sites that produce coal with sulphur contents as below:

Hwange coal	: 2.5% S (mostly for power production)
Sengwa coal	: 0.5% S (currently not in use)
Lubumbi coal	: 1.6% S (currently not in use)

Liquid fuels with a total volume exceeding 2 million cubic metres are used in the country predominantly in the transport sector. Gasoline combustion emits 42 tonnes of sulphur per year while diesel consumption emits 5800 tonnes of sulphur. High levels of liquid fuels combustion are however concentrated in major cities especially Harare the capital. The City of Harare's Health department published in 1999 stated that the air in the city had an average sulphur dioxide concentration of 86.73 micrograms per cubic meter which is well above the WHO standard of 50 micrograms per cubic meter. Areas that are however to the west of the city had high values of even up to 286 micrograms per cubic meter in some cases. The city has other major pollution problems associated with energy given the increasing poverty resulting in 50.95% [Ecoweb site www.ecoweb.co.zw/education-statistics.asp] of the population relying on paraffin for cooking [City of Harare, 2000, City Health Dept. Annual Report].

Calculation of the vector (Energy Sector Only):

Country's emissions in 1990 = 60090 tonnes of S = 120180 tonnes of SO₂
[Southern Centre, 1999, GHG Country Studies]

In 1998 = 61450 tonnes S = 121900 tonnes of SO₂

Country's population 1990 = 9.75 million In 1998 = 11.69 million

Country's emissions per capita in 1990 = 12.33 kilograms of SO₂ per capita.

Country's emissions per capita this year = 10.43 kilograms of SO₂ per capita.

1998 Vector = $(10.43 - 12.33) / 11.69 = -0.16$

Discussion:

Between the years 1990 and 1998, SO₂ emissions per capita from Zimbabwe have modestly decreased. Although the volume of traffic in the country has increased significantly in this period, the amount of coal, which is a major source of this gas, slightly decreased while the population increased significantly hence the decrease in country per capita emissions. While these figures are good national indicators, the geographical location and wind regimes that affect these areas to a large extent determine the severity of the impacts of the pollution. Studies have shown that in the SADC region Botswana, Zimbabwe and South Africa emit the largest volumes of sulphur. It was however shown that due to transboundary pollution other countries like Swaziland, Lesotho and Mozambique could be affected by the pollution from the three emitting countries [SADC ELMS, 1995, SO₂ emissions and transfrontier Air Pollution in Southern Africa].