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Zambia Environmental and Climate Change Policy Brief¹

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Executive Summary

This Environmental and Climate Change Policy Brief has been written as an input to the Poverty and Development Assessment that Sida is undertaking as part of the preparation of a revised Swedish cooperation strategy with Zambia. It aims at briefly presenting key environmental sustainability challenges and opportunities (including climate change and disaster risk reduction) in Zambia, their linkages to poverty reduction and economic development and how they are addressed in the Zambian Sixth National Development Plan (SNDP). Opportunities for Sida and other development partners to supporting improved environmental management are also briefly discussed.

Due mainly to rampant *deforestation* Zambia is unlikely to achieve the Millennium Goal 7 on environmental sustainability. The deforestation rate is well above the global and regional average and is closely linked to other key environmental problems such as *land degradation, wildlife depletion and loss of biodiversity and ecosystem services*. These problems constrain poor households' income opportunities through lowering agricultural productivity and access to different non-timber forest products. *Water- and air-pollution* (indoor and outdoor) as well as the *low access to clean water and sanitation* have serious negative health implications for poor households in general and for children in particular. Environmental health factors play a very significant role for the low life expectancy and high child mortality and morbidity in Zambia. Poor households also have the least capacity to cope with food insecurity or economic shocks following natural disasters, which are likely to become more frequent with climate change.

Environmental degradation poses significant constraints to key growth sectors such as agriculture and tourism. Climate variability is estimated to reduce agricultural growth by 1% per year. Revenues from mining of finite natural resources have not been translated into human development, as indicated by the negative adjusted net savings in Zambia (a World Bank sustainability indicator). Loss of eco-system services and environmental degradation is largely unaccounted for in national accounts and statistics, which imply that real economic growth most likely is significantly lower than what the GDP growth rate indicates.

The continued environmental degradation strongly indicates that the Zambian state largely fails to sustainably manage its environment and natural resources. The new National Policy on the Environment is supposed to address the scattered policy and legal framework for environment and natural resources management, but if it is not backed by a strong political commitment and

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financial resources there is a clear risk that it will not be translated into practical action. The Ministry of Tourism, Environment and Natural Resources (MTENR) is in practice too weak to fulfil its mandate to coordinate environment and natural resources management. The lack of enforcement of national environmental legislation is a key problem. Several policy areas of key importance for environment and natural resources management are outside the confines of the MTENR, which underlines the importance of improved inter-sectoral collaboration and mainstreaming of environment and climate change in Zambia's core systems for planning and financial management.

The Environment and Natural Resources Management and Mainstreaming Programme (ENRMMP) is an important initiative aiming at both strengthening the MTENR and support environmental mainstreaming. However, there may be a risk that the division of roles and responsibilities in accordance with JASZ reduces environmental issues to a concern only for development partners working with MTENR. Development partners working with other sector ministries and Ministry of Finance and National Planning have a key role in promoting environmental mainstreaming and addressing environmental problems.

In this context the lack of integration of environmental concerns in the draft SNDP is a case for concern. Unlike the FNDP, the SNDP does not have an environment chapter, neither are there clear measurable targets and indicators relating to environmental concerns. Climate change related concerns are on the other hand generally well addressed in the draft SNDP, which may be a reflection of the great attention to climate change lately. Development partners could play an important role through a continued dialogue with the government on environmental integration in the SNDP. In such a dialogue it is important to point at the large opportunities to promote pro-poor growth through wiser and more pro-active management of Zambia's soils, waters, biodiversity and mineral resources.

These opportunities include addressing deforestation through compensating farmers for ecosystem services that standing forests provide (REDD+) and promoting sustainable biofuel production. In order for both REDD+ and biofuel initiatives to be pro-poor and environmentally sustainable, careful planning and participation of local stakeholders is necessary. Similarly, providing poor households with alternative energy sources (e.g. solar, gas) could contribute to both reducing deforestation and health problems due to indoor air-pollution. Linking agriculture, health and energy sector interventions could potentially bring a range of similar opportunities and carbon finance and technology transfer may help increase access to and affordability of energy.

Important opportunities for climate change adaptation which also can enhance food production and security include diversification of cropping, water-saving techniques, small-scale irrigation schemes and the further development of systems for seasonal forecasting.

Finally, there is a need to put the specific governance challenges related to environmental management into the broader perspective of weak governance in Zambia. While the current environmental degradation implies large costs to many poor stakeholders, there are also some stakeholders benefiting from the lack of implementation and enforcement of environmental policies. Environmental governance is embedded in a complex political economy which may hamper reform efforts. Accountability initiatives that improve and transparency and access to environmental information as well as strengthens actors, such as media, civil society and community based organizations, that can draw attention to environmental problems and demand environmental improvements can be very important in this situation.

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1. Introduction

Zambia is richly endowed with a number of valuable natural resources including minerals, forests, wildlife and fertile land, which have played a crucial role for economic and political developments. As many other natural resource rich countries, Zambia has failed to translate natural resource rents into a broad based development and poverty reduction. Instead, resource extraction has been characterized by boom and bust cycles, rent-seeking behaviour and rampant degradation of the country's environmental resources. As a consequence, Zambia remains one of the low-income countries in Africa with low levels of human development, and high levels of corruption. However, rich natural resource endowments do not need to be a "curse" for poor countries². With appropriate institutions and policies, natural resources can be a source of wealth, as shown by the recent review - "*Creating and Protecting Zambia's Wealth – Experiences and next steps in environmental mainstreaming*" - led by the Ministry of Finance and National Planning (MFNP) and the Environmental Council of Zambia (ECZ)³.

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The Swedish Government has identified environment and climate change as one of three thematic priorities for development cooperation. This is reinforced in the new Swedish policy on environment and climate change in development cooperation concluding that these aspects are a "central point of departure for all development cooperation"⁴. The Policy further requires that environmental impacts, effects of climate change and associated risks are assessed and integrated in analysis, planning, strategies, implementation and follow-up in Swedish development cooperation.

Despite the obvious importance of natural resources and ecosystem services for the *Zambian economy* there is surprisingly little official information available on the state of Zambia's environment and its contribution to the economy and to the health and livelihoods of different social groups. Data is often lacking or contradicting and should hence be regarded with sound scepticism when reading this policy brief. Reportedly, a *Zambia State of the Environment Report* will be published during 2010, but was not available for this study.

² Lederman & Maloney, 2007, *Natural Resources, Neither Curse nor Destiny*.

³ Aongola et al 2009.

⁴ Policy för miljö- och klimatfrågor inom svenskt utvecklingssamarbete 2010-2014. UD 2010-09-23

2. Key environmental challenges, and their causes

The Millennium Development Goals. The MDG Progress Report 2008 states that “Zambia needs to take bold measures if it is to meet MDG 7.”⁵ Progress has been made in access to safe water and modest improvements related to sanitation. Continuing rampant deforestation makes the target of *reversing the loss of environmental resources* utterly challenging to achieve⁶. The National Policy on the Environment identifies Zambia’s main environmental challenges, briefly stated in Box 1 and described in further detail in Appendix 1.

Box 1: Key environmental challenges in Zambia

Deforestation: Zambia’s forests are under tremendous pressure, and the deforestation rate is well above the global and regional average. Deforestation threatens biodiversity and undermines key ecosystem services such as climate and water regulation. Shortened flow of seasonal streams and the drying up of formerly permanent rivers have been observed

Wildlife depletion, loss of biodiversity and ecosystem services: Biodiversity and ecosystem services are fundamental for the livelihood of many Zambian citizens, and especially the poor depend on healthy ecosystems for *i.a.* food, regulation and purification of water, and building material. Wildlife depletion has been identified by the Zambian government as a priority environmental challenge.

Land degradation: Land degradation causes hydrological imbalance and increased risks for floods and droughts, undermines social economic development and continues to deepen the poverty crisis.

Air pollution: Indoor air pollution is the most widespread air-pollution challenge in Zambia, mainly from using biomass fuel (such as firewood and charcoal) for cooking. It is a serious health treat in Zambia (see Table 2), with disproportionate impacts on women and children. Outdoor air pollution is a problem in parts of Zambia, localised to major mining areas and urban centres, mainly felt around fertiliser and cement manufacturers, lime producers and petroleum production facilities.

Inadequate management of water resources, water pollution and sanitation: Zambia is endowed with enough water to meet the demands of a growing population. However, variable rainfall coupled with a lack of proper management, water infrastructure and a poor distribution of *surface water*, lead to local water shortages. Water quality is a major concern in some rivers, like the Kafue on the Copperbelt.

Natural disaster risk and climate change: Zambia is prone to extreme meteorological events such as droughts and floods, with major impacts on food security and public health. Climate change adds to existing environmental stress and is likely to negatively affect Zambia's natural resource base and exacerbate existing problems of land degradation, flood regulation and water purification, and droughts.

These environmental challenges are interlinked, mutually reinforcing, and impact on people’s livelihood opportunities (especially for poor women and men). Ecosystem goods and services are essential for everyone, but especially crucial for poor women and men whose livelihoods

⁵ Millennium Development Goal 7 “Ensuring environmental sustainability” is divided into the following three targets: (a) Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources. (b) Halve by 2015 the proportion of people without sustainable access to safe drinking. (c) Achieve by 2020 a significant improvement in the lives of at least 100 million slum dwellers.

⁶ GRZ 2008a.

and incomes are especially dependent on the natural commons. The driving forces behind the environmental challenges include illegal or unregulated harvesting of e.g. timber, fish and wildlife, expansion of economic activities such as agriculture and mining, inadequate agricultural practices, and lack of good governance and management (see Appendix 1).

3. What are the effects of the environmental challenges on poverty and economic development?

3.1 Impacts on Poverty in urban and rural areas

Poverty levels remain high in Zambia, and 68% of the population falls below the poverty line. The population of Zambia stood at 9.9 million in 2000, estimated at 13.3 million in 2010 and is projected to increase to 15.5 million by 2015, and double by 2030.⁷ The population growth is very high (over 3%, 2010 estimates) and puts additional pressure on Zambia's environment. Zambia is one of the most urbanised countries in Africa; over a third of the population lives in urban areas (a majority in Lusaka and the Copperbelt towns) and the annual urbanisation rate is 2.3%⁸. A recent review⁹ identifies three distinct groups of poor people who suffer 'environmental poverty' – poverty deriving directly and indirectly from environmental problems:

The urban poor suffer mainly from 'brown' environmental problems: lack of clean water and sanitation, indoor air pollution from dependence on solid fuels and outdated cooking equipment, unsafe and insecure land and housing, and solid waste problems. Water contamination problems are more acute in peri-urban than in rural areas. The high urbanisation rate pose challenges to authorities to meet the needs of the growing population. Almost 75% of the urban population were classified as slum-dwellers in 2001¹⁰, indicating that they lacked at least one of the following: access to safe water or improved sanitation facilities, sufficient living area of adequate quality, and tenure security.

Small-scale farmers, especially in remote areas suffer mainly from 'green' environmental problems: unproductive land on which to grow food, lack of access to markets and services to develop that land, dependence on unreliable rainfall, and increasingly climatic vulnerability. Agricultural growth to date has largely passed these farmers by. In the economic boom of the 1940s and 1950s, the mines and factories of the Copperbelt provided wages to pay for food grown commercially on a relatively small amount of land. A large decrease in such employment over the past two or three decades has forced more people back to the rural areas to carry out subsistence agriculture and fishing, which puts pressure on a greater area of wildlife habitat. When people have no employment and no alternatives to feed themselves, it is no good telling them that they should not use the resources around them. Hence, without sustainable income alternatives for small-scale farmers it will also be more difficult to protect biodiversity, which in the long term will negatively impact on the farmers themselves and other vulnerable groups.

Women, children, refugees and migrants within the above categories tend to be particularly vulnerable, mainly due to their lack of assets, rights and alternatives. These groups are heavily dependent on access to land and water and ecosystem services for food security and income.

⁷ GRZ, 2010c.

⁸ CIA World Factbook, Zambia

⁹ Aongola et al 2009

¹⁰ UNEP, 2008.

When activities such as mining pollute the water and contaminate the food, these people are directly affected, often with severe consequences as they lack alternatives.

Household income: A majority of the poor rely on natural resources for their livelihoods. 70% of Zambia's population are engaged in the agricultural sector. For households living adjacent to forests a large share of the household income is deriving from forest products (see Figure 1). Wood fuel (charcoal and firewood) is by far the most important source of household energy in Zambia, especially in rural and peri-urban areas. Charcoal production is also a reliable source of income for the rural population. An estimated 78,000 people are directly dependent on charcoal production; and there are indications that several hundred thousands of people are indirectly dependent on charcoal production. Wood fuel harvesting is associated with many negative impacts, such as deforestation, inefficient use (low energy conversion), and indoor air pollution causing respiratory diseases. A change of fuels would have environmental, health and efficiency benefits, although affordability is currently a problem for many poor households.¹¹

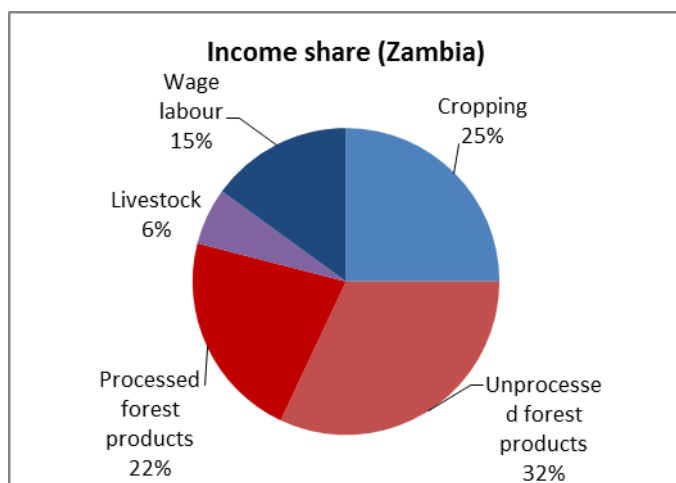


Figure 1: Income shares of forest adjacent rural households Source: CIFOR 2010)

While agriculture is the most important source of livelihood, Zambia has 15 million hectares of water in the form of rivers, lakes and swamps, which provide the basis for extensive freshwater fisheries. Fish provide an important source of food of high nutritional value, especially for vulnerable groups, and the fishery sector supports more than 300,000 people deriving their livelihood directly as fishers and fish farmers, or indirectly as traders, processors and other service providers. The overfishing of Zambian water resources will have a direct impact on their livelihood opportunities.

3.2 Impacts on Public Health

Zambia has low life expectancy, high levels of child mortality and high rates of malaria, cholera and other communicable diseases. Health coverage is low and the WHO estimate that 45% of the population received less than the minimum nutritional requirements from 2004-2006. HIV/AIDS prevalence is higher than the regional average. Environmental health factors play an important role in this dismal picture. WHO estimates that there are more than

¹¹ Zambia Household Energy Report, Draft 2010.

23,000 annual deaths in Zambia due to diarrhoea caused by polluted water/bad hygiene¹², indoor air pollution and outdoor air-pollution. See Table 1 below for comparison with neighbouring countries Kenya, Mozambique and Tanzania. The DALY¹³ for diarrhoea is considerably higher in Zambia and Mozambique than in Kenya and Tanzania, and especially serious for children under five. The DALY for indoor air pollution (caused primarily by use of wood fuel for cooking) is higher than in the comparison countries and mainly affect women and children. The DALY for outdoor air-pollution is considerably higher in Zambia than in the comparison countries, although not as important as indoor air pollution.

Country	Water, Sanitation & Hygiene		Indoor air pollution		Outdoor air pollution	
	Diarrhoea deaths/year	Diarrhoea DALYs/1000 capita per year	Deaths/year	DALYs/1000 capita per year	Deaths/year	DALYs/1000 capita per year
Kenya	21 800	23	13 000	12	600	0.2
Mozambique	26 900	47	9 700	16	900	0.6
Tanzania	28 200	26	27 500	24	1 000	0.4
Zambia	13 700	42	8 600	27	1 100	1.5

Table 1. Estimated deaths and DALY's attributed to selected environmental risk factors (Source: WHO, 2007)

Many Zambians suffer from low rates of *sanitation* and access to *clean water*. While 90% of Zambia's urban population has access to an improved water source and 41% has access to improved sanitation¹⁴, only 40% of rural people have access to safe water and a mere 13% to improved sanitation¹⁵. Meanwhile, with population growth, demands on available water are increasing and are difficult to meet reliably. Net water demand in Lusaka almost tripled between 1995 and 2005¹⁶. Wastewater treatment is inadequate and the few existing utilities are unable to finance operation, maintenance and investments. Sanitation in terms of solid waste management is also a great concern.

Malaria is another environmental-health related concern in Zambia, responsible for an estimated 4 million clinical cases and 50,000 deaths per year. Rural populations along inland waters also suffer from other water-related diseases such as Bilharzia and River blindness.

Climate change is likely to bring additional burdens both through direct effects such as more favourable conditions for transmission of communicable diseases, and also via indirect pathways such as effects on food security and nutrition. However, it has been repeatedly shown that with strong eradication efforts it is possible to greatly reduce the incidence of Malaria, despite climatic conditions. Funding for Malaria control has increased from \$5m in

¹² This figure only includes diarrhoeal diseases. Other water related diseases e.g. river blindness are not included. Hence, the total number of deaths related to hygiene, water and sanitation is higher.

¹³ The Disability Adjusted Life Year or DALY is a health gap measure that extends the concept of potential years of life lost due to premature death to include equivalent years of "healthy" life lost by virtue of being in states of poor health or disability.

¹⁴ Improved sanitation includes a flush toilet or a ventilated improved pit (VIP) latrine.

¹⁵ GRZ, 2008b. WHO, however, estimates that in urban areas 87% has access to improved water sources and 59% to improved sanitation, while in the rural areas 46% has access to improved water sources and 43% to improved sanitation. Differences are assessed to partly be due to the definition of 'improved' sanitation?

¹⁶ Aongola et al 2009

2002 to over \$17m in 2008 and there is some evidence that the scaling up of activities to control Malaria (for instance a large campaign in 2007) has had an effect, with decreases of 55% in the number of cases and 60% in the number of deaths in the first half of 2008 compared to the same period for 2000-2002. Remote rural areas are also plagued with trypanosome infection transmitted by tsetse flies. The tsetse flies are controlled through spraying of pesticides in infested areas, but the distribution of flies may change with changing climate.

A study in 2009 showed that an increase in temperature of 1°C above average before the start of the rainy season increases the number of people affected by cholera by 4.9%. In addition, any increase in flooding due to extreme rainfall events will also increase the risk of cholera transmission. This indicates that climate change will increase the risk of cholera epidemics; however as with malaria, targeted sanitation and public health initiatives could counteract this effect.¹⁷ The purpose here is to highlight that targeted public health measures can often have much larger effects on the burden of disease than changes due to environmental factors.

3.3 Impacts on Economic Development and Key Sectors

Zambia has had a positive economic growth trend during the 2000s (until the global financial crisis, which affected also Zambia). This growth has, however, not translated into any significant reduction of household income poverty, partly because economic growth has been driven by few, highly capital-intensive sectors that have not created income opportunities for a broad-based poverty reduction.¹⁸ Furthermore, Zambia’s economic development has not translated into substantial investments in human capital, and has led to depletion of natural resources and pollution. This is indicated by a negative Adjusted Net Saving (-0.7, in 2009).¹⁹

The SNDP outlines the following key growth areas: agriculture, tourism, manufacturing, mining, energy and human development particularly in health, education and skills development, and water and sanitation. Environmental and climate change related problems severely constrains growth in several of these sectors, but there are also large opportunities for economic growth through more proactive management of the environmental and natural resources base.

Impacts of climate change on economic growth.

A 2009 study estimated that from 1976-2007 climate variability reduced economic growth by 0.4%/year, with a total cost of \$13.8bn²⁰. The losses are greatest in the agricultural sector and reduce household food security both in rural areas directly through yield losses and in urban areas due to increases in the price of staple foods such as Maize. The study also estimated that for 2006-2016, average climate variability would keep an extra 300,000 people living below the national poverty line, whereas more severe climate

Box 2: Economic growth and environment:

An important challenge, if Zambia is to sustain high rates of growth, is to ensure that growth is environmentally compliant, especially since the mining industry makes a major contribution to growth. Investors in this sector may not have paid sufficient attention to environmental issues: One indication is the recent collapse of bridges as a result of the release of mining sediments into the riverbed. The tourism industry, another growth sector with significant employment potential, depends on well managed biodiversity. However, most of the 19 national parks and 34 game management areas are degraded. If tourism is to be sustained beyond the Victoria Falls area, and if the country’s natural assets are to continue to provide their valuable ecosystem services, the government faces a challenge to significantly improve policy and conduct investments in hydropower, World Bank ANS website.

Source: WB, CAS 2008-2011

¹⁷ Fernandez, M. et al (2009)

¹⁸ GRZ, 2008b.

¹⁹ Adjusted net saving (ANS) is a sustainability indicator building on the concept of green GDP and significantly improved policy and conduct investments in hydropower. World Bank ANS website.

²⁰ Thurlow et al. 2009

variability would keep an extra 650,000 people in poverty. An attempt to incorporate climate change into this analysis estimates that it could increase these numbers to 433,000 for the average scenario and 950,000 for the severe scenario.

The 2009 study estimates that a drought as severe as the one in 1994/5 would decrease GDP by 6.6% and increase the number of those in poverty by 7.5%. Although individual extreme events cannot be linked to climate change, the likelihood of severe events such as these will increase. The impacts of climate variability and climate change are felt hardest by poor rural groups reliant on subsistence agriculture and fisheries, and as such significantly damage Zambia's attempts at poverty reduction.

The recent report on the Economic Impacts of Climate Change in Zambia estimates that the real cost of climate change in degradation of natural resources over the next 10 years may be as high as \$5.5bn²¹. While acknowledging the difficulties involved in this assessment, it nevertheless strongly indicates that climate change is likely to incur considerable costs to the Zambian economy.

Agriculture accounts for 85% of employment and 19.7% of GDP in Zambia²², although this figure fluctuates with the rainfall patterns, as the irrigation potential is not fully exploited. According to SNDP, agriculture is the most important sector for achieving sustainable economic growth and reduction of poverty in Zambia due to the country's natural assets (land, water, fertile soils). Land degradation is posing a severe threat to agricultural productivity, and could if not managed, seriously impair the growth of the agricultural sector.

The agriculture sector is highly sensitive to climate variability in the form of droughts and floods. A recent study based on average losses from 1976-2007 estimated that climate variability from 2006-2016 would reduce agricultural growth by 1% each year, with an economic loss of \$2.2bn compared to a reference scenario with no extreme climatic events²³. The impacts of such variability, and of the decrease in growing season length observed, are greatest in the south of the country as the length of growing season in this region is already close to the threshold for certain varieties of Maize.²⁴ Climate variability already reduces Maize yields and household food security. This will be exacerbated if the trend for shorter growing seasons continues as expected²⁵, with negative effects on targets for agricultural growth and poverty reduction as outlined in the Sixth National Development Plan (SNDP). As indicated, high poverty levels are most prevalent in rural areas where the majority of households are dependent on agricultural activities. Investments particularly in agriculture infrastructure offer an effective means to make a significant impact to reduce poverty levels. These should embrace efforts to promote quality livestock and fisheries production and crop diversification while improving marketing systems and productivity in farming to ensure national food security and income from exports.

Mining: Mining (especially cobalt and copper) is an important economic sector in Zambia. However, after the privatisation of the copper mining industry in 1998, extensive tax reductions were introduced for mining concessions and the government lost valuable revenues: in 1992, budget revenues from copper mining taxes was \$200m, while in 2004 it

²¹ Aongola et al 2009

²² CIA Factbook 2010

²³ Thurlow *et al* 2009

²⁴ Tadross *et al* 2009

²⁵ Thurlow *et al.* 2009, Tadross *et al* 2009

was a mere \$8m.²⁶ In 2008, significant new legislation concerning the mining sector was implemented, for instance related to a considerable increase of taxes and royalties on mining activities. In 2008, mining and quarrying accounted for about 8.2% of GDP. The same year, Zambia's mines accounted for an estimated 9% of total world cobalt output and 4% of world copper production.²⁷

Mining is typically associated with large environmental impacts, such as pollution to air, soil, and water; with serious health effects (see Box 3). The sector is also using large quantities of water and electricity. Many of the country's large mining operations are located in Copperbelt Province in north-central Zambia, which is also one of the most polluted regions. Potential disruptions of electricity and fuel supplies are threats to the mining sector, and droughts and low hydropower-production thus affect the mining sector. Growing interest from international investors in Zambia's mineral wealth provides an opportunity for economic growth, but also highlights new challenges for the government related to environmental and social safeguards, licensing, control, and enforcement.

Energy: Wood fuel accounted for over 70% of the national energy consumption in 2007. Only 22% of the households in Zambia have access to electricity (14% on average and only 2% of the rural households use electricity for cooking). The charcoal industry generated in 1994 about US\$ 50 million annually; today that figure is likely to be much higher.²⁸

99% of Zambia's electricity supply is from hydropower, making it particularly vulnerable to reduced production during droughts²⁹. Higher temperatures will increase evaporation from reservoirs, and any intensification in the severity of droughts could cause power shortages and blackouts. In addition 75% of the population rely on biomass for energy, which is a major driver of deforestation and carbon emissions³⁰.

Tourism: The tourism sector has been growing, and it is expected to be a large contributor to Zambia's economic development. Tourism is largely based on wildlife, which in turn is dependent on healthy ecosystems and habitats. As Zambia's wildlife is declining, it will affect the tourism sector and the growth potential negatively. Furthermore, infrastructure (energy, roads, water, services) has to be developed and maintained for the tourism sector to grow. It is important that these developments are properly planned as unplanned development may have negative effects on the environment, such as increased resource-use and pollution, and will thus be negative for tourism.

Box 3: Pollution in Kabwe

Mineral deposits were discovered in 1902, and mining and smelting activities lasted until 1994, without safeguard measures. Today, high concentrations of lead dust in soil and metals in water are detected. Most workers and inhabitants are exposed to toxic levels of lead. Children and young men who scavenge the mines for scrap metals are most susceptible and on average, children's blood lead levels in Kabwe are 5 to 10 times the permissible maximum and in many cases are close to those regarded as potentially fatal.

Clean-up measures, resettlements, and educational activities have recently started, supported i.a. by the World Bank.

Source: Top 10 most polluted places, 2007 website.

²⁶ Open Society Institute of Southern Africa et al., 2009.

²⁷ Mobbs, 2008.

²⁸ Zambia Household Energy Report, Draft 2010.

²⁹ Government of Zambia 2010c National Climate Change Response Strategy. First Draft Sep 2010

³⁰ UN-REDD (2010)

Infrastructure and Transport: Increases in flood magnitude could damage major roads, and high temperatures could buckle important regional railway links. Intense rainfall events have the potential to overwhelm the existing water infrastructure more frequently, as happened in Lusaka in 2010³¹. There will be a need to assess risks posed by climate change to existing infrastructure, and change the design standards for certain types of infrastructure to incorporate a changing climatic regime, as noted in the SNDP³².

4. Climate change Mitigation and Adaptation

4.1. Mitigation

Zambia's industrial emissions of carbon dioxide are relatively small even regionally.³³ The main issue in Zambia that regards mitigation is halting deforestation. Any mitigation activities in Zambia should have clear pro-poor and development benefits.

Zambia is one of nine countries participating in the UN-REDD Quick start programme, and is in the process of developing a national REDD+ strategy by the end of 2010³⁴. The aim is to build capacity so that Zambia will be able to access international funding for REDD+ activities and reduce its deforestation rate (currently 250,000-300,000ha annually, mostly for biomass and charcoal production). The drivers of deforestation in Zambia are complex and will require strong political support and engagement across different sectors.³⁵ There is however a history of community-based resource management in Zambia that provides good foundations from which REDD+ activities can build. Key challenges for REDD+ in Zambia include adequate funding for the implementation of existing forest management policies, the provision of alternative sources of livelihoods and energy for the rural poor engaged in charcoal and fuelwood selling, community perceptions of the value of forests, absence of secure land tenure and a lack of baseline information of forests and coordination between different stakeholders³⁶. The near complete lack of reference to REDD+ in the SNDP is a significant gap, which will need to be addressed in order to realise the potential for REDD+ to support Zambia's national development objectives.

At present there is only one registered Clean Development Mechanism (CDM) project in Zambia³⁷, however the Mining and Manufacturing sectors in particular offer potential to attract finance for mitigation activities undertaken. Given the emphasis on these sectors as drivers of growth in the SNDP the CDM could be an important tool in low carbon growth, although it receives low priority in the current draft of the SNDP. There are large challenges which need to be overcome in order to attract CDM funding, however, principally related to capacity-building and awareness raising in the private sector around the possibilities offered by the CDM, and a complex project preparation process³⁸. The Designated National Authority for the CDM is housed in the Ministry of Tourism.

³¹ Government of Zambia 2010a

³² Government of Zambia 2010b

³³ IEA 2010

³⁴ UN-REDD 2010. REDD+ Reducing Emissions from Deforestation and Forest Degradation and conservation, sustainable management of forests and enhancement of forest carbon stocks. Likely to be a key part of any treaty to replace or extend the Kyoto protocol. In essence it involves payment for the conservation of forest stocks.

³⁵ *Ibid*

³⁶ *Ibid*

³⁷ UNFCCC 2010

³⁸ Government of Zambia 2010c

4.2. Adaptation

Opportunities exist to reduce climate change impacts through adaptation. In the agricultural sector these include diversification of cropping, water-saving techniques, small-scale irrigation schemes especially if linked to micro-hydro dams and the further development of systems for seasonal forecasting and the dissemination of such forecasts. Micro-insurance schemes also hold potential to protect smallholder farmers from drought losses.

The climate change spending proposed in the water sector is in line with proposals made in the Zambia economic study and includes expansion of the hydro-meteorological monitoring network as well as investment to improve and expand water and sanitation infrastructure³⁹. The key question is whether the institutional capacity can be built to implement these plans, for example whether Integrated Water Resource Management can be operationalised as proposed.

Health sector adaptation options outlined in the NAPA are primarily focused on mainstreaming climate change into existing public initiatives, for example strengthening disease surveillance programmes and adding a climate-based early warning system to Malaria programmes. In addition, it is noted that activities to increase food security will increase the resilience of the population to health related climate impacts⁴⁰.

The only project from the NAPA to be directly funded through the GEF Least Developed Country Fund so far is the 'Adaptation of the effects of drought in the context of climate change in agro-ecological region I of Zambia', worth \$3.45m. This is being implemented by UNDP⁴¹. The current focus, through initiatives such as the World Bank funded Pilot Programme for Climate Resilience (PPCR) is on mainstreaming climate change into national and sectoral planning, which is the preferable approach, rather than funding stand-alone projects of the type proposed in the NAPA.

4.3 Disaster risk reduction

Extreme events such as floods and droughts cause major damage in Zambia. The PPCR plans to strengthen existing early warning systems within the Zambian Meteorological Department, however efforts should move beyond early warning to a holistic approach to disaster risk reduction that focuses on prevention as well as emergency response and offers strong complementarities when building resilience to climate change. The Disaster Management Act, passed in April 2010, gives legal power over disaster management and disaster risk reduction to the Disaster Management and Mitigation Unit (DMMU) within the Office of the Vice-President⁴². Although strengthening capabilities for disaster early warning systems within the Zambian Meteorological Department is repeatedly mentioned in official climate change documents, for example the NAPA and the NCCRS, it is not clear what the coordination mechanism between the DMMU and the proposed institutions for coordinating climate change activities will be. Given the clear overlaps between disaster management and adaptation it will be important that the DMMU coordinates closely with the Climate Change Facilitation Unit (CFFU) and any future institutional arrangements such as the National Climate Change and Development Council outlined in the NCCRS, and that roles and responsibilities are clearly defined. The NCCRS would be strengthened by better defining the

³⁹ Government of Zambia 2010b

⁴⁰ Government of Zambia 2007

⁴¹ Climate Funds Update 2010

⁴² Government of Zambia 2010c

complementarities between adaptation and disaster risk reduction, and including DMMU into institutional coordination on climate change.

5. Policy framework and Key actors for managing environment and climate change challenges

5.1. Policy framework for managing environment and climate change challenges

Integration of Environment and Climate Change into the Sixth National Development Plan⁴³:

The 0-draft of the Sixth National Development Plan (SNDP) 2011–2015 focuses on broad-based pro-poor growth, employment creation and human development. The SNDP priority growth sectors are agriculture, mining, tourism, manufacturing, commerce and trade, information and communications technology (ICT), energy, education and skills development, health and water and sanitation⁴⁴.

The SNDP includes “Environment” as one of several cross-cutting issues, but other environmental concerns than climate change are surprisingly poorly integrated in the SNDP. Unlike the Fifth NDP, the SNDP does not have an environment chapter, neither are there clear measurable targets and indicators relating to environmental concerns⁴⁵.

In general climate change is well addressed in the draft SNDP, however there are large variations in the level of integration of climate change issues between different sectors. The Energy chapter includes several programmes for both adaptation and mitigation, including programmes for the development of renewable energy. However, these are very small compared to the budget allocation for major hydro-power expansion which may actually increase the vulnerability of the energy sector to climate change⁴⁶. Further information on how to replace the high dependence on biomass as an energy source would be useful, in particular given that this is a major driver of deforestation.

In the SNDP there is no recognition of the opportunities for REDD+, and Payment for Ecosystem Services more generally, in achieving both conservation of natural resources and contributing to rural poverty alleviation. Given a target to halt deforestation completely by 2015, and the fact that Zambia is a REDD+ QuickStart country, it is surprising that there is just one solitary mention of REDD+ in the document.

Environmental integration will hopefully be improved in subsequent drafts of the SNDP. However, the real test of integration of environment and climate change in the SNDP will be whether there is the institutional capacity and funding to successfully implement the envisioned programs.

Policy and legislation for environment and natural resources management: Zambia’s body of environmental law is spread over more than 33 sets of legislation and can be characterised as fragmented, with dispersed responsibility across at least ten line ministries. The recently

⁴³ Status of integration into the October 2010 Zero Order Draft, Government of Zambia 2010b

⁴⁴ GRZ 2010, p.1

⁴⁵ This poor integration of environmental concerns has been highlighted in written comments submitted by Cooperating Partners in the Environment and Natural Resources Sector.

⁴⁶ Government of Zambia 2010a

approved National Policy on the Environment (NPE) has been designed to address this daunting challenge and create ‘a comprehensive framework for effective natural resource utilisation and environmental conservation’. See appendix 2 for an overview of key policy and legal documents for environmental and natural resources management⁴⁷.

The Environmental Impact Assessment (EIA) regulations of 1997 require that EIA should be prepared for all investments that have a major impact on the environment, and must include the identification and implementation of adequate environmental mitigation measures. The EIA regulations are compatible with international requirements, and is generally well established, information is available, but the quality of the EIA reports remain low. There seems to be a lack of genuine political will to address environmental issues and the transparency is low. EIAs are often side-stepped by politicians, partly due to disconnected or weak environmental institutions. Hence, in short: the EIA performance is improving, but there remain political, resource and follow-up problems. There are initial experiences from applying Strategic Environmental Assessments (SEA) to plans and programmes. However, there is no legal requirement for SEA.⁴⁸

Climate change: Zambia has ratified the UN Framework Convention on Climate Change (1993) and the Kyoto Protocol (2006), and has submitted both a NAPA and First National Communication. A second National Communication is currently being drafted⁴⁹ Zambia agreed to the Copenhagen Accord, however expressed a wish for funding for adaptation to be additional to existing ODA, and noted the need for more stringent emissions targets.⁵⁰

The government is drafting a National Climate Change Response Strategy (NCCRS), which aims to coordinate and harmonize national activities around climate change⁵¹. The strategy is due for completion at the end of 2010 and is being developed to assist the objectives of the National Long Term Vision 2030 and SNDP. The strategy argues that there is no clear division of roles and responsibilities of different actors working on climate change in Zambia, resulting in a lack of coordination and duplication of efforts. As such a key recommendation of the draft strategy is to create a new institutional framework for overseeing climate change activities nationally - the National Climate Change and Development Council (NCCDC). The NCCDC would liaise closely with institutions such as the Zambian Meteorological Department, the Environmental Council of Zambia and the Ministry of Tourism, Environment and Natural Resources (MTENR), which is at present the main ministry with responsibility for climate change. As the NCCRS has not yet been approved in final form it is unclear whether or not this proposal will be taken forward.

5.2. Key Actors⁵²

The *Ministry of Tourism, Environment and Natural Resources* (MTENR) is the main authority and coordinating body for environment natural resources management and houses several key statutory bodies and departments, including the *Environmental Council of Zambia* (ECZ) with statutory responsibility for protecting the environment and acting as a regulator

⁴⁷ Aongola et al., 2009

⁴⁸ Ibid

⁴⁹ Government of Zambia 2010c

⁵⁰ Government of Zambia 2010d

⁵¹ Government of Zambia 2010c

⁵² As part of this desk-review it has not been possible to cover the role that the private sector, civil society and community based organizations play in the management of environment and natural resources.

under the Environmental Protection and Pollution Control Act (EPPCA 1990); the *Zambia Wildlife Authority* (ZAWA); and the *Forestry Department*.

The MTENR/ECZ has a very comprehensive environmental management mandate, but in practice environmental management is largely dependent on the interest and competence of other line ministries who typically regard the environment as an externality to their principal business. Formal environmental institutions are typically not well linked to development planning, finance and sector institutions. They are also weaker politically and in capacity terms. Furthermore, new institutions such as the ECZ and the ZAWA were established without adequate resourcing, with fiscal constraints requiring them to be partially self-funding (60% in the case of ECZ)⁵³. This form of funding risks diverting attention from performing core functions such as monitoring compliance with environmental laws to implementation of projects.

Sector ministries are powerful actors in Zambia and in order to address the key environmental challenges outlined above environmental concerns need to be integrated in the development and implementation of sector strategies. The 1994 National Environmental Action Plan recommended line ministries to establish environmental units, with adequate skills to mainstream environment into operations. Some key ministries, such as mining, roads and electricity, have established environmental units. Planning departments in other ministries are tasked with all mainstreaming issues, including environment, gender, and HIV/AIDS, and do not have enough capacity to give all mainstreaming issues full attention.⁵⁴

The Ministry of Finance and Planning (MFNP) allocates funds in a sectoral manner, according to priorities determined by the Government. In this context MTENR and *the Ministry of Local Government and Housing* (MLGH) which are important for environmental issues, typically loses out. MTENR's budgetary allocations from MFNP have been far from commensurate with its global and national environmental responsibilities, resulting in heavy dependence on donors for support to fulfil national obligations under international environmental conventions. Due mainly to inadequate funding of MLGH less than 10 of the country's 72 Councils have managed to develop the by law required Integrated Development Plans.⁵⁵

Environment and natural resources management as well as climate change adaptation programmes are heavily dependent on international funding and many different *development agencies* have been involved in supporting a wide variety of projects. The MTENR now views the *Environment and Natural Resources Management and Mainstreaming Programme* (ENRMMP) 2008- 2012 as "the umbrella vehicle" for all Cooperating Partners interventions in the Tourism, Environment and Natural Resources sector⁵⁶. The programme has three components. The first is Strengthening Capacity of the MTENR, which will help the ministry to coordinate more effectively the activities of the sector. The second is Harmonizing the legal regime to de-fragment environmental legislation and promote effective enforcement of existing regulations. The third is Support to Environmental Mainstreaming supported by an Interim Environmental Fund.

⁵³ Dolan 2007

⁵⁴ Aongola et al., 2009

⁵⁵ Ibid

⁵⁶ GRZ 2008c

During the last years internationally supported initiatives for climate change adaptation and mitigation have intensified. Zambia is one of the first countries to receive funding under the World Bank funded Pilot Programme for Climate Resilience (PPCR). The focus of the initial phase of the PPCR has been on mainstreaming climate change into the SNDP and improving institutional coordination around climate change. UNDP has been active in supporting the preparation of the 2nd National Communication to the UNFCCC as well as capacity building for the Clean Development Mechanism and support to the UN-REDD programme.

The main bilateral donors in Zambia with relevance to climate change are Finland, Norway and Denmark. Finland is supporting several relevant initiatives at the community level, including an IUCN programme on community based adaptation, and projects to strengthen community natural resource and forest management. It also supports regional SADC initiatives on renewable energy and improving meteorological capacity. Norway is focussing support around conservation agriculture, as well as providing support to the Climate Change Facilitation Unit and the UN-REDD programme in Zambia. Norway also provides support to develop tourism in Zambia's national parks. Denmark has a large programme focussed on water supply and sanitation and Integrated Water Resource Management. It also provides support to the Zambia Meteorological Department to improve the meteorological station network and develop capacity to produce regional climate projections. Denmark and Finland are also jointly supporting a programme on mainstreaming environment and natural resources.

5.3. Governance, implementation and enforcement

The rampant deforestation, widespread pollution and other serious environmental challenges described in section 2 strongly indicate that the Zambian state largely fails to sustainably manage its environment and natural resources. The new National Policy on the Environment is supposed to address the scattered policy framework for environment and natural resources management, but if it is not backed by a strong political commitment and financial resources there is a clear risk that it will not be translated into practical action.

MTENR is in practice too weak to fulfil its mandate to coordinate environment and natural resources management. The World Bank's CPIA⁵⁷ assessment on environment in Zambia gives a particularly weak score of 2.5 (out of 5) on intersectoral coordination and an overall score of 3.5 for the country systems for environmental management.

The lack of enforcement of national environmental legislation is a key problem. Enforcement is carried out by 11 line ministries through statutory bodies or institutions such as directorates. However, with the exception of ZAWA, the enforcement institutions must rely on prosecutors from the Police Service to investigate and prosecute cases, even though these may not understand the principles and objectives of environmental management.

As mentioned above, several policy areas of key importance for environment and natural resources management are outside the confines of the MTENR. Notably, tenure arrangements for land and other natural resources play a fundamental role for effective and sustainable management. Currently more than 90% of the land is under traditional tenure and insecurity of tenure may have significant effects on the willingness of farmers to invest and sustainably manage their land⁵⁸. The decentralization reform process is another area with important consequences for environmental management. Environmental ministries are typically very

⁵⁷ Country Policy and Institutional Assessment

⁵⁸ Bigsten and Tengstam 2009

weakly represented at district and local levels and attention must be given to responsibilities and capacity for environmental management at these levels.

There is a need to put the specific governance challenges related to environmental and natural resources management into the broader perspective of weak governance in Zambia. While the current environmental degradation implies large costs to many stakeholders, especially the rural and urban poor, there are also some stakeholders benefiting from the lack of implementation and enforcement of environmental policies. Examples include traders in illegal logging, industries which do not need to reduce their emissions and government officials getting paid for letting illegalities continue. Environmental governance is thus embedded in a complex political economy which may hamper reform efforts.

Accountability initiatives that improve transparency and access to environmental information as well as strengthens actors, such as media, civil society and community based organizations, that can draw attention to environmental problems and demand environmental improvements can be very important in this situation. As argued by Bigsten and Tengstam (2009) development agencies can play an important role in Zambia in pressuring for improved governance.

6. Constraints and Opportunities related to the Environment and Climate change

6.1. Key Constraints

Based on this brief review, it is clear that environment and ecosystem degradation pose important constraints to development at both the micro and the macro level. Climate change adds to existing environmental stress and aggravates the importance of taking action to address environmental degradation.

At the *micro* level, deforestation and soil erosion constrain poor households' income opportunities through lowering agricultural productivity and access to different non-timber forest products. Air and water pollution has serious negative health implications for poor households in general and for children in particular. Poor households also have the least capacity to cope with food insecurity or economic shocks following natural disasters, which are likely to become more frequent with climate change.

At the *macro* level, further environmental degradation will pose significant constraints to key growth sectors such as agriculture and tourism. Climate variability is estimated to reduce agricultural growth by 1% per year. Revenues from mining of finite natural resources have not been translated into human development, as indicated by the negative adjusted net savings, a World Bank sustainability indicator. Without strong institutions and policies, experiences from Zambia and elsewhere show that windfall revenues from mining can be a curse, rather than a blessing, which constrains overall economic development. Finally, loss of eco-system services and environmental degradation is largely unaccounted for in national accounts and statistics, which imply that real economic growth most likely is significantly lower than what the GDP growth rate indicates. This may prove to be a key constraint to strategic decision making and long term management of Zambia's wealth. In this context the lack of integration of environmental concerns in the draft SNDP represents a set-back compared to the FNDP.

6.2. Key Opportunities

Global production and consumption patterns require large inputs of natural resources. The transition to a more resource efficient and low carbon growth economy holds opportunities for Zambia given its abundance of both renewable (forests, water, wildlife etc) and non-renewable resources (minerals). Improved negotiation capacity within the government of Zambia could result in significantly better deals with international mining companies and increasing government revenues⁵⁹. Improved enforcement of environmental legislation could diminish commercial illegal harvesting of timber and wildlife and increase revenues for both government and national companies.

New international financing for climate change mitigation brings opportunities to address deforestation through compensating farmers for ecosystem services that standing forests provide. This is however utterly complex and must most likely involve large institutional change, including a review of land tenure arrangements, in order to be effective. Similarly, increasing world demand for biofuels provides growth opportunities for Zambian agriculture. However, in order for both REDD+ and biofuel initiatives, to be pro-poor and environmentally sustainable, careful planning and participation of local stakeholders is necessary.

Environmental problems caused by large polluters in the mineral sector may be solvable by strengthening the existing systems for environmental assessment, stepping up enforcement of existing environmental laws and investing in modern technology. However, most of Zambia's environmental problems are intrinsically linked to poverty and cannot be solved by environmental policy alone. Solutions must rather form part of a broader mix of reforms aiming at pro-poor growth and improved governance. Improved inter-sectoral collaboration and mainstreaming of environment and climate change in Zambia's core systems for planning and financial management will be core to success. For example, providing poor households with alternative energy sources (e.g. solar, gas) could contribute to both reducing deforestation and health problems due to indoor air-pollution. Linking agriculture, health and energy sector interventions could potentially bring a range of similar opportunities and carbon finance and technology transfer may help increase access to and affordability of energy.

For Zambia important adaptation opportunities which can enhance food production and security include diversification of cropping, water-saving techniques, small-scale irrigation schemes especially if linked to micro-hydro dams and the further development of systems for seasonal forecasting and the dissemination of such forecasts. Micro-insurance schemes also hold potential to protect smallholder farmers from drought losses. Climate finance can help Zambia to act on these opportunities if sufficient institutional capacity is available.

6.3. Opportunities for Sida and other development agencies

The National Development Plan and the accompanying JASZ represents key guiding documents for development cooperation partners in Zambia. For Sweden and other developing agencies providing budget support to Zambia the lack of integration of environmental concerns in the draft SNDP should be a cause for concern. If the Zambian government does not step up its efforts and capacity to address environmental concerns it is likely that the opportunities outlined above will not be realized. Development partners should thus continue to engage in a dialogue with the government on how to improve the integration

⁵⁹ Lambrechts et al 2009

of environmental issues in SNDP. Development partners could also consider doing a joint budget support environmental appraisal similar to the one conducted in 2007⁶⁰.

The Environment and Natural Resources Management and Mainstreaming Programme (ENRMMP) is an important initiative aiming at both strengthening the MTENR and support environmental mainstreaming. However, there may be a risk that the division of roles and responsibilities in accordance with JASZ reduces environmental issues to a concern only for development partners working with MTENR. Development partners working with other sector ministries or Ministry of Finance and National Planning have a key role in promoting environmental mainstreaming and addressing environmental problems.

The central role of the MFNP for environmental mainstreaming is stressed in the recent review “*Creating and Protecting Zambia’s Wealth – Experiences and next steps in environmental mainstreaming*” led by MFNP and ECZ⁶¹. Development Partners could engage with the MFNP on environmental mainstreaming and build on the experiences from this review as well as the rich experiences from working with environmental mainstreaming with ministries of finance and development in other African countries, through the Poverty Environment Initiative⁶². A key lesson is that there is a need to look beyond the integration of environment in planning documents, such as the SNDP, and look at budget processes, institutions and policy instruments which matters greatly for the implementation of environmental commitments.

Finally, given the importance of environment and climate change to development in Zambia, a good understanding of the issues at stake is necessary for both Zambian stakeholders and development partners. Further studies, seminars and stakeholder dialogues around environment, climate change and related issues could be promoted. Support to strategic environmental assessments in relation to sector reforms or public environmental expenditure reviews could be considered.

⁶⁰ Dolan, 2007. Conducted for DFID, the Netherlands, Sweden, Norway and the Tourism, Environment and Natural Resources Sector Advisory Group.

⁶¹ Aongola et al 2009.

⁶² www.unpei.org/. The initiative is partly funded by Sweden.

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Appendix 1: Key environmental challenges in Zambia

Deforestation: Forest, woodland and scattered woodland associated with farming covers about 34 million hectares, or 45% of Zambia's land area, with a bias in the northern half of the country⁶³. Zambia's forests are under tremendous pressure; the rate of deforestation is estimated to be in the range of 250,000 to 300,000 hectares annually⁶⁴. Even though this is considerably below earlier estimates of 900,000 hectares per year, the rate of deforestation in Zambia is well above the regional average and continues to be one of the biggest environmental problems in the country.⁶⁵

Deforestation has global, regional and local impacts: it contributes to global climate change through emissions of greenhouse gasses, threatens species diversity, for instance by loss of habitat, and undermines key ecosystem services such as climate and water regulation. Shortened flow of seasonal streams and the drying up of formerly permanent rivers have been observed⁶⁶. Deforestation in Zambia is estimated to have led to emissions of around 106 million tons of carbon dioxide annually 1990-2005 which makes Zambia the 9th largest emitter of carbon dioxide from deforestation in the world⁶⁷. The driving forces behind deforestation are complex but include illegal commercial logging, poor law enforcement, wood fuel harvesting, uncontrolled fires, and expansion of agriculture and mining activities.

Wildlife depletion, loss of biodiversity and ecosystem services: Wildlife plays an important role for Zambian livelihoods and tourism industry and wildlife depletion has been identified by the Zambian government as a priority environmental problem. However, it is important to understand that ecosystems provide many different types of life-supporting services that, in addition to providing for wildlife, are vital for livelihoods and economic development and provide resilience to natural disasters and climate change. Zambia is highly dependent on agriculture (including crop and animal husbandry, forestry and fisheries). The livelihoods of the majority of Zambia's people, especially those living in rural areas, are thus dependant on healthy ecosystems and biodiversity. For example, 600,000 households depend directly on agricultural biodiversity for their livelihood. In addition, aquatic ecosystems provide fish and a source of protein for many Zambians.⁶⁸ Inland waters and wetlands⁶⁹, provide food and clean water, but are increasingly threatened by land use changes, pollution and invasive species. All major fish resources are over-exploited. A fishing ban has been introduced from December to March to allow fish stocks to recover, however, the ban is difficult to enforce.⁷⁰ Although under pressure, forest ecosystem services such as timber and energy production as well as erosion control, are of crucial importance to local peoples' well-being. Threats to biodiversity and wildlife include illegal harvesting, unregulated harvesting of both fish and wildlife resources, and destruction of habitats, especially deforestation but also other economic activities (cultivation, mining, livestock grazing, etc.).⁷¹ Climate change is expected to put further stress on Zambia's biodiversity.

⁶³ Pope, Adam 2006.

⁶⁴ GRZ 2010a. Sixth National Development Plan – zero draft

⁶⁵ According to World Bank data the rate of deforestation in Zambia was 1.0% 1990-2005, compared to 0,6% for SubSaharan Africa.

⁶⁶ GRZ 2008a, and 2009

⁶⁷ World Bank 2010.

⁶⁸ GRZ 2009

⁶⁹ Inland waters and wetlands, such as Lake Bangweulu Lukanga Swamps; Lakes Tanganyika, Mweru-wa-Ntipa, Mweru; Itetzhi-tehzi, Lusiwashi, and Kariba, as well as the Kafue, Zambezi and Luangwa Rivers.

⁷⁰ GRZ, 2008b

⁷¹ GRZ, 2009.

Land degradation⁷²: poses one of the most serious threats to biodiversity and sustained food production and Zambia's development in general. Small scale agricultural practices such as continuous ploughing due to increased pressure on adjacent agricultural land, maize mono-cropping and lack of fertilizers (or nutrient recycling) have contributed to land degradation. Deforestation and wildfires, due to clearing land for agriculture or production of charcoal, contribute to degradation of land and loss of Zambia's biodiversity. Land degradation is also reflected in reduced water in rivers and streams during the dry seasons – even drying-up of streams - and floods during rainy season, poor ground water recharge and siltation and sedimentation of dams and rivers.⁷³ Large-scale agriculture (e.g. tobacco, cotton, tea, coffee and sugar) also contributes to land degradation through pollution from the use of agrochemicals and land clearing. Noting that the human population in Zambia is dependent on agriculture, land degradation undermines social economic development and continues to deepen the poverty crisis.⁷⁴ Land degradation may also be irreversible.

Air pollution: *Indoor air pollution* is the most widespread air-pollution challenge in Zambia. Indoor air pollution, mainly from using biomass fuel (such as firewood and charcoal) for cooking, is a serious health treat in Zambia (see Table 2), with disproportionate impacts on women and children. *Outdoor* air pollution is a problem in parts of Zambia, localised to major mining areas and urban centres, mainly felt around fertiliser and cement manufacturers, lime producers and petroleum production facilities. One example is the 200-million-dollar mine, which Chiman opened about two years ago in Kabwe, a mining town 150 kilometres north of the capital, Lusaka. The area is known as one of the world's most polluted places from decades of mining substances like copper and lead, with serious health implications for residents. The copper industry is the largest air polluter in Zambia: smelting of the copper ore release an estimated 1,250 ton of sulphur dioxide (SO₂) daily⁷⁵. Concentrations of SO₂ are above WHO and Zambian guidelines in some places, with effects on both health and the environment (such as acid rains and desertification).⁷⁶

Inadequate management of water resources, water pollution and sanitation: Zambia is endowed with enough water to meet the demands of a growing population. However, variable rainfall coupled with a lack of proper management, water infrastructure and a poor distribution of *surface water*, lead to local water shortages, especially in the south. The increasing water demand of the population and economic activities is currently not met. Zambia uses below 40% of its available water resources, of which a vast majority (90%) is used for hydropower generation, 7.5% for irrigation, 1.6% for domestic purposes, and the rest is used by industry. *Groundwater* is important in many parts of the country, although less well understood than surface water. Some aquifers (e.g. the Lusaka aquifer) appear to be under stress due to over-extraction and pollution (pollution from mining, leakages from latrines, septic tanks and unplanned quarrying of construction materials).

Water quality is a major concern in some rivers, like the Kafue on the Copperbelt. Kafue is threatened by pollution from industrial (especially mining), agricultural and municipal activities, including discharge of heavy metals, hydrocarbons, agro-chemicals, and bacteria.

⁷² E.g. soil erosion, loss of soil structure and soil micro-organisms, acidification, oxidation of organic matter and compaction

⁷³ GRZ, 2009

⁷⁴ Pope 2006; GRZ 2009; FAO

⁷⁵ Innes and Hassan, 2000.

⁷⁶ GRZ, 2008b

One example is the Konkola Copper Mine, which discharges approximately 600,000 m³ of water per day into the Kafue River. High population densities in urban areas leading to smaller plots and very short distances between latrines and open yard wells or hand pumps present considerable risk to subterranean and surface pollution of water.

Natural disaster risks and Climate Change: Temperatures in Zambia have increased by around 1.3°C since 1960. There is significant variability in the onset and the cessation of the rainy season, and a significant decrease in growing season length, particularly in the North, has been noticed. El Niño events tend to bring dry years and La Niña events are associated with wet years and floods. The National Adaptation Programme of Action (NAPA) reports an increase in floods and droughts since 2000 and that the intensity of these events has increased. The SNDP reports that the most serious climate hazards to be drought, seasonal floods and flash floods, extreme temperatures and dry spells. Some of these, especially droughts and floods have increased in frequency, intensity and magnitude and have adversely impacted heavily on food and water security, infrastructure, energy, health and sustainable livelihoods of rural communities”.⁷⁷

Temperatures in Zambia are likely to increase although changes in precipitation are less clear and vary for different climate model projections. The general pattern is expected to be of less rainfall in the early part of the rainy season (Sep-Nov), but an increase towards the end (March-May). Extreme rainfall events are likely to increase and floods and droughts may intensify. This will impact on growing seasons and crop selection and ultimately farming systems and food production, in addition to increasing risks in farming at all scales.

Climate change adds to existing environmental stress and is likely to negatively affect Zambia's natural resource base. Impacts may include the loss of grassland and forest habitat and reductions or increased variability in river flow impacting both habitat provision and hydroelectric generation. The combination of intense rainfall events and droughts will exacerbate existing problems of land degradation due to overgrazing and deforestation. Hydrological changes may increase pressures on Zambia's wetlands, which provide extensive ecosystem services such as flood regulation and water purification, as well as important livelihood resources for rural communities.

⁷⁷ GRZ, 2010 Sixth National Development Plan – zero draft

Appendix 2: Key policy and legal documents for ENR management

Sources: GRZ, 2008c; and Aongola et al., 2009

Zambia's body of laws relating to the management of the environment and natural resources (ENR) sector is spread over more than 20 international treaties and over 30 Acts of Parliament and responsibility dispersed amongst at least ten line ministries. The Ministry of Tourism, Environment and Natural Resources (MTNER), established in 2002, is responsible for policy development and new environmental and natural resource legislation in Zambia. There are also Statutory Bodies that fall under MTNER, including three that are directly responsible for management of environment and natural resources:

- **Environmental Council of Zambia (ECZ)**, which is a regulatory body mandated to protect the environment and control pollution. Its primary functions are to advise government on policy formulation, recommend measures to control pollution, including research, oversee the Environmental Impact Assessment (EIA) process and co-ordinate environment and pollution control activities.
- **Zambia Wildlife Authority (ZAWA)** is responsible for the management and conservation of wildlife in Zambia
- **National Heritage Conservation Commission (NHCC)** is mandated to identify national heritage sites and manage their aesthetic value.

Key policy and legal documents for environmental and natural resources management in Zambia include:

- 1985 National Conservation Strategy (NCS) – a comprehensive ‘conservation for sustainable development’ policy and strategy responding to the UNEP/WWF/IUCN World Conservation Strategy.
- 1990 Environmental Protection and Pollution Control Act (EPPCA), which led to the subsequent establishment of the ECZ.
- 1992, Environment Council of Zambia (ECZ) – An autonomous corporate body to implement the EPPCA, with a multi-stakeholder board. Its general function is to ‘protect the environment and control pollution’.
- 1994 National Environmental Action Plan (NEAP 1994) – a detailed plan for investment in the environment, ostensibly an action plan for the NCS; but also prepared in response to World Bank requirements to cover environmental issues if Zambia is to be able to obtain loans under IDA-10.
- 1998 National Biological Diversity Strategy and Action Plan.
- 1998 Zambia Wildlife Act - provides, among other things, the establishment, control and management of National Parks and for the conservation and enhancement of wildlife ecosystem, biodiversity and also for the establishment, control and management of Game Management Areas and recently the management of wetlands. The Act also provided for the establishment of the institution and emphasises the functions of ZAWA.
- 2004 Integrated Water Resource Management/Water Efficiency Plan - the national response to the 2002 Earth Summit's call for an integrated approach to water planning.
- 2004 National Solid Waste Management Strategy – prepared by ECZ through a consultative process and adopting a waste cycle approach, aiming to minimise the generation of waste, maximise the efficiency of waste collection, reduce waste needing disposal by maximising its economic value, and adopt environmentally sound treatment and disposal.

- 2008 Integrated Water Resource Management and Water Efficiency (IWRM/WE) Implementation Plan.
- 2008 National Policy on the Environment (NEP) - a comprehensive policy for managing environmental and natural resources in harmony with the national development policy. NEP was completed in 2005, approved by Cabinet in 2007.

National plans and responses to multilateral environmental conventions (1990s and 2000s):

- a) National Biodiversity Strategy and Action Plan – the national response to the Convention on Biodiversity, covering access and benefit sharing, sustainable use and protection;
- b) National Communication on Climate Change – the national response to the Convention on Climate Change;
- c) National Adaptation Plan of Action to support adaptation to Climate Change 2007 – a further response to the Convention on Climate Change;
- d) National Action Plan for implementing the UN Convention to Combat Desertification;
- e) Zambia Wetland Strategy and Action Plan – the national response to the Ramsar Convention on Wetlands;
- f) Zambia Forestry Action Programme – the national response to the FAO Forestry Action Programme.

Table A1: Zambian government ministries involved in or mandated to manage issues related to environment and natural resources (source: GRZ, 2008c).

Ministry of Local Government and Housing	Responsible for initiating policy and legislation on infrastructure, development and human settlements; coordinates and monitors finance and projects to local authorities. Facilitates enabling environment for the smooth functioning of all councils in the country; disburses money earmarked for local councils.
Ministry of Mines and Minerals Development	Responsible for policy development in the mining sector.
Ministry of Agriculture and Cooperatives and the Department of Fisheries	Initiates policies on agriculture, fisheries and food security; mandate for promoting the development of commercial fishing, enforcement of regulations and laws and for registration of fishermen and their boats; Authority to oversee all fisheries gazetted areas
The Ministry of Energy and Water Development	Responsible for policy development on water resources and energy development.
Ministry of Lands	Is mandated to carry out the functions of land administration in Zambia.
Ministry of Health	Is responsible for public health and development of related policy.
Ministry of Education	Oversees the Curriculum development Centre, University of Zambia and the Copperbelt University
Ministry of Science, Technology and Vocational Training	Responsible for policy direction for the provision of technical education, vocational training and entrepreneurship training.
Ministry of Sport, Youth and Child Development	Responsible for community based skills training
Ministry of Community Development and Social Services	Responsible for the policy on, and provision and management of social welfare services including being responsible for leadership and practical skills as well as literacy classes that are offered mainly to vulnerable groups, such as the handicapped, women, orphans, and non-literate youth and adults

Table A2: Other regulatory institutions of significance to environment and natural resources management in Zambia include (source: GRZ, 2008c):

Water Board	Responsible for water resources management and issuing of water rights.
National Water and Sanitation Council	responsible for licensing the water supply service providers; advising government on water supply and sanitation matters, local authorities on institutional arrangements for the provision of water supply and sanitation services; developing sector guidelines, establishing and enforcing standards; and disseminating information to consumers.
Energy Regulation Board	Regulates the energy sector.
House of Chiefs and the Traditional Rulers, the Chiefs	A wing of the Zambian legislator through which traditional rulers contribute to national legislation development.
National Institute for Scientific and Industrial Research (NISIR)	The government research and development unit which operates under the Ministry of Science and Technology.