

THE ZAMBEZI RIVER: ITS THREATS AND OPPORTUNITIES

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1. ABSTRACT

The Zambezi River is the fourth largest in Africa after the Congo, the Nile and the Niger. It is the largest river in Africa flowing into the Indian Ocean and its basin drains eight states namely; Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe. These eight Zambezi riparian states are members of the economic grouping called the Southern African Development Community (SADC). Major economic activities of the Basin, with a human population of about 38million (2000), include mining, tourism, hydropower production, fisheries, agriculture and manufacturing.

This paper gives a general overview of the Zambezi River Basin and discusses some of the major threats to, and opportunities for, the efficient and sustainable management and economic development of the water and other natural resources of the basin. Possible mitigatory measures necessary to deal with the threats are also given. Among some of the threats considered are; climate change, poverty, floods and droughts, water pollution, deforestation and HIV/AIDS whilst some of the opportunities discussed in the paper include; hydropower development, inter-basin water transfers, regional power inter-connectors and energy trading, tourism and wetlands utilisation and the provisions of various SADC Protocols, programmes and projects.

2. THE ZAMBEZI RIVER BASIN

The Zambezi River rises from the Kalene Hills in the North Western Province of Zambia, flowing south and then eastwards for some 2 650Km to the Indian Ocean. Its basin covers some 1359 000Km² with a mean annual runoff at its mouth of some 94 billion cubic metres per year. Figure 1 gives the location of the Zambezi River Basin whilst Table 1 gives the Basin's areal sharing between the riparian states and hydrometeorological details.

In the Basin, various economic and industrial activities are undertaken. Lakes Kariba and Cahora Bassa were created for hydropower generation on the mainstream Zambezi. The Copperbelt of Northern Zambia is well known for the production of copper and related minerals whilst Lake Malawi, which is a natural fresh water lake and lies within the Basin, offers various economic opportunities which include commercial fisheries.

One of the seven wonders of the world, the Victoria Falls, lies on the Zambezi whilst important wetlands like the Barotse wetlands of western Zambia, offer unique habitats for diverse ecosystems.

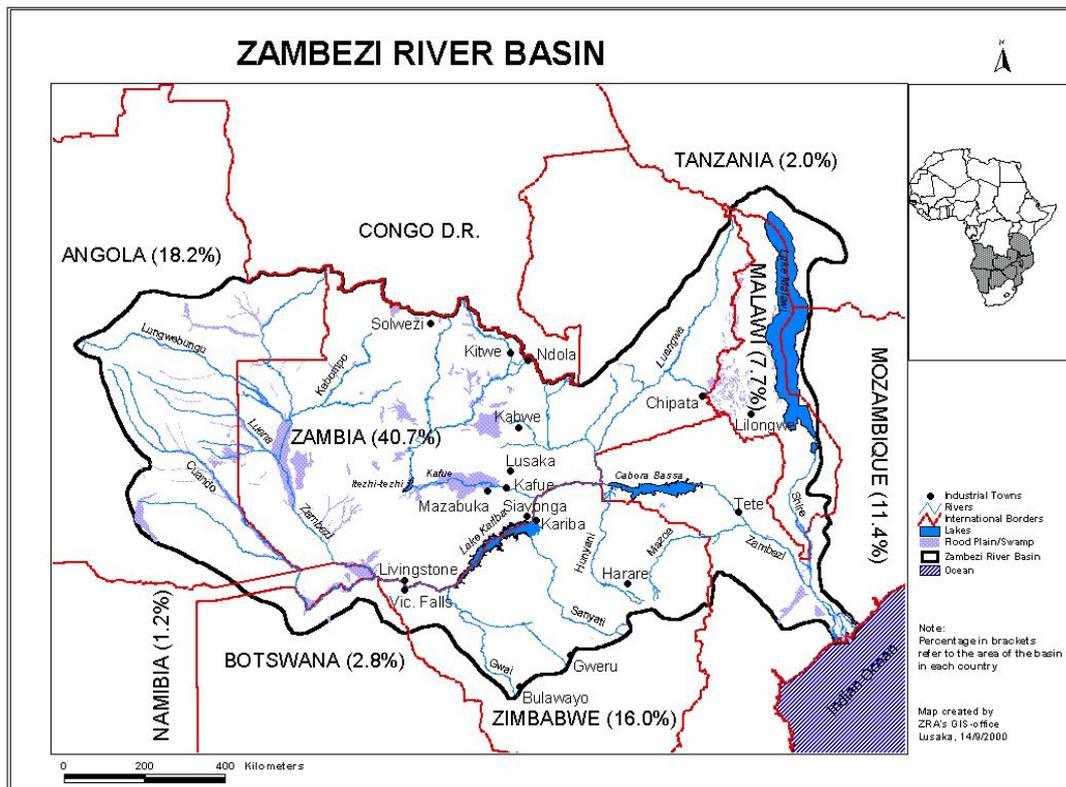
3. THREATS

Whilst the Zambezi River Basin is rich in water and other natural resources, there are various threats to the sustainable use of these resources. The major threats are climate change, poverty, floods and droughts, water pollution, deforestation and the HIV/AIDS pandemic.

3.1 Climate Change

Climate change is generally understood to be occurring due to global warming caused by continued emission of greenhouse gases into the atmosphere exacerbated by large scale deforestation .

Figure 1: The Zambezi River Basin



The greenhouse gases trap radiated heat from the earth's surface resulting in global warming whilst the destruction of large forests reduces the environment's ability to absorb and remove the greenhouse gases from the atmosphere.

Table 1: Area Details and Hydrometeorological details

Country	Surface area within Catchment (Km ²)	% of total Catchment Area	Mean Annual Rainfall(mm)	Mean Annual Potential Evaporation (mm)	Total Surface Runoff (mm)
Angola	247 484	18,2	800	1 950	104
Botswana	38 074	2,8	400	3 150	0,6
Malawi	104 705	7,7	1 000	1 900	60
Mozambique	155 017	11,4	1 100	1 550	275
Namibia	16 318	1,2	250	3 150	1,5
Tanzania	27 196	2,0	750	1 550	78
Zambia	553 438	40,7	800	2 250	133
Zimbabwe	217 568	16,0	700	2 300	34
Total	1 359 800	100	-	-	-

The World Wide Fund for Nature (WWF) has observed that "global warming is already affecting much of Southern Africa. Records from the countries that make up SADC reveal that temperatures have risen by over 0,5°C over the past 100 years, with the last decade being the warmest and driest. Over the past 20 years, there has been noticeably less rainfall and drought has become an increasing serious threat. These disturbing changes are happening despite the fact that Africa has contributed little to the build-up of greenhouse gases in the atmosphere" (www.panda.org)

Table 2: Rainfall pattern of Southern Africa (1800 – 2000) (Source: Chenje, 2000)

PERIOD	EVENT
1800-30	Southern African rivers, swamps and other water sources dried up. Some well-watered plains turned to semi-arid karoo.
1820-30	This was a decade of severe drought throughout Africa.
1844-49	Southern Africa experienced five consecutive drought years.
1870-90	This period was humid in some areas and former Lake Ngami filled in the northwest of Botswana
1875-10	There was a marked decrease in rainfall over Southern Africa but 1910 experienced a severe drought.
1921-30	This was a period of severe droughts in the Southern African region.
1930-50	Southern Africa experienced dry periods alternating with wet ones, and in some years the rains were very good. The 1946-47 season experienced a severe drought.
1950s	There was abnormally high rainfall in some parts of the region. However, the equatorial region experienced below normal rainfall.
1967-73	This six-year period was dry across the Southern African region.
1974-80	This period of six years was relatively moist over much of Southern Africa. In 1974 the mean annual rainfall was 100 percent above normal throughout the region.
1981-82	Most of Southern Africa experienced drought.
1982	Most of sub-tropical Africa experienced drought.
1983	This was a particularly bad drought year for the entire African continent.
1985-82	Conditions improved.
1986-87	Drought conditions returned.
1991-92	Southern Africa, excluding Namibia, experienced severe drought.
1992-93	Conditions slightly improved, but the previous year's drought effects continued.
1993-94	Conditions improved.
1994-95	Many SADC countries hit by worst drought in memory, surpassing the effects of the 1991-1992 drought in some parts of the region.
1995-96	Widespread rains in most parts of the SADC region, prompting forecasts of a bumper agricultural yield.
1996-97	Normal rainfall for most of the region
1997-98	Normal rainfall throughout the region including the northeast although impacts of <i>El Nino</i> were significant.
1998-99	Near normal rain in most of the region except in the northeast, namely Tanzania, where below normal rainfall was experienced.
1999-00	Most of the SADC countries received normal to near normal rainfall except Tanzania which experienced dry conditions. Widespread floods devastate several countries in Southern Africa with Mozambique the most affected due to cyclone Eline.

Threats due to climate change arise from the resultant high variability of rainfall and runoff in both quantity and time and other weather patterns, affecting negatively agricultural crop and livestock production as well as wildlife populations. The ecosystems of the wetlands will be negatively affected due to the high variability of runoff into and out of the wetlands as well as groundwater recharge rates and patterns. A continued decrease in rainfall would reduce the areas that can support plantation and growth of woodlands resulting in desertification.

Table 2 demonstrates the cyclic nature and trends of rainfall in Southern Africa for the past 200 years. There are both periods of high and low rainfall. Of these 200 years of rainfall record, 60 years were drought years representing 30% of the period. It is expected that the years of drought will increase due to global warming.

Table 2 further demonstrates the higher variability of high and low rainfall from the 1980s to the late 1990s as compared to earlier years.

Mitigating climate change is a global effort as the greenhouse emissions of the Americas affect Africa, whilst the harvesting at a large scale of woodlands in the Amazon will affect Asia. The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) was adopted in 1997 in Kyoto, Japan. Countries committed to the Protocol agree to the reduction of their greenhouse gas emissions by at least 5% below their 1990 levels during the period 2008 to 2012. In the Zambezi River Basin, this reduction can be effected through;

- use of alternative energy sources other than fossil fuels. This includes wind, solar, geothermics amongst other possible alternatives.
- use of efficiency technologies in reducing both fossil fuel consumption and exhaust levels
- fully utilising the Clean Development Mechanism (defined in Article 12 of the Kyoto Protocol) which intends to assist developing countries achieve sustainable development through investments in new projects that reduce greenhouse gas emissions
- Institutional framework to monitor, research and advise the riparian countries on best practices and critical management zones. Within the SADC, of which the Zambezi River lies, various organisations and mechanisms have now been put in place which include; the Southern African Centre for Co-operation in Agricultural Research (SACCAR), the SADC Press Trust for disseminating information and the Regional Drought Monitoring Centre based in Harare.

3.2 Poverty

Poverty is a relative word with several definitions.

In the context of the Zambezi River Basin, poverty relates to lack of resources of production that enable or empower the populace to afford a decent standard of living. This lack of resources also includes access to information, health facilities, education and other services generally resulting in the affected population being diseased, illiterate and dependent.

The main causes of poverty in the Zambezi River Basin are;

- poor economic government policies
- poor governance
- corruption
- inadequate access to land and capital
- poor prioritisation of use of available resources by governments
- natural disasters (droughts, floods)

Poverty is a threat to the sustainable integrated water resources management of the Zambezi River because of the following, amongst other reasons;

- the persistence of poverty and deprivation is pervasive and results in high birth rates, prostitution and corruption. High birth rates increase demands on food production, employment, health services etc which are already inadequate creating a vicious circle. Prostitution and HIV/AIDS are synonymous whilst politicians easily bribe the poor for their votes and abuse their human rights through their ignorance. The World needs better societies.
- on average 70% of the population of the Zambezi Basin is rural and poor. The rural economy of the basin countries is principally subsistence agriculture. With limited agricultural inputs, equipment and land, poor agricultural practices are prevalent resulting in land degradation. This land degradation accelerates soil erosion leading to siltation and pollution of water sources.
- the poor have no access to alternative energy sources and rely entirely on firewood and charcoal. Large forests are daily being destroyed to meet this demand which not only produces greenhouse gases but also leads to deforestation and land degradation.

Poverty can be mitigated if each Zambezi riparian state is committed to its reduction. There are various "poverty eradication" programmes and projects being undertaken in the Zambezi Basin states by primarily Non-Governmental Organisations (NGOs). Some riparian states are receiving donations to assist in poverty reduction programmes and projects but such will not succeed unless the governments are fully committed, prioritise available resources properly and are fully accountable and transparent in their governance.

Specific mitigatory measures can be listed as;

- empowering the rural poor with production resources to secure food production in a sustainable manner whilst reducing land degradation

- provision of facilities such as clinics, schools, dams, roads etc to rural and other poverty stricken areas to improve their social and well-being
- liberalisation of the economies so as to attract foreign direct investment to build up the industrial sector whilst creating employment opportunities
- initiating in each riparian state and fostering efficient macro-economic and sectoral policies for sustained economic growth
- shift actual social services expenditures from urban to rural areas where the majority of the poor live

3.3 Floods and droughts

Hydrological and historical records of the Zambezi River show that floods and droughts have occurred in the past centuries and are cyclic in most cases.

Floods and droughts are a serious threat to the sustainable management and development of the Zambezi River Basin for the following reasons;

- floods destroy crops, infrastructure, wildlife habitats and in some cases, claim human lives. The El Nino effects of 1982/83 resulted in floods that left over 2000 people world wide dead and infrastructural damage worth 13billion dollars (Suplee, 1999). The Cyclone Eline induced floods of February 2002 in the Zambezi Basin left 700 people dead, over 500000 people homeless and over US\$1billion of infrastructural damage (Wamukonya et al, 2001)
- droughts are as devastating as floods. They reduce food production, negatively affect wildlife populations and wetlands ecosystems. In the Zambezi River Basin, the worst drought in living memory was that experienced in 1994/95. The world had to come to the assistance of the region to feed the population. A large livestock and wildlife population was lost due to lack of adequate water resources and grazing pasture and it has taken some years to restore the population levels.

Floods and droughts will always occur in future. The best the Basin can do is to be prepared for these events by putting in place mitigatory measures prior to, during and after such events. Some mitigatory measures are;

- global warming triggers El Nino/La Nina events. El Nino conditions occur when sea surface temperatures change by at least 0,5⁰C above normal whilst La Nina events occur when sea surface temperatures change by at least 0,5⁰C below normal. El Nino conditions bring less rainfall to Southern Africa whilst La Nina conditions bring more rainfall. It is thus important that measures to reduce global warming be put in place and practiced so as to reduce the El Nino/La Nina events and thus reduce the rainfall variability
- destruction of large areas of biomass not only reduces the environment's capacity to absorb greenhouse gases, but also changes the rainfall/runoff patterns. In the Zambezi River Basin, research is required to establish the direct linkages between these parameters.
- alternative energy sources should be made available to reduce deforestation which changes runoff patterns
- the dams and reservoirs in the Zambezi River Basin, if not operated conjunctively and purposefully, can easily contribute to flooding. They can also create water shortages if adequate downstream flow releases are not made.
- basin-wide drought and flood early warning systems and disaster management and mitigation plans are required for the Zambezi River
- there is need to better understand the causes of floods and droughts so as to be better prepared. This can be achieved through supporting monitoring and research programmes, increasing the density and distribution of weather/climate monitoring stations and analysing the data collected and disseminating the findings
- forecasting models are available which can be used to predict drought or flood events. These can be statistical like the "differential mass curve technique" or the Global Climate Change Models (GCCM).

- practicing integrated water resources management (IWRM) within the Basin will assist in better river catchment planning and resources utilisation

3.4 Water Pollution

Pollution of surface and groundwater resources and the atmosphere have become major environmental problems for the Zambezi River Basin. The increase in pollution discharges is largely attributed to urbanisation, increased industrial and agricultural activities, mining and soil erosion. The urban centres produce sewage effluent, industries emit greenhouse gases and other industrial wastes, the agricultural sector uses fertilisers and other pesticides which all contribute to the pollution of the surface and groundwater resources. In the Zambezi River Basin, gold panning is prevalent resulting in soil erosion and water resources pollution. Mine wastes, if not disposed and managed properly, result in heavy metal water pollution.

Water pollution is a threat to the water resources of the Zambezi River for the following reasons;

- it negatively affects aquatic life and ecosystems in general by degrading the water quality
- it worsens eutrophication of lakes and reservoirs. Eutrophication increases the growth of evasive aquatic weeds like water hyacinth which impact negatively on the utilisation of the water body. The Zambezi River Authority had to implement a water hyacinth monitoring and control programme for the Lake Kariba as the water hyacinth was now affecting power generation and lake transport
- it impairs reproduction and fish growth
- acid rain, which results from air pollution, leaches soil nutrients whilst increasing solubility of other soil minerals resulting in poor soil fertility and lower crop yields
- it increases costs of purification of water supplies for domestic, industrial or agricultural use

Mitigatory measures to curtail water pollution in the Zambezi River Basin include;

- putting in place where not in existence, legislation and regulations relevant to pollution and waste management
- enforcement of existing water pollution regulations
- adequate resources to empower institutions to monitor, research and disseminate water pollution and waste management information to enable better decision making and regulation enforcement
- harmonisation of the legislation and regulations of the riparian states to enable common agreed water quality and effluent standards to be adopted and applied to the whole River Basin
- recycling of waste
- disincentives to pollute using principles such as "polluter pays"

3.5 Deforestation

The increasing population growth and poverty levels in the Basin are increasing the demand for firewood used for cooking, lighting and heating purposes resulting in deforestation. Deforestation is rampant in most rural areas where clearing of forest areas is done for subsistence farming. Increased demand for timber for building and furniture purposes has also exacerbated the situation. It is noted for example that between 1972 and 1990, Malawi's total forest cover declined by 41% representing an average loss of forest area of 2,3% per year (Chenje,2000)

Deforestation is a threat to the sustainable utilisation of the natural resources of the Zambezi River for the following, amongst other reasons;

- deforestation leads to land degradation
- sedimentation and siltation of water bodies results from the degraded land induced by deforestation

- the resultant reduction in the Basin's capacity to curb climate change since forests absorb greenhouse gases particularly carbon dioxide

Mitigatory measures that may be put in place could include;

- reforestation programmes
- land reclamation programmes in badly eroded areas
- reviewing, updating and enforcing forestry policy and legislation within the Basin countries
- provision of alternative energy sources to the rural populations depended on firewood

3.6 HIV/AIDS Pandemic

Southern Africa is one of the worst HIV/AIDS hit regions of the World. Over 60million people have been infected with more than 25million deaths since the first cases of HIV/AIDS were reported in the early 1980s. HIV/AIDS, which has been described by SADC (1999) as "one of the greatest social problems facing Africa", will continue to reduce the life expectancy levels of the Zambezi River Basin's population.

HIV/AIDS is a threat in the Zambezi River Basin for the following reasons;

- it has placed heavy demands on an already overstretched health sector service making a bad situation worse
- HIV/AIDS is killing the basin's most productive human resource aged between 18 and 45 years thus reducing the human capacity whilst wasting training and skills development resources
- HIV/AIDS poses a threat to development and economic growth. Recent studies show the negative impacts on both workers and employers resultant from HIV/AIDS (Brookings Institution, 2001)
- many families have been left orphaned by the loss of one or both of the family's breadwinners, plunging those remaining into poverty

In trying to deal with the HIV/AIDS pandemic, a regional approach over and above that of national level in each of the riparian states has been taken through the formation of the regional organisation, Southern Africa AIDS. This regional organisation amongst other issues, disseminates AIDS information. UNAIDS and the International Labour Organisation (ILO) are also involved in HIV/AIDS programmes within the Basin. Other mitigatory measures are;

- provision of cheaper and affordable HIV/AIDS drugs
- increased awareness of the causes, effects and management of HIV/AIDS to help reduce infection rates
- sexual behavioural change particularly within the 18 to 45 year age group

4. OPPORTUNITIES

The Zambezi River Basin is endowed with vast natural resources. Amongst these that provide opportunities for sustainable growth and investment for the riparian countries and the Basin as a whole are; hydropower development, inter-basin water transfer schemes, regional power inter-connectors and energy trading, tourism and wetlands utilisation and the provisions of various SADC Protocols, programmes and projects.

4.1 Hydropower Development

By far the most realisable economic natural resource on the Zambezi River is its hydropower potential. Since the turn of the century, various feasibility studies and investigations have been carried out on potential hydropower sites. These include those on the mainstream Zambezi River and also its tributaries. The estimated hydropower potential of the Zambezi River and its tributaries is some 20 000 MW of which about 5000MW has been developed (Denconsult, 1998).

Table 3: Possible New Hydro Plants (Source: Denconsult [1998])

Sub-basin	Power Plant	River	Plant Type	Installed capacity (MW)	Av. Annual generation (GWh)	Turbine discharge (m ³ /s) ¹⁾	Com. Year
1-02 Tete	Cahora Bassa II	Zambezi	Storage	1,200	6,800		2005
	Mepanda Uncua	Zambezi	RoR ³⁾	2,000	10,524	3,732	
	Boroma	Zambezi	RoR	444	3,240	3,050	
	Luapata	Zambezi	RoR	654	4,960	3,025	
	Ancuaze-Sinjal I	Zambezi	RoR	300	2,230	2,520	
	Ancuaze-Sinjal II	Zambezi	RoR	600	4,460	2,510	
	Chemba	Zambezi	Storage	1,040	8,740	2,740	
	5.8	Revubue	Storage	36	155	60	
	5.9	Revubue	RoR	110	310	80	
	5.13	Revubue	Storage	85	380	100	
7.6	Luia	Storage	267	600	350		
7.11	Capoche	Storage	60	250	80		
1-03 Shire River/ Lake Malawi	Kapichira II	Shire	RoR	64 ²⁾		135	2002
	Kholombidzo	Shire	RoR				
	Nachimbeya	Shire	RoR				
	Mpatamanga	Shire	RoR				
	Lower Fufu	S Rukuru/ N Rumphu	RoR	90	570	30	
	Songwe	Songwe	Storage	150	930	200	
	Masigira	Ruhuhu	RoR	118	630	57	
Rumakali	Rumakali	Storage	222	1,320	19		
2010							
1-04 Mupata	Mupata Gorge	Zambezi	Storage	640			
1-05 Lungwa River	Lusiwasi Ext.	Lusiwasi	Storage	40	49	7	
1-06 Kariba	Victoria Falls Ext	Zambezi	RoR	390			372
	Vic Falls (Zim)	Zambezi	RoR	300			
	Kariba North Ext	Zambezi	Storage	300			
	Kariba South Ext	Zambezi	Storage	300			
	Katombora	Zambezi	Storage	300 ²⁾			
	Batoka Gorge	Zambezi	Storage	1,600	4,700	555	
	Devil's Gorge	Zambezi	Storage	1,600			
1-07 Kafue River	Kafue Gorge	Kafue	RoR	600	3,000	353	
	Lower Itezhi-Tezhi	Kafue	Storage	80			
1-12 Upper Zambezi	1	Lumbage		1	11		
	2	Zambezi		4	32		
	3	Zambezi		2	19		
	4	Luvua		1	10		
	5	Luizavo		11	100		
	6	Ludeu		3	26		
	7	Lunache		1	5		
	8	Lufuige		2	16		
	9	Macondo		3	25		
Total				13,318			

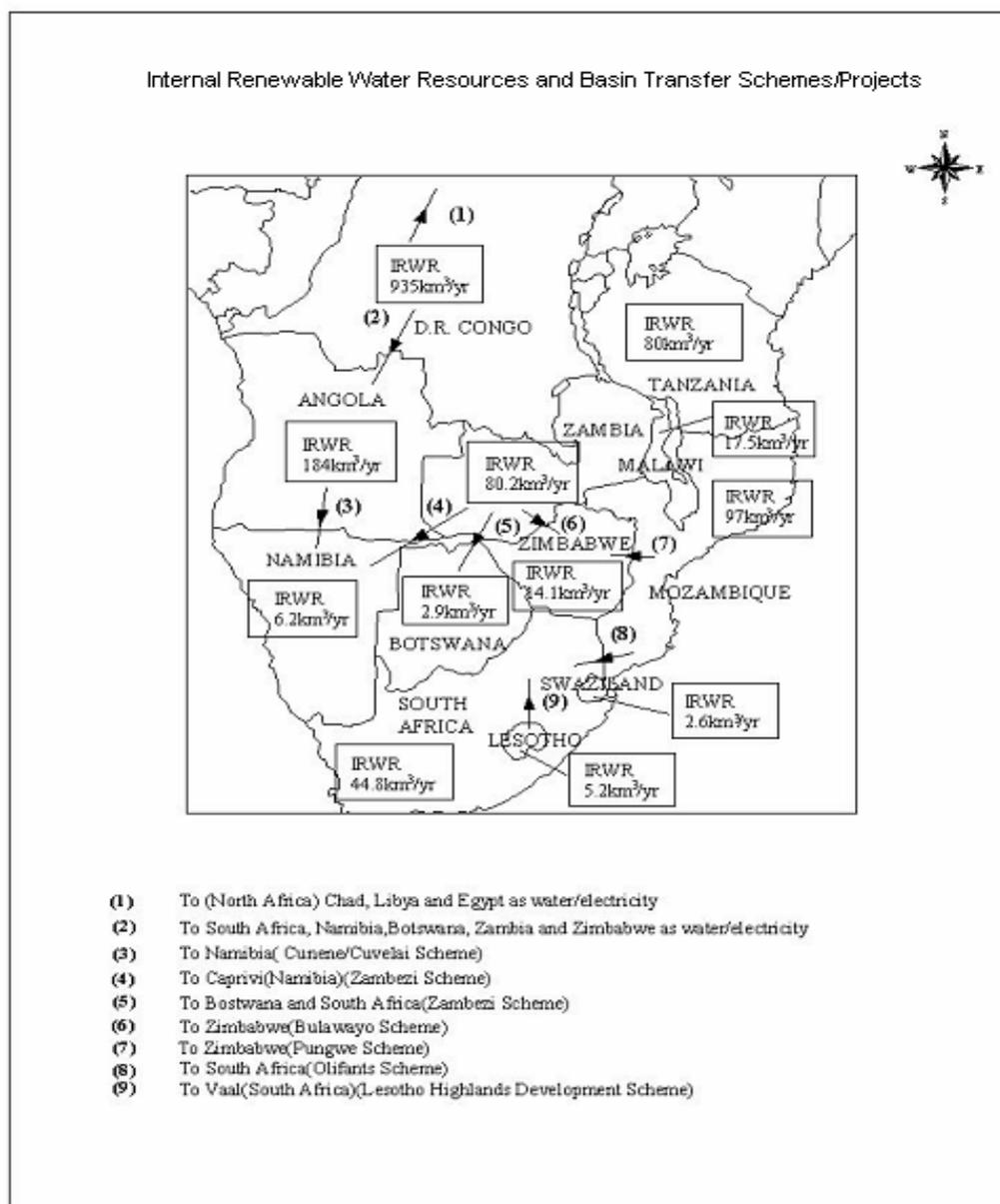
¹⁾ Discharge at rated turbine head

²⁾ Not included in total

³⁾ RoR = Run of River

The untapped hydropower potential offers opportunities for investment in a renewable clean energy source. Table 3 gives the possible new hydropower stations on the Zambezi River and its tributaries.

Figure 2: Interbasin Water Transfers



4.2 Inter-basin Water Transfers

Figure 2 and Table 4 give some details on some existing and proposed inter-basin water transfer schemes within the SADC region.

Due to continued population and economic growth within the region, the demand for water will continue to grow and the need to transfer water from areas of abundance to shortage areas will arise necessitating the implementation of the proposed schemes. Some of these schemes provide investment opportunities for economic growth for the Zambezi River Basin.

Those that have been implemented like the Lesotho Highlands Water Transfer Scheme have benefited both contracting countries. Such schemes bring closer ties and co-operation between the various countries.

Table 4: Existing and Proposed Inter-basin Water Transfers

Source		Transfer to		Existing (E) Proposed (P)	Purpose of Scheme
River	Country	River/Area	Country		
Cunene	Angola/Namibia	Cuvelai	Namibia	E	Primary
Pungwe	Zimbabwe/Mozambique	Odzi/Mutare	Zimbabwe	E	Primary/Industrial
Sengu/Orange	Lesotho	Vaal	South Africa	E	Primary/Mining/ Industrial
Orange	South Africa	Port Elizabeth/ East London	South Africa	E	Primary/Mining/ Industrial
Okavango	Angola/Namibia	Central Namibia	Namibia	E	Primary/Irrigation Primary/ Environmental
Zambezi/Chobe	Angola/Zambia/Namibia/ Zimbabwe/Botswana	Selibe- Pikwe/ Gaborone	Botswana	P	
Zambezi	Angola/Zambia/Namibia/ Zimbabwe/Botswana	Vaal/Pretoria	South Africa	P	Mining/Industrial
Zambezi	Angola/Zambia/Namibia/ Zimbabwe/Botswana	Caprivi Strip	Namibia	P	Irrigation
Zambezi	Zambia/Zimbabwe	Gwayi/Bulawayo	Zimbabwe	P	Primary/Irrigation Industrial
Incomati	Mozambique/South Africa/ Swaziland	Olifants	South Africa	P	Primary
Congo	Congo DR	Okavango	Namibia	P	Primary/Industrial
Congo	Congo DR	Zambezi	Namibia/Bot swana/ S.Africa/Zim babwe	P	Primary/Industrial/ Irrigation/Mining

4.3 Regional Power Inter-Connectors and Energy Trading

The eight Zambezi River Basin states are fully inter-connected and have started energy trading through the Southern African Power Pool (SAPP). This has brought about the following benefits to the Basin population and riparian states power utilities;

- improved reliability of electricity supplies through sharing of reserves and balancing of outages
- application of common operational standards
- flexible energy trading amongst the utilities
- transmission access at reasonable wheeling charges

Further, the regional power inter-connections and SAPP offer the opportunities for co-operation and co-ordination between the basin states for the installation and operation of new generation and transmission facilities.

Opportunities for further interconnections abound.

4.4 Tourism and Wetlands Utilisation

The Zambezi River Basin boasts of the Barotse Wetlands, the Victoria Falls, the banji jumping at the Victoria Falls bridge, the white-water rafting in the rapids of the waters of the gorges downstream of the Victoria Falls, the numerous National Parks which abound with diverse wildlife and fauna, Lake Kariba and its tiger fishing, Lake Cahorra Bassa and its kapenta fishing rigs, Lake Malawi/Nyasa and the Zambezi River delta itself, which all provide intriguing and memorable tourist destinations.

Whilst tourism volumes to the basin states has reduced since the September 11 air disasters in the USA, the tourism industry still provides employment and investment opportunities with new hotels and lodges being built.

The Regional Tourism Organisation of Southern Africa (RETOSA), located in Johannesburg, was created so as to co-ordinate and develop the region's tourism potential whilst acting as an information one-stop-shop for both member states and the tourists.

Namibia, Botswana, Zambia and Zimbabwe are also jointly marketing their touristic natural resources and wildlife packages for the Victoria Falls/Chobe/Okavango region which become very attractive and economical for tourists whilst the four countries have a share of the tourism market.

4.5 Provisions of the SADC Protocols, Programmes and Projects

The SADC has proposed various Protocols which obligate/bind member countries to the provisions. Nine such Protocols have since been signed and are at various stages of ratification or implementation in the Region. These Protocols are:

- Shared Watercourses
- Energy
- Combating illicit Drug Trafficking
- Transport, Communications and Meteorology
- Trade
- Education and Training
- Mining
- Immunities and Privileges
- Electoral Process

The SADC Heads of State/Government have also signed a Declaration on Gender and Development which among other things calls for equal representation of men and women in decision making structures of SADC and achievement of at least 30% of women representation in political and decision making structures of member countries by year 2005. Most countries are on target in achieving the objective of the Declaration.

The Protocols provide opportunities for member states to co-operate and have a common regional vision for economic and developmental growth.

The Protocol on Shared Watercourses has given the legal framework from which the shared river basin institutions within SADC can be formed and managed. On July 13th 2004, the Agreement on the establishment of the Zambezi Watercourse Commission (ZAMCOM), was signed by seven of the eight riparian states and the creation of the institutional structures for implementation of the Agreement's provisions will follow in due course. The purpose of ZAMCOM is to facilitate the management of the Zambezi River on a basin-wide basis, whilst implementing IWRM principles and policies for the sustainable development and utilisation of the water and other natural resources of the Zambezi River.

There are also opportunities for co-operation between the Zambezi River Basin states provided through the Zambezi River Basin Project, ZACPLAN, as listed in Appendix 1. So far five of these projects have been undertaken with varied degrees of success with the sixth project, ZACPRO 6 currently being undertaken in Lusaka by the Zambezi River Authority on behalf of the SADC Water Division and the eight riparian basin states.

There is also the SADC Regional Strategic Action Plan. The droughts of the 1980s and 1990s and the floods of the early 2000 within the Region, have had wide-ranging negative impacts. These negative impacts ranging from social, environmental to economic losses, have led the SADC to formulate a Regional water resources development and management strategic plan. The RSAP tries to address issues of Regional concern whilst complementing and reinforcing existing and ongoing initiatives at the national levels. The RSAP Projects are listed in Appendix 2.

5 CONCLUSION

The Zambezi River Basin is the fourth largest in Africa and the largest in the SADC region. It is home to some 38 million (2000) people and is endowed with vast natural resources.

The Basin has its threats and opportunities. The threats have to be identified and mitigated whilst the opportunities have to be sustainably exploited for the benefit of the Basin's population.

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Appendix 1: ZACPLAN PROGRAMME PROJECTS

CATEGORY I PROJECTS	CATEGORY II PROJECTS
<p>ZACPRO 1 Inventory of completed, ongoing and Planned projects. Environmental Evaluation of major projects. Initiation of basin-wide exchange of Information</p>	<p>ZACPRO 9 Harmonise methodologies for water resources management and apply on selected projects</p>
<p>ZACPRO 2 Development of regional Legislation for the Zambezi River Basin</p>	<p>ZACPRO 10 Develop and strengthen national capabilities for carrying out environmental impact assessments</p>
<p>ZACPRO 3/4 Development of human resources Administrative and institutional Structures and technical capabilities</p>	<p>ZACPRO 11 Promote increased technical and financial support for environmentally sound management practices</p>
<p>ZACPRO 5 Development of a basin-wide unified Monitoring system related to water Quality</p>	<p>ZACPRO 12 Assess major energy sources and potential use, energy conservation measures, the feasibility of linking major hydropower plants, environmental impact studies for energy schemes and improved fuel wood utilisation</p>
<p>ZACPRO 6 Development of an integrated water Management plan for the Zambezi River Basin</p>	<p>ZACPRO 13 Adopt basin-wide environmentally sound watershed management guidelines</p>
<p>ZACPRO 7 Environmental education and public Participation in ZACPLAN</p>	<p>ZACPRO 14 Prevent and control water related and water-borne diseases</p>
<p>ZACPRO 8 Establish minimum water quality Standards for water supply and Waste water disposal within the Zambezi River Basin</p>	<p>ZACPRO 15 Limnological studies of major basin lakes</p>
	<p>ZACPRO 16 Develop and apply ecologically sound vector control programmes, particularly against tsetsefly and mosquitoes</p>
	<p>ZACPRO 17 Study impacts of inter-basin water transfers on the Zambezi River system</p>
	<p>ZACPRO 18 Establish and implement living resource conservation programmes</p>
	<p>ZACPRO 19 Research on aquatic plants and prevention of the spread of harmful flora</p>

Appendix 2: SADC REGIONAL STRATEGIC ACTION PLAN PROJECTS

- Project 1: Guidelines for Review and formulation of National Water Legislation**
- Project 2: Regional Guidelines for Dam Safety Legislation and Procedures**
- Project 3: Capacity Building for Joint Integrated River Basin Management**
- Project 4: Consultative fora on Water Issues**
- Project 5: Development of a Programme on Water Supply and Sanitation for the SADC Region**
- Project 6: Groundwater Management Programme for SADC Region**
- Project 7: Water Sector Coordinating Unit Capacity Building**
- Project 8: Support in the Implementation of the SADC Protocol on Shared Watercourse Systems**
- Project 9: Guidelines for National Water Policy Formulation Review in Member States**
- Project 10: Support for the Development of the National Water Sector Policies/Strategies in the Selected Member States**
- Project 11: Formulation of Regional Water Sector Policy and Strategy**
- Project 12: Economic Accounting of Water Use**
- Project 13: Study for Expanding Private Sector Participation in Water and Sanitation Services**
- Project 14: Assessment of Surface Water Resources**
- Project 15: Expansion of SADC-HYCOS**
- Project 16: Regional Project to Control Infestation and Translocation of Aquatic Weeds**
- Project 17: Training in Surveying, Mapping and Geographic Information Systems**
- Project 18: Upgrade and Modernize Water Resources Monitoring system for Lake Malawi/Nyasa**
- Project 19: Rehabilitation of Joint Monitoring Systems between Angola and Namibia**
- Project 20: Awareness Building for Decision Makers**
- Project 21: Involving the Media in water Issues**
- Project 22: Human Resources Development Programme**
- Project 23: WaterNet**
- Project 24: Promotion of Stakeholder Participation in Water Resources Management**
- Project 25: Feasibility Study for Creating a Fund to Support NGO and CBO Participation in Water Resources Management Issues**
- Project 26: Programme on Means to Empower Women in Water Issues**
- Project 27: Control and Development of Lake Malawi/Nyasa and Shire Rivers**
- Project 28: Study of Navigability of the Zambezi and Shire Rivers**
- Project 29: Stabilization of the Course of the Songwe River**
- Project 30: Pre-feasibility Study of Future Development and Management Options in the Lower Orange River**
- Project 31: Integrated Basin Management Plan for the Okavango River**