Pollution in the Southern African Development Community (SADC) Region: The case of lead in Zambia and South Africa

Mundu MWILA

International Development Studies Program

National Graduate Institute for Policy Studies (GRIPS), Japan

FASID/IDRI Intern

February 2010

1.0 Introduction

This paper examines the effects of environmental degradation, particularly mineral lead pollution, in Zambia, a low income country and South Africa, a middle income country, which are both members of the Southern African Development Community (SADC[1]). The analysis for these two countries at different stages of development will give insight into how low and middle income countries deal with pollution as well as provide precedents on dealing with similar problems for countries within the SADC region and beyond. This paper shows the important role of environmental protection institutions in an economy by illustrating how the lack of such institutions could lead to environmental degradation by lead and affect human health through different pathways. This paper also shows that though such institutions may exist, they may not be fully legally equipped to prevent environmental pollution until their mandate is revised.

Through this paper, we will learn why a century of lead pollution in Zambia went on without any Government regulations and how South Africa could not enforce regulations on environmental pollution, including regulations on lead, even though this country had legislation for such purposes. Furthermore, this paper shall show how the Dakar Declaration of 2001 influenced the phasing out of lead in not only Zambia and South Africa but the entire SADC region.

The next section therefore discusses the overview of the Africa region and the economic overview of the SADC region and gives a brief description of the Dakar Declaration. Section 3.0 discusses lead pollution in SADC and refers to regional agreements that have a bearing on reducing lead pollution. Thereafter, a detailed discussion on lead pollution in the SADC region through case studies on Zambia and South Africa follows with emphasis on the different pathways through which lead contaminates the environment and approaches used to remedy the environment of the pollutant. This section also highlights the measures the two governments put in place to prevent future contamination by lead.

Finally, a discussion on the lessons learnt and conclusion which also prescribes the best practices in handling the potential of lead pollution for SADC countries. As we discuss pollution in SADC, it is

1 SADC is a regional inter-governmental organization that comprises the following Sub-Saharan Southern African countries: Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Tanzania, South Africa, Seychelles, Swaziland, Zambia and Zimbabwe. Its aims are to: integrate the region, alleviate poverty, harmonize and rationalize policies and strategies while its goals include establishment of a regional development fund, creation of a free trade area, establishment of a SADC customs union and implementation of a common external tariff by 2010 and finally, establishment of a SADC Central Bank and single currency by 2016 (SADC, 2009).

important to address some of the historical issues in the next section that may have a bearing on pollution on the African continent, particularly in the SADC region. This will give us proper insight into understanding the problems the region has experienced with lead.

2.0 Africa Region

2.1 Overview of the African Region

Africa is the second largest continent in the world and is home to 14% (934million) of the world's population (About.Com, 2009). About 110 years ago, Africa's population was recorded at 118 million while by 1990, the continents fast population growth had managed to slow down as high fertility rates were offset by high death rates attributed to poor health conditions, infectious diseases, civil wars and the struggle for independence. However, by 1997, the continents population was estimated at 778.5 million. The sharp increase in population growth is attributed to improvements in health resulting from economic growth; whereas improvements in health were through improved general standard of health care as well as new and better medicines. Economic growth however comes with its own costs, which include environment degradation through pollution.

At current levels of population growth, estimates indicate that Africa's population will reach 1.453 billion by year 2025 (UNEP, 2009). As population increases, it will need to be complemented by a commensurate increase in economic growth; as such, there would be even more demand on the environment for natural resources to meet new demand for finished products and services. For instance, in South Africa, where almost 100% of power is produced from coal, power demand increases due to an increase in economic activity, also attributed to a rise in population. By-products of thermal power production such as sulphur dioxide may increase the probability of acid rain and consequently increase environmental degradation. Furthermore, this may lead to environmental degradation because in most African countries, there is a vicious link between environmental degradation and poverty (UNEP, 2009). This is partly because individuals, private sector, governments may not have sufficient resources to care enough for the environment and partly because they may not rank environment matters as highly important. This is further worsened by the lack of proper laws and weak institutions to deal with pollution. Poverty and lack of institutions therefore remain major causes and consequences of environmental degradation and resource depletion. Estimates show that 40% of the people in Sub-Saharan Africa live below the poverty line and that both income and poverty have been increasing (UNEP, 2009).

For most African countries, the 1980s were perceived as a lost decade mainly because of the negative or slow growth experienced. Signs of recovery were only witnessed in the mid-1990s as the continent recorded an aggregate growth rate of 4% – 5 % with growth experienced in all regions

except central and western Africa. The growth was attributed to better weather, improved macroeconomic policies and improved agriculture but was, however, not sufficient to reduce poverty by greater levels. Further, most African countries during the 1980s implemented the World Bank/International Monetary Fund's Structural Adjustment Programme (SAP) and economic liberalization policies. In most countries, these policies included the devaluations and abolishment of fixed exchange rates, abolishment of price controls, improvement of parastatal efficiency, and privatization in most instances (Oxford Journals, 2009). The countries only showed signs of economic recovery in the mid-1990s and recorded positive growth beginning in 2000. Since then, Africa has recorded positive growth averaging 3% - 5%. However, Interpress (2009) argues that this level of growth is not sufficient to reduce poverty. Nonetheless, it is a step in the right direction as the continent may in later period's record higher growth levels that would be enough to significantly reduce poverty.

The next section gives an economic overview of the SADC region and also prepares to discuss lead pollution.

2.2 Economic Overview of the SADC Region

The SADC region has a population of 220 million. The SADC population makes up only 4% of the world population (SADC Today, 2009). In 2004, the region had a total nominal GDP of US$296.4 billion of which 1.69% (US$5 billion) was Zambia's share while 71.9% (US$213.1 billion) was South Africa's share, more than double the combined GDP of the rest of the SADC countries. The region has enjoyed economic growth with most countries recording positive growth between 2002 and 2008, despite the post war disarmament in Angola and the Democratic Republic of Congo (DRC) and the continuing internal strife in Zimbabwe that has adversely affected economic performance in these countries. However, by 2007, the two countries GDP had grown to US$11.6 billion and US$283 billion, respectively. As shown in tables 1 and 2, the growth rates for the past seven years for the region have on average been positive. However, there are signs of growth in both countries as peace agreements and the power sharing deal in Zimbabwe begin to make progress.

South Africa consumes about 80% of the SADC region's energy and is responsible for about 88% (112 million metric tons) of total green house gas emissions in the SADC region (SADC Today, 2009). Figure 1 shows that the country's total carbon dioxide emissions have been rising since the 19th century while in the early 1930s the rate of growth became even greater. On the other hand, figure 2 shows that carbon dioxide emissions in Zambia in the early 1960s to the end of the 20th century on average fell and only started to rise in 2000 and continued to do so at a constant rate.

The SADC region has energy reserves of coal, petroleum and natural gas, with natural gas becoming more significant in fields off Mozambique, Namibia, South Africa and Tanzania being developed. About 80% of the region's electricity is produced from thermal while the rest is from hydro and nuclear energy. Table 3 shows that power demand is projected to grow at an average rate of 4.4% per annum from 2009 to 2015 (SAPP, 2010), it is therefore expected that greenhouse gas emissions will also rise at a rate commensurate to the rise in power demand unless the region finds an alternative to coal which currently is the source for over 60% of its power. Ideally, what is desirable is that greenhouse gas emissions do not rise to a level where they can cause acid rain or cause significant environmental damage.

Currently, Angola is the only producer of crude oil in Southern Africa and produces an average of 1.05 million barrels per day (bbl/day). This has in the post war era greatly improved the country's economic performance. Angola has 96% (5.4 billion barrels) of the reserves in the region with a lesser amount of reserves located off the coast of other SADC countries such as DRC and South Africa. The regions refineries are concentrated in South Africa, while one refinery each is located in Angola, Tanzania and Zambia.

2.3 The Dakar Declaration, 2001

The Dakar Declaration of 2001 was a declaration by 25 Sub Saharan African countries to phase out leaded gasoline by 2005. The Dakar Declaration was preceded by the World Summit on Sustainable Development (WSSD) of 2002, which resulted in the launch of the partnership for cleaner fuels and vehicles. The partnership seeks to improve air quality across the developing world by encouraging development of cleaner fuels, such as unleaded and low sulphur gasoline and gas oil and improved technologies such as catalytic converters that can greatly reduce exhaust fumes (SADC Today, 2009). The Dakar Declaration among other things sought to request regional blocs like SADC and the Economic Community for Western African States (ECOWAS) to endorse the phasing out of leaded gasoline in their priority programs and to contribute to the harmonization of standards and technical specifications (Clean Air Initiative, 2009). In the SADC region, the phase-out of leaded gasoline was prioritized and the target of before 2006 was achieved by most SADC countries. Lead is a biodegradable, non-corrosive metal. In addition to being an additive in petrol, it is also used in paints, vehicle batteries, candles, mobile phones, computers, televisions and many other things.

Exposure to lead occurs mainly through inhalation and ingestion and causes a range of different ailments especially in middle aged and older individuals (SAHealthinfo, 2009). Exposure to lead even in small amounts causes irreversible neurological damage in children resulting in reduced school performance and lower test scores and may further result in a decline in lifetime earnings. In

adults impacted upon by lead, hypertension, reproductive disorders, and other adverse neurological outcomes may be observed. High exposure to lead causes reproductive disorders, severe damage to the brain and kidneys in adults or children and ultimately death depending on the duration and extent of exposure. Exposure to lead is even more dangerous for the young and unborn children and may result in premature births, smaller babies, decreased mental ability in the infant, learning difficulties and reduced growth in young children.

Most SADC countries with the exception of Mozambique and Zimbabwe (SADC Today, 2009) had by 2008 managed to phase out leaded petrol. The two countries however indicated that they would phase out the use of leaded petrol soon.

3.0 Case Studies on Lead Pollution in the SADC Region

Even though SADC countries committed to phase out leaded gasoline by 2006, most of them only managed to do so by 2008. On a continental level, this was achieved mainly through the Dakar Declaration of 2001 while at regional level the Harare Resolution of 1998, Maputo Declaration of 2003 and more recently, the Lusaka Agreement of 2008 have all had different levels of influence on reducing lead pollution. All these efforts generally deal with air pollution while the Dakar Declaration specifically dealt with lead pollution. This has been a key instrument in tackling lead pollution in the region as SADC member states are also party to the agreement.

Despite such efforts, there are other ways through which the heavy metal can pollute the environment and affect health. Furthermore, despite lead being a pollutant that greatly compromises human health, for a long time in both these countries there were no programs to promote community awareness about its harmfulness. This section shows how lead can affect the environment in the absence of awareness programs, government regulation and institutions to protect the environment, and the section also shows how pollution can compel such legislation and institutions to be enacted and established.

3.1 Lead Pollution in Zambia

Kabwe is the provincial capital of Zambia's Central Province. It is located about 140 km north of Lusaka, the capital city of Zambia, as shown in figure 3. The former Zambia Consolidated Copper Mines (ZCCM), a giant government mining conglomerate, owned and operated mines in most of the Copperbelt Province including the zinc and lead mines in Kabwe. Mining of lead in Kabwe started in 1904 and ended in 1994. However, ZCCM mines were individually sold to different buyers with some of the shareholding in selected mines being retained by a newly created investment holding

company, Zambia Consolidated Copper Mines Investments Holdings (ZCCM – IH), in the mid 1990s.

3.1.1 Lead contamination in Kabwe

Kabwe's mines, which had deposits with lead concentrations greater than 20%, mined deep in the earth as smelters to process the ore were also set up (Afro, 2009). The rich deposits consisted of silicate, oxides and carbonates of lead that averaged 34% in lead concentrations. Although the city's mines generated substantial revenue for ZCCM, no attention was ever paid to its residents as the lead mines polluted the environment without any action from the authorities. The lack of action on pollution was due to the country not having any regulations or environment laws during the entire period of close to a century of mining operations in Zambia. This was a careless oversight on the part of the colonial and post colonial governments. Smelters too were unregulated as they emitted dust sized particles that settled in the surrounding areas. Even though Kabwe's mines are no longer operating, its remnants have poisoned the city with lead. In most affected places such as Katondo Township where lead is highly concentrated, especially in slag heaps, soil concentration of up to 2400 micrograms/deciliter (mcg/dl) and blood concentration of up to 200 mcg/dl were recorded in children with an average concentration ranging from 50 mcg/dl to 100 mcg/dl. Blood concentration of 20mcg/dl or greater will result in vomiting and diarrhea while a concentration of 100 mcg/dl is enough to impair brain development in children. Blood concentration in excess of 120 mcg/dl often leads to death. The recommended or permissive level of lead in blood in the United Sates is up to 10 mcg/dl (Afrol News, 2009)

In certain cases, soil dispersal from the smelters and mining areas through wind up to a circumference of 20 kilometres in the surrounding areas of Kabwe, reveal higher than normal concentrations of lead, zinc, cadmium, copper (Afrol News, 2009). As a consequence, Kabwe's vegetation, soils and water are contaminated with lead (BBC, 2009).

Clinical tests taken as early as 1970 indicate that children in Kabwe are exposed to lead poisoning. Even recent studies on children in Kabwe have shown lead concentration of up to 300 mcg/dl with an average level ranging between 60 mcg/dl to 120 mcg/dl (Science in Africa, 2009). In a similar report on lead pollution in Senegal where people died as a result of recycling vehicle batteries in their backyard in order to sell the lead contained in them.

When the symptoms of lead poisoning first showed up in Kabwe, the community misconstrued them to be ailments of a type of malaria until the health authorities notified them that the ailments were due to lead poisoning. The area that was most affected was Katondo - a township located beside a

stream that had previously been used to ferry waste from the mine. The groups most affected are children and youths scavenging the mine heap for lead remains which if found would be sold.

Due to the lead pollution, the Afrol News (2009) reported that the New York based Blacksmith Institute Report for 2006 ranked Kabwe as the fourth most polluted city in the world. It depicted the city as an example of how large-scale mining pollution in a low income country can affect the health of thousands of poor families.

3.1.2 The Copperbelt Environment Project (CEP)

After the sale of the Zambia Consolidated Copper Mines (ZCCM) in 1995 as part of the privatization agreement for the copper mines, the Zambian Government through ZCCM – IH retained the environmental remediation measures of pollution as new mine owners could not be held liable for the problem they did not create. Therefore, potential new mine owners negotiated that Government inherit such liabilities. As a result, the Copperbelt Environment Project (CEP) was established under ZCCM - IH in 1997 for that purpose. Its establishment was also partly due to pressure on Government of the Republic of Zambia from local environmental groups and the international community to do something about the lead pollution in Kabwe.

With assistance from a consortium of western donors including the World Bank and the Government of the Republic of Zambia, the CEP was therefore developed. The consortium of donors pledged US$50 million with the World Bank providing US$19 million in loans and US$21millon as grant (World Bank, 2009) while the Nordic Development Fund provided the rest - US$10 million (Langmead, 2009). US$15 million was exclusively set aside for Kabwe and the Copperbelt Province for remedial measures for lead contamination and the careful disposal of uranium, respectively.

The aim of the CEP was to clean up hazardous mining areas in the country and protect people from further pollution by strengthening institutions responsible for controlling pollution so that what happened in Kabwe does not happen again anywhere in Zambia irrespective of the pollutant. In the first phase, the project focuses on the remedial measures of which examining the exact extent of the damage shall be undertaken, while strengthening institutions responsible for environmental management, particularly in the mining areas, will be the focus in the second phase. The Environmental Council of Zambia (ECZ), a national regulatory institution, is involved in the project by approving the remediation measures. Ideally, the long term solution to this problem is to cover the mine dump with vegetation or cap it with concrete in order to prevent pollutants from being blown across the town.

In September 2003, ZCCM – IH, through the CEP, requested the 2000 Katondo residents to relocate from their canal side houses so that the CEP could dredge the clogged canal so that in the event of flooding during that year's rainy season, the flooded canal waters may not carry the toxins into people's gardens and yards. However, the residents resisted temporary relocation stating that they did not have alternative housing. This therefore increased the probability of having a repeat of what happened in the previous year's rain season when the canal flooded onto its banks and into people's gardens (BBC, 2009). It is evident that community awareness of lead contamination was low; therefore, efforts to educate the community about lead poisoning were initiated by the Kabwe Environment and Rehabilitation Foundation (AFrol News, 2009).

The Daily Mail of Zambia (2010) however reports that the project has so far achieved eleven major milestones that will minimize the health impact of lead contamination. These include the removal of 39,000 cubic meters of mine waste that had deposited at the road slag dump, demolition of defunct plant infrastructure, removal of 51,000 cubic meters of dredged sediments from the canal margin (a waterway running from the mine to the town centre), the construction of eleven lead free play parks and rehabilitation, establishment of an information dissemination centre with the civic authorities office and construction of boreholes.

None of the reports studied so far address the core problem of dealing with lead pollution either by relocating families in most affected areas or ensuring that mine dump sites are contained by preventing further contamination of sites that are currently not affected. Furthermore, besides the brief reports of successes of the project in the Daily Mail of Zambia, there are no other reports that give detailed records of achievements of the Copperbelt Environments Project's. Further, attempts to relocate people without giving them a relocation site was a great oversight. It was therefore obvious that the affected families would not relocate. However, they may still continue to be affected by the contamination despite the canal getting dredged because some toxins could still be present. Much more needs to be done by giving them alternative shelter and compelling them to relocate. This is for their best interests in terms of personal health and the nation's at large.

3.1.3 Zambia's Environmental Policy

As referred to earlier, the ECZ, a national regulatory institution, is responsible for environmental regulation in Zambia. ECZ was established by the Environmental Protection and Pollution Control (EPPC) Act (Act 12 of 1990) to implement the environmental policy of the Zambian Government while the institution only started operating in 1992. Prior to the enactment of the EPPC Act, no environmental regulation existed in Zambia. The Act has many provisions including guidelines on water, air and the careful disposal of garbage. However, the guidelines on environmental impact

assessment state that for all infrastructure developments of a certain scope, an environmental impact assessment has to be undertaken and approved by the Environmental Council before any construction could start. The Act further provides that based on the impact assessment results, in the event that the Council disapproves the development of a project, the potential developer may appeal to the minister responsible for environment who in this case is also empowered by the EPPC Act to either overrule or approve the decision of the council irrespective of the results of the environmental impact assessment.

The observation of such a law is that it may promote the unsustainable use of the environment because in the ministers view, the project seemingly may lead to economic growth, however, when a proper analysis taking into account all the impacts of the project, including the environmental impact, the results may reveal that environmental costs outweigh the benefits of the project. As such, the net benefit of the development process may be negative. Such a scenario would inevitably create environmental problems for future generations and is therefore unsustainable. It is therefore important if phase 2 of the CEP could also address this matter by establishing that the council's decisions be final, subject to review only by the courts.

3.2 Lead Pollution in South Africa

The South African case of lead poisoning is uniquely different from the Zambian case in many aspects. The South African case focuses on lead pollution in Besters, a semi-urban community in Durban, Kwa Zulu Natal Province where the lead levels in children were observed to be higher than 10 mcg/dl. As shown in figure 4, Durban is located in the eastern part of South Africa. The major sources of lead pollution in Besters are canned foods, air/dust/soil and traditional medicines. The different methods under which lead contaminates individuals have become a source of concern even though lead problem did not receive much attention until the mid 1990s.

3.2.1 Pathways of Lead

Different levels of airborne lead ranging from 0.56 mcg/dl to 1.8 mcg/dl occur in Durban for residential to industrial areas. By comparison, at a remote location near Durban lead levels were recorded at 0.26 mcg/dl. The higher concentration illustrates that large numbers of children in Durban are at higher risk than those residing outside the city. However, the prevalence of lead poisoning in Besters, a relatively remote location outside Durban city, is evidence of a wide health problem in the entire Durban area. However, currently, there are no studies to show how widespread the problem is. From the latter source of lead, it appears that children with very high levels of lead contamination would have contracted it from consuming cheap canned foods with lead solder. Other

sources of lead contamination are local pottery vanished with lead and rain water collected from roof tops made of materials that contain lead.

The South African case shows that there are different pathways of lead contamination resulting in excessive exposures to lead and probably leading to the high concentration of lead. It further suggests that with limited infrastructure like roads, electricity, piped water, hospitals and a local economy based on subsistence farming, such a situation may possibly increase the risk of lead contamination of children from traditional local foods, medicines and other causes. However, this argument seemingly appears not to make a lot of sense because lead contamination is closely associated with industrialization. Therefore, the less industrialized an area is, the less the likelihood of lead contamination. This argument may apply if the remote area is involved in an activity that exposes individuals to lead contamination. For instance, illegal vehicle battery operations where the locals remove the lead contained in them.

The levels of lead contamination in Besters do not show a significant relationship between lead and child risk behaviors contrary to what is typically found in other countries or other areas within South Africa. It is likely that the location of Besters in an area where there is heavy dust that often finds itself in both indoor and outdoor environments where children play may inevitably result in extensive contamination of the environment and may make it difficult to fully comprehend the exact source of contamination. Furthermore, the importance and existence of cottage industries on childhood lead levels in townships is an important aspect to consider. Most household heads had informal jobs or were self employed with a number of them involved in repair of appliances such as batteries, electronics, welding and paint finishing. Such activities utilize lead solder and lead compounds and can result in extensive contamination of the home environment. It is possible that such activities are responsible for the lead contamination in Besters Township

3.2.2 Efforts to Address Lead Pollution in the 1980s

However, despite the few reports showing how chronic lead poisoning has affected children of Cape Province, the study in Kwa Zulu Natal also showed other places in South Africa that are affected by lead and possibly many others are yet to discovered. Despite such reports, public awareness on lead pollution in South Africa in the early 1990s was very limited with not much effort to identify and address the root causes of the problem (Nriagu, 1996). One prominent method of controlling airborne lead pollution was the removal of lead from gasoline which apparently was one of the major contributors to lead pollution even though this did not exclusively solve the problem. Apparently, the benefits of removing lead from gasoline were not immediate as children aged from 4 to 6 years old in Cape Town were found to have the same average levels of lead as before, 10 years after the

introduction of unleaded gasoline in 1983 (Nriagu, 1996). The average level of lead had therefore remained constant between 1982 and 1991. However, the observation that even though lead had been removed from gasoline, leaded gasoline continued to be sold on the market alongside unleaded gasoline because the South African Government could not put a ban on leaded gasoline lest they inconvenience consumers who owned old vehicles that could not use unleaded gasoline. The decision to completely remove leaded gasoline in South Africa, as in most SADC countries, became effective in 2006.

3.2.3 South Africa's Environmental Policy

From 1965 to 1998, South Africa's environment was regulated by the Atmospheric Pollution Prevention Act (APPA) 45 of 1965. This Act sought to reduce or regulate pollution but had many shortcomings including the lack of a national air quality standard and the lack of compliance and enforcement provisions or carrying out sanctions against those violating the Act. Therefore, enforcement of removing leaded gasoline from the market would have been difficult under the laws then. However, since the manufacture of unleaded gasoline is undertaken at refineries, it is possible that in such a case, violation of the law would not be possible. In view of such a weak law, and the lack of attention to environmental issues prior to 1994, the South African Government introduced the National Environmental Management Act (NEMA), (Act 107 of 1998). The NEMA was introduced following a comprehensive consultative process that took place after the adoption of a new constitution in 1996, which had also laid the foundation for such a law to be enacted.

NEMA sets out a series of environmental management principles that apply to the interpretation and application of all legislation that may affect the environment (Envolve, 2008). Therefore, since 1998 various statutes that fall under NEMA have been enacted. These are the Air Quality Act (Act 39 of 2004), the Biodiversity Act (Act 10 of 2004) and the Protected Areas Act (Act 57 of 2004). Through these statutes, standards are set by the minister responsible for the environment while environmental management inspectors, on air quality for instance, are empowered to monitor compliance to standards. In order to effectively monitor the environment, violation of environmental regulations and standards has been made equal to a criminal offence while inspectors have been granted more authority and powers. Furthermore, more legal provisions for inspectors to work with public prosecutors, the police as well as other law enforcement officers were established. Therefore, all economic agents violating environmental regulations shall be prosecuted. For instance, if an inspector has reason to believe that a vehicle, ship or plane has banned toxic substances on board, the inspector, working with the legal enforcement officers like the police, has the authority to delay or cause to delay the vehicle, ship or plane until a thorough search is undertaken.

4.0 Lessons Learnt and Conclusion

ZCCM operated its Kabwe mines from 1904 to 1994. During this period, the mines operated without any government regulations on environmental pollution. Therefore, the only restraint ZCCM could have had on pollution was its own internal pollution controls. Because of the lack of environmental controls by the Government of the Republic of Zambia, over time, the environmental cost became huge and needed to be corrected without any further delays. Ideally, Government should have established and developed environmental safeguard agencies to minimize the environmental damage. This situation is different from South Africa where, through efforts to reduce lead pollution, the Government had as early as 1982 introduced unleaded gasoline. However, this regulation was not strictly implemented as the South African Government could not do so because there were old vehicles that still operated on its roads and could not use unleaded gasoline. In Zambia, however, such efforts by the Government only came much later after 90 years of environmental damage through mining and other means. In any case, regulations specifically dealing with exhaust lead pollution were fully implemented in 2006. Moreover, an institution to regulate pollution in Zambia was only established in 1990, therefore, all the pollution prior, was never controlled. In this respect, it may not be possible to fully estimate the environmental damage by lead for the entire period. It is therefore highly likely that any estimates made on the damage by lead may not reflect the true cost of the damage and are therefore underestimated.

From the two cases of Zambia and South Africa, it is clear that a comprehensive awareness program on lead pollution in both countries was lacking until the problem became pronounced and that perhaps pollution, particularly lead pollution, did not get much attention then especially in Zambia. For instance, in Zambia, only recently was knowledge on this matter been widely shared. This was after the CEP was initiated. The media has publicized the sources of lead pollution in Kabwe while the CEP has implemented awareness programs on prevention. We can therefore conclude that the majority of the people, particularly the local communities are now aware of the problem and have at least taken some minimum precautions even though, it has also been often reported that some individuals still go to the lead mine to scavenge for the mineral remains in the hope of reselling. Furthermore, even though the target group was Kabwe, there are spillover benefits to other mining areas where individuals are now at least informed of the pollution problems that may potentially result from mining.

Furthermore, unlike the South African case, the Zambian case did not consider the different pathways through which lead could compromise human health. In the initial assessment of how widespread the lead contamination in Kabwe was, the CEP did not show if there were other sources of lead contamination besides the defunct mines. It is therefore possible to deduce that the mining

activities in Kabwe were solely responsible for the lead contamination. The two cases further show the different methods used to reduce the misery of the local communities after the contamination had taken place. Even if none of these methods remedy the problem immediately, they at least lay the foundation or set a precedent for addressing similar problems in future. They have done this by enacting or seeking to strengthen the legal framework under which oversight pollution institutions operate.

In both countries, there was at least a period characterized by weak or no enforcement of legal environmental provisions or even worse a period characterized by non-existence of environmental regulations. Zambia did not have a legal regulatory framework while South Africa feebly enforced environmental laws and did not set environmental standards. Therefore, the expectation is that the general negative environmental impact in both countries may be greater than estimated.

Despite enacting legislation to deal with environmental pollution two years earlier, the ECZ only started in 1992. Since then, ECZ still has only two offices, one each located at headquarters and the Copperbelt Regional Office where most of the mines are located. While the inspectors have a range of authority and powers under the EPPC Act, similar to their South African colleagues under Air Quality Act, they lack numbers which may compromise the quality of work done. Notwithstanding the size and population of South Africa, its environmental inspectorate has a presence at headquarters and at provincial level. The challenges of environmental degradation are vast stretching beyond mining to other basic factors such as careful disposal of garbage. If the motive is really to protect and to guarantee the health of its citizens, Zambia must therefore increase its inspectorate team to cover all areas especially those that are relatively more industrialized.

It is possible that many developing countries may experience a similar situation as Zambia where pollution went on for close to a hundred years unabated. In such a situation it becomes difficult or expensive to implement corrective measures. Even though expensive, it is necessary to implement corrective measures rather than not to do anything at all or defer such measures. It is therefore more prudent to implement a development agenda simultaneously with an environmental management plan so that the health of the local people is not compromised.

Moreover, if an environmental management plan is implemented along with a development plan, a country like Zambia may reduce the burden of having to borrow funds from institutions like the World Bank in order to implement corrective measures after the environmental damage has occurred. In conclusion on this matter, it is therefore important to implement the right policy the first time and save on the environmental cost and on loans than to implement follow up remedial policies. For

instance, Zambia is in the process of finalizing the development of the Sixth National Development Plan (SNDP) whose implementation will begin in 2011. The SNDP has strategies for different sectors, for instance on infrastructure development, so the SNDP must also have a component on environmental management so that implementation of infrastructure programs includes environment measures as well. Furthermore, as is the case in least developed countries, most of them may have plans which, though they exist on paper, may lack the willingness or commitment from Government to be implemented. Therefore, if the environment is to be preserved for future generations, there must be greater commitment to not only develop but to implement the plan as well. If such commitment exists, what it guarantees is prevention of the mistakes made on mining in the last century characterized by a lack of Government regulation and institutions to monitor pollution in places where mining is taking place.

Phase II of the CEP will be implemented after the current phase I. Phase II will deal with strengthening the regulatory powers of the ECZ so that it will be able to effectively deal with environmental regulation and avoid the reoccurrence of what happened in Kabwe and other mining areas. Phase II must at least deal with environmental regulation where the minister responsible for the environment has powers to overrule the decisions of the council. This particular aspect deals with the provision that states that for all infrastructure development of a certain scope, an environmental impact assessment has to be undertaken and approved by the Environmental Council of Zambia before the project is implemented. The Act further provides that based on the impact assessment results, in the event that the Environmental Council of Zambia does not authorize the development of the project, the potential developer may appeal to the minister responsible for the environment who also has authority under the same EPPC Act to overrule the decision of the council irrespective of the results of the impact assessment. Such a law is retrogressive to development because in instances when you have a corrupt minister, the minister may always overrule the Council and this may have devastating implications on the environment, especially for future generations. Therefore, the new regulatory powers must among other things review the EPPC Act such that the council may be the final authority on environmental issues as opposed to having the minister responsible for the environment.

5.0 Bibliography and References

About.Com: Geography (2009), Largest Continent – The World's Largest Continent, Continents Ranked by Area and Population, Retrieved from <http://geography.about.com/od/lists/a/largecontinent.htm>

Afrol News (2009), Zambia's Kabwe: Worlds most polluted place, Retrieved from <http://www.afrol.com/articles/22087>

All Countries (2010), Quick Maps for the World, South Africa Map, Retrieved from <http://www.theodora.com/wfb/south_africa/south_africa_maps.html>

All Countries (2010), Quick Maps for the World, Zambia Map, Retrieved from <http://www.theodora.com/maps/new9/zambia_map.gif>

British Broadcasting Corporation (2009), Zambia's Child Poisoning Tragedy Retrieved from <http://news.bbc.co.uk/2/hi/africa/3241037.stm>

Development Zambia (2009), Money Secured to Tackle Pollution, Retrieved from <http://www.langmead.com/development/copy/17.htm>

Carbon Dioxide Information Analysis Centre (2009), Retrieved from <www.cdiac.ornl.gov>

Clean Air Initiative (2009), Regional Conference on the Phasing Out of leaded Gasoline in Sub-Saharan Africa – Dakar Declaration, Retrieved from <http://www.cleanairnet.org/ssa/1414/articles-36204_dakar_pdf.pdf>

Copperbelt Environment Project (2009), About Copperbelt Environment Project, Retrieved from <http://www.cepzambia.org.zm/>.

Southern African Institute for Environment Assessment (2009), Environmental Impact Assessment in Southern Africa: Summary and Future Focus, Retrieved from <http://www.saiea.com/saiea-book/Summary1.pdf>

Daily Mail of Zambia (2010), Zambia Consolidated Copper Mines – Investment Holdings (ZCCM-IH) Undertakes Lead, Retrieved from

<http://www.daily-mail.co.zm/media/news/viewnews.cgi?category=8&id=1260781870>

Envolve (2010), Enforcement of Air Quality in South Africa, An Overview prepared for the United Nations Environment Programme, Eastern Africa Workshop for better Air Quality in Cities, 21st-23rd October 2008, Retrieved from <http://www.unep.org/urban_environment/PDFs/EABAQ2008-airqualitylegislationSAOct08.pdf>

Google Maps (2010), Map of Zambia, Retrieved from, <http://www.allcountries.org/maps/zambia_maps.html>

Interpress (2009), Africa Registers the Fastest Growing Economy, Retrieved from, <http://www.hartford-hwp.com/archives/30/091.html>

Southern African Development Community Today (2009), Volume 8, Number 4, Retrieved from <http://www.sardc.net/editorial/sadctoday/view.asp?vol=223&pubno=v8n4&page=SUMMIT>

Southern African Development Community Today (2009), Volume 10, Number 6, Retrieved from <http://www.sardc.net/editorial/sadctoday/documents/v10n6.pdf>

Southern African Power Pool (2010), Southern African Power Pool, Statistics - 2008, Retrieved 2010, <http://www.sapp.co.zw/viewinfo.cfm?id=47&linkid=2&siteid=1>

Science in Africa, Africa's First On-Line Science Magazine (2009), Lead Poisoning – Neighbourhood May Relocate, Retrieved from <http://www.scienceinafrica.co.za/2005/march/zambialead.htm>

South Africa Health Information (2009), Burden of Disease, Retrieved from, <http://www.sahealthinfo.org/bod/lead.htm>

University of Western Cape (2009), Acid Rain, Retrieved from, <http://www.botany.uwc.ac.za/Envfacts/facts/acidrain.htm>

United Nations Environment Programme (2009), Lusaka Agreement 2008 – Southern African Development Community Regional Policy Framework on Air Pollution, Retrieved from, <http://www.unep.org/urban_environment/PDFs/SADC-LusakaAgreement.pdf>

United Nations Environment Programme, Retrieved from (http://www.unep.org/DEWA/Africa/docs/en/AEO2_Our_Environ_Our_Wealth.pdf), 2009

Oxford Journals (2009), The Royal African Society, Zambia Under the International Monetary Fund Regime, <http://www.jstor.org/pss/722896>

Wikipedia (2009), Kyoto Protocol, Retrieved from, <http://en.wikipedia.org/wiki/Kyoto_Protocol>

Wikipedia (2010), List of Countries by GDP Growth, Retrieved from, http://en.wikipedia.org/wiki/List_of_countries_by_GDP_growth_1990%E2%80%932007

World Bank (2009), Zambia: Copperbelt Environment Project, <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/ZAMBIAEXTN/0,,contentMDK:20100085~menuPK:375716~pagePK:2865066~piPK:2865079~theSitePK:375589,00.html>

World Bank (2009), Africa Development Indicators for 2008-09

Table 1: GDP per capita

Series : GDP per capita (constant 2000 US$)

	2002	2003	2004	2005	2006	2007	2008
Angola	710.9	711.8	767.4	898.7	1,036.2	1,213.3	1,356.8
Botswana	3,783.1	3,975.9	4,189.4	4,335.8	4,410.7	4,541.0	4,440.0
Congo, Dem. Rep.	81.5	83.6	86.4	90.4	92.4	95.4	98.5
Lesotho	424.5	437.2	453.3	453.0	486.2	508.1	525.2
Madagascar	221.7	236.6	242.2	246.4	251.7	260.2	270.8
Malawi	129.2	133.9	137.9	137.9	145.4	154.0	164.7
Mauritius	4,003.9	4,089.1	4,244.7	4,403.5	4,526.5	4,709.2	4,928.7
Mozambique	270.4	279.7	294.7	312.4	332.4	349.1	364.7
Namibia	2,133.6	2,194.4	2,432.4	2,461.9	2,603.3	2,665.3	2,692.4
Seychelles	7,266.5	6,913.0	6,740.4	7,209.0	7,650.5	8,164.6	8,267.4
South Africa	3,127.8	3,186.3	3,301.9	3,425.5	3,569.9	3,715.8	3,763.8
Swaziland	1,391.3	1,436.6	1,463.3	1,483.1	1,509.2	1,542.2	1,558.5
Tanzania	287.7	296.0	307.5	321.1	333.3	347.1	362.4
Zambia	317.9	328.6	338.8	348.3	361.3	374.5	387.3
Zimbabwe	549.8	492.9	474.9	450.3			

Source: World Bank

Table 2: GDP growth

Series: GDP growth (annual %)

	2002	2003	2004	2005	2006	2007	2008
Angola	14.5	3.3	11.2	20.6	18.6	20.3	14.8
Botswana	3.3	6.3	6.5	4.7	3.0	4.2	-1.0
Congo, Dem. Rep.	3.5	5.8	6.6	7.9	5.6	6.3	6.2
Lesotho	1.6	3.9	4.6	0.7	8.1	5.1	3.9
Madagascar	-12.7	9.8	5.3	4.6	5.0	6.2	6.9
Malawi	-4.4	6.3	5.7	2.6	8.2	8.6	9.7
Mauritius	2.7	3.2	4.7	4.6	3.6	4.7	5.3
Mozambique	8.8	6.0	7.9	8.4	8.7	7.0	6.5
Namibia	4.8	4.2	12.3	2.5	7.1	4.1	2.7
Seychelles	1.2	-5.9	-2.9	7.5	8.3	7.3	2.8
South Africa	3.7	3.1	4.9	5.0	5.3	5.1	3.1
Swaziland	1.8	3.9	2.5	2.2	2.9	3.5	2.5
Tanzania	7.2	5.7	6.7	7.4	6.7	7.1	7.5
Zambia	2.7	5.7	5.4	5.2	6.2	6.2	6.0
Zimbabwe	-4.4	-10.4	-3.8	-5.3			

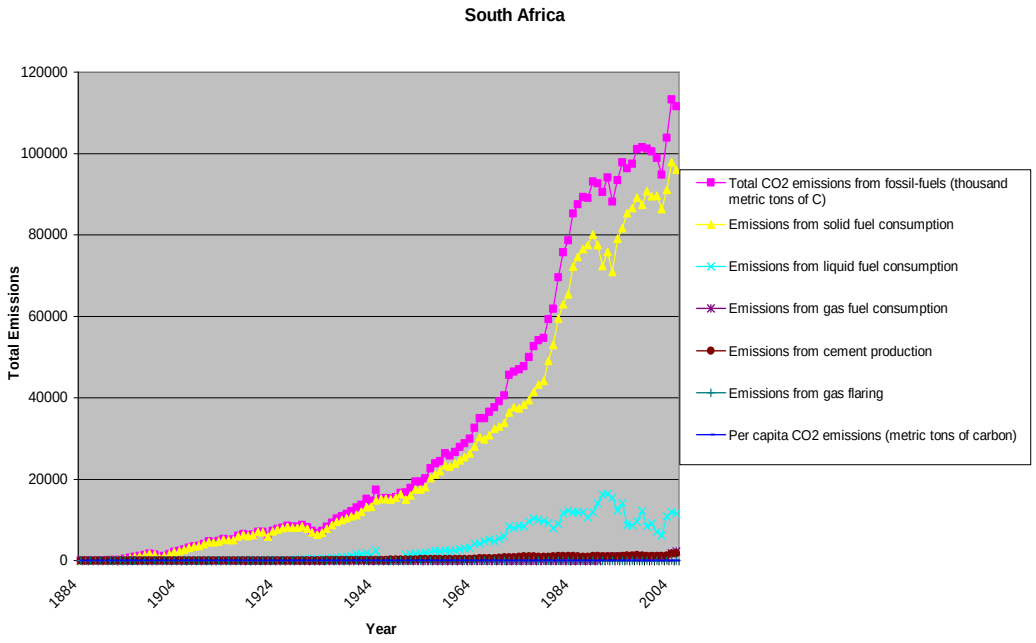
Source: World Bank

Table 3: Electricity Demand Forecast

Annual Maximum Peak Electricity Demand Forecast MW								
Country	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Angola	897	1016	1114	1217	1320	1426	1540	1657
Botswana	563	675	737	795	817	864	904	928
Congo, Dem. Rep.	1179	1220	1262	1306	1351	1398	1446	1496
Lesotho	111	117	123	127	132	138	144	150
Malawi	268	287	306	376	394	412	430	448
Mozambique	418	478	557	583	609	636	662	714
Namibia	475	485	509	531	576	599	623	651
South Africa	38201	39811	41524	43283	45125	47085	49116	51204
Swaziland	204	213	223	233	245	255	264	271
Tanzania	772	810	844	879	916	955	995	1037
Zimbabwe	2186	2230	2281	2345	2414	2484	2558	2643
Zambia	1752	1908	1935	2095	2341	2395	2420	2446
Total	**47026**	**49250**	**51415**	**53770**	**56240**	**58647**	**61102**	**63645**
% Change		**4.73**	**4.40**	**4.58**	**4.59**	**4.28**	**4.19**	**4.16**

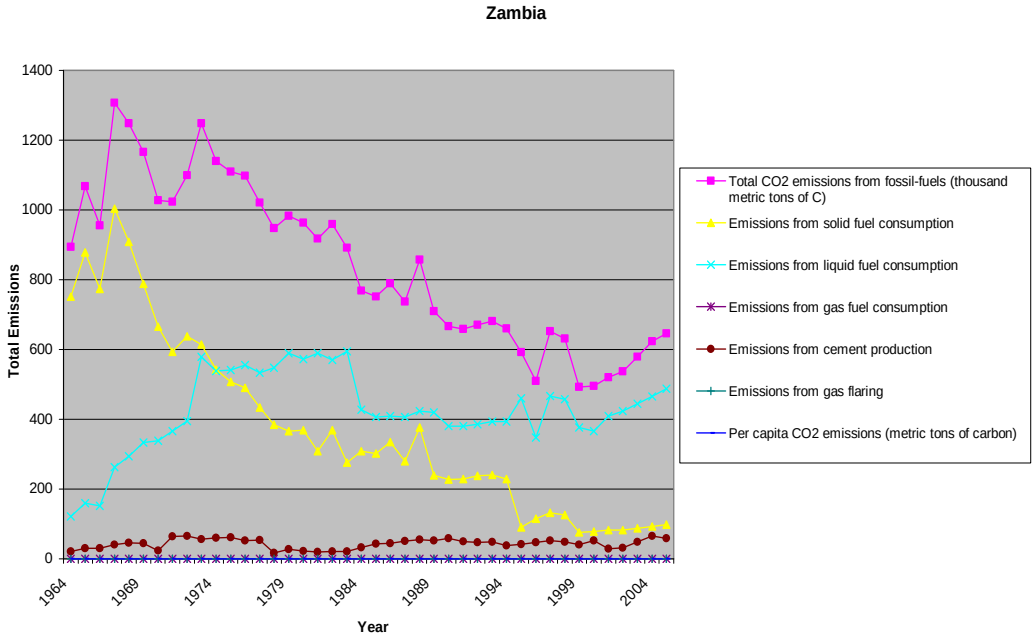
Source: Southern African Power Pool (SAPP)

Figure 1: Greenhouse Emissions in South Africa



Source: Carbondioxide Information Analysis Centre (CDIAC)

Figure 2: Greenhouse Emissions in Zambia



Source: Carbondioxide Information Analysis Centre (CDIAC)

Figure 3: Zambia Map

Source: All Countries

Figure 4: South Africa Map

Source: All Countries