

DOWN THE MEMORY LANE: REVISITING THE 1972 HWANGE COLLIARY KAMANDAMA DISASTER

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Abstract:

On the morning of 6 June 1972, 427 coal miners perished in a suspected methane gas explosion in Hwange Colliery Kamandama Shaft. On that fateful day Miners from South Africa, Angola, Zambia, Malawi, and Costa Rica met their untimely death at the number two mine. This has been the worst mining disaster ever in Zimbabwe's history, which hampered sustainable development. Through content analysis, questionnaires and interviews research findings suggest that the suspected causes of the accident were, blown out Shots, Welding and the Collapse of Panels, sabotage and diesel fuel fires. To ensure effective sustainable development the company embarked on a massive campaign to curb any occupational hazards mainly through observing contraband rules, ISO certification, and setting proto teams, sub-contracting rock specialists, maintaining a wellinformed safety department. The paper recommends, the use of person wearable methane control monitors, maximum stone dusting, methane drainage, and the elimination of igniting sources.

Keywords: *Kamandama, Disaster, Methane, Hwange Colliery, Memory, Zimbabwe.*

1. Introduction

The Hwange Colliery 1972 accident left the whole nation shell shocked. On that fateful morning as the news filtered the whole country and across international boundaries most people felt not only for the families that were affected but many felt for the company that had lost its most critical assets, its human resource. It is a fact that accidents do happen no matter how one is prepared but most importantly they happen when we least expect them and when we are ill prepared to match their magnitude such as the situation of the Kamandama disaster, which caused human suffering and a serious damage to the environment and affected the sustainability of a number of families. The world has witnessed serious heart taking accidents and to date we all have lost count of these accidents. Most importantly to note is the fact that accidents no matter how small or big they are affect sustainable development since they adversely affect not only the current social fabric but the future as well as in the case of Hwange Colliery disaster. Against this background through content analysis and self administered questionnaires and interviews the research unearthed the suspected reasons behind the suspected methane gas explosion accident, looked at key lessons that were drawn from the accident. The research also revealed the extent to which the mine is now fully prepared to deal with any accident no matter how severe. The paper also looked at activities that the company carried out soon after the accident to help all the families that were affected. The research therefore managed to demystify the mystery surrounding the accident through establishing the major causes, after effects, achievements to date, challenges and prospects. The research triangulates the use of interviews, and self administered questionnaires as primary data sources, anchored by a content analysis of existing documentation on the accident.

2. Sustainable Development and Workplace Safety

This research paper is based on the need to maintain sustainable development, by making all workplaces free and safe environment. According to the World Commission on Environment and Development (1987) a widely accepted definition of sustainable development states that, Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Individual employees in organisations work to sustain their families and meet their needs in preparation of tomorrow. Accidents of any magnitude affect the needs of employees and their future as well as their dependents. This is supported by Kates, Paris and Leiserowik (2005) who make reference to the Brundtland Commission's (1987) by reiterating that on development, the report states that human needs are basic and essential; that economic growth—but also equity to share resources with the poor—is required to sustain them; and that equity is encouraged by effective citizen participation. A close look at this view indicates rather that accidents affect human needs, the need to free working environment safe from injuries and diseases, where they

enjoy the fruits of their labour and where they have a fair share to their cake, just like the other stakeholders. This is also supported by Hardi and Zdan (1997) who further contents that sustainable development is not a “fixed state of harmony.” Rather, it is an ongoing process of evolution in which people take actions leading to development that meets their current needs without compromising the ability of future generations to meet their own needs. Conversely, actions that reduce the ability of future generations to meet their own needs should be avoided, like the Kamandama disaster.

3. Hwange Colliery an Overview

Hwange Colliery Company Limited currently employs 2876 people of diverse skills. Its mining operations are domiciled in the western part of the country. The registered offices and the marketing functions are in the capital city, Harare, and there is a marketing and liaison office in Bulawayo. All the company`s operations and offices are housed on company owned premises. The company trains its apprentices for the production and technical side over and above running its own railway, road transport system, internal security and communication system. The company also has a modern and well-equipped hospital, which provides comprehensive medical care not only to employees and their dependents but also to the whole Matabeleland Province and the mine also train student nurses for the company and the nation at large. All services associated with local and central government --- from road maintenance to refuse collection, water reticulation, education, health, housing, recreation facilities and sewage disposal have always been provided by company since the establishment of the mine.

The company has developed into a highly successful organization with an excellent reputation for its customer service and its broad range of quality products. The Company which over decades grew to become a significant player in coal exploration, extraction, processing and distribution in Southern Africa, is listed on the Zimbabwe, Johannesburg and London stock exchanges. The company changed its name from Wankie Colliery Company limited to Hwange Colliery Company Limited in November 2004. The company is an ISO certified company and achieved this status in 2005. It was re-certified to the ISO 9001: 2000 standard and underwent the conversion and was certified to the ISO 9001: 2008 standard. With this project, the organisation strives to translate the marketing motto, “the Customer is King”, into reality by building customer confidence. The project focuses on provision of quality service to customers. The company has a policy statement implemented through a quality management system which is based on ISO 9001: 2008 (Share Option Scheme Booklet). The statement provides a framework for establishing and reviewing objectives as well as communicating the changes to all employees. Conditions of service are controlled by the Labour Act, National Employment council for low level employees and a registered code of conduct to ensure smooth running of the business, providing an environment which fosters individual motivation, initiative and creativity.

4. The Kamandama Accident

According to the (1976) Rhodesian Archives literature at approximately 10h27 on Monday the 6th June, 1972, a violent explosion ripped through the entire extent of the underground workings of No. 2 Colliery. Indeed tremendous columns of smoke and gases poured out of all the shafts, mounting hundreds of feet into the atmosphere. It is indicated again in the Memoirs of Hon Clifford Dumpant that the accident resulted in the destruction of Kamandama fan and the Bisa fan. The Kamandama incline shaft was completely blocked by falls of roof and twisted steel girders. For nearly four days as the report suggests rescue teams made the most determined efforts to reach possible trapped survivors. The Kamandama incline shaft was sufficiently cleared to permit the entry of proto teams and necessary equipment. Forty-one hours after the explosion the Bisa fan was brought back into operation and sluggish ventilation current established but all rescue operations proved futile.

According to a report by Livingstone Belivins entitled Four Days in June (1972) in an effort to rescue the trapped miners brattices were erected in the splits along the Railway Main to direct the current of air towards the areas where the workers were known to have been at the time of the accident. To do this the proto teams, working in relays, the report suggest that they penetrated 2 000 meters into the mine among scenes of the most appalling devastation. It is reported that explosions were heard at frequent intervals and freely burning fires were encountered. In the end the rescue attempt was abandoned and the teams withdrawn. The report suggests that it had become obvious that nobody had survived the holocaust - 427 persons had died in one of the greatest, underground explosions ever known. All the company efforts to save the lives were to no avail. According to the Rhodesian Archives on Wankie Colliery Disaster (1976) the accident claimed 36 Europeans and 390 Africans.

Victims	Nationalities
91	Zimbabweans
52	Mozambique's

71	Malawi
36	Tanzanians
14	Britons
12	South Africa
9	West Africa
4	Caprivi Strip
1	Botswana

Table 1 Statistics on the disaster

5. Source Raw Data

The world is full of painful examples of accidents that had not only claimed lives but equally destroyed the environment and affect the peoples in the long term basis. Green Cross (2001) suggests that in the early morning hours of 26 April 1986, a testing error caused an explosion at the Chernobyl nuclear power station in northern Ukraine. During a radioactive fire that burned for 10 days, 190 tons of toxic materials were expelled into the atmosphere. The wind blew 70% of the radioactive material into the neighboring country of Belarus. Almost 20 years later, the people of Belarus continue to suffer medically, economically, environmentally and socially from the effects of the disaster. They further indicated that the explosion of the reactor at Chernobyl released 100 times more radiation than the atom bombs dropped on Hiroshima and Nagasaki. At the time of the accident, about 7 million people lived in contaminated territories, including 3 million children. UNDP/UNICEF (2002) suggests that about 5.5 million people – including more than a million children – continue to live in contaminated zones. These are individuals that are under the threat from this disaster.

Brown (1993) indicates that in the early hours of Monday, Dec. 3, 1984, a toxic cloud of methyl isocyanate (MIC) gas enveloped the hundreds of shanties and huts surrounding a pesticide plant in Bhopal, India. The Indian government reported to its Parliament that 1,430 people had died. In 1991 the official Indian government panel charged with tabulating deaths and injuries updated the count to more than 3,800 dead and approximately 11,000 with disabilities. This shows how workplace accidents can cost people's lives. A thorough analysis on the above examples suggests that massive blame is labeled on employee behavior. However Cooper (2007) and Geller (2004), suggest that behavior-based safety has stimulated controversy, with some arguing that a behavioral focus puts excessive responsibility on the workers, and that BBS is too limiting and should aim for a more holistic or culture-focused approach. In any case, behavioral safety has provided a platform for constructive debate, and the conflicting opinions have provided the opportunity to learn more about the psychology of injury prevention. Accidents at different workplaces can be managed with effective pro active measure available in organisations. This is supported by Swanepoel, Erasmus, Wyk and Schenk (2003) who suggests that part of a proactive approach to managing employee health and safety at work is to draw up contingency plans and to have the necessary infrastructure to deal with any emergency. Indeed if companies have infrastructure to deal with emergencies the total damage of these accidents can be minimized. Most people suggest that one traditional way to manage accidents has been managing and implementation of a good safety culture at the workplace. According to the Safety and health issue (2009) a good safety culture in a workplace exists when safety and health is understood to be, and is accepted as, a high priority. Safety and health does not exist in a vacuum isolated from other aspects of organizations, such as people and financial management. Safety culture is an integral part of the overall corporate culture.

6. Major Coal Mine Accidents

Methane gas accidents have been taking place in both developing and developed countries. Krog et al (2007) documented that, between 2000 and 2005, the number of frictional ignitions reported in underground coal mines in the United States numbered between 34 and 60 per year. Although these ignitions are generally small and localized, they have the potential to lead to much larger explosions. Reference can be made to the Sago Mine coal mine explosion of January 2, 2006 in Upshur County, West Virginia, USA, near the county seat of Buckhannon. The blast and collapse trapped 13 miners for nearly two days. One of the 13 trapped miners survived. It was the worst mining disaster in the United States since the Jim Walter Resources Mine Disaster in Alabama on September 23, 2001. It left a scar in the hearts of many but credit can be given to the proto teams that tirelessly worked to retrieve the bodies of the diseased and rescue the survivor.

South Africa has equally recorded a number of coal mine accidents since time immemorial. Niekerk, (1986) indicates that 68 mine workers were killed after an underground methane gas explosion at the Hlobane coal mine near Vryheid in Kwazulu-Natal South Africa. The gas explosion was caused by poor safety standards. He further explained that a week before the explosion a miner who also died in the explosion discovered methane underground., but the mine captain scratched out his report about underground methane to give the mine a good safety record, which eventually resulted in the accident happening. Surprisingly the mine owners were fined R400 for contravening the Mines and Works Act. Niekerk P (1986) further lamented that despite this explosion, the authorities continued to give the mine high ratings for safety standards. Interesting to observe from this accident is the fact that accidents that normally happen are as a result of human error. The main culprits are people who ignore safety issues.

As alluded to above South Africa has recorded significant number accidents in its mines, as supported by Anon, (1995) who underlines that on 16 September 1986, 177 mineworkers were killed at Kinross Mine in one of South Africa's worst mine disasters since 1946. Parks, M. (1986) suggests that apart from the 177 mine workers killed, 235 were injured and one was reported missing. The Kinross mine disaster is one of the worst gold mine disasters in South African history. Swanepoel, B. et al, (2005) suggests that other mine accidents that killed a large number of people include the 1960 Coalbrook Mine accident with 437 fatalities. This worst mine disaster in South Africa, a large section of the Clydesdale Colliery, at the Coalbrook mine near Sasolburg, Orange Free State, caved in and trapped 435 mine workers 180m underground. There were no survivors. No machine capable of drilling holes large enough through which to rescue people was available anywhere in the country. The accident was believed to have been caused by the disintegration of some 900 underground pillars which cause a massive collapse. Around 1000 miners were underground, only about half of them survived.

7. Research Methodology

The research was purely qualitative in nature and it adopted a case study approach of Hwange Colliery, focusing mainly on the 1972 disaster. The research combined both primary and secondary sources of data collection. The research utilised content analysis of the Kamandama Accident reports, mainly the report by Livingstone Belivins (the then General Manager) and the Memoirs of Hon Clifford Dumpant and other related documents. Questionnaires were distributed to senior managerial respondents and interviews were carried on both managerial and non managerial respondents. The research targeted a sample of 5 managerial respondents and 15 non managerial respondents, from the SHEQ department, HR and Underground Mining Division and other witnesses who by the time of accident were fairly young and benefited from the company policy to educate the children whose fathers perished because of the accident. The questionnaires were specifically a combination of both closed and open ended questions. Through adopting a case study approach there has been an in-depth understanding of the Kamandama accident.

8. Possible causes of the explosion

8.1. Blown out Shot in the Matura Main

The research findings indicate that there were three suspected major causes of the accident. Senior managerial respondents representing the Underground Mining Section cited blown out shots as the major suspected cause of the accident. This was also documented by Livingstone (1972) who suggests through his report that the explosion originated in the Matura Main as the result of a blown out shot, which resulted in the flame that ignited the firedamp. The same view was supported by respondents from the SHE section who also suggested blown out shots through questionnaires that were distributed by the researcher. Livingstone (1972) further suggests that there was methane that was being encountered in the area with an increasing frequency, combined with the blasting pattern recommended by the Management which eventually led to blown out shots. This points out clearly to human error. Makhonge (2009), suggest that accidents all over the world are generally caused by a combination of several factors, poor or lack of accidents prevention and safety promotions systems. It appears that the underlying cause of accidents has in most cases been associated with flaws in management systems such as the recommendations that were given by management which resulted in blown out shots.

Maunganidze, Ncube and Sibanda (2013) believe that accidents do not just happen but they are caused. From the Livingstone report on the day of the disaster the miner-in-charge of the section was a man with little coal mining experience at Wankie; the fact that the disaster took place at a time when, in the ordinary way, blasting operations would have been at their peak, and finally the development of an area of still air along the line of the Matura face caused the accident. This argument holds water in the fact that partly the accident was as a result of human error mainly poor judgment by the miner in charge. This view is supported by Chilton et al (2005) who suggest that

methane ignition may be further reduced by dealing directly with the ignition source, a fact that was ignored by the minor in charge at Hwange.

The Livingstone report further highlighted that the Commissioner's who were summed up to give their thinking on the-probable cause of the disaster, suggested that management instructed, miners to follow a set pattern and sequence of blasting the shot holes in the coal faces. The directive required that certain charges with the heaviest burdens should be amongst the first to be fired. This, in effect, as indicated in the report was an open invitation for blown out shots to occur. It is strongly believed that the management directive resulted in the accident, once again pointing out to poor judgment by management. With that judgment the accident eventually claimed the lives of the 427 minors.

8.2. Welding

The research findings through questionnaires that were distributed to managerial respondents representing HR, SHE and Underground mining indicated that Welding may have triggered the methane explosion. This confirmed the report by Livingstone (1972) which suggests that at the time of the disaster welding was being carried out at the intersection of G. South and G. East, where a new conveyor structure was being installed. These managerial respondents strongly believe that welding ignited the methane gas. According to the Livingstone report evidence exists that the coal dust was ignitable directly by a welding touch, which in its own right was an unsafe act. Frank (1974) postulates that, unsafe acts are a violation of accepted safe procedure, which could permit the occurrence of an accident and in case of Kamandama it had a serious devastating effect. Basic options are to prevent the occurrence and accumulation of flammable bodies of methane and to eliminate sources of ignition such as open flames, frictional and electrical sparks, heat from spontaneously combusting coal and heat from mining equipment including, but not limited to hot exhaust manifolds and frictional heat (belts, brakes). Kissell and Goodman (1991) carried out a study on the possible causes methane explosions. Their research indicated human factors as another major cause of methane explosions. In their study, 15

“initiating events” were identified to represent starting conditions that can lead to an explosion. They identified that most initiating events involved a human factor rather than an engineering specification. Therefore, safe conditions require the everyday vigilance of those working underground a situation that explains why the explosion took place because people did not pay attention to detail. Respondents indicated that management was concerned more about production than the safety of employees. According to Bird (1974) poor supervision can triggers accident, indirect causes or real causes, the basic causes are the personal factors and the job factors.

9. Collapse of the Panels

Senior managerial respondents indicated that the explosion may have been as a result of the collapse of panels. This was equally supported by non managerial employees who indicated that it was rumored that the explosion was as a result of the collapse of the panels. Secondary data through the Livingstone report suggests that the third possible cause of the accident was the collapse of the “high extraction” panels and to the enormous volumes of methane gas generated during mining operations. The report also mentions the fact that panels HE 2 and HE 3 had been sealed off by 14" brick stoppings instead of by explosion proof stoppings such as had been erected in HE 1. They further suggested that the method of mining practiced in these areas involved the systematic reduction of pillars to the degree where ultimate pillar failure occurred, and large scale collapse of the superincumbent strata resulted. However, Humphreys and O'Beirne, (2000) suggests that such collapse do not always occur and large areas were left standing on pillars which were totally inadequate in the long term, but ultimately, a coal dust explosion can pass through the entire mine to the surface, destroying panels, a reality of the Kamandama accident.

10. Immediate Action that was taken

The research established that soon after the accident rescue operations were activated and lasted for four days. The proto team that attended the scene was air lifted from South Africa, who came and labored for four good days till the decision was taken by management to seal the shaft. Other proto (rescue) teams arrived from all over Africa and Europe. One managerial respondent indicated that through the Rhodesian government was under sanctions during the time the United Nations approved sanctions against the then Rhodesian government were brusquely ignored and swept aside, a sign of solidarity and togetherness in times of crisis. Respondents indicated that the rescue teams went down No Two Colliery, one after the other; in desperate bid to save lives if possible or at worst bring up bodies. But such was the devastation and the possibility of further explosions they could not get further than about 200 meters down and finally the decision was made to abandon any rescue operations.

Other respondents indicated that the Kamandama incline shaft was sufficiently cleared to permit the entry of proto teams and necessary equipment as part of the rescue operation which was abandoned. The research also established that the Bisa fan was brought back into operation with sluggish ventilation current established to try and direct air

to the last known positions of the workers. This was equally confirmed by non managerial respondents through an interview who reiterated that the first attempt was to direct air to the last known positions of the workers. The underground mining team also indicated that the butraces were erected.

After all these efforts the mine management recommended the establishing of a commission of enquiry was used to investigate the accident. This may then explain the report by Livingstone which then formed the greater part of secondary data on the Kamandama disaster. Respondents indicated that the commission of enquiry's role was to make recommendations for the mine to use in avoiding accidents of that nature. Finally management ordered the barricading of the shaft area preventing unauthorized entry.

11. Warning signs

The research sought to determine if there were signs of the impending catastrophe. Managerial respondents in the SHE department indicated that there were signs of methane with small incidences of methane explosion having been encountered before the accident occurred. Hazardous incidences had occurred such as large scale collapse and methane gas related fires. They cited the 29 December 1960 methane explosion that affected 3 employees in No 4 section, the Kamandama area No 2 Colliery. Interestingly both the respondents and the Livingstone report indicated that the main cause of the methane ignition was a match that was struck to light a fuse igniter. Maunganidze, Ncube and Sibanda (2013) indicated that nobody expects an emergency or disaster, especially one that affects them, their employees, or their company, and yet in real life emergencies always occur and at times they are caused by such small mistakes.

The second ignition in No 2 colliery was on the 21st October 1970. The second cause according to the report was caused by blown out shots. The miner in charge admitted that he did not test for gas. Both managerial and non managerial respondent indicated that the bottom line was that managers did not regard coal dust at Wankie as presenting a serious hazard. The responsibility to ensure safety was enshrined in the responsibility the mine manager through his appointed officials. Naked flames when welding if methane gas is present then an explosion can occur. Saari (2001) states that humans tend to underestimate known risks and overvalue new risks like in the case of the Kamandama accident.

12. Emergency plan in place

Responses through interviews that were carried out indicated that there was Swift communication since telephone lines were not disturbed by the accident. Respondents indicated that the explosion affected the panels that collapsed but the communication system outside the shaft was not affected a situation that resulted in swift communication to outside help including the coming in of proto teams all over the world. Respondents from HR indicated that there was a local rescue team and plans were there for rescuing employees, however the respondents indicated that the plan that was there was more of accident (human injury) prevention. Maunganidze et-al (2013) indicated that the accident resulted in national calls to reinvigorate the operations of the Mine Rescue Association of Zimbabwe, which although in existence since 1970s had been relatively dormant. Its mandate was to coordinate mine rescue activities throughout the whole country and its work being coordinated through the Mine Rescue Working party. This working party brings together the Chairman appointed by the Association of Mine Managers of Zimbabwe, zone coordinators, the national trainer, the national coordinator, a representative of the Chamber of Mines and a committee member.

13. The impact of the accident

Weiss (1992) notes that a sustainable society is one where every child in both the current and future generations and from his or her earliest years has access to care, nutritious food and clean water and a safe environment in which to grow, participate and learn free of violence, pollution and the risks of disaster. Based on this companies should thrive by all means to take care of those that take care of the children. The Kamandama disaster affected 427 families, who all looked at their parents as bread winners. Research findings suggested that after the accident a lot of families relocated to their rural homes, which were against their will and the hopes of their children and that which they desired and hope for were shattered. Some managed to stay put around the Mine since they had nowhere to go, but that accident changed the course of their life and their desired dream. According to Bates (1999) "Accidents are costly both in human and financial term, these are insured costs which are costs covered by insurance and workers' compensation e.g. hospital and medical costs and machinery costs, uninsured costs, which are often hidden, e.g. time lost, lost production and administrative cost of processing paper work which results from the accident. The Kamandama disaster had a serious impact to the company, families of the deceased and the country at large. Managerial respondents indicated that the accident was so devastating to the company. The research findings through the questionnaires that were distributed to both managerial and non managerial respondents indicated that the company lost its human capital, expertise, skilled, semi skilled and unskilled

workers who were among the 427 employees that perished. This created a serious crisis for the company which also affected profitability, productivity and reputation of the company. Thus the occurrence of an accident, according to the Red Cross Society of Zimbabwe (2012), is exclusively undesired just like in the Kamandama case.

Eller (2005) suggests that cost of accidents, should be considered from several points of view, accidents can cause cost to the worker, cost to the employer, and cost to the country as a whole. Eller (2005)'s views were supported by managerial respondents who indicated that there was a serious financial loss as all assets were destroyed due to the accident. They pointed out that all the equipment and machinery was buried together with their users. When the proto teams' efforts were deemed futile management made a decision to bury the equipment it was impossible to retrieve the equipment. This resulted in a serious financial loss to the company which posed a business viability threat. Respondents representing the HR department cited low morale on the part of survivors whose performance was affected by the thought of the loss of their counterparts. HR respondents further indicated bad reputation on the part of the company, due to the accident that affected the image of the company. This was supported by James (2000) who suggests that the public image of companies with a poor safety and environmental record is at normally at risk,

When accidents happen in most cases they result in casualties and affects families. Through the interviews that were carried out both managerial and non managerial respondents indicated that most families lost their bread winners. Saari (2001) emphasises that one cannot be satisfied with occupational health and safety as long as anyone can lose a spouse, a parent, a son or daughter in an accident. He further contents that it is a basic human right to return home safe from work since nobody should be killed or harmed in work accidents. He equally suggests that as long as the harm exists, there is a job to do. Research findings indicate that there was a massive loss of bread winners, a situation that affected the livelihood of families whose providers were victims. Both managerial and non managerial respondents cited the loss of future financial support for the very families who relied heavily on their breadwinners. According to Jensen (2001), the internal marketing ethics subscribes to the fact that organizational effectiveness is anchored around how an organization treats its employees as first – working environment and their wellbeing safety. The same respondents indicated that there was equally loss of urban home for some families who had only one breadwinner. After the accident some families were forced to go back to their rural homes. For others that was the end of the road for them to stay around the mine area. But above all the respondents representing the HR department lamented over the failure to get comfort from friends, neighbors and colleagues since most of the houses had funerals.

Hardi and Zdan (1997) are of the view that, the idea of sustainability is the persistence of certain necessary and desired characteristics of people, their communities and organizations, and the surrounding ecosystem over a very long period of time. Achieving progress toward sustainability thus implies maintaining and preferably improving, both human and ecosystem wellbeing, not one at the expense of the other. Accidents affect human wellbeing at all cost. They cause pain in people and their beloved ones. The Kamandama disaster affected workers greatly as most families lost their bread winners. Maunganidze, Ncube and Sibanda (2013) suggest that occupational hazards and disasters threaten the integrity, reputation and ultimately the viability of a company. Once the major companies are affected the ripple effect affects the country at large. The Kamandama accident affected Zimbabweans across all walks of life, who were shocked and devastated by losing the lives of 427 employees the same day This view was reinforced by managerial respondents in the SHE section, who reiterated that the country was over whelmed by the devastating news. Both managerial and non managerial respondents indicated that the accident resulted in the loss of tax on the part of the government through lose of Pay As You Earn. Other managerial respondents in the HR office indicated that the accident resulted in a massive brain drain where the country lost the highly skilled human resource a situation that bedeviled the country at large tremendously. They cited men like Basil Papenfus, the No. 2 manager who lived for mining and had risen to his position of authority in ten short years. He was tipped to become the next general manager among a host of fellow comrades.

14. After effects

According to the (2013) Sustainable report on Africa, generally, there is an improvement in the participation by local communities in mining projects and in benefits accruing to communities, which have been facilitated by international schemes on corporate social responsibility. Boda and Radacsi (1996) suggest that corporate social responsibility involves the positive activities a company undertakes in the society in which it operates. A socially responsible company possesses the following characteristics; it treats employees fairly, operates in an ethical way and with integrity, respects basic human rights, sustains the environment for future generation and finally is a responsible neighbor in the community. Through the questionnaire that were distributed to both managerial and non managerial respondents indicated that soon after the accident the company established the Kamandama Disaster fund to support the families that were affected. This was an act of good social responsibility by the

company which supports the view by Boda and Radasci (1996). To date there are families that are still benefiting from this fund, a good course for sustainable development.

Weiss (1992) suggested that it is increasingly recognized that a sustainable world will require a global shift in values, awareness and practices in order to change our increasingly unsustainable patterns of consumption and production. To achieve this, children and young people will need to be educated and mobilized as catalytic forces for sustainable development. This goes hand in glove with the research findings since after the catastrophe the company took it upon itself to embark on a deliberate recruitment of orphans after the post independent era of the deceased Kamandama disaster victims. This was a strategy to employ the siblings of all those that were affected by the accident and a way of reaching out to them, as a social responsibility program. Companies are now compelled to focus on corporate social responsibility as a key activity towards improving the corporate image. McKinsey (2005) suggested that business executives across the world overwhelmingly believe that corporations should balance their obligations to shareholders with explicit contributions to the broader public good. More so the company equally resorted to the offering educational scholarships of all those that were left behind by the deceased employees. So far more than 50 students are benefiting from the educational scholarship fund that is being offered by the company.

In Zimbabwe 6 June has been set aside as an annual day of commemoration. Managerial respondents indicated that the company through Zimbabwe Congress of Trade Union (ZCTU) and the ministry of labour lobbied for the establishment of an annual day of commemoration. This establishment of the annual day of commemoration is observed by the nation at large and the victims of Kamandama are remembered. Research findings highlighted that the company on this day every year organizes Hwange Open which is a golf tournament that will also be attended by the widows in order to raise funds; thereafter the widows will be given money or one blanket each and a T shirt. On the same note the company established a self sustaining project for widows' e.g. truck inn as a way to cushion them financially. A place close to the Mine and along the Victoria Falls Highway was designated for truck drivers to rest and all the widows of the Kamandama and their families were given room to carry out entrepreneurship activities like preparing food for them selling airtime and other wears. This is good on their side because apart from benefiting only through the Kamandama fund they also generate their own revenues.

15. Achievement to date

The research sought to find out the extent to which the mine has put pro active measures in place to manage the safety of workers. Through questionnaires and interviews that were carried out respondents from the mining division indicated that the company has since moved away from being a labour intensive to be a capital intensive operation. Traditionally the mine was using traditional methods of mining which relied on manual labour which explains 427 people per single shift. Currently the mine is now relying on more machinery for instance both managerial and non managerial cited the use of the Continuous Miner Machine. According to the South African Institute of Mining and Metallurgy a continuous miner has a face and cutter head ventilation strategies, with water sprays and the evaluation of 'wet head' cutter drums, with a directed use of active on-board explosion suppression systems. These systems are mounted on board continuous mining machines and detect the presence of a methane ignition by means of light sensors. The electronic signal from the sensors is used to trigger the suppression system, creating a barrier of flame-suppressing material, thus containing the flame in the immediate vicinity of the ignition and so preventing further development and the propagation of a coal dust methane explosion. Hwange Colliery uses this method and instead of having 427 people per shift only 50 including maintenance crew are enough. Management indicated that they only have a staff compliment of 170 for the whole department. Ashford and Zwetsloot (2000) state that in order to make significant advances in accident prevention, the focus of industrial firms must shift from assessing the risk of existing production and manufacturing systems to discovering technological alternatives which curb some of these accidents so as to ensure a sustainable work environment.

Hardi and Zdan (1997) further contents that achieving progress toward sustainable development is clearly a matter of social choice, choice on the part of individuals and families, of communities, of the many organizations of civil society, and of government. Because it involves choice, change is only possible with the broad involvement of the general public and decision-makers in government and across civil society. And because of the need for this involvement, care must continually be taken to ensure that substantive conceptual and technical issues are considered within the context of the delicate value-driven processes of real, day-to-day decision-making. Research findings also suggested that another achievement to date has been that the underground mine has four entrances unlike one entrance as was the case of Kamandama. These entrances allow enough circulation of air a situation that reduces methane gas explosions. This view is supported by Zipf, Sapko, and Brune (2007) who suggests that the mine ventilation system must be designed such that all mine openings are ventilated with sufficient quantities of air to dilute all accumulations of methane in intake air course to below 1.0%. they further suggests that if higher concentrations of methane are detected in intake air courses, all electrically powered and mechanized equipment must be shut off and the ventilation controls adjusted such that the methane concentration is reduced to a level

below 1%. Kissell (2006) points out that considerable margin of safety below the lower flammable limit (5%) needs to be provided to protect miners from methane explosions. This is achieved through proper ventilation as the case of Hwange now.

Respondents from the mining section indicated that the other achievement has been that Mined out panel is being sealed. They suggested that the entire northern panel of 3 main was sealed. They further pointed out that the mine engaged a recognised expert to do their panels. They pointed out that the mine engaged an expert in rock mechanic Pro-Van –de Mere who designed the 3 main underground pillars. He is one of the leading rock expert's world over and he has the experience and the skill.

Respondents also pointed out the presence of a well trained and equipped proto team as another milestone. By the time the accident occurred, the proto teams that were in place were not strong enough to deal with accidents of that nature. They indicated that a South African Proto Team was air lifted to try and rescue the workers but together with other teams in the region and world over their efforts were to no avail. The research through secondary data established that only 4 bodies were retrieved but they were burnt beyond recognition. To date the mine now has established a strong proto team to deal with accidents of any magnitude. In line with this Hwange has established a safety department with massive experience and knowledge about safety issues who visit the shafts once every week to carry out inspections. Through the safety department the mine has a fully fledged emergency fire section to deal with fires of any magnitude. They carry out fire drills and are fully equipped, well trained and dedicated to their job.

The mining division equally indicated that Stone dusting process is being carried out. Cain, P. (2003) suggests that Stone dusting involves the application of an inert dust to the roof, ribs and floor of the mine roadway to render coal dust inert. Stone dust can be applied in any one of several ways; however automated stone dusters are now commonly used. Hartmann and Westfield, (1956) indicates that Coal dust explosions occur when fine coal particles become airborne and are ignited by some means. In a coal mine, the precursor to a coal dust explosion is usually the ignition and explosion of a quantity of methane (explosive in the range of 5% to 15%). () they further point out that Float coal dust can be deposited on the roof and sides of the roadway, as well as the floor, which makes it dangerous hence the need to carry out the coal dusting exercise massively.

Both managerial and non managerial respondents indicated that the other success factor highly recognised has been the continuous observation of contraband rules. Contraband in coal mines means items which are not allowed to be taken underground in a coal mine because if there is firedamp it may start a fire or explosion, just like the 29 December 1960 first ignition that injured 3 employees it was a match that was truck to light a fuse. This includes: matches, tobacco and other smoking materials, anything that may cause sparks, anything with electric components except what has been safety-approved. They have to be declared before going down and left there, and collected after coming out of the mine. Smoking and open flame are generally prohibited inside underground coal mine. However, if it becomes necessary to work with an open flame for cutting or welding operations, special precautions must be taken to prevent methane ignitions, a condition that was not done the minor in charge in 1972. Respondents from the HR department suggested that the company now has safety committees in place to deal with all OHS concerns. The purpose of safety committees is to create and maintain a harmonious safety environment to reduce accidents Halonen (2005) .Safety committee is there to promote an awareness of health and safety issues and an atmosphere of co-operation between employees and managers, more so as a safety promotion it helps to identify problems, formulating policies and procedures, motivating and improving workplace health and safety. At Hwange each section has a representative in the committee. Lard Mac (2001) alluded that training managers should develop and maintain a safety training programs that ensure that personal are trained and competent to perform their duties and maintaining good safety standards.

16. Challenges

Managerial respondents indicated that the company is facing serious financial challenges. The company is seriously under a serious financial crisis through having inadequate capital which management indicated that sometimes results in lagging behind on stone dusting and other safety promotion activities. This situation may affect sustainable development should such an accident repeat since it affects all stakeholders, employees, government and the economy in general. However management was quick to point out that the risk is declining as more funding lobbying is being done, by the company. The respondents equally pointed out that safety programs were being jeopardized by low morale of workers. Workers moral was therefore added to the endless list of issues affecting safety programs by managerial respondents.

17. Future prospects

We desire a bright future in companies, and families, a life that is free from fear of workplace accidents as suggested by Saari (2001) who states that the zero accident vision is not directly a goal in the usual sense but

rather a way of thinking that all accidents are preventable. It is too common for people to accept accidents, or a certain level of accidents, just because they think prevention is impossible in that situation. The views by Saari (2001) were supported by managerial respondents who indicated that the company should Finance more projects on Safety issues, that is support all training programs, for both managerial and non managerial employees, eliminate all hazards identified, investigate all accidents, support fully fire drills and train effectively the proto teams. Management also indicated the company should have ISO standard accreditation such as the OSHAS 18000. They further reiterated that by adopting it fully means that more attention can be given to OHS. It was equally pointed out by respondents that the company should keep on giving compliance to the statutory requirements of domestic standards.

A good safety culture is a work environment where all members of the organisation share a high safety ethic. Either fatalism, or production-first thinking, provokes the negligence of hazards in a bad safety culture. Top management commitment is essential to promote a safety culture as suggested by Saari, (2001). This was pointed out by managerial respondents who pointed out that by fully adopting the domestic standards good OHS practices will be maintained. Management equally pointed out that there should be massive routine audits both by internal and external resources. These audits help in identifying hazards and eliminating them. two senior managerial respondents indicated that the company should ensuring correct competence levels for each role. They further explained that, with fully competent individuals and departments in place good safety standards can be maintained.

18. Conclusions and recommendations

The research findings indicate that the accident was mainly due to human error and as a result it affects sustainable development as in the case of Kamandama disaster that shattered the dreams of many. It seemingly convincing that management during the time of the accident was more production oriented and ignored safety issues a situation current management has corrected by prioritising safety first, a positive move towards sustainability. To date the company has managed to come up with strategies to reduce the devastating effects of the accident, through designing programs to cater for the families that lost their beloved ones, the employees who desperately needed assurance that such accidents would be mitigated strongly. Thus the researcher recommends, the company to offer person-wearable methane monitors which is now a new development in gas monitoring. These are lower-cost light- weight devices that operate continuously to warn miners of any gas accumulations. The light blinks when methane is encountered. Secondly based on the research findings the paper recommends preventing the accumulation of flammable gases which is mainly achieved through adequate, positive ventilation of all mine openings and through drainage of methane from the coal bed prior to and during mining, a process mainly referred to as methane drainage. In addition to diluting methane accumulations by providing fresh air to ventilate the entries, methane may also be drained from the active coal bed as well as from adjacent coal beds above or below the active seam. The researcher also recommends the elimination of ignition sources, through observing contraband rules which are in place. More so having a barrier pillar between panels and proper design of panels. The paper also recommends the mine to have a flame retardant belt material to avoid fires. Likewise having qualified ventilation officer reporting to the general manager as appointed may mitigate such accidents. Lastly maintaining and managing effective mechanical means to applying stone dust can reduce accidents.

References

- [1] Anon. (1995) 'Mine disaster pushes safety to top of political agenda'[online] Available at: www.mg.co.za
- [2] African News Letter on OHS Volume 19, Number 1, April 2009
- [3] Ashford, N. and Zwetsloot, G. (2000), 'Encouraging inherently safer production in European firms: a report from the field', *Journal of Hazardous Materials*, 78, pp. 123–144.
- [4] Cain, P. (2003); "The Use of Stone Dust to Control Coal Dust Explosions: A Review of International Practice", ROKDOK,
- [5] Chilton JE, et-al (2005). Evaluation of person-wearable methane monitors. Proceedings of the 8th International Mine Ventilation Congress, Brisbane, Queensland, Australia, July 2005 pp.189-195.
- [6] Chilton JE, Taylor CD, Timko RJ (2003). Evaluation of Iyoni II Methanometers. Proceedings 30th International Conference of Safety in Mines Research Institutes, Johannesburg, South Africa
- [7] Clifford Dupont (1978). *The Reluctant President: The Memoirs of the Hon. Clifford Dupont*, GCLM., ID. Books of Rhodesia Publishing Co. (Pvt) Ltd. pp. 222–224. ISBN 0-86920-183-2.
- [8] Cooper, D. (2007). "Behavioral Safety Approaches: Which Are the Most Effective?" White Paper, B-Safe Management Solutions Inc., Franklin, Indiana
- [9] Green Cross: CD (2001): Guide to Chernobyl Consequences in Belarus, Minsk
- [10] Hardi, P and Zdan, T.J (1997). *Assessing Sustainable development Principles in Practice*. Canadian Cataloguing in Publication data [11] Swanepoel, B., Erasmus, B., Van Wyk, M., & Schenk, H. (2005). *South African Human Resource Management: Theory and practice* (3rd ed.). Cape Town: Juta.
- [12] Parks, M. (1986) 'South Africa Miners Strike to Protest Deadly Fire',[online]
- [13] Kissell, FN., Goodman. G. (1991). *Preventing tunnel methane explosions: what's most important*. Littleton, CO: Society for Mining, Metallurgy, and Exploration, Inc., pp. 605–610.

- [14] UNDP/UNICEF: The Human Consequences of the Chernobyl Nuclear Accident, January 2002
- [15] Zipf, RK, Sapko, M and Brune, JF: (2007) Explosion Pressure Design Criteria for New Seals in U. S. Coal Mines, US Dept. of Health and Human Services, NIOSH IC, 2007 91p.
- [16] Kissell FN (2006). Handbook for Methane Control in Mining. National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2006-127, 184 pp.
- [17] Krog, RB and Schatzel, SJ: Frictional Ignitions in Underground Bituminous Coal Operations 1983-2005. 2007 SME Annual Meeting, Denver, CO, Preprint 07-132. Littleton, CO: Society for Mining, Metallurgy and Exploration, Inc., 8p.
- [18] James, L., (2000) 'Redefining work as a result of globalisation and the use of new information technologies', Magazine of the European Agency for Safety and Health at Work, No 2.
- [19] Lord Mac .S (1994), Healthy and Safety around the World, Sage, London
- [20] Krog, RB and Schatzel, SJ: (2007) Frictional Ignitions in Underground Bituminous Coal Operations 1983-2005. Littleton, CO: Society for Mining, Metallurgy and Exploration, Inc., 8p.
- [21] Kates R. W, Paris T. M and Leiserowik A.A (2005), What is sustainable development? Goals Indicators, values and practice
- [22] South African Institute of Mining and Metallurgy, Colloquium-Coal Mining 2000 and Beyond, Johannesburg, South Africa, 1996
- [23] Jensen, P. L.,(2001) 'Conclusions and perspectives: reconsidering regulation', TUTB-Saltsa Working Without Limits Conference and Newsletter, No 15–16, February.
- [24] Humphreys, D. and O'Beirne, T, (2000); "Risk Assessment Based Stone Dusting and Explosion Barrier Requirements", Townsville, Queensland, Australia
- [25] Saari, J., 'Accident prevention today', Magazine of the European Agency for Safety and Health [26] at Work, No 4, 2001.
- [27] Makhonge. H (2009), Occupational Health and Safety in Africa, 1st Edition New York :HRD Press .
- [28] Jager, W. and Sturk, P. (2000), 'Zeitarbeit und Arbeitssicherheit bedingen einander'. BG (Die
- [29] Berufsgenossenschaft), No 5, p.258–261.
- [30] McKinsey Quarterly (2006) "The McKinsey Global survey of Business Executives: Business and Society" McKinsey Quarterly 2:3339
- [31] Maunganidze, L., Ncube F., & Sibanda P., (2013) Rethinking Pro-Active Disaster Planning in the Workplace: The Case of a Selected Mine in Zimbabwe, International Journal of Business and Management; Vol. 8, No. 15; 2013
- [32] UNICEF (2013) Towards a Post- 2015 World Fit for Children; UNICEF's Key Messages on the Post 2015 Development Agenda
- [33] Weiss, E. B., (1992), In fairness to future generations and Sustainable development. Am. UJ.Int'l & Polly 8, 19 [34] Chakrabarti, S. (2000): Data mining for hypertext: A tutorial survey. SIGKDD explorations, 1(2), pp. 1–11.