

# Conflict implications of coal mining and environmental pollution in South Africa: Lessons from Niger Delta, Nigeria

*Adejoke C. Olufemi, Paul O. Bello and Andile Mji\**

## **Abstract**

Globally, mining and combustion of fossil fuels, especially coal, have resulted in various environmental problems. The adverse effects of these industries on human health, agriculture and the general ecosystem, and how they could result in conflict, have been widely reported. Firstly, this study examines the current state of environmental pollution at a few places in South Africa, and how it could possibly result in environmental conflict between the affected communities and the polluting industries. Secondly, using Nigeria as a case study, it suggests pre-emptive measures that can be taken to forestall such conflict. The issues raised in this study are supported by findings from previous studies conducted at Emalahleni, in the Mpumalanga Province of South Africa. This study used a mixed-methods

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\* Dr Adejoke Christianah Olufemi is currently a Research Associate in the Faculty of Humanities, Tshwane University of Technology, South Africa.

Dr Paul Oluwatosin Bello is a Lecturer in the Department of Criminology and Forensic Studies, University of KwaZulu-Natal, South Africa.

Professor Andile Mji holds the position of an Assistant Dean in the Faculty of Humanities, Tshwane University of Technology, South Africa.

approach involving interviews with relevant stakeholders and scientific analysis to prove the levels of pollution in the Emalahleni area. The levels of certain air pollutants which are commonly linked with coal combustion and mining activities were assessed at five different schools around mines. Based on these scientific and qualitative results and other issues raised in this study, a number of recommendations are made. It was found that air pollution is a problem which cannot be ignored and immediate action should be taken to avoid future problems.

**Keywords:** Coal mining, industries, pollution, environment, health implications, South Africa

## **Introduction**

Since the emergence of industries and technological advancement, our planet has faced many challenges which have put pressure on the global environment. One such challenge is environmental pollution, which is primarily caused by the mining and combustion of fossil fuels, such as coal. This has resulted in ancillary environmental problems such as environmental degradation, global warming and climate change. Environmental pollution through air, water, soil and other factors, has become a serious issue throughout the world, especially in industrialised environments. All these have had adverse effects on human health, plants and animals and have led to the general disturbance of the earth's ecological systems. The World Health Organisation (WHO) reported that an estimated 1.3 million deaths annually can be ascribed to urban outdoor air pollution (Morakinyo et al. 2016:1). Moreover, if not addressed in time, these problems foreshadow and may culminate in threats to human life from human conflict.

Air pollution, with its detrimental effects on human health, could be a result of indiscriminate or uncontrolled burning or combustion of different substances such as coal. Exposure to certain pollutants that come from those substances could result in chronic health conditions such as increased respiratory problems, reduced lung function and cardiovascular

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diseases (Albers et al. 2015; Brunekreef and Holgate 2002; Olaniyan et al. 2017; Samet et al. 2000; Stieb et al. 2002; Thaller et al. 2008). An increased number of deaths from respiratory diseases have also been reported (Laumbach and Kipen 2012; Jiang et al. 2016).

The effect of coal mining is not only limited to air pollution, but has further resulted in global warming all over the world. During coal mining activities, a number of greenhouse gases such as carbon dioxide, methane, nitrogen oxide and other heat-trapping gases are produced which remain in the atmosphere for several years once emitted (Lockwood et al. 2009; Hertwich et al. 2010). For example, the emission of carbon dioxide has drastically increased over the past years and continues to increase every passing year. Even though carbon dioxide is known to be the largest contributor to global warming yet, methane is 21 times more potent, since its greenhouse effect will become greater than that of carbon dioxide (Lloyd 2002:2).

The Natural Resources Defence Council has warned that '[w]ith current coal (and oil) consumption trends, we are headed for a doubling of CO<sub>2</sub> concentrations by mid-century if we don't redirect energy investments away from carbon-based fuels and toward new climate-friendly energy technologies ...' (Lashof et al. 2007:28). The effects of global warming have posed a great danger to human health, plants, animals and the general ecosystem. In fact, according to the Natural Resources Defence Council, '... global warming already is causing more severe storms, heat waves, droughts, and the spread of malaria and other diseases ...' (Lashof et al. 2007:28).

In the case of water, the continuous release of various chemicals from coal mines has drastically affected water quality all over the world. This has further resulted in acidification and degradation of the water, affecting the aquatic bodies and human health (Ali et al. 2017; Cloete et al. 2017; Mishra and Das 2017; Moschini-Carlos et al. 2011; Ochieng et al. 2010). For example, a study conducted in some rivers and stream sites in Australia revealed that these water resources contained different heavy metals at high

concentrations that were above the water quality guidelines for freshwater streams (Ali et al. 2017:1). A similar case was reported in Brazil where coal mining activities have seriously affected the water quality of three different lakes due to the presence of several metals at high concentrations which were above acceptable limits. The authors lamented that this detrimental impact has rendered the lakes unsuitable for human uses (Moschini-Carlos et al. 2011:280). All these reports agree with the United Nations Environment Programme (UNEP) reports which state that ‘... there is a global deterioration of water quality as a result of heavy metals concentration which has direct impacts on human health and environment ...’ (Ali et al. 2017:2). People exposed to water polluted with heavy metals released from coal mining such as Arsenic have suffered from a range of chronic health problems which include increase in blood cholesterol, cardiovascular diseases, cancer and high mortality rates (Ali et al. 2017).

Reports from several other countries have revealed that these environmental problems have resulted in conflicts. For example, Ukraine – one of the largest producers of coal in the world – has experienced lots of problems such as economic disruption, environmental damage, conflict, various health problems and even deaths. As a result of these, serious fights occur daily in Ukraine (Kashuba 2012). Further, reports from this country have indicated that despite all the various efforts put in place to combat these problems, these circumstances are still prevalent (Kashuba 2012). A report of The Environmental Law Alliance Worldwide (ELAW) indicated that ‘[i]t is the right of Ukrainians, and citizens of all countries, to live in a healthy environment with fresh water, clean air, abundant food, open green spaces, and diverse species’ (Weiskel and Voytsihovska 2014:2).

Similarly, China, the most industrialised and polluted country, over the past 30 years has also experienced serious environmental pollution problems with regard to contaminated air, soil and water, which have resulted in harmful effects on public health and environmental well-being (Hu et al. 2014:1). This severe pollution in China is reported to claim the lives of huge numbers of people every year. In fact, in the year 2015 alone, about

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1.8 million Chinese died as a result of environmental pollution (Yan 2017:1). Several reports have indicated that the pollution is not only affecting China but also neighbouring countries such as Japan and South Korea (Cain 2013; Galbraith 2013). This could possibly result in wars between China and these countries if care is not taken. The people of China, especially those in the most affected areas, experience critical problems from time to time with regard to their soil, water and health and this results in frequent protests against the government and the polluting industries (Xue et al. 2018; Zhang et al. 2014). In fact, Xue and others (2018:190) in their study went further to declare that ‘... environmental protest actions have come to be viewed as the most effective method of drawing government attention to environmental protection’.

South Africa’s experience with regard to the issues of pollution is not different from those reported in other countries. This is because South Africa largely depends on coal for electricity generation. Emalahleni on the Highveld of Mpumalanga province is the heart of South African coal production (eNCA News 2015). According to the Electricity Supply Commission (Eskom), this country produces about 224 million tonnes of marketable coal per year (Eskom 2016). This makes South Africa renowned as one of the largest exporters of coal worldwide, or, more specifically, the world’s fifth largest coal exporting country (Eberhard 2011; Eskom 2016). The country exports 25% of its production internationally while it uses 53% of the balance on electricity generation, 33% for petrochemical industries (Sasol), 12% for metallurgical industries (ArcelorMittal) and 2% for domestic heating and cooking (Eskom 2016:1).

### **Environmental pollution at Emalahleni**

Emalahleni (meaning place of coal), formerly known as Witbank, is located on the Highveld of the Mpumalanga Province, South Africa. As far back as the 18<sup>th</sup> century, coal mining activities have been in operation in this area and the largest number of South Africa’s coal fields are located here (Maya et al. 2015; Munnik et al. 2010). In addition, there are about 45 coal

mines and 12 power stations situated in this Highveld (Yende 2016) and on a yearly basis about 220 million tonnes of coal are mined in Mpumalanga (Baillie 2015). This is equivalent to around 90% of South Africa's annual total coal mine yield (Baillie 2015). Emalahleni also supplies the coal to neighbouring coal-fired plants. In addition, there are a number of smelting companies around the mines which use coal in the foundries (Maya et al. 2015). The effect of the mining, electricity generation and smelting industry in the area is the release of coal related gasses in very high concentrations (Pone et al. 2007). Emalahleni has the highest concentrations of these toxic substances in the atmosphere and is known to have the dirtiest air in the world (Maya et al. 2015; Munnik et al. 2010; News24 2013). This air pollution hotspot (Emalahleni) was declared by the Department of Environmental Affairs a Highveld priority area in terms of the National Environmental Management: Air Quality Act 39 of 2004 (Department of Environmental Affairs 2011; Munnik et al. 2010).

In view of the above-mentioned, conversations with a number of the town's residents revealed that almost every evening one would notice smog emanating from the mines and other related industries (personal communication, 15 September 2010).

### **South African coal and consequences**

South African coal is mainly used for electricity generation, and due to lack of suitable alternatives, the use of coal is unlikely to change over the next decades (Statistics South Africa 2005:10; Eskom 2016:1). While coal remains a very good source of energy, it has undeniably caused great damage to the health of the people of South Africa and the general ecosystem (Nkambule and Blignaut 2012). All these have also affected the country's economy in terms of monetary cost (Nkambule and Blignaut 2012). Similarly, acid mine drainage is reported to have caused great damage to South African water resources (Feris and Kotzé 2014; McCarthy and Humphries 2013).

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Below is an overview of how coal and its usage have resulted in destructive consequences in South Africa.

### **Effect on air**

Coal burning from power stations for generating electricity is responsible for high levels of air pollution in South Africa (Department of Environmental Affairs and Tourism 2005) and has caused a great hazard to human health and the South African environment in general (Munnik et al. 2010; News24 2013). Electricity generation in South Africa annually releases 170 million tonnes of carbon dioxide into the environment, as well as about 0.7 million tonnes of nitrogen oxides and about 1.5 million tonnes of sulphur oxides (Lloyd 2002:3). However, according to Department of Environmental Affairs (2014) these amounts have continued to increase over the years. The increased and continuous use of coal for energy is the major cause of global warming in South Africa (Nkambule and Blignaut 2012; Tongwane et al. 2016).

### **Effect on water**

Mining activities have had many effects on South African water resources for many years. Water drainage from coal mines is highly acidic and contains high concentrations of different toxic chemical substances (Council for Scientific and Industrial Research 2009). Acid mine water drainage in South Africa as in other countries over the years has resulted in serious degradation of the water quality. It is also regarded as one of the major causes of water pollution which has affected aquatic bodies (McCarthy and Humphries 2013). This affects the health of the people and animals that depend on the water for drinking (Bureau for Food and Agricultural Policy 2012; Ochieng et al. 2010).

As Mpumalanga is known to be a province where most of the South African coalfields are concentrated, the province is simultaneously regarded as a source for some of the country's most important rivers (Kardas-Nelson 2010). These rivers supply water to South Africa's major dams which are used for drinking, agriculture, and several other domestic purposes.

Unfortunately, all these water ways have already been polluted by the increased and continuous release of different toxic substances from the various mines (Council for Scientific and Industrial Research [CSIR] 2010). An example is the Olifants River, regarded to be one of the most polluted rivers in Southern Africa as a result of mining and power generation in the area (Department of Water Affairs 2011). Aquatic organisms have also been threatened and have become critically endangered as a result (World Wide Fund for Nature 2013). A study conducted in a certain stream site in Mpumalanga showed that several of the aquatic bodies were contaminated and died as a result of the presence of various heavy metals such as lead (Pb) and cadmium (Cd) (Cloete et al. 2017). In a situation where these contaminated organisms such as fish are consumed, they can pose a great danger to human health (Cloete et al. 2017; Ochieng et al. 2010).

This problem not only affects South African water resources, but also those of nearby countries such as Mozambique and Botswana (Kardas-Nelson 2010). This water pollution issue is likely to persist in South Africa for centuries to come (CSIR 2009), as a continuing environmental problem for future generations of South Africans.

### **Effect on agriculture**

South Africa has good soil for agricultural production, especially in Mpumalanga Province, and most of the South African coal mines are also located in this same province (Bureau for Food and Agricultural Policy 2012). The fact that this province has had good soil for agricultural production makes the province the largest producer and supplier of food in South Africa (Bureau for Food and Agricultural Policy 2012). Unfortunately, the activities of the coal mining industry have led to a high concentration of heavy metals in the soil, with consequent degeneration of that soil over the years (Ochieng et al. 2010). Specifically about maize, there has been contamination and death of several tonnes of this crop by the toxic elements in the past years and more tonnes are expected to be lost in the future (Bureau for Food and Agricultural Policy 2012).

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Farmers in Mpumalanga have continued to lament the severe pollution from the mining industries and to point out how this may result in a national food crisis if care is not taken. It was also expressed in a report of the Bench Marks Foundation that ‘... Mpumalanga is at the heart of South Africa’s maize triangle and coal mining is drastically reducing the land available for the growth of maize and it is also destroying the water required for farming ...’ (Bench Marks Foundation 2014:1). The severe pollution from coal mining activities has not only affected food crops but also animals in various ways. Farmers in this area have complained about how it has affected their cows’ drinking water, which, in turn, affects milk production and quality. There were also complaints by them about the negative effects on the fertility of their cows and their ability to reproduce (Bench Marks Foundation 2014).

### **Effect on human health**

Exposure to these toxic substances from coal mining could result in various health problems, such as cancer of some types, respiratory problems, cardiovascular problems and even deaths (Albers et al. 2015; Tang et al. 2008; Wright et al. 2011). Children as minors are especially vulnerable and can be affected to the extent that it can lead to lowered IQs, mental retardation and permanent loss of intelligence (Lockwood et al. 2009; Mathee et al. 2006; Okonkwo et al. 2001; Olaniyan et al. 2017). It is even worse for those that live, work or attend schools located in the vicinity of these industries. This claim was substantiated by studies of Bryan and Loscalzo (2017) and Guarnieri and Balmes (2014). They reported that people who live around industrial sources of contamination such as coal-fired plants are exposed to higher levels of whatever pollutants are being released, and are affected health-wise. In the same vein, a study conducted in schools located around mine dumps indicate that these school children are exposed to high levels of air pollutants such as sulphur dioxide (SO<sub>2</sub>) inside their classrooms. Some of them are reported to have suffered from asthma attacks as a result of exposure to these pollutants (Nkosi et al. 2017).

As a result of incorrect town planning in the past, some communities and residential areas were sited close to mines and industrial areas.

Unfortunately, those communities are continually exposed to whatever pollutants are being released from these industrial activities (Department of Environmental Affairs 2016:12). A conversation with one high school principal in Emalahleni revealed that there were approximately 15 mines in the general vicinity of her school (personal communication, 10 March 2011).

Another school's principal indicated that: 'Our children are constantly sick and hospitalised from time to time apparently without realising that their health issues may be linked to the pollution in this area' (personal communication, 15 September 2010). According to Environment Youth Activism (2014), many people in this area are already sick with different diseases as a result of continuously drinking dirty water and inhaling bad air as part of their daily lives. Although people in these communities may be aware that their health challenges may be linked to the pollution, they have no control over the problem.

A series of studies conducted in Mpumalanga has reported a connection between the pollution in the area and the people's health challenges (Albers et al. 2015; Environment Youth Activism 2014). Studies of children have revealed that they are more affected by this pollution and that this invariably happens within their homes and the school environment (Albers et al. 2015; Mathee 2003; Olaniyan et al. 2017).

These claims are supported by a previous study conducted in Emalahleni community (Olufemi 2012) in which conversations were held with school principals in the vicinity of the coal mines. A conversation with one principal revealed that the smoke and fumes from the mines, foundries and the power generating plants were affecting the schools and the health of the learners and staff (personal communication, 11 January 2011). When asked in what way, he indicated that learners who were subject to the effects of this pollution often fall ill. This, he argued, might be as a result of prolonged exposure to the nuisance from the industries that resulted in illnesses and 'undue absence from school'. He further pointed out that these problems are not limited to learners, but affect teachers too. One important issue the

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principal proposed was to investigate which pollutants could be affecting all those in the vicinity of the schools. This suggestion in fact prompted the scientific investigation which was incorporated in this study.

The researchers involved in this study decided to investigate the levels of certain air pollutants, which are commonly linked with coal mining activities, at five different schools around Emalahleni. Air samples were collected from within and outside the classrooms of these five schools and were later subjected to standard laboratory analysis. The results (as seen in the table below) reveal that these elements were detected within and outside the classrooms at various concentrations. The sampled air pollutants included sulphur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>) and compounds of lead (Pb).

**Table 1: Concentrations of NO<sub>2</sub>, SO<sub>2</sub>, and O<sub>3</sub> measured inside and outside the classrooms in each school**

School	Location	Sample ID	NO <sub>2</sub>	SO <sub>2</sub>	O <sub>3</sub>
			(µg/m <sup>3</sup> )		
School A	Inside	O-12-1680	19	4.8	40
School B		O-12-1691	20	3.0	10
School C		O-12-1693	20	6.0	30
School D		O-12-1695	26	38	26
School E		O-12-1697	28	8.8	18
School A	Outside	O-12-1690	9.9	17	110
School B		O-12-1692	24	20	82
School C		O-12-1694	19	17	110
School D		O-12-1696	24	84	66
School E		O-12-1698	27	31	75

Adapted from: Olufemi 2012; Olufemi et al. 2018.

For the sampling of Pb, a 'filter' was used. There were only two filters available which were placed at Schools C and E. At the point of retrieval, the filter placed on the school premises of school E was found to have been tampered with, so no results could be reported from it. Nevertheless, a

Pb reading could be reported from the filter at School C, and laboratory analysis indicated that the Pb density was just less than 0.007  $\mu\text{g}/\text{m}^3$ .

When the values in Table 1 are compared with the national air quality standard for South Africa for exposure durations, as shown in Table 2 below, it indicates that the reported air pollutants were below or at acceptable limits. It may be argued then, that no problem exists.

**Table 2: National ambient air quality standards for NO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub>, and Pb compounds**

	Averaging period	Density
NO <sub>2</sub>	1 hour	200 $\mu\text{g}/\text{m}^3$
	1 year	40 $\mu\text{g}/\text{m}^3$
SO <sub>2</sub>	10 Minutes	500 $\mu\text{g}/\text{m}^3$
	1 hour	350 $\mu\text{g}/\text{m}^3$
	24 hours	125 $\mu\text{g}/\text{m}^3$
	1 year	50 $\mu\text{g}/\text{m}^3$
O <sub>3</sub>	8 hours	120 $\mu\text{g}/\text{m}^3$
Pb compounds	1 year	0.5 $\mu\text{g}/\text{m}^3$

Adapted from: Department of Environmental Affairs 2004.

If prolonged exposure to these chemicals is taken into account, however, there is a problem to be dealt with. For instance, learners starting in Grade 8 in one of the schools are likely to be exposed to the pollutants for the next five years if they are to study there until Grade 12. According to the World Health Organisation (WHO) and other organisations, these chemicals are dangerous and are of great public health significance. They are all known to be carcinogenic and cause body organs and systems damage, even at lower levels of exposure, especially for the more susceptible populations (for example, the very young, the elderly, and the infirm) (Geiger and Cooper

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2010; Tchounwou et al. 2012; United States Environmental Protection Agency [USEPA] 2002a and 2002b; WHO 2007).

The argument raised in the present study can be confirmed with a similar study conducted in the same study area (Albers et al. 2015). These researchers examined respiratory health consequences and associated risk factors in children living in two highly polluted towns in Mpumalanga. The results indicate that they were exposed to air pollution both at their schools and homes. As a result, they were diagnosed with various health conditions (see table 3) which some of them had experienced from their childhood up till the present time. Several of the children were sometimes absent from school as a result of these health problems.

**Table 3: Prevalence of health conditions among children (N=627)**

Health outcome	(%)
Bronchitis	15.6
Asthma	7.1
Chest wheeze	11.4
Chest cough	10.1
Phlegm	25.6
Respiratory infections	34.1

Adapted from: Albers et al. 2015.

One can deduce from the above results that the pollution in the environment where the children learn and live has adverse effects on their health. However, the World Health Organisation declares that ‘... the physical, social and intellectual development of children require an environment, which is both protected and protective of their health. A growing number of diseases in children are linked to unsafe environments in which they live, play, learn and grow ...’ (South African Human Rights Commission 2001:323).

One would think that there will soon be a solution to all these problems. Unfortunately, it has been constantly reported that production of coal for electricity generation in South Africa will extensively increase in the future (Eberhard 2011; Statistics South Africa 2005). In other words, the more coal

is mined and burned for electricity generation in the course of time, the more health problems will be encountered – by present and forthcoming generations. It is very important that the environment where children live and learn is safe for their health.

### **Environmental pollution in the South Durban community**

Other than Mpumalanga province, there are some other areas in South Africa where pollution problems are serious. An example is the case of the South Durban community which has also been rated as one of the most polluted areas in South Africa as a result of activities from the petrochemical industries (Nriagu et al. 1999; Naidoo et al. 2013). The people in this community, as those of Mpumalanga, are being exposed to various toxic substances from the Industries on a daily basis (Department of Environmental Affairs and Tourism 2007). This pollution has negatively impacted the people, and has resulted in various health problems such as respiratory conditions and asthma (Nriagu et al. 1999; Department of Environmental Affairs and Tourism 2007).

Naidoo et al. (2013) conducted a study in this area and indicated that the most vulnerable group of people were the school children. They were more vulnerable than children in other areas of Durban and in the country. This is because schools are located around the industries and as a result, these children are exposed to all sorts of nuisance in their school environment (Naidoo et al. 2013). So many efforts have been made by government, organisations and activist groups to deal with these issues and to make sure that the people of this community enjoy a clean environment, but the problem has remained unabated (South Durban Community Environmental Alliance 2003).

The fact that the lives of many people in South Africa are being endangered due to exposure to pollution on a daily basis is a cause for great concern.

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Section 24 of the Constitution of the Republic of South Africa (1996:10–11) clearly states that ‘... everyone has a right

(a) to an environment that is not harmful to their health and well-being; and

(b) to have the environment protected for the benefit of the present and future generations, through reasonable legislative and other measures that–

(i) Prevent pollution and ecological degradation;

(ii) Promote conservation; and

(iii) Secure ecologically sustainable development, and the use of natural resources while promoting justifiable economic and social development’ (Goolam 2000:124; South African Human Rights Commission 2001:323).

### **South African youth awareness of pollution and conflict implications**

One thing that is clear from the above overview of the serious consequences of pollution in South Africa is: if the situation is not addressed immediately, it may cause full-scale conflict among the affected communities, the industries, and the government in the near future. Such clashes might arise, when the community members, especially the current youth, become conscious and aware of the health problems which may emanate from environmental pollution.

The growing awareness is acknowledged by a study earlier conducted in Emalahleni, Mpumalanga. This study investigates the awareness high school students have of environmental pollution. The study reveals that students’ level of awareness and knowledge of pollution is high (Olufemi 2012; Olufemi et al. 2016).

The argument is that as these young ones grow older and increase their knowledge and awareness, there is a tendency for them to raise issues which may lead to conflict. Environmental activists may also bring the attention of the community to the effects of pollution on the inhabitants’ health and the immediate environment. This may later give rise to incessant attacks

and counter-attacks, as well as various kinds of skirmishes experienced in other countries. It has become evident that the environmental activists have called the attention of the young ones to these problems, and that this awareness has gathered momentum in South Africa. The youth have become increasingly involved in interventions into environmental issues, and these activists are already protesting against the mining industries (Environment Youth Activism 2014).

Some of the youths in Mpumalanga have protested against the state of unemployment and poverty. They claim that since there are several mineral resources present in their area, especially coal, job opportunities should be created for them. They complain that the companies are capitalising on the resources and yet are unwilling to employ and compensate the workers. However, the companies continue to be responsible for pollution, emitting toxic gases causing great damage to the environment (Environment Youth Activism 2014).

A parallel can be drawn between the situations in the coal-producing Mpumalanga region and the oil-producing Niger Delta region in Nigeria. In the Niger Delta, environmental pollution was caused by gas flaring, oil spillage and a range of other harmful activities by the multinational companies. These resulted in negative impacts on people's health, agricultural activities and living conditions, to mention a few, and that led to the formation of different activist groups to protest against such injustices (Chukwuemeka and Aghara 2010). The direct consequence of the reactions was conflict, culminating in the loss of many lives and many adverse effects on the economy.

From the above-mentioned it can be gathered that South African youth can be similarly alerted to the implications of such environmental issues and become involved in protests against the industries and the government. The government of South Africa should not wait for this to happen before they begin to take necessary actions – as occurred in China where it is reported that ‘... environmental protest actions [conflicts] have come to be viewed as the most effective method of drawing government

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attention to environmental protection ...' (Xue et al. 2018:190). Although the situation is not as severe in South Africa, it can surely escalate and become exacerbated, following in the footsteps of riots occurring in other countries. That can be avoided, however, if the South African government starts taking preventive measures now.

## **Overview of conflict in the Niger Delta region of Nigeria**

One prominent skirmish that has marred the landscape of Nigeria since it gained independence from the British, is the Niger Delta conflict. The conflict cannot be divorced from the oil-palm price regulatory policy crises that pitted the indigenous Niger Delta communities against the British explorers during the colonial era (Oluwaniyi 2011; Obi 2006). This conflict witnessed the demise of several inhabitants of Niger Delta configuration on one hand, and on the other hand cemented a platform for a ground swell of persistent conflicts that have taken different forms in the region.

Following the discovery of oil in commercial quantities in Oloibiri in present day Bayelsa State in 1956, and the expansion in oil discoveries in other parts of the country, there was a shift in the calculation of wealth in the country, from palm oil to fossil oil, and the region was put in a strategic position both nationally and internationally. The radical shift contributed to the rise in the price of oil on the global oil market and an exponential increase in export earnings from crude oil from 1% in 1958 to almost 100% in the 1990s, as well as to generating almost 90% of the government revenue in the same period (Oluwaniyi 2010; Akande 2008).

Ironically, while the Transnational Oil Companies (TOCs) and the Federal Government of Nigeria (FGN) experienced a boom from the revenue generated from crude oil exploration, exploitation and exportation, the rural Niger Delta communities continue to suffer lack in the midst of plenty (Oluwaniyi 2010). Such lack was pummeled by incessant environmental pollution, particularly from oil spillage and gas flaring (Ajugwo 2013; Ebegbulem et al. 2013). The impacts of such pollution were reflected in the depletion of agricultural resources – including farm lands, the pollution of

rivers and drinking water, the death of aquatic animals, the extinction of gemstones, and health-related problems. These are in addition to spectrums of socio-economic problems such as poverty, hunger, unemployment and a poor standard of living (Ebegbulem et al. 2013; Nriagu et al. 2016; Oluwaniyi 2010). To make matters worse, very little attention was given to the development of communities despite all the damage done to their natural environment. The people live in the midst of plenty, yet they are poor, suffering and uncomfortable. The result of these incessant problems and effusive agitations has been violent conflict (Ajodo-Adebanjoko 2017; Nwankwo 2015). Although there were agitations for self-determination, resource control and equity, among other grievances of the Niger Delta communities, the occurrence of such skirmishes stems from the undulating impact of the above-mentioned environmental pollution and degradation.

Such negativities have fuelled a number of protests, demonstrations and agitations by people of Niger Delta configurations (Chukwuemeka and Aghara 2010). Unfortunately, most of such agitations have been suppressed by various regimes in the country, especially the military government. For example, environmentalists from the Niger Delta regions like Ken Saro Wiwa and eight other Ogoni chiefs were executed by one of the military regimes in Nigeria (Nwankwo 2015; Oluwaniyi 2010).

Since 1999, Nigeria's return to democracy brought another dimension to the entire conflict episode. This period witnessed a renewed involvement of civil societies, human rights and environmental activists, amongst others; their aim being to galvanise the Niger Delta people. Unfortunately, it very soon happened that the tensions and violent nature of the Niger Delta socio-political and economic milieu were exploited by politicians. Some of the youth became ready tools for thuggery, ballot snatching and other political crimes during elections, particularly between 1999 and 2003 (Chukwuemeka and Aghara 2010). Such thuggery, consolidated by booties from politics and the underlying agitations, resulted in full-scale militancy and insurgence activities in the region in 2006 (Oluwaniyi 2010).

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In addition to oil pipe-line vandalism and bunkering, these militants took to kidnapping and hostage-taking of TOC workers, to mention a few (Ajodo-Adebanjoko 2017). Repressive approaches by the FGN further aggravated the agitations and struggles of the Niger Delta people, most of which resulted in the emergence of insurgency cum militant groups. Prominent among them are the Movement for the Survival of Ogoni People (MOSOP), Movement for the Emancipation of Niger Delta (MEND), Niger Delta Volunteer Force (NDVF), Niger Delta People Volunteer Force (NDPVF), and the Tombolo Boys. According to Oluwaniyi (2011:49), these militant groups unleashed both 'lethal attacks and the sabotage of oil installations with the effective use of global media to publicise their campaign' of fighting for the emancipation of their people and communities.

When it became obvious that the efforts of the State were not yielding dividends, even with the establishment of commissions, such as the Oil Mineral Producing Areas Development Commission (OMPADEC) in 1992; the Petroleum (Special) Trust Fund (PTF) in 1995, and the Niger Delta Development Commission (NDDC) in 2000, a review of strategies became inevitable. Unfortunately, some of the new strategies are still very dictatorial, especially the Joint Military Task Force (JTF) that was set up to protect oil installations and the TOCs in a vacillating, troubled region (Chukwuemeka and Aghara 2010).

In 2009, the Federal Government of Nigeria (FGN), decided to adopt part of the recommendations of the Willink Commission of 1958, which had Disarmament, Demobilisation and Re-integration (DDR) as one of the conflict resolution models (Ebegbulem et al. 2013; Oluwaniyi 2011). This model was crowned by the granting of Amnesty to these militants. This initiative was applauded both locally and internationally, especially in light of the willingness of the militant groups to surrender their arms and embrace the presidential pardon. There was an improvement in government revenue due to an increment in oil production from 700 000 barrels to 2.4 million barrels per day (Oluwaniyi 2011). Kidnappings and oil-pipeline vandalism also witnessed a drastic reduction.

However, the initiative was not free from hitches. Within a few weeks after the expiration of the 60-day amnesty window, there were accusations and counter-accusations between government officials and the ex-militants concerning delay in payment of allowances, and corruption. Hence, the scheme became what Oluwaniyi (2011:52) described as ‘a very lucrative business, rather than a transformational strategy’. Moreover, such a scheme consumed enormous resources that could have been used to address other major perennial challenges facing the country.

### **Recommendations about pre-emptive measures**

From the above account, it is evident that if the South African government will not now rise up to take action about the present environmental state of the country, the implication is that South Africa is likely going to face even more problems than Nigeria and other countries have experienced. In addition, the future generations of South Africa may be laden with more problems. To avoid these, the following preventive measures should be taken now.

1. If the well-being of the people is to be of primary importance, it is fundamental that the environmental laws already on the books should be strengthened. The government should bear in mind that the reason why the environment must be free from pollution is that the health of the people can be protected.
2. Measures should be taken to reduce the emission of gases into the environment. This can be done by constant monitoring of the pollution in the environment in order not to exceed the acceptable limits. The South African government should present better legislation for the mineral resources industry.
3. Polluting industries or companies should be properly educated about the consequences of their activities and actions. This is essential because many of them might not know the implications of all these indiscriminate activities for human health and the general ecosystem. This will help the companies to begin to adopt effective measures to mitigate their emissions.

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4. Renewable sources of energy such as the sun, wind and water should be considered. These are more sustainable and are cleaner sources than coal. It is realised that the South African government, as the governments of other countries, is already in the process, but they should speed up the process in order to combat the pollution resulting from the use of coal.
5. Community leaders of the affected areas should meet periodically to discuss how to engage in a dialogue with the government and the management of these industries. They should also try to persuade the youth not to see violence as a way of solving problems.
6. Deliberate efforts should be made to educate the younger generations about how individual actions can lead to the degeneration of the natural environment and the general ecosystem. It is crucial that proper understanding and knowledge regarding pressing environmental issues and corresponding redemptive actions for mitigating them should be acquired early in life. The current state of the natural environment on the planet earth would not have been so disastrous if citizens, industry captains and executives had been given appropriate environmental education, empowering them to be responsible custodians of their environment.
7. Finally, government should make new policies that will warrant that industries are sited far enough away from residential areas and schools. In the case of mines which have to be situated where the resources are, appropriate distances should be mandated for residential areas and schools. If possible, existing schools and residential areas around mines now should be relocated, and industries should be relocated away from residential areas and schools.

The above recommendations are critical and cannot be left unaddressed. If the status quo continues and the people continue to be at the mercy of whatever chemicals are being released from the industries, it will have devastating effects.

## Conclusion

This study has examined implications of coal mining and environmental pollution in South Africa with lessons drawn from the Niger Delta, Nigeria. The purpose of the study was twofold. First, to explore the current state of environmental pollution in South Africa, and how it could possibly result in environmental conflict between the affected communities and the polluting industries. Secondly, to suggest pre-emptive measures that can be taken to avoid such conflict. The case study focused on Emalahleni town, formerly known as Witbank, in Mpumalanga province. It has been rightly noted in the study that the negative impact of coal mining activities on the ecosystem of Mpumalanga region has given rise to severe air pollution, and pollution of water resources which has further led to contamination and depletion of aquatic bodies. Amongst other results, degradation and rapid agricultural decline, and injuries to human health have also been discussed.

Findings of our research study conducted in the vicinities of coal mines in Emalahleni were presented. It was observed that sulphur dioxide, nitrogen dioxide, ozone and lead compounds were present inside and outside the schools. Results from other studies conducted in these areas were also presented to support the present study. Other instances of pollution in South Africa such as the South Durban area were also highlighted.

It is evident from the above-mentioned that the effects of pollution in South Africa are not only detrimental to human health or the general ecosystem, but also have the propensity to disrupt relationships if nothing is done to address it timeously. Unfortunately, although previous studies on environmental pollution in South Africa have drawn the attention of the State to the devastating effects and future implications of coal mining activities, little or no effort has been made to address these. The concern of the authors of this article is that if all these issues persist, South Africa might follow in the footsteps of Nigeria and its Niger Delta region. Hence, this article is meant as a wake-up call for the South African Government to take proactive measures to address this re-occurring environmental malaise. If pre-emptive steps are not taken, it poses an enormous threat

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to the peace and security of the Republic. Contemporary South African citizens' awareness levels are gaining momentum, not just concerning political matters per se, but regarding a spectrum of issues that affect the people. They are coming to realise the horrendous effects of pollution on their lives and the environment. Hence, in the near future, the public might begin to ask questions, make demands and agitate for compensation. Nigeria is still paying the price for not heeding early warning signals from various quarters in the past. It is therefore advised that the South African government should take preventative steps.

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