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Chapter 6

The effectiveness of environmental management strategies employed by paper milling industries in Zimbabwe: The case of Kadoma Paper Mills

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Abstract

The 21st century has witnessed a major turn of events, especially with regards to the world's focus on environmental management. To that effect, industrialists have been compelled by various pieces of international and domestic environmental laws to balance their industrial activities with environmental protection. This paper examines the effectiveness of environmental management strategies employed by paper milling industries in Zimbabwe, with a focus on Kadoma Paper Mills (KPM). To deduce the effectiveness of the strategies employed at Kadoma Paper Mills, comprehensive on-site observations of its industrial operations were made, using specifications contained in the Zimbabwean environmental legislation and the Strategic Environmental Management Approach document as yardsticks to measure the effectiveness of environmental management strategies employed at the operation. It was noted that KPM's environmental management strategies meet the requirements of the current Zimbabwean environmental legislation and the strategic environmental management approach in many respects. However, the research also noted that there is room for improvement in environmental management techniques by Kadoma Paper Mills, that relevant line ministries need to be more actively involved and to complement industry efforts, and that there is need for more coordinated and focused research on the subject to inform the efforts of the industry in protecting the environment.

Key words: *Environmental management, environmental management strategies, environmental sustainability, Strategic Environmental Management (SEM), environmental degradation*

Introduction

The world over, environmental depletion resulting from industrial activities has become a major concern. To combat these problems, world bodies like the United Nations and the World Commission on Environment and Development have been formulating ideas for environmental protection and sustainable development. Several international conferences, summits and conventions have been held on this subject. Surprisingly, all these conventions, protocols and summits have not influenced the implementation of Strategic Environmental Management (SEM) in Zimbabwe. Zimbabwe is part and parcel of the Stockholm Conference 1972, United Nations Convention Framework on Climate Change (UNFCCC) 1992 and the Kyoto Protocol of

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1997 among others. Interestingly, it is one of the first countries to sign and ratify the UNFCCC at the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992. These conventions provide the best practices to be implemented by industrialists in protecting the environment (Frost, 2001). Such practices include the Strategic Environmental Management approach which calls for industrialists to consider the environment in all their industrial operations. Driven by sustainable aspirations, the Strategic Environmental Management approach extends the art and science of formulating, implementing and evaluating decisions that enable an industry to ensure environmental sustainability. The approach also proffers that firms can uncover profit opportunities by cutting costs and/or boosting revenues while reducing their environmental impacts. The approach believes that firms can harmonize environmental and profit goals by integrating impact-reducing products and process design into companies' central strategic visions. In short, the approach reminds corporations to shift from pollution control policy initiatives and corporate practices to pollution prevention (Barry and Barry, 1999)**.** However, many industrialists have failed to adhere to the provisions of the SEM approach.

To ensure environmental management best practices the Government of Zimbabwe, through relevant line ministries, has called for the prioritization of the Strategic Environmental Management approach by Zimbabwean industries. This is reflected through the enactment of strict environmental regulations such as the Environmental Management Act of 2002. It is interesting to note that whilst the Zimbabwean economy has been dogged by economic challenges, the paper industry has not stopped its operations in Kadoma. However, the economic hardships have affected industrial production which has resulted in environmental management challenges. For example, environmentally friendly operations have somehow ceased to be effected; solid waste management has now become a neglected area and as such this is threatening environmental sustainability (Ogunyawo and Soyingbe, 2014).

In many cases, industrial activities have both depleted the environment directly and also induced permanent environmental scars. Most infrastructural services in Kadoma have come under great stress. Social relations have also come under great pressure. The most worrying issue is that Environmental Management is never taken seriously by concerned industrialists. The piled up solid waste and industrial emissions are threatening environmental well-being. In their attempts to minimize environmental depletion, industrialists are now seeking to effectively adopt the Strategic Environmental Management approach as a methodology to achieve environmental sustainability, though with varying levels of success.

Primarily, the Strategic Environmental Management approach aims at effecting strategies such as the reduction of hazardous industrial emissions at source and recycling and re-use of materials among other strategies. To effectively implement the Strategic Environmental Management approach, various aspects should be considered such as source reduction of harmful substances, onsite storage, collection and transfer, processing, and disposal (Barry and Barry, 1999).

Whilst many academics have tended to focus on environmental management as a broad concept, this paper tried to focus on the context of the Strategic Environmental Management approach. This is because the SEM approach considers environmental costs caused by industrial operations unlike other approaches like the Neo-classical approach. The Neo-classical approach argues that the costs of environmental management programs will often outweigh the benefits. Furthermore, the approach argues that companies that act to reduce their environmental impacts should expect most of the time, under most circumstances, to raise their costs and reduce profits. The SEM approach however argues that economic growth should not compromise environmental sustainability (Department of Environmental Affairs and Tourism

Pretoria, 2004). To understand the effectiveness of environmental management strategies employed at Kadoma Paper Mills, the SEM approach and the Zimbabwean legislation on environmental management were used as yardsticks in the study.

Background and literature review

Whilst industrial paper products play a critical part in our daily life, production of these products has resulted in rampant environmental depletion. For example, the production of paper items worldwide has been environmentally hazardous as it has resulted in various types of pollution (Smith, 2011). In India, approximately 10.11 million tons of such products are consumed every year. Considering that 65% of paper consumption ends up as waste, roughly 6.7 million tons per annum of paper waste is generated in India (India's Planning Commission Report, 2011). The major problem is that paper is not biodegradable and can remain on landscapes for many years thereby affecting environmental aesthetics. Whilst it can be recycled, recycled products are more hazardous to the environment than the virgin products. This is because the recycling of paper results in the release of inks and other toxic polymers during the de-inking process. These substances can be washed away as run off thereby resulting in pollution of nearby water reservoirs (Agarwal et al, 2015).

In the Arab states, indiscriminate littering of some industrial waste has raised several environmental issues on the Asian continent. For instance, during the polymerization process, fugitive emissions are released and these have threatened environmental sustainability on the continent (Chin, 2011). Also, during manufacturing, various types of toxic emissions such as carbon monoxide, chlorine, hydrochloric acid, dioxins, furans, amines, nitrides, styrene, benzene and acetaldehyde are released. According to the executive report produced by the Joint Technical Secretariat, indiscriminate industrial waste disposal on open land has made the land infertile. This is because in some cases, the waste creates an impervious layer on the soil surface which can hinder the infiltration of soil nutrients.

As one of the emerging economic giants on the Asian continent, the People's Republic of China has proven to be the major environmental distorter through its various industrial activities. China is now producing goods and services at par with developed countries of the world such as the United States of America. The highly populated country is involved in various industrial activities which include, among others, the automotive, paper, garments and textiles, iron and steel and mining. The garment and textile industry has always been criticized for causing land pollution through disposal of various wastes (You et al, 2009).

Being one of the major giants in West Africa, for decades Nigerian expatriate oil companies have extracted oil while pumping toxins into rivers which have been killing people, animals, and plants, thereby affecting the vision of African development. The activities of large and internationally reckoned oil companies such as Mobil, Chevron, Shell, Elf and Agip have raised serious environmental problems and in many cases successive governments have failed to attend to such environmental malpractices (Ayotamuno et al, 2013). Ayotamuno et al further posit that in the Niger Delta area of Nigeria there has been over 500 reported cases of crude petroleum oil spillages since 1976 releasing about 2.5 million barrels of crude oil into the natural environment. As a result, farming and fishing activities by the local communities have become impossible or extremely difficult in the oil affected areas.

In the context of the Zimbabwean society, environmental problems are not new. As one of the major cities in Zimbabwe, the city of Gweru has always been constantly blamed for environmental management failures by environmentalists and academics. The high-density suburbs of Gweru like Mutapa and Ascot were originally meant to be major industrial hubs.

Information from the current body of knowledge indicates that the area was not only an industrial site but there was overpopulation in the area. Many residents of the city found their way to these areas in pursuit of employment as cheap labour. Even today, these suburbs are the most crowded high-density suburbs in Gweru as they constitute more than thirty percent of the total population in the city and are also close to major industries (Steven, 2016). Furthermore, the informal industry is at its peak in these areas. Whilst efforts have always been made to contain some of the adverse effects of such industrial activities, local communities in the city of Gweru have complained considerably about environmental decay, in particular the continued pollution of the nearby Gweru River because of industrial activities.

Gweru River runs from the eastern part of the city, and passes through several suburbs such as Windsor Park, Riverside, Nashville, Northlea, Mutapa and Ascot. The area along the river has a wide range of informal industrial activity, much of which is illegal. Their industrial wastes are disposed of into the river and the consequences of such activities have resulted in thermal pollution and other aquatic challenges (Stephen, 2016).

Equally important, the Mukuvisi River in Harare has also been affected by industrial activities. Recent studies by some environmentalists show that Zimbabwe Phosphate Industries in the Msasa industrial area discharges effluent into the river. The effluent contains dissolved solids such as calcium, magnesium, iron, sulphates, phosphates, nitrates and aluminium that are well above the highest permissible concentrations for pollutants discharged into water reservoirs. Other pollutants such as oils, solid particulates, paper, cans, bottles and other discarded materials that are generally associated with industrial activities are also registering high levels of concentration (Nyakungu and Mbera, 2013). Thus, the major question is to what extent the Zimbabwean government has succeeded in addressing such environmental management flaws especially in light of industrial pollution observed in various parts of the country. An allied question relates to how industrialists have complemented government's efforts towards ensuring environmental sustainability, especially considering the provision of environmental legislation in the country.

Statement of the problem

The environment is being destroyed each day and industrial activities constitute significantly to the destruction. Zimbabwe is party to several international environmental conventions, protocols and summits. It is a signatory to the Stockholm conference of 1979, the United Nations Convention on Climate Change and the Kyoto protocol among others. The Kyoto protocol established that national governments should make sure that they reduce their industrial emissions. In keeping with that commitment, the government of Zimbabwe enacted the Environmental Management Act of 2002. As a statutory instrument, the Act states the duties of the Environmental Management Agency in protecting the environment, and emphasizes the need for everyone in the country to protect the environment. The act is particularly clear and elaborate about the following: water pollution prohibition (section 57), industrialists' duty to supply plant information to the Environmental Management Board (section 58), effluent to be discharged only into sewage systems (section 59) and standards for waste (section 69). All these provisions are in line with SEM which states that the environment should be protected at all the stages of industrial production – planning, production and marketing. Yet, no research has been carried out, either by government or by academics, on whether or the extent to which the paper industry in Zimbabwe complies with these environmental management requirements and standards. The question that arises is: what are the steps taken by industrialists in ensuring environmental sustainability? This is germane if we aim to come up with a more relevant model for industrial growth and environmental sustainability, one which is cognisant of some of the industrial activities which are inimical to the natural environment. This consideration arises from the realisation that some industrialists are not acting in accordance with the requirements of the law.

Research design and methodology

Research questions
Preliminary on-site observations made by the researcher at Kadoma Paper Mills showed various types of pollution resulting from the plant. This spurred the researcher to ask the following questions: Why is it that despite the existence of the various pieces of environmental legislation in Zimbabwe, the environment is still being destroyed through industrial pollution and what environmental management strategies, if any, have been put in place by the paper industry, and how effective are these strategies?

Research objectives

- To investigate the environmental management strategies put in place at Kadoma Paper Mills in ensuring environmental sustainability
- To examine the extent to which Kadoma Paper Mills' environmental management strategies are adhering to the Zimbabwean legislation on environmental management and the SEM
- To establish the effectiveness of the environmental management strategies employed at Kadoma Paper Mills in light of the Zimbabwean legislation on environmental management and the SEM.

Methodology
Onsite observation by the researcher was the main data gathering methodology used for the research. This methodology gave the researcher direct access to the environmental management strategies employed at Kadoma Paper Mills. Complementary data gathering methods used were individual in-depth face to face interviews of key informants using structured (on few circumstances) and non-structured (in many cases) formats, and content or documentary analysis of organizational reports. Purposive sampling was employed in selecting the interviewees. At Kadoma Paper Mills, there are four main directorates, namely, the quality control and environmental systems, finance, operations, and the human resources directorates. Two key informants from each department were selected for the research. In analyzing the data collected, Zimbabwe's environmental legislation and the SEM approach were used as yardsticks to see whether the paper mills' environmental management strategies are in compliance with basic environmental management principles and practices.

Findings and interpretation

With the responsibility of monitoring industrial performance, the International Standards Organisation (ISO) has consistently been awarding quality assurance awards to KPM. The industry boasts of the ISO 9001 and the ISO 14001 certification awards. Thus, the company maintains quality standards in its systems and process management. The Strategic Environmental Management approach also notes that industrialists should match their operations with international best practices. The recently adopted sustainable development goals have also a particular focus on industrial growth and environmental sustainability. For example, goal number 9 emphasises the need to promote inclusive and sustainable industrialisation (United Nations Report, 2016).

Cleaner production systems
Cleaner production mechanisms are defined as the systematic application of preventive environmental strategies at all the levels of production. Cleaner production techniques are also employed at service level; this means that the technique is not only limited to the physical products such as tissue paper but also applies to organizational operational procedures. According to the cleaner production mechanism, the operation of an organisation has a

significant role to play towards protection of the environment (Clift 1996). Also, cleaner production aims to enhance environmental protection through identifying possible organizational risks such as spillages from the industrial plant. To ensure the effective use of resources, cleaner production champions the conservation of raw materials and energy, avoiding toxic harmful raw materials and ensuring environmentally friendly gaseous emissions and wastes at industrial sites. The study observed that, at Kadoma Paper Mills, cleaner production is largely championed.

Product modification

To ensure the utilization of sludge at Kadoma Paper Mills, the sludge released from industrial processes is pressed to form cakes. The cakes are dried and sold to egg tray makers who use the trays as containers when selling eggs. The recovery of sludge is done from the clarifying tank. The sludge contains fibre fines and slurry mainly filler calcium carbonate. The quantification and composition of the sludge from the process is done.

Also, as a move aimed at reducing pollution, the Kadoma Paper Mills has moved some steps further by recycling sludge and burning it using bioremediation ponds, and employing less damaging agents in the pulping and bleaching processes. This is in line with the Environmental Management Act which stresses that no person shall discharge or dispose of any wastes, whether generated within or outside Zimbabwe, in such a manner as to cause pollution to the environment or ill health to any person (section 70). The same section further stresses that every person whose activities generate waste should employ measures essential to minimising wastes through treatment and reclamation. The fact that sludge is being used in the production of egg trays is a reflection that the strategy is effective as it is helping in the minimization of waste.

The organisation has moved some steps further in reusing products through product modification which is part of the organization's way of ensuring environmental sustainability and at the same time putting in practice the provisions of the company's environmental policy. Also, the fact that sludge is being sold to egg tray makers means sludge can be a waste product to the Paper Mills but it can also be used as a raw material in some industries. The arrangement is mutually beneficial to the company and the country especially given the current nature of the Zimbabwean economy – it makes economic sense to modify products and save the limited resources which are in the country. This scenario protects the environment in the sense that waste is not disposed to the environment but rather it is used in the production of other products.

Waste paper inspection

As an environmental management strategy, waste paper undergoes a sampling process upon its arrival from the various waste paper suppliers. Waste paper suppliers include the National Waste Paper Collection and countries such as Botswana and South Africa. Usually the waste paper comes in very large containers which are mainly open containers. Waste paper inspection is usually done at the back, middle and the front of the delivering truck. To ensure the protection of the environment, a quality analysis process is undertaken to make sure that waste paper does not show traces of pollutants such as particulates. A visual inspection of the paper is done to check for the paper's cleanness as, in some cases, paper may contain impurities which, when disposed of, may result in discolouring of nearby water bodies. Conforming waste paper is passed and stored in the warehouse. Non-conforming waste paper is downgraded or upgraded depending on the level of non-conformance. This is in line with the EMA act. The act stresses that any person, who discharges or applies any noxious or obstructing matter, or other pollutants into the aquatic environment in contravention of water pollution control standards

shall be guilty of an offence and is liable to imprisonment for a period not exceeding five years, or to a fine, or to both such fine and such imprisonment (EMA Act 2002).

Therefore, waste paper inspection has a complementary effect to environmental legal provisions and SEM which calls for preventive mechanisms in all industrial activities to avoid pollution. This means the strategy employed at KPM is effective. This is because the quality of waste paper recycled affects the quality of the final product and in the long run the environment. Also, waste paper inspection results in suppliers being alerted that received waste paper is being inspected and therefore the need for them to be environmental conscious.

Waste paper sorting

The employees at Kadoma Paper Mills are dedicated to employing preventive environmental management strategies to processes. This is indicated by the greatest value they attach to waste paper sorting as an environmental management principle. The primary aim of sorting is to reduce machine inefficiencies which are mainly caused by impurities fed into the system through waste paper. Inefficiencies of the machine may result in incomplete combustion which results in the release of toxic gaseous emissions. Toxic gaseous emissions in large quantities have a negative effect on the environment as they can cause thermal pollution and acidification. Thermal pollution and acid rain are destructive to crops and other organisms on the earth's surface. At Kadoma Paper Mills, there is a continuous application of an integrated preventive environmental strategy to processes, products, and services to increase eco-efficiency and reduce risks to humans and the environment. The paper mills champions progressive reductions of the environmental impacts of processes, products and services through preventative approaches rather than control and management of wastes and pollutants. This practice is in line with the SEM approach where corporations are encouraged to shift from pollution control policy initiatives and corporate practice to pollution prevention (Barry and Barry, 1999). Thus, to protect the machines from the adverse effects of contraries the employees at Kadoma Paper Mills make sure that sorting of received waste paper is always done to remove contaminants such as carbon paper.

Recycling paper, de-inking process and environmental sustainability

The recycling of paper involves a de-inking process. Newspaper and magazine recycling is improving our environment. For example, inks used to print newspapers and magazines are safe as they contain either vegetable oils produced from crops like soya or non-hazardous mineral oils. Dried ink is also of significant importance as it serves as a great soil conditioner, helping much in maintaining soil fertility; this is why farmers and other environmentalists are very interested in getting the dried ink which is released after the de-inking process.

Chemical raw material inspection

The production of paper requires large amounts of chemical raw materials such as edoze chemicals. Edoze chemicals contain large amounts of corrosive particles which can be harmful if disposed to the environment. At Kadoma Paper Mills, samples are obtained from different containers and analyzed according to individual testing parameters in the raw material specification file. It is an environmental management safety precaution the world over that every chemical is delivered with a Material Safety Data Sheet (MSDS) which states the specification and parameters of the chemical. A MSDS gives the composition of the chemical, safety precautions and measures during handling and storage, and physical and chemical properties of the chemical. The information includes appearance, odour, pH, boiling, melting and flash points, vapour pressure, density and solubility of the chemical. This helps in protecting the environment as the chemicals will be properly stored. At Kadoma Paper Mills, information used in the inspection and analysis of chemical raw materials is obtained from the MSDS.

After the inspection of the chemicals, non-conforming chemicals are put on hold pending investigations and notification of supplier. These practices are in line with section 73 of the EMA Act which stresses that no person shall discharge any hazardous substance, chemical, oil or a mixture containing oil into any waters or any other parts of the environment contrary to any criteria prescribed in terms of section 72. In light of this provision, it can be argued that the process of chemical analyses at the KPM plant is effective as it is in accordance with environmental legislation and also effectively reduces chances of hazardous chemicals being disposed to the environment.

Constant acidity checks of waste water and other effluent

Section 73 of the EMA act prohibits the disposal of any hazardous and toxic waste to the environment. The section also specifies the legal implications of such practices. According to this section, a person who discharges hazardous substances, chemicals, oil or a mixture containing oil into any waters or any parts of the environment in contravention of this legal provision commits an offence (EMA ACT, 2002). Worryingly, the industrial process of making paper, if not properly managed, involves the release of highly acidic or alkaline effluents which are corrosive and hazardous to the environment. Waste water released after the pulping process can be acidic or alkaline if not treated. At Kadoma Paper Mills, the ph. value of waste water is always maintained between seven and eight before its disposal.

Recycling of waste water

In a move aimed at conserving water, the employees at Kadoma Paper Mills have developed some water conserving strategies. This is so because the paper making process itself requires large volumes of water. Water at the plant exists in two main forms, namely fresh and used water. Fresh water refers to water which is in its natural state and has not suffered any modifications; on the other hand, used water is water that is released after it has been used within the plant. In their quest to save the precious resource, the employees at Kadoma Paper Mills have opted to continually make use of recycled water. The water is reused after undergoing a purification process within the plant. The purification plants use the concepts of flocculation and coagulation in clarification by density and filtration, in line with the company's environmental policy which champions sustainable resource utilization. On this issue, one key informant from the management team had this to say:

> When waste water is released from the pulper, which is a special machine used in the production of paper, the waste water is always directed to the purification plant for purification. After purification, the water is reused in carrying out industrial functions. Waste water can be reused for more than fifty times, until a time when it gradually becomes exhausted.

Waste storage

At the paper mills, waste paper, pulp and chemicals are stored in warehouses. However, it was observed that the warehouses are sometimes poorly managed, meaning that at times waste is not properly managed at the plant. One member of staff admitted the poor state of the warehouses in the following way:

> Warehouses are sometimes not secured and at times maximum ventilation of the warehouses is compromised. One of the major problems is that the company is heavily suffering from the economic situation currently facing the country... The current nature of the economy is affecting the proper storage of waste paper… this is because there is shortage of key personnel who are supposed to take care of the warehouse.

Proper management of warehouses is important for environmental safety. This is so, because, some chemicals are environmentally hazardous; if they wash away into the environment, they may cause damage to plants.

Effluent ponds to contain oil leaks
Most of the effluent ponds at the plant are not functional. The ponds are used to contain oil and other industrial wastes in the event of a leakage. These ponds are made of a special metal which is resistant to corrosion, and clay which has impervious characteristics. The fact that the ponds are no longer functional clearly indicates that the environment is at high risk from possible oil leakage.

Conclusion

The findings of this study are that a greater portion of the strategies employed at Kadoma Paper Mills are effective as they comply with the current environmental legislation, Strategic Environmental Management approach and KPM's Environmental Policy. However, in some few cases the company has failed to put in practice the requirements of Zimbabwe's environmental legal provisions, a reflection of the ineffectiveness of its environmental management strategies. For example, in terms of warehouse management, little is being done as toxic materials are not properly kept. However, the study concluded that Kadoma Paper Mills is keen to put in place and implement effective environmental management strategies but is hindered by the prevailing economic environment.

Also, if not effectively managed, the paper making process may result in pollution, high energy use, biodiversity loss and global warming among other environmental problems. Recognizing such problems, KPM has come up with various strategies. Waste paper recycling, water recycling, product modification, waste paper inspection, constant acidity checks and chemical raw material inspection are some of the strategies which have been put in place at Kadoma Paper Mills. The above strides are not only environmentally friendly but also very effective to a large extent.

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