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An Assessment of the Risk Communication, Community Perceptions and Lived Experiences of Residents Living Around the Mine Despite Its Adverse Effects. A Case Study of Maamba Town in Sinazongwe District.

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ABSTRACT:
The study aimed to establish whether Maamba Collieries Limited, a mining company in the Sinazongwe District of Zambia contributes to risk communication (advancing knowledge about risk issues, influencing risk-related behavior, and facilitating cooperative resolution). The study adopted an Evaluative Survey Design and employed both quantitative and qualitative methods to complement data analysis. It also explored the extent to which risk messages influence people's lives by modeling the relationships between risk-related emotive and cognitive contexts in which these factors are embedded. The research employed both quantitative and qualitative methods. The sample size for the study comprised 180 people living around the mine area, 17 Maamba Collieries Limited employees in their capacity, and 3 from Zambia Environmental Management Agency (ZEMA). The study used purposive sampling (non-probability) to ensure the inclusion of relevant individuals from pertinent categories (McNeil,2001). The study used questionnaires, interview guides, and document analysis. Quantitative data were analyzed using descriptive and inferential statistics.
The major findings show that Maamba Collieries Limited has fully implemented a risk communication policy in the area of its operation despite mixed views by the respondents who showed no knowledge of MCL's efforts to communicate risks associated with mining. Overall the study concluded that Maamba Collieries Limited has contributed to risk management by among other measures complying with Government laws related to mining and management of risks associated with mining.
The study recommends that the negative attitudes exhibited by some sections of the community on risk perceptions be managed well to avoid negative impacts on the well-built reputation of and compliance with the local laws by Maamba Collieries Limited. Further, it is recommended that Maamba Collieries Limited may consider enhancing a specific risk communication policy that could further be jointly implemented in collaboration with the community through Community Social Responsibility projects.
The study recommends that the Government should include among other specific policies that may require mining companies to extensively carry out community education on regular basis highlighting the risks of living around the mining area in Zambia.
The study additionally recommends that the community needs to cultivate interest in the mining activities within their communities as well as endeavor to understand the risks associated with mining activities.

1. INTRODUCTION

1.1 Introduction

This study has investigated the perceived risks of living around the mining area in Maamba of the Sinazongwe District of Zambia, to find out risk communication strategies employed by Maamba Collieries Limited and establish their effectiveness, and find out the Mining industry's risk communication culture specifically of the Maamba Collieries Limited design.

1.2 Background

Maamba Collieries Limited is a player in the Zambian mining and power generation industries (zccm-ih.com.zm). Maamba Collieries Limited is located in Maamba about 345 km south of Lusaka on 17.30 31°S latitude and 27.16 29°E longitudes approximately 700 meters above sea level, Zambia. Maamba town where Maamba Collieries Limited operates has a total population of approximately 10,249 residents and a 154.7 km2 density population (Central Statistics Office Zambia, 2012). The mine was founded in 1969 and was one of the large state-owned companies to be privatized in 2010 (Chilipamushi, 1994).

According to Humann,2003, Maamba Collieries Limited's safety record and its benchmark, community social responsibility programs, and environmental responsibility have been recognized, and are recommendable Maamba Collieries Limited's culture continued as more stringent practices and standards were continually implemented. From 2010 to 2020 Maamba Collieries Limited recorded negligible minor incidents (Maamba Collieries Annual Report, 2020:4). The mine employs approximately one thousand (1,000) employees and about six hundred (600) people live in the villages closer to the mining area these include Sikalozyo, Sipumina, and Siankodombo villages. The people of Maamba know no other big industry apart from Maamba Collieries Limited and to a lesser degree Column Coal mine in Sinanzenze in Sinazongwe. Otherwise, for most people, life revolves around Maamba Mine.

Risk communication is any purposeful exchange of information about risks between interested parties, which includes government, agencies, corporations, and industry groups; unions, the media, scientists, professional organizations, interested groups, and individual citizens (Covello, 1991). More specifically, in the context of this study, risk communication is the act of conveying or transmitting information between parties about a range of areas including water quality: guidelines, standards, and health. All too often it has been the case, concerning policy-making, that there was an emphasis on 'public misperceptions' with a tendency to treat all deviations from expert estimates as products of ignorance or stupidity, hardly an ideal basis for meaningful communication. Fortunately, this stance is gradually changing, to acknowledge that public reactions to risk often have a rationality of their own and that 'expert' and 'lay' perspectives should inform each other as part of a two-way process (Bennett et, al, 1999). The necessity of the two-way process has been highlighted by the Food and Agriculture Organization and World Health Organization's ongoing reciprocal communication among all interested parties as an integral part of the risk management process.
Risk communication is more than the dissemination of information, and a major function is a process by which information and opinion essential to effective risk management are incorporated into the decision (Bennett and Calman, 1999). The days when it was possible to take a 'we know the best approach, simply informing the public that a risk has been identified, telling people not to worry, and stating what was intended to be done about it, have in most cases long gone (Coles, 1999). The public today no longer automatically accepts authority but now demands a greater role in decision-making.

While opening up a route for better decision-making and stakeholder involvement, this is no small undertaking and it involves some major challenges including the provision of information when science is uncertain; explanation of the risk assessment process; incorporation of the different ways that various groups interpret the science into risk communication strategies. Additionally, these challenges include: accounting for differing concepts of an 'acceptable level of risk, provision of information that assists in personal decisions and informs

opinions on policy and in terms of incident management, maximizing appropriate public responses, and minimizing inappropriate public responses (Cole, 1999).

1.3 Statement of the problem

Increases in industrialization in search for profit from industrial activities, rapid urbanization, population growth, and increases in consumerism, have brought with them serious negative consequences on the environment due to environmental pollution of the air, water, and soils (Soussan, 1992 and (Chipungu and Kunda, 1994)). This is the problem this study aimed at investigating the effectiveness of communication systems Maamba Collieries Limited is using as a result of the risks arising therefrom. Data collected by World Health Organization (2001), states that air pollution has a direct and /or indirect impact on the health of humans, animals, and the environment. In humans, the pulmonary deposition and absorption of inhaled chemicals from coal mining can have direct consequences on health. In this regard, the research has endeavored to access the risk communication strategies, and environmental, health, and safety performance of the mining company in Maamba.

There are an increasing number of factors affecting water, air, and land supplies. These factors might include chemical as well as microbiological hazards. Besides, there is a growing realization that for risk communication to be effective, it should be a continual and evolving process and not simply a crisis management measure.

1.4 Purpose of the study

The purpose of the study is to establish how effective Mining companies' policies regarding risk communication are to the community and how informed is the community about the risks associated with mining activities.

1.5 General research objective

The principal objective of this study is to examine the effectiveness of risk communication in the neighboring mine communities at Maamba Collieries Limited, in the Sinazongwe District of Zambia.

1.6 Specific objectives

I. To investigate if Maamba Collieries Limited has policies on risk communication.
II. To investigate if the community is aware of Maamba Collieries Limited's risk communication policies.
III. To establish the perceived risks of living around the mining area.

1.7 Research questions

I. Does Maamba Collieries Limited undertake any risk communication to the neighboring mine communities?
II. Do residents of Maamba understand the risks associated with living around the mining area
III. What are community perceptions and attitudes towards such risks?
IV. What risk assessment and mitigation measures have been employed by Maamba Collieries Limited to combat the risks?

1.8 Significance of the study

The importance of this study lies in the contribution it will make to the body of knowledge and literature in the mining industry, especially Maamba Collieries Limited's risk communication. Secondly, the study will serve as a basis for the improvement of the stakeholder management component of risk communication implementation in Zambia. Lastly, the study will provide a framework for further study and will be beneficial to students, academicians, and other scholars who may wish to undertake further research on the subject.

1.9 Scope of the study (Delimitation)

This research is a Case Study of Maamba Collieries limited, which has a production capacity of approximately (not Official) 150,000 tons of coal per month, in an area covering about 100 square kilometers, covering operations over a period of 12 years from 2010 to 2022. According to Central Statistics Office Zambia, 2012, Maamba town where MCL operates, has a population of approximately 10,249 residents and a 154.7 km2 density population within the Sinazongwe District of the Southern Province of Zambia.

1.10 Limitations of the study

According to Macmillan Study Dictionary (2009:431), limitations are factors that a researcher foresees as restrictions, problems, and other elements that might affect the objectivity and validity of the research findings. In this study, the major limitation might be the sample size; this is because it might fail to make a full representation of the whole targeted population. However, it is hoped that after the study the results will help to make generalizations that will be very significant in the future. The research further anticipates time factor limitations that may be a constraint to configuring the expected challenges on perceived outcomes. The research might prove costly to extend the research, collect data and interpret findings, conclude and make recommendations, and finally submit the dissertation reports. Both the challenge of time and data collection were overcome by systematically managing and allocating resources.

1.11 Conceptual Framework

Risk communication has heredity in a variety of disciplines and dominions from which it has inherited practices, systems, and associated concepts of which all base argument on communication. Chorus and Bartram (1999), affirm that it is no accident that risk management, which was traditionally depicted as a linear process, is now generally viewed as a cyclic process with risk communication at its heart. As shown in Figure 1, the variables shown in the framework, are hazard identification, risk assessment, policy development, policy implementation, and policy evaluation.

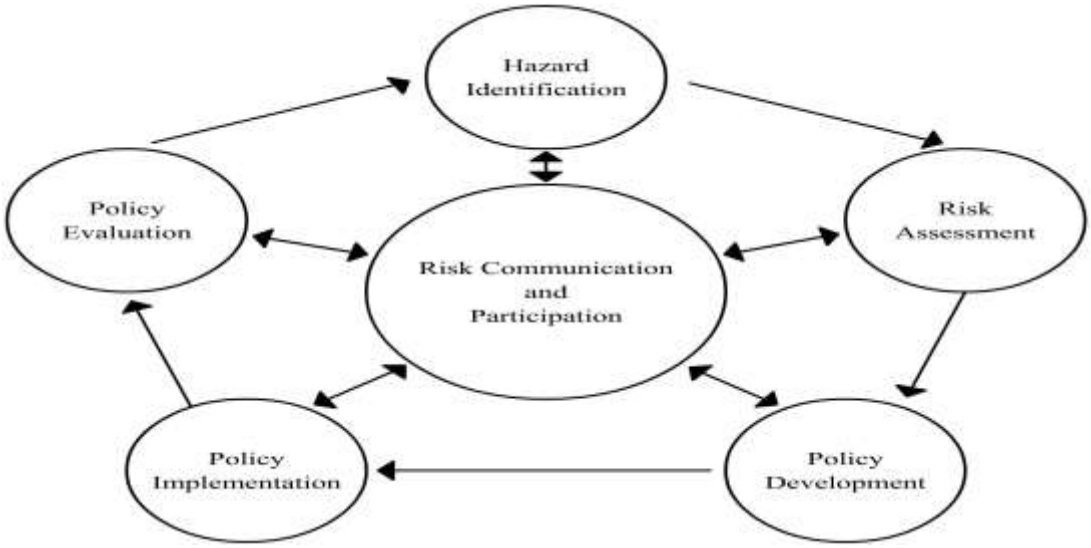


Fig. 1: The risk management cycle (adapted from Chorus and Bartram, 1999).

Chorus and Bartram, 1999 state that responsible risk and crisis management agencies should adopt a risk management philosophy through which the relevant agency can preserve its shareholder value, reputation and credibility, and market share in the event of a health or environmental risk. An essential component of this philosophy is a risk audit process, which assists to identify likely issues requiring risk communication strategies, with the central circle of the figure above being made up of numerous different audiences. According to Chorus and Bartram, 1999, there are several functions that a risk communication program might seek to fulfill. These include guidelines, standards, and health policies.

However, the available body of information on the subject matter is perhaps still insufficient to support an arching theory on it and form corrective frameworks. This study has focused on the review, its interface with other disciplines and discusses some definitions and models of recommendations regarding risk communications and stresses not only the exchange of information between actors but also the wider institutional and cultural contexts within which risk data is formulated, transmitted and embedded (Krimsky and Plough, 1988). The analysis revealed themes regarding the risk that Maamba residents are allegedly exposed to. It further reveals themes or stories, lived experiences with emissions, perceptions of risks, risk communication strategies, and themes.

2. LITERATURE REVIEW

2.1 Introduction

Considering that the literature review is a critical look at the existing research that is significant to the work the researcher is carrying out, (Kombo and Tromp, 2006, in this chapter, the literature review was covered in five parts. Thus, this section progressed from an exploration of the risk communication discipline and conceptual approaches to risk communication. The study further examined risk communication applications. The study finally looked at citizen participation and risk communication trust.

2.2 Communication Theory

According to (Leiss, 1996), this theory suggests that to set realistic, achievable objectives and deliver advice and programs that are effective, public relations practitioners need to have at least a rudimentary understanding of communication theory. What the study brought about is that, assumptions about what communication can achieve lead to misguided and overly optimistic claims in some companies or organizations which make evaluation risky and problematic. Although considerable lip service is allegedly paid to the importance of program evaluation, and communication, the rhetorical line is much more enthusiastic than the actual utilization. Communication Theory has evolved from the early, simplistic information processing model which identified a source, message, channel, and receiver. As some other scholars point out, the information processing model assumes that changes in knowledge will automatically lead to changes in attitudes, which will automatically lead to changes in behavior (Leiss, 1996).

This line of thinking was reflected in the evolution of the Domino Model of communication and the Hierarchy of Effects model, which saw awareness, comprehension, conviction, and action as a series of steps of communication where one logically led to the next. The influential work of social psychologist, Dr. Leon Festinger, in the late 1950s challenged the information processing model and the domino model of communication effects. Festinger's Theory of Cognitive Dissonance stated that attitudes could be changed if they were juxtaposed with a dissonant attitude; but importantly, dissonance theory held that receivers accepted only messages that were consonant with their attitudes and actively resisted dissonant messages (Grunig, 1983).

A significant recent contribution to public relations theory is Grunig's Situational Theory of Communication. In contrast to the simplistic Domino Theory, Situational Theory holds that the relationship between knowledge (awareness), attitudes, and behavior is contingent on many situational factors. According to Grunig, (1983), these include; the level of problem recognition; the level of constraint recognition (does the person see the issue or problem as within their control or ability to do something); the presence of a referent criterion (a prior experience or prior knowledge); and level of involvement.

The results of communication will not always be behavioral. The outcomes of communication may be cognitive (simply getting people to think about something), attitudinal (forming an opinion), or behavioral. Public Relations executives should note that results are less likely the further one moves out along the axis from cognition to behavior. If overly optimistic objectives are set, the evaluation of public relations will be a difficult and frequently disappointing experience (Grunig, 1983).

An understanding of Grunig's Four Models of Public communications which describe the evolving types of Public Relations practice from press gentry through Public Information to Two Way Asymmetric and Two-way Symmetric communication is also important to a study of evaluation, as different objectives pertain to each model and therefore different evaluation strategies are required for each. In particular, modern two-way Asymmetric and Symmetric models of public relations seek to achieve persuasion and understanding rather than simply dissemination of information and therefore rely on feedback and evaluative research to gauge results.

This discussion only skims the surface of important communication research and theory building which are vital to developing professionalism. The issues raised do not mean to imply that communication has no effect. But they do indicate that it is dangerous to assume about communication outcomes and suggest a greater understanding of communication theory.

According to common knowledge, humankind has always tried to communicate and make it understood. Before alphabets, characters, and numerals, there were pictograms. People also wrote on tablets of stone and leather, parchment and papyrus, as with the Dead Sea scrolls. If we go back only 150 years, we find the house journal one of the oldest forms of creative communication. In his book "American Notes", published in London in 1842, Charles Dickens records the Lowell offering, edited by the women working in a cotton mill in New England. When I.M Singer began selling sewing machines in America in 1855, he published his Gazette to teach customers how to use a sewing machine (Palm, 2006).

Harvey (1985) states that to gain an understanding of what makes the organization tick, one could do better to turn to the classics in the field. He went further to identify the following four types of culture that reflect the way those leading organizations prefer things to be:

I. Power Culture

Small entrepreneur organizations are likely to have a power culture centered on the founder. In this model, the founder is often the voice of the organization and will, at least in its early days, take control of the communication. At a later stage, a professional communicator might be appointed, but the founder will remain a prominent factor in both internal and external relations.

II. Role Culture

The role organization places its emphasis on function and specialty. It has many procedures, and rules and job descriptions are prevalent here, as are procedures for doing such things and rules for settling disputes. In these organizations, the post is likely to be more important than the post-holder, and conversely, the post holder gains credibility from the position held.

III. Task Culture

A task culture refers to a team-based approach to completing a particular task. Task culture is job or project-oriented, and its accompanying structure can best be represented as a net. Some of the strands of the net are thicker or stronger than others, and much of the power and influence are located at the interstices of the net, at the knots. Task cultures are often associated with organizations that adopt matrix or project-based structural designs. The emphasis is on getting the job done, and the culture seeks to bring together the appropriate resources and the right people at the right level to assemble the relevant resources for the completion of a particular project.

IV. Person Culture

Within some bureaucracies can reside traces of yet another culture that thrives relatively happily within, but has an affliction on the wide educational establishments, and hospitals particularly spring to mind. Harvey himself also cites barristers, chambers, architects, practices, and small consultancies as having their focus on the person's culture. This may sound rather like the power culture prevalent in entrepreneur organizations, but it is quite different. The focus, if described as such, is on the individuals themselves as separate individuals

who choose to work together. Where this kind of group has sprung up within universities and healthcare settings, there can be real stresses and strains with the overarching structure, which will often be largely bureaucratic. Concentrations of highly skilled professionals are less likely to pay attention to messages they perceive as having been centrally generated by the organization.

2.3 The discipline of risk communication

Risk communication is defined as any two-way communication between stakeholders about the existence, nature, form, severity, or acceptability of risks. It is vitally important to understand the basic concepts of risk communication and to ensure that communication among stakeholders is integral to the risk management process. The focus of risk communication has evolved since the 1980s from concern about how best to inform the public about the technical aspects of risk assessments to a process of early and ongoing dialog among stakeholders. While guidelines for risk communication have been prepared by various agencies, putting principles into practice is a long-term process requiring considerable resources, time, and effort (Takeuchi, 2008).

The study of risk communication is a relatively new development; as such several interrelated factors have led to the emergence of interest in risk communication research projects. There is an increasing requirement placed upon governments and industries to inform populations about the environmental hazards to which they might be exposed. Risk communication is one of the support systems for risk management (Kikkawa, 1999). Risk communication consists of an understanding of risk and implementing risk reduction plans. To make risk communication successful, three elements are necessary, namely holistic learning, facilitation, and trust. Our thinking is that communication cannot go smoothly when there is a gap between the information sender and receiver. Therefore, to reduce gaps, both hard measures such as enhancing engineering structures, and soft measures such as disaster education and evacuation training should be carried out. Soft measures are particularly important for residents. To sustain and save lives, people need to act. For example, Takeuchi et al., (2008) tried to develop and implement supporting tools for understanding risk information.

However, the information sender should not only try to help residents understand risk information but also need to build relationships including trust with community people for successful risk communication. To achieve successful risk communication, trust is the most important element (Hovland and Weiss, 1951). When a risk information sender (for example, a researcher, Non-Governmental Organizations, an official, etc.), is not trusted by the risk information receiver (for example, local people, local associations, etc.), risk communication would be difficult to establish. The communicative survey method can reduce this kind of distrust gap very well (Takeuchi et al., 2007). Hence, it remains a pertinent component of a workable risk communication framework as highlighted below.

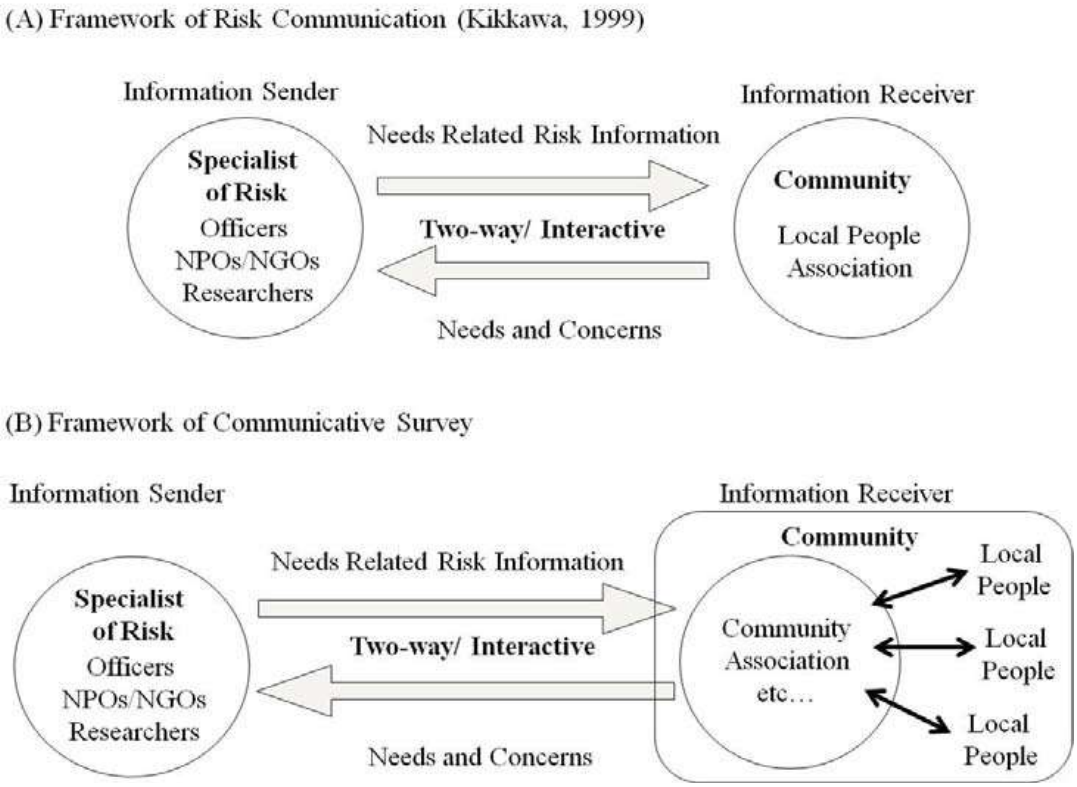


Fig.2: Differences between Risk Communication framework and Communicative Survey (Takeuchi *et al.*, 2008).

A methodological framework of "Communicative Survey" is proposed here to systematically study the process of risk communication among concerned stakeholders by way of participating in and observing its mutual learning activities. This was first developed by Takeuchi et al., (2008) to build trust between risk information sender and receiver based on research activity. The risk information sender tries to collect the needs and concerns of the risk information receiver by using social survey methods such as questionnaire surveys and workshops. In general, it is difficult to obtain minority opinions through a simple social survey. Hence, large community involvement in research would be ideal.

During a social survey, the general opinion is obtained through questionnaires [for quantitative surveys] and focus group discussions [for qualitative surveys]. However, it is difficult to understand minority opinions, since statistical analysis mainly gets the majority views. The key point to understanding minority opinion is the time factor, where the researcher needs to understand the community well to draw the opinion of the minority groups.

The "Communicative Survey" method can help to collect opinions because of its flexibility due to the strong and long-term relationship between researcher and community member. Such an information-sharing framework is called the "Communicative Survey Method". Because of the limitations of the interactive mode, there is a need to learn direct and collective communication. This survey method was developed based on the following objectives:

a) To find out the needs and concerns of the community;
b) To design questionnaire sheet with community members;
c) To carry out a questionnaire survey among residents; and
d) To organize a workshop.

More specifically, the design and operation of the "Communicative Survey" framework adopted in this study are characterized as follows:

a) Members (especially the leaders) of the autonomous council ("Jichi-Kai" in Japanese) or voluntary disaster prevention organization ("Jisyu-bousai-Kai" in Japanese) are identified as key persons who serve as the bridge for risk communication between risk management specialists and residents.

b) Through a long process of continuous survey, feedback, and risk communication, the specialist and residents are expected to mutually share and eventually reach a common understanding of the community's needs.

Through these activities, the trust could be established between the risk information sender and receiver. The needs and concerns of risk information receivers have been identified by risk information senders through long-term and continuous communication.

2.4 Conceptual approaches to risk communication

Defined as "the techniques used by risk managers to inform the general public of the risks about products and/or activities, to influence behavior" (Institute of Lifelong Learning (2008), it remains a relatively new development in the general area of risk perception research. Several factors have contributed to the emergence of interest in risk communication research. The first is the increasing requirement placed on governments and industries to inform populations about the environmental, technological, and health hazards they might be exposed to. Information is passed on in advance as a statutory requirement so that those that might be affected are forewarned and mechanisms can be put in place to respond to any emergencies. Legislations like the 1982 European Communities Seveso Directive and the Emergency Response and the Community Right to Know Act in the US were born out of major incidents (Pigeon et. al, .1992: 118 - 119). Another reason identified by Krimsky and Plow (1988, cited in Pigeon et al., 1992: 119) is the public policy dilemmas that have arisen because of social conflicts over the sighting or expansion of hazardous facilities. Such conflicts arise because the same risks mean different things to different people due to their varied perceptions and frames of reference.

While acknowledging that risk communication is difficult to define, Pidgeon et, al; (1992) identified four conceptual approaches to risk communication. In addition to what the author has said, one approach defines risk communication within an engineering context where communication is a top-down' or a one-way where messages about, risks are passed from 'an expert' to a 'non-expert' audience. This model is criticized for ignoring the perspectives and knowledge of the risk bearers.

A second approach adopts the interactive two-way exchange of information. Messages are tailored to cover not only information about the risk but also opinions and reactions to messages from parties to the issue. This approach seeks to foster mutual understanding by listening to all sides of the risk debate.

The third approach incorporates not only the aspect of exchange of information between actors but also the wider institutional and cultural contexts within which risks are formulated, transmuted, and embedded (Fessenden-Raden, Fitchen & Heath, 1987; Krimsky & Plough, 1988). The approach recognizes the need for the communicator to appreciate the context within which communication occurs.

A final approach views risk communication as part of the wider political processes that operate within a democratic society. It advocates the empowerment of risk-bearing groups in society to participate in decision-making about risks. Defined this way, the question of whether the public should be granted the right to know the risks they face and their role in decision-making becomes central to the model (Pidgeon et. al (1992:121).

The methods of communication defined in the above approaches are related to objectives 3 and 4 of this research. While the first conceptual approach is considered important because it shows the inherent limitations associated with this mode of risk communication, the rest highlights the significance of understanding the institutional and cultural contexts in which communication takes place. This study looked

for evidence linking the problem being investigated to any of these approaches. Given that this is an important part of the research issue; attention was given to these at a later part of the review. The next section will focus on the relationship between trust and risk communication.

2.5 Risk communication application

Inherent in risk management, decisions are uncertainties and value assumptions about the nature and significance of the risk. Stakeholders may bring information and perspectives to the table that are critical to the decision process. Academics, practitioners, and citizen leaders agree that the process by which agencies make decisions are critical, in fact, often more critical than the eventual decision outcome. An ongoing exchange of information and ideas between risk managers and the affected public is fundamental to the overall risk management process. It is critical to build trust in the decision process and therefore ensure a successful outcome. Experiences increasingly show that decisions made with the involvement of interested and affected parties are more effective and more durable (Leiss, 1998).

The risks associated with ineffective risk communication include irreplaceable loss of management credibility, unnecessary and costly conflicts with the government, the difficult and expensive approval process for project sites, bitter and protracted debates and conflicts with stakeholders, diversion of management attention from important problems to less important problems, non-supportive and critical employees, and unnecessary human suffering due to high levels of anxiety and fear. The table below emphasizes the concept and application of the risk communication process.

RISK MANAGEMENT STEP	RISK COMMUNICATION TASK
Initiation	• Identify stakeholders • Consult with stakeholders in defining the scope of the Issue
Preliminary Analysis	• Develop stakeholder analysis for ongoing verification and refinement
Risk Estimation	• Discussion of source, exposure issues • Communication of results with stakeholders • Assess changes in knowledge/perception in light of new information
Risk Evaluation	• Elicit stakeholder perceptions of the risks, and benefits, and the reasons for these, if possible • Assess stakeholder acceptability of the risk
Risk Control	• Consult with stakeholders to gain input into identifying and evaluating control options • Inform stakeholders of chosen risk control and financing strategies; • Inform stakeholders of benefits, costs, and any new risks associated with the proposed control options; • Evaluate acceptance of control options and residual risks; • Determine if risk trade-offs might be possible
Implementation (Action)	• Communication of risk control decisions and Implementation
Monitoring	• Ensure implementation of communication strategies • Monitor changes in needs, issues, concerns of existing or new stakeholders

Table: 1. Risk communication application and tasks

Source: Adopted from Leiss, W. (1998).

Risk researchers Doug Powell and Bill Leiss have described risk communication as: "the causeway that links all the organizational elements in a well-functioning risk management process." This view is reflected in the risk management framework, where risk communication among stakeholders is deemed integral to all stages of the risk management process. It has been noted that while most firms and agencies which ought to be implementing good risk communication practices are not yet doing so, the situation is slowly changing as there is a growing awareness that communicating well has benefits for good risk management.

During the initiation step, the risk communication tasks include identifying stakeholders and assessing stakeholder perspectives on the risk issue to define the scope of the issue to be addressed. Stakeholders include groups that are affected or affected by the risk, risk managers, and groups that will be affected by any efforts to manage the source of the risk. Stakeholders may include decision-makers; community groups, local governments, public health agencies, businesses, labor unions, the media, individuals and groups; environmental advice organizations, and provincial and central government agencies.

The appropriate level of stakeholder involvement is situation-specific. Risk Assessment and Management offers the following factors to consider in determining the nature and extent of stakeholder involvement:

a) The complexity, uncertainty, impact, and level of controversy associated with the decision to be made.
b) The urgency with which the problem must be addressed.
c) The extent to which participants can have a genuine influence on the decision.
d) This leads to four key considerations in designing a deliberation process.
e) That participation is sufficiently broad.
f) That the selection process is fair and perceived as fair.
g) Those participants who represent interested and affected parties are acceptable to those parties as representatives.
h) Participants bring to the process the kinds of knowledge; Experience, and perspectives that are needed for the deliberation at hand.

Organizing appropriately broad deliberations presents significant challenges including managing scarce resources, setting realistic expectations, identifying all the parties that should be involved, and nurturing the process. Leiss, (1998) recommends that under situations when the stakes are high and trust in the organization is low, the organization may need to make special efforts to ensure that the interested and affected parties accept key underlying assumptions about the risk-generating processes and risk estimation methods as reasonable. Stakeholders may also be consulted during the Initiation phase of the risk management process to gather information to assist in defining or validating the scope of the risk issue.

The risk communication activity of the Risk Identification (or Preliminary Analysis) step of risk management focuses on developing a stakeholder analysis. A stakeholder analysis provides the decision-maker with a profile of potential stakeholders for consideration in decision-making and communication processes. The stakeholder analysis includes the following information for each stakeholder group: needs, issues and concerns, and underlying values; risk perceptions; level of interest and knowledge on the issue(s); knowledge gaps and misconceptions; trusted information sources and communication preferences. The profile is verified and updated through dialog with stakeholders throughout the risk management process (for example, through group meetings, focus groups, and telephone interviews).

During the Risk Estimation step of risk management, the frequency and consequences associated with each risk scenario are estimated and communicated with stakeholders. Stakeholders may have important knowledge of sources and patterns of exposure that analysts will need to integrate into a risk assessment.

However, conflict is likely to arise at this step as stakeholders are not typically involved in the risk estimation process, and the uncertainties and value assumptions associated with the methods may not be communicated.

During the Risk Estimation stage, stakeholders, knowledge, and perceptions are assessed in light of receiving new information resulting from the risk estimates, and the stakeholder analysis is updated. Third-party review by third-party experts and explicit communication of the methods, assumptions, and uncertainties will contribute to credibility and trust in the technical analysis. Communication is central to the Risk Evaluation step, in which the risks, costs, and benefits of the activity are estimated and integrated to determine stakeholder acceptability of the risk associated with the activity. This is where an understanding of stakeholder perceptions of risk and benefits and the influences on these perceptions is critical. The following steps are part of the risk communication process at this stage:

a) Discuss with stakeholders the purpose of the risk evaluation step.
b) Discuss with stakeholders the benefits of the activity, as well as any other information pertinent to their decision-making.
c) Elicit stakeholder perceptions of the risks, and the reasons for these, if possible.
d) Assess stakeholder acceptability of the risk.

The purpose of risk communication during the Risk Control step is to evaluate the proposed risk control options and assess stakeholder acceptability of the residual risk. The risk communication tasks are as follows:

a) Consult with stakeholders to gain their input, in identifying and evaluating feasible control options for reducing risk.
b) Inform stakeholders of chosen risk control and financing strategies.
c) Inform stakeholders of benefits, costs, and any new risks associated with proposed control options.
d) Identify because through implementing control measures, any new stakeholders, or new issues.
e) Evaluate acceptance of control options;
f) Evaluate acceptance of residual risks; and,
g) Determine if risk trade-offs might be possible

The risk communication tasks of the Action step are associated with stakeholder outreach to communicate the risk control decision and its implementation involving contacts developed through the risk management process. The Monitoring program includes ensuring the implementation of the communication strategies, and monitoring for changes in the needs, issues, and concerns of existing or new stakeholders.

2.6 Models of risk communication

The onset of the industrial revolution in the 19th century was characterized by polarization of views between the public concerned with the new developments in science and technology and how they might affect their lives and the scientists wary of public ignorance getting in the way of scientific/technological progress (Irwin, 1995: 9-10). Whereas scientists saw the future as belonging to science and the public indifference as an obstacle to progress, the public on the other hand was unconvinced with scientific accounts on issues of environmental safety, the desirability of new consumer products, the merits of new energy policies, and an endless array of social questions (Irwin, 1995: 9-10). From this debate emerged two models of risk communication mirroring the two divergent views. The models which have since gained prominence among risk managers are the science-centered deficit model, which derives legitimacy and credibility from its alleged scientific rationality, and the sociological model of risk communication. At this point, the review looked at each of these models in detail, starting with the deficit model.

The deficit model posts that science is the unquestionable source of knowledge and provides solutions to the risks and hazards of modern life. Influenced by the science-centered worldview, it displays the following characteristics:

a) Delegitimizes lay understandings and assumes that formal science is the only legitimate form of knowledge.
b) Relies on a form of discourse where scientific uncertainties and organizational commitments are filtered out to project a single, authoritative, unimpeachable integrity.
c) Assumes an ignorant public that needs to be informed by experts about the risks they face and how they should respond in case of emergencies.
d) It portrays science as objective and 'uninterested' and therefore value-free.
e) Communication is by a technical argot displaying expertise and specialism, thereby barring the public.
f) Communication approach is unidirectional with no provision for feedback.
g) Most risk communication exercises are 'one-offs' usually with evaluating success.

This portrayal of science as authoritative, objective, and value-free is challenged by many analysts. One major concern is its tendency to delegitimize lay understanding while portraying scientific knowledge as unquestionable truths. In what Beck terms as the 'risk society the lay public is portrayed as both unformed and uninformed passive audience and science as authoritative, consensual, and independent. According to Irwin (1995: 54), there is usually a divided scientific opinion over the so-called rational messages. Delegitimizing lay accounts and privileging expert opinions amidst such uncertainties does not foster understanding, instead, it exacerbates the problem of communication between scientists and the wider public.

Though the science-centered deficit model derives legitimacy and credibility from its alleged scientific rationality, it is not wholly objective or free of bias. Drawing from the contemporary Sociology of Scientific Knowledge, Irwin (1995: 67) argued that expertise will inevitably be shaped by the social and institutional setting within which expert judgments are developed and applied. Thomas Kuhn's (1962 cited in Module 2, Unit 3:8) observed that science reflects the paradigms and agenda of experts and institutional settings in which it is created, and since it is constituted in a particular social context, the outcomes are amenable to certain vested interests; hence confirms this position.

Many similar points are made by Walter (1922) with his concept of "pseudo-environment, Schwartz (1984: 422) with the concept of the domain, and Wilkin (1991:139) with his Schema theory. They all concurred that, when looking at any situation, the reality is constructed based on experience. Hence, it is argued that constructs of professional groups may select only hazards which are of professional interest.

Another limitation arises from using unfamiliar language to convey messages about major hazards. Such communication Irwin argues aims to reassure the public and avoid any debate over the location of the hazardous industry, but essentially bars the public from engaging in a discussion over competing views on risk assessment. This arrangement purports to incorporate local people but only reinforces one social standpoint and denies citizens the opportunity to express their point. Using the example of the Wind scale inquiry in Britain, Wynne (undated, cited in Irwin, 1995: 69) observed that the inquiry was essentially a 'ritual' rather than an attempt at democratic decision-making. This is why, even if citizens have concerns, they often get alienated from the mixture of technical and legalistic procedures being followed. Therefore, as Irwin puts it, science is the servant of power and serves to reinforce the existing social order (Irwin, 1995: 29).

The deficit model's other limitation is its assumption that the public is homogeneous and undifferentiated. Douglas and Wildavsky (undated, cited in Toft and Reynolds, 2005: 2) argue, that the individuals, of which they are composed, create their own sets of goals; the risks associated with a particular hazardous circumstance will be interpreted and measured. The point on variations in hazard construction is shared by other theorists Wynne (1992: 108) suggests that there may be significant individual and group perceptions that come about because of relatively long-term psychological predispositions. Hence, as Wynne (1992, cited in Pigeon et. Et al, 1992: 117) notes that because of their different frames of reference, the social framing of risks between the public and the experts is bound to differ. This suggests that framing risks by a given society or individual will not be objective. Looking at the case of the Carrington petrochemical complex, it was unreasonable to assume

that the people living within the public information zone (PIZ) would be undifferentiated and homogeneous in their framing of the risks they face from the complex. As Irwin (1995: 85) put it, the exercise was attempting to eliminate social and technical uncertainty to keep the message simple for the public to grasp. Yet the technical context of this message is inseparable from its assumptions about the public it was attempting to inform. Moreover, the construction of the audience plays an essential role in shaping the form and content of technical information.

Furthermore, the model also assumes that social behavior is stereotyped and that reactions to risk will be standardized. The assumption that during an emergency those affected will react exactly, in the same way, is erroneous. The messages, therefore, fail to acknowledge the varied conditions and instead focus on the assumption that responses will always be uniform (Institute of Lifelong Learning (2008) Module 2; Unit 3: 26).

Confronted with the limitations and uncertainties embedded within science, Irwin (1995) suggests the need to explore the possibility of building constructively rather than remain entangled in a sterile 'science versus ant science' debate. He, therefore, proposes an approach that offers a dialog between science and citizen groups. This is important to know as it relates to the aim of this research. The five supporting objectives were designed to assist in determining if the communication approach used by Maamba Collieries Limited has similar characteristics to the deficit model, which is criticized for inhibiting dialog between lay groups and experts. The findings will be assessed to determine if applying the alternative model, as suggested by Wynne and Irwin, can offer a solution. The next section is dedicated to exploring the sociological view of risk communication as advanced by Wynne and Irwin.

The sociological approach to risk communication is premised on the reasoning that people see the world differently and as such issues, whether political, economic, or scientific, are framed differently by different people. Put simply, it means that everyone has a unique way of constructing the world around them, so the same phenomenon may mean different things to different people (Institute of Lifelong Learning (2008) Module 2, Unit 3: 27). According to Bennett and Shaw (2003), two things are central to Irwin and Wynne's model. (a) "that experts are not the sole repositories of insight and wisdom" and (b) "that useful knowledge resides at all levels of a work team, establishment, organization, industry or community". To them, better decisions could have been made if such knowledge had been exploited; after all, lay accounts may be more open to changing circumstances and new information than idealized official or expert accounts. Moreover, listening to and learning from each other would reduce social conflict and facilitate technological citizenship.

In justifying the need for an alternative to the 'public ignorance' (or deficit) model, Irwin argues that science must make sense to citizens within particular situations, and this requires the active generation of everyday meaning. To him new information must be developed through direct and practical experience of the world; otherwise, it will simply be meaningless. Hence the importance of considering the kinds of knowledge and understanding developed by citizens in the face of truth claims by science (Irwin (1995: 110-11, 1). Given the various limitations of science, he recommends the need to discern the existence of lay knowledge which might enrich decision-making processes and the general knowledge of hazards and health issues, though currently are excluded due to their supposed irrationality and anecdotal nature (Blumer, (1969). His standpoint is not to privilege either citizen or scientific understanding, but to note the diversity of knowledge which seems relevant to risk environmental issues (Irwin (1995: 115). He summarizes what he proposes should characterize the new knowledge relations as that which is willing to engage with non-scientifically generated understandings and expertise, is heterogeneous in form rather than trying to impose a unitary consensus, and is also prepared to engage with the 'problem situations' which give rise to citizen concerns rather than merely attempting to filter out science from non-science. He recommends one that is reflective regarding uncertainties and limitations, but also the constructive possibilities for science within everyday life and that is institutionally flexible and open to change (Irwin, 995:167). However, the question of non-compliance to environmental laws or relevant statutory provisions remains a significant challenge to be addressed if a better environment has to be realized for people living around Maamba Collieries Limited mine.

2.7 Citizen participation and risk communication trust

The issue of trust in risk communication is considered important to risk management institutions. According to Lee (1986) in Pidgeon et al (1992: 12) "credibility of a communication depends on the trust placed on the sender. This means that if the source is not trusted, likewise the message will not be trusted". Secondary, considerations arise from the difference between experts and lay perceptions which are influenced by different frames of reference. This mismatch between the two leads to the public losing, trust in responsible institutions to act in their interest. The Ladder of Citizen Participation describes the various levels of public participation in decision-making. Kasperson noted that often the agency errs by giving too little power to the public, essentially placing interactions with the community at lower levels on the ladder than might be appropriate (Kasperson, 1992).

Commenting on the aspect of trust, Kasperson, et.al; (1992:27) observed that, interactions with communities are more likely to be successful if the agency proposes a higher level of interaction from the outset. According to my thinking, it is important that agencies clearly define early in the process the public's role in the decision-making process. The selection of techniques for involving the public should be based on the size and diversity of the community, the level of interest expressed by community members; the geography of the site and community, the preferences of community members, and the resources and time available (Hance, Chess, and Sandman, 1988).

Ladder of Citizen Participation (Hance, Chess, Sandman, 1988)

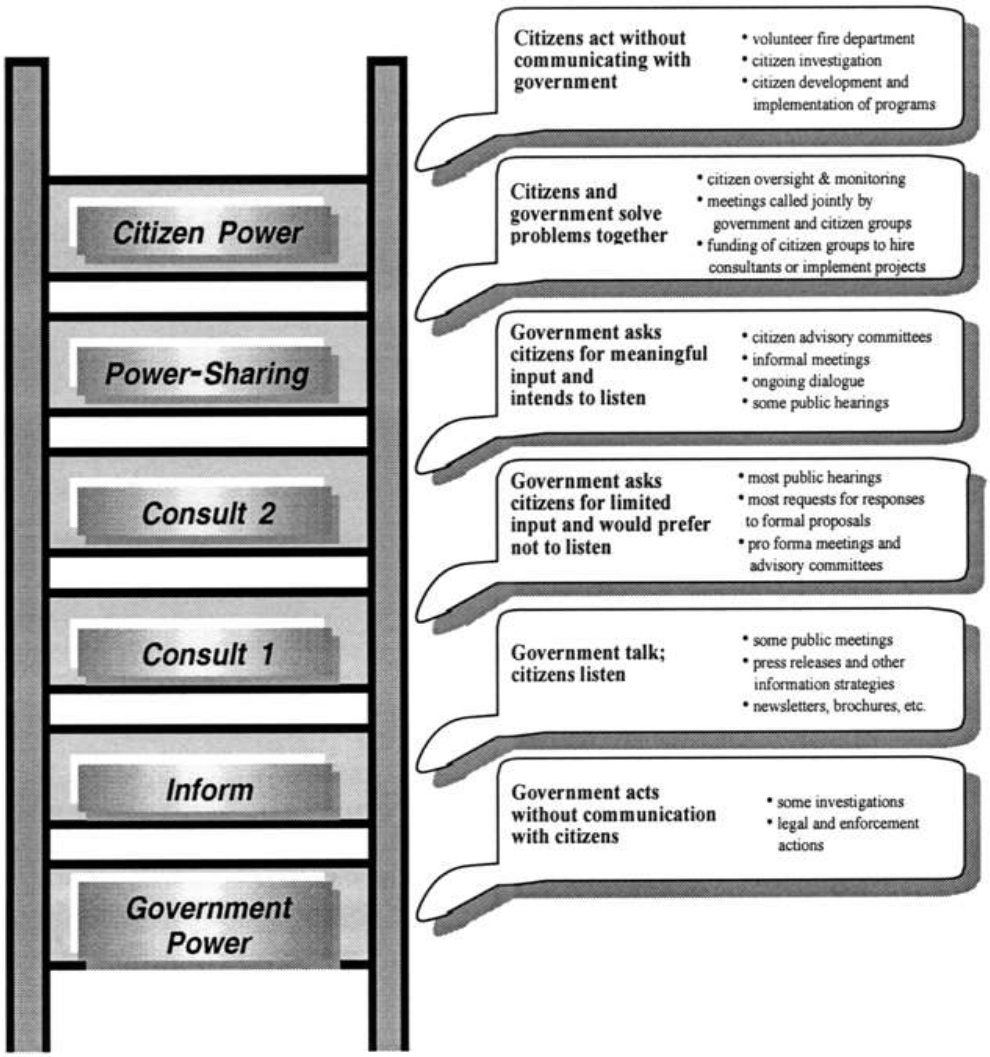


Fig 2:1 Ladder of Citizen Participation

Powell and Leiss (1997) reviewed recent examples of risk communication failures, including the case of communicating the risks of polychlorinated biphenyls (PCBs) in breast milk, mad cow disease, and silicone breast impacts, to arrive at ten lessons for risk management communicators. The lessons learned, briefly stated, are as follows:

I. A risk information vacuum is a primary factor in the social amplification of risk.
II. Regulators are responsible for effective risk communication.
III. Industry is responsible for effective risk communication.
IV. If you are responsible, act early and often.
V. There is always more to a risk issue than what science says.
VI. Always put the science in a policy context.
VII. Educating the public about science is no substitute for good risk communication practice.
VIII. Banish all risk messages.
IX. Risk messages should be addressed directly. contest of opinion. In society
X. Communicating well has benefits for good risk management.

Powell and Leiss (1997) note that there are no quick fixes to the inherent difficulties in communicating about risks and that there is a need for long-term institutional commitment to the development and application of good risk communication practice.

Commitment • Risk managers are judged to be uncompromisingly committed to achieving shared goals • Includes providing accurate information and adhering to objective and fair decision-making processes	**Caring** • Risk managers are judged to behave in a the manner that shows concern for members of the public • Includes the ability to listen, ability to see issues from the perspective of the other
Competence • Risk managers demonstrate technical competence overtime in their area of responsibility	**Openness/Honesty** • Risk managers demonstrate truthfulness, candidness, objectivity, sincerity

Table 2:1
Source: Adopted from Kasperson, (1992)

2.8 Dimension of trust

The trust issue is a challenging problem and difficult to prove with empirical data. However, trust is the key to the decision-making process in a community Kasperson, (1992**)**. People will listen to the leader only when there is trust in the leader as well as in the local government Kasperson, (1992).

When an external researcher enters the community, trust-building with the residents is the most important issue to understand the process, challenges, and solutions of community activities.

Community people have relationships and trust in general. Specialists and related stakeholders need to be clear about, and the risk information they are providing. The following figure shows the different steps and processes of the risk communication framework focusing on this trust. Boxes (1), (2), and (3) denote the sequence of the process, where Box (1) is the community and people trust, which exists naturally; Box (2) is the relation of the specialist with community leaders; and Box (3) is the collective involvement of the specialists, community leaders, and residents. This becomes a comprehensive risk communication framework where there are three main outputs: understanding of risk information, building trust in risk information provided, and capacity building of the local community leaders. Generally, community people do not have a direct relationship with the risk specialist. Therefore, community people feel, at first, that researchers will

bring good things. Through a communicative survey, however, community people gain an understanding of risk information and community situation.

Fig 2.2 Effective of Communication survey

Source: Adopted from Kasperson, (1992)

2.9 Risk Communication and Guidelines

According to Kasperson, (1992**),** risk communication plays an important role in the guidelines approach. World Health Organization's related normative work attempts to provide a scientific basis to support individual countries in developing national (or local or regional) risk management strategies – including developing standards. Kasperson, (1992) further states that, the emphasis on providing a common worldwide scientific underpinning requires that the guidelines are orientated specifically towards health hazards, and those aspects likely to vary widely between countries and regions are generally unsuitable for direct inclusion. For this reason, the outputs are called guidelines rather than standards to reflect the fact that they are intended to be adopted by countries to reflect their social, cultural, economic, and environmental circumstances. The Guidelines for Drinking-water Quality (WHO, 1993), for example, specifically advocate that a risk-benefit approach be adopted in developing an overall strategy. One figure illustrates that risk communication is a circular process requiring two-way communication at all stages. As such, 'scientific' and 'rational' elements (which are typically the domain of environmental health administrations) cannot be isolated from other elements. WHO guidelines, therefore, typically recognize that factors such as societal values vary widely between cultures, and therefore specific approaches and indeed standards themselves may vary between countries and cultures.

The area of risk communication is developing rapidly and, currently, there are great disparities across countries and regions in policy and practice. We see the link to change management being paramount and knowledge management sensual as the two promote shared learning and responsibility. At the country level, development is likely to be influenced by parallel developments in the field of human rights and related to international trade. In the former, slow steps have been made toward the recognition of water and sanitation as 'human needs' and they are implicit as 'human rights in a lot of legal instruments. In the latter, the involvement of international companies in service provision may lead to increasing pressure toward internal standardization.

A risk communication strategy is very important while adapting international guidelines to national policy. However, regulators tend to be defensive and, exclude the public. This is the opposite of what is expected of

them, and as such, they tend to be counterproductive. Engaging in-risk communication creates awareness to the public who should be allowed to have the right sort of input into the regulatory process.

3. METHODOLOGY

3.1 Introduction

The previous chapter reviewed literature relevant to the study. This chapter contains the research methodology that guided the research process. It contains research design, sample population, research location, sampling procedures, data collection, and ethical considerations.

3.2 Research Design

A research design is a program designed to guide research in collecting, analyzing, and interpreting observed facts and specifying which of the various types of research approach to be adopted (Moore and McCabe, 1989). In other words, it is a plan for how an investigation will be carried out. It specifies the procedure to be taken in carrying out the research. The study has been based on empirical data from both primary and secondary sources. The study adopted a Qualitative Evaluative Survey Design and employed both quantitative and qualitative methods to complement data analysis. This is because positivists have adopted a natural science model of research, and, therefore, search for causes through methods such as questionnaires, inventories, and demography that produce data amenable to statistical analysis. On the other hand, phenomenologists seek to understand situations through qualitative methods such as participant observation, in-depth interviewing, case study, politics and ethics, participatory inquiry, interviewing, visual methods, interpretive analysis, etc. That yields descriptive data. They seek to understand the motives and beliefs behind people's actions on a personal level (Mbozi, 2004).

To meet the research objectives, this study used both methods at times based on the recognition that any method used on its own has limitations and biases which are reduced by employing multiple approaches (Creswell, 2004). A double technique approach fits logically with the research strategy adopted for this study, which is a purposive research strategy (Creswell, 1980). The specific design used was a descriptive study; this was due to the topic of the study. The descriptive study involves the systematic collection and presentation of data to give a clear picture of the situation (Cooper and Schindler, 2006).

The questionnaire was designed in six main sections, Section A represented demographics to establish the age groups and sex as well as the level of understanding of the research question, and, Section B, focused on Internalizing the research to the relations between Maamba Collieries Limited and the community affected by the company's operations. The researcher established the link to risk communication and assessed whether the strategies used raised perceived experiences or not. In Section C, the researcher addressed reinforcing factors that could either be in favor of the company or expose Maamba Collieries Limited's risk communication weaknesses. In section D, the focus was on systematic processes. This was to establish and develop a standard deviation or correlation to experiences and communication strategies. In Section E, the researcher looked at the bottom-line measures set by the company and established whether these were tallying with resources employed by the firm and results from the receivers; the community. Finally, Section F made the respondents share their lived experiences freely through a focus group discussion.

Before the questionnaire was distributed, a pilot study was conducted to check the wording of the questionnaire. The design of the answer categories and the layout of the questionnaire should be completed within a reasonable period. Some residents were asked to complete a questionnaire and provide feedback on their experience. This feedback was used to inform the researcher of any amendments required before finalizing the questionnaire. Consequently, several areas were identified where questions and/or the choice of response were ambiguous. Besides, areas, where improvements could be made to the questionnaire, were identified and collected.

The research was also designed for one-on-one interviews whose participants came from the public and were purposively chosen. Personal interview data collection was done to get views that could not be captured via qualitative collection.

3.3 Study Site

Sidhu (2005:59) describes a study site as; the physical, social, and cultural site in which the researcher conducts the study. The research was conducted in the Sinazongwe District of the Southern Province of Zambia, where Maamba Collieries is located. Maamba is situated about 345 km south of Lusaka at 15.39oS latitude and 28.19oE longitude; in Zambia. Maamba mine was the area of interest for the research and the reason for the choice of this area is that people living around the catchment are the allegedly affected and may give a clear testimony to the effects thereof.

3.4 Target Population

Given the practical significance of statistics relating to the distinctiveness of population, it was indispensable that they are produced with as high a degree of precision as possible. "The question of how to make accurate inferences about population characteristics by drawing samples from that population was the focus of this research" (Nigel, 2009:166). A sample is made up of some of the members of the population. A population may refer to a body of people or any other collection of items under consideration for research purposes (Collis & Hussey, 2003:155). Given the above, of the 600 people that live around the mine area, 200; a 10 % representation was the target population.

3.5 Sample Size

According to Central Statistics Office Zambia, 2010, Maamba constituency has a population of approximately 10,249 residents and a 154.7 km2 density population out of which, approximately 600 people live around and near Maamba Collieries Limited mining area (Central Statistics Office Zambia, 2012). A purposive sample of 180 (90 males and 90 females) participants was selected from people living around the Maamba mine, 17 participants were randomly selected from Maamba Collieries Limited employees in their capacity, and 03 participants from the Zambia Environmental Management Agency (ZEMA) in their capacity. The age ranged from 15-to-59 of all respondents selected to participate.

3.6 Sampling procedure

In light of such considerations, the research sample for this project was chosen to focus the study on the affected area or population. Purposive sampling (non-probability) was employed as the main technique in this research as it selected participants from the relevant categories (McNeil, 2001). According to Lund Research Ltd (2010), "the objective of purposive sampling is to focus on particular characteristics of a population that are of interest, which will best enable researchers to answer their research questions". This approach was adopted in defining the sample as it was thought to be vital in ensuring proper representation of views of each part while informing on operational issues and interpretation. In this regard, the sample for this study could not be obtained randomly because the nature and topic of research demand a clear focus on the exclusive group that is likely to be affected by the mining of coal within the community. To ensure that language was not a barrier to participants, an individual within Maamba town was engaged to interpret, particularly for community members that could not speak or comprehend. Recording of data was done by way of taking notes during the interviews.

3.7 Data Collection

This section looked at data collection techniques, in this study; it is comprised of two major sources. The first one involved reviewing the existing literature/data from secondary sources including the target respondents. The second source of data was primary source through questionnaires and in-depth interviews, for further clarifications.

The questionnaire provided quantitative data and was presented graphically using tables and graphs, compiled using Statistical Package for Social Science (SPSS) software. Personal Interviews provided qualitative data and were analyzed using the quantitative presentation to expand the researcher's analysis and findings; this

helped the researcher to explain some tables and graphs grounded in means of comparison on quantitative and qualitative collections. The purpose of the one-on-one interviews was to investigate quantitative findings that otherwise would prove difficult to gather from a qualitative view. This was done by organizing the data because it helps to summarize, synthesize, and sort out many observations made from the data (Charmaz, 1983: 112).

Having defined the research sample, the researcher considered only two means by which the relevant data could be gathered; questionnaires, and interviews (one-on-one). To allow for a smooth uninterrupted experience, no one question was allowed to be split over two pages. The questionnaires were distributed to residents living closer to Maamba Collieries Limited mine. A complete questionnaire can be seen attached as an appendix for details. The choice of a questionnaire as a research instrument also provided the survey with a good degree of reliability. On the other hand, this was so because it is anonymous and confidential and, as such, encourages greater honesty in the respondents. Questionnaires also negate the interview effect introduced earlier and attributed to McNeil and Chapman (2005).

A structured interview was conducted to validate some of the complaints of the residents. At ZEMA, interviews were conducted to raise a point on whether the department carried out periodical research to ascertain whether the settlement of Maamba was necessary or needed relocation due to its effects. This was done because interviews have several advantages over other research techniques and this centers on a degree of control over the respondent. They permit probing and clarification of questions from the interviewer. This usually, however, can lead to dangers of the interview's effect (McNeil and Chapman, 2005) whereby the interview process was subjected to the personal influence of the researcher. Despite the advantages of personal interviews, the needs of research had to be balanced against the demands of workload, time, and cost. Both qualitative and quantitative data were collected for purposes of analysis and evaluation. The term quantitative refers to data that is structured in number form or can be instantly transformed into numbers, while data that is unstructured to be structured is called qualitative.

Secondary data was obtained from reports from the Central Statistical Office, Zambia Environmental Management Agency, Central Government, newspapers, websites, and other literature about risk communication. The other part of the data was collected from the library, or rather, desk data.

3.8 Ethical Considerations

Consent was sought from relevant research authorities and participants before going into the field for data collection. As stated by Sapsford and Abbott (1996), respondents signed a copy of the protocol form before the interviews were conducted indicating that they understand and agree to all the conditions. Maamba Collieries Limited was asked for permission to conduct the study. No coercion was exerted on the respondents. Every participant in the research was protected and their confidentiality was respected. Participants in this study were briefed before researching so as for them to understand what was involved in this research and why it was important for them to participate. These enabled respondents to participate fully without withholding information necessary for the completion of the study. Since participation in this research was voluntary, participants were informed that they were free to discontinue if they felt so without the fear of being victimized. The study was not inflicted to undermine the personal, professional, or other ethical conduct of the researcher and respondents. Bulmer (2008:153) argues that there is a general awareness that social research may have consequences for those being studied. Therefore, the potential for this research project to cause harm or distress to participants was mitigated. Respondents made a free choice to participate and the research was undertaken openly and honestly. A commitment was made to discuss the findings of the research project with respondents and provide a summary of the findings to them if requested.

3.9 Summary

This chapter presents the research methodology used in the study, highlighting the research design, research site, sampling procedures, research instruments, data collection procedures, data analysis techniques, and reliability and validity of measurement. The chapter ends with ethical issues.

4. PRESENTATION OF FINDINGS

4.1 Introduction

This chapter describes how data was presented in this thesis. Secondary, data was presented as it was collected from books, the internet, questionnaires, and interviews. The researcher relied heavily on books, published and unpublished documents, and reports on risk communication and disaster management studies on aspects of communicating the risk associated with doing business, and in particular, the mining of coal by Maamba Collieries Limited.

Document analysis guided research design and development of research tools. The internet proved helpful and provided the most current information regarding Risk Communication. The discussions added value to the interpretation of some of the concepts that seemed alien to the researcher. The findings are presented in two main sections, according to themes which are based on the questions asked on the questionnaire and in-depth interviews.

Section **A** looked at the demographic data, and provided the background of the respondents; name, age, education level, the status of the respondent, type of business engaged in, and position in their respective families that have been sampled in this study. Section **B** focused on the internalization intent, and covered areas that defined internal communication strategies used by Maamba Collieries Limited. The reinforcing factors provided variables to show the extent of company involvement in the Maamba community. Furthermore, this section looked at the systematic knowledge process that aims at establishing management commitment as well as involvement in the creation and implementation of risk communication culture. Finally, it focused on the bottom-line measures that bring out measurement policies as well as key points to establish success and failure factors about the strategies employed and to communicate the risks associated with mining activities.

4. 2 Questionnaire

Sidhu (2005:131) defines a questionnaire as:

A form was prepared and distributed to secure responses to certain questions. It is a device for securing answers to questions by using a form that the respondent fills in by himself. He/she describes it as a systematic compilation of questions that are submitted to a sampling of the population from which information is desired.

The total number of respondents was 200 and out of which;

- 138 were male respondents and 62 were female respondents, which means there are more male residents; 69 percent compared to the females of 31 percent.
- The age distribution ranged from 15 to 35, had 78 males and 29 females with a frequency distribution of 72.9 and 27.1 respectively; from 36 to 56 age gap, there were 60 males and 33 females represented with 74.6 and 25.4, respectively. The researcher noted that 44 males and 15 females were under the age of 25.

This means that there is a younger generation, living in and around Maamba mine, compared to the elderly. This may be because they are seeking employment or it's just economical spillover from the employee effects and going into small business enterprises to serve the community.

- The education distribution showed males at every representation had 60 percent and females came up short by 34.29 percent. There is still a need to increase female fork representation in education. This may warrant high-level failures by the community to understand the risk involved and also to assimilate the information given to them by the company.
- It was found that 22.86 percent represented both females and males by positions working at different levels in the company.

- 20 of the respondents targeted as part of the research population were in small enterprises; 05 were working in education and only 5 were in the health sector. Therefore, the study could achieve its purpose as it was focused on understanding the strategies used by Maamba Collieries Limited, to communicate the risks of doing their business.

On section B, which was looking at internalizing communication intent, it showed that;

- Most of the respondents; 57.14 percent knew what internalization and company communication were. And there was 42.86 percent of respondents did not know what the cost (opportunity cost) of risk communication was.

On reinforcing factors, a lot of variables were provided and 'communication culture' got the highest response of 51.43 percent, and 'educating community' had 42.86 percent. The systematic process was acknowledged as being present by most respondents at 42.86 percent, and on the other hand, the Bottom line measures were 43 percent going for laid-down policies that help companies to measure the internal and external communication performance contribution to the organization.

The pollution experience by the residents shows that 48.8 percent of the total respondents have had some complaint owing to both, land, air, and water pollution. Consequently, the company has sought to identify new ways in which a valuable contribution can be made and demonstrated towards the reduction of pollution in the area as well as sensitizing the community on both levels of pollution.

4.3 One-to-one interview

The following is the presentation of the responses given by the one-on-one respondent. A total number of 20 respondents were selected from the community to assess Maamba Collieries Limited's involvement with the community.

The respondents were given the option of giving responses in a range of 0, 1, 2, and 3 depending on how strongly they felt about an issue, where 0 was the lowest degree and 3 was the highest. Non-applicable responses were represented by not applicable (N/A).

		RESPONSE			
	QUESTION	0	1	2	3
1	Consultations with communities	17	2	1	0
2	Responsibility of the community	9	1	9	0
3	Involvement in community project activities	20	0	0	0
4	Awareness of the risk involvement	10	7	2	0
5	Involvement in key decision-making on risk	20	0	0	0
6	Communication of risk effectiveness	20	0	0	0
7	Awareness of the pollution levels	13	7	0	0
8	Government intervention and regulations	11	9	0	0
9	Effectiveness of the awareness campaigns	16	2	2	0
10	Availability of Maamba mine Management to community complaints	15	3	0	2
11	Rate of responses on reported risk	2	8	6	4
12	Are the communication materials or tools used understood by the community or not	4	9	2	4
13	Community and company exchange of ideas open or closed	20	0	0	0
14	Not applicable	0	0	0	0

This data represented a whole sample size because it was used to help the research have a face-to-face reaction of the residents, towards Maamba Collieries Limited. It helped the researcher to improve the qualitative report and discussing of the quantitative data that were difficult to analyze due to responses. This data was further analyzed in the next chapter.

5. DATA ANALYSIS

5.1 Introduction

Data analysis entails categorizing, summarizing, and ordering the data and describing them in meaningful terms. The process of evaluating data using analytical and logical reasoning to examine each component of the data provided. This form of analysis is just one of the many steps that must be completed when conducting a research experiment. Data from various sources is gathered, reviewed, and analyzed to form some sort of finding or conclusion. There are a variety of specific data analysis methods, some of which include data mining, text analysis, business intelligence, and data visualizations. In this study, data were subjected to sorting both from questionnaires and one-on-one interviews. Further, the researcher subjected data editing to Statistical Package for Social Science (SPSS) suited to codifying information after which data was codified and presented in frequencies, and tables to deduce the relationship between and among the research variables. This enabled the researcher to review the data and attain reliability and completeness (Miles and Huberman, 1994). The findings are presented in six parts starting with a section **A**-which covered the demographic aspects of the study which will help us understand the relationship of the respondent to risk communication and section **B**-which covered the intent of the study on internal communication strategies used to induce external communication.

Several sections and subheadings concretized the questionnaire and the in-depth interviews. Section **C**-which focused on reinforcing factors, helped the researcher identify behaviors between the four variables intended to identify how the risk communication strategies have resulted in activities. The researcher also presented and analyzed the data in section **D**-which showed the systematic process taken by Maamba Collieries Limited to implement the risk communication strategies available. The report further looked at section **E**-which identified the bottom line measures which compared resource use to results on the communication strategies employed. Finally, the research looked at section **F**-which exposed the experience of the respondents to both the risk communication strategies employed and the risk experienced.

5.2 Demographic Factors: (Questionnaire)

Q1 and Q2 from the questionnaire showed that the average age in the sample was 34.62 years. This meant that every respondent was at least 35 years old. The minimum age was 15 years and the maximum was 55 years. The sample contained 200 respondents, of which 138 (69%) were male and 62(31%) were female. The sample was skewed towards the male respondents due to the greater number of sampled respondents of male respondents compared to the female counterparts and the standard deviation was 12.471.

Q3. Table 5a: Sex vs. Age (Sex will mean both sexes Male and Female. with row percentages).

	Sex			
Age	**Male**	**Female**	**Total**	**P-value**
15 years to 25 years	44 (74.6)	15 (25.4)	59 (100)	0.708
26 years to 36 years	35 (66.0)	18 (34.0)	53 (100)	
37 years to 47 years	32 (65.3)	17 (34.7)	49 (100)	
48+	27 (69.2)	12 (30.8)	39 (100)	
Total	**138 (69.0)**	**62 (31.0)**	**200 (100)**	

Table 5a: Sex vs. Age

	Sex			
Age	**Male**	**Female**	**Total**	**P-value**
15 years to 25 years	44 (31.9)	15 (24.2)	59 (29.5)	0.708
26 years to 36 years	35 (25.4)	18 (29.0)	53 (26.5)	
37 years to 47 years	32 (23.2)	17 (27.4)	49 (24.5)	
48+	27 (19.6)	12 (19.4)	39 (19.5)	
Total	**138 (100)**	**62 (100)**	**200 (100)**	

Table 5b: Sex vs. Age (with column percentages)

Tables **5a** and **5b** above show that there was no statistical association (P=0.708) between sex and one's age. The majority (44 out of 138, 74.6%) represented males aged below 25 years compared to (15 out of 62, 25.4%) females who participated in the research.

Q3 Table 5.1: Sex vs. Education and Age (with column percentages)

Sex		**Age Group**					
		15-25 years	26-36 years	37-47 years	48+	Total	P-value
Male	Uneducated	10 (22.7)	6 (17.1)	4 (12.5)	3 (11.1)	23 (16.7)	0.932
	Junior sec	5 (11.4)	7 (20.0)	7 (21.9)	6 (22.2)	25 (18.1)	
	Senior sec	12 (27.3)	9 (25.7)	8 (25.0)	8 (29.6)	37 (26.8)	
	College	9 (20.5)	7 (20.0)	4 (12.5)	5 (18.5)	25 (18.1)	
	University	8 (18.2)	6 (17.1)	9 (28.1)	5 (18.5)	28 (20.3)	
	Total	**44 (100)**	**35 (100)**	**32 (100)**	**27 (100)**	**138 (100)**	
Female	Uneducated	1 (6.7)	4 (22.2)	6 (35.3)	5 (41.7)	16 (25.8)	0.512
	Junior sec	6 (40.0)	4 (22.2)	4 (23.5)	1 (8.3)	15 (24.2)	
	Senior sec	1 (6.7)	1 (5.6)	0 (0.0)	1 (8.3)	3 (4.8)	
	College	3 (20.0)	4 (22.2)	5 (29.4)	1 (2.5)	13 (13.0)	
	University	4 (26.7)	5 (27.8)	2 (11.8)	4 (33.3)	15 (24.2)	
	Total	**15 (100)**	**18 (100)**	**17 (100)**	**12 (100)**	**62 (100)**	

Table 5.1 shows that there was no statistical association that was computed for the analysis between sex, age, and education. The table shows that the majority (28 out of 138. 20.3% male) had attained a university level of education while the majority (16 out of 62, 25.8% Female) respondents had no education level background. This means that compared to the male, respondents', women in Maamba need more sensitization, especially regarding language barriers to be sensitizing them in their local languages so that they can easily understand and participate more effectively in understanding the effects of risk and communication.

5.3 Internalization Intent

This section explored various factors that were associated with internal concepts. It was important to establish the intent of the study and so respondents have introduced to the real core of the research and particularly the subject of internalization of risk communication and communication in general. It is important to recognize that internal communication effort, which is a critical variable for the organization's flow of decision-making, care, must be taken to ensure that all the complexities it brings are harnessed and protected properly. The study started with a question to understand whether Maamba Collieries Limited, was doing the right thing as a company about community needs.

Four multiple answers were provided to the respondents to choose from and the results were as follows: provides employment option, male respondents were 46 (74.2%) female respondents were 16 (25.8%), on gives money to the community had 1 (50%) for male and 1 (50%) for female, we don't know option male respondents 70(68.6%) female respondents had 32(31.4%) and on both on A and B option there were 21 males (61.8) female had 13(38.2%).

The questionnaire further quarried the importance of a company to the community in Q2.

There were a significantly high number of men 46 who thought Maamba Collieries Limited was important because it offered employment to the community compared to 16 females who felt the same, this was

because Maamba Collieries Limited employs more men as compared to female, and so men thought that the company was beneficial to the community.

Cross tabulation

Q2. What is the benefit of Maamba Collieries Limited to your Community?

		Employment	Funds	No idea	A&B	Total
Q1. Sex	**Male**	46	1	70	21	138
		74.2%	50.0%	68.6%	61.8%	69.0%
	Female	16	1	32	13	62
		25.8%	50.0%	31.4%	38.2%	31.0%
Total		**62**	**2**	**102**	**34**	**200**
		100.0%	**100.0%**	**100.0%**	**100.%**	**100.0%**

Table 5.2

Then, the study looked at the benefit of Maamba Collieries Limited's activities for Maamba residents, this part was necessary to establish whether the respondents understood what they were answering by stating the benefits acquired as a result of Maamba Collieries Limited's activities. Four options were provided for this one in alphabetical multiple choices and the results were presented in the table below with male and female representation both on frequency and percentage results.

Q4. How has Maamba Collieries Limited helped your community in development?

		Q4. How has MCL helped your community to develop?				**Total**
		Education	**Employment**	**Health**	**Recreation**	
Q.2 Sex	**Male**	35	36	27	40	138
		70.0%	72.0%	54.0%	80.0%	69.0%
	Female	15	14	23	10	62
		30.0%	28.0%	46.0%	20.0%	31.0%
Total		50	50	50	50	200
		100.0%	100.0%	100.0%	100.0%	100.0%

Table 5.3

The research looked at the implementation of the internal risk communication in this target audience, this was intended to bring out the reality of the study and focus on the inside of the organization, to highlight the internal involvement by this organization's communication strategy. And again three options were present for this one.

Q 5. Which of the following do you see as a major risk?

		General liability	**Damage to personal health**	**Pollution of air, land, and water**	**Total**
Q1. Sex	Male	40	47	51	138
		61.5%	77.0%	68.9%	69.0%
	Female	25	14	23	62
		38.5%	23.0%	31.1%	31.0%
Total		65	61	74	200

	100%	100%	100%	100%

Table 5.4

The results presented above showed that a high percentage of men felt the damage to personal health was the major risk associated with mining coal in their community as opposed to the female folks whose larger percentage of respondents felt it was a general liability issue. The disparities here could be explained by lived experience rather than general perception. It is obvious men had experienced most of the personal health problems owing to their involvement in mining of coal activities.

It was necessary to establish the level of community company involvement in the processes of communicating the potential risk associated with mining coal and also establish the community sensitization link from the company. The findings were presented as follows;

Q6. Does Maamba Collieries Limited carry out community education concerning its operations to the community?

		Sometimes	Always	Once in a while	Does not exist	Total
Q1. Sex	**Male**	37	30	32	39	138
		72.5%	71.4%	66.7%	66.1%	69.0%
	Female	14	12	16	20	62
		27.5%	28.6%	33.3%	33.9%	31.0%
Total		**51**	**42**	**48**	**59**	**200**
		100.0%	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table 5.5

The results showed that Maamba Collieries Limited was carrying out the sensitization process and the people might have not taken or considered it as a serious issue as we can notice in the data presented that a large number of respondents both male and female felt that 'sometimes and always' Maamba Collieries Limited carried out community education concerning the risk associated with mining coal.

5.4 Reinforcing Factors

It was important to bring in the study of reinforcing factors as these showed clearly how the organization's management was involved in the internal risk communication and its implementation. Variables were given to which level of agreement was required;

Q1a. To what extent do you take education in the community?

Q1a. To what extent do you take education in the community?

		Always	Frequently	Occasionally	Never	
Q1. Sex	Male	34	36	43	25	138
	Female	14	17	16	15	62
Total		48	53	59	40	200

Table 5.6

Results represented a high frequency of men looking at the education policy as occasional and a high frequency for female respondents showed frequently. The researcher noticed that women may notice the importance of education compared to men, who thought just merely being employed at Maamba Collieries

Limited was good enough. However, we can notice several men (25) respondents compared to women (15) responders felt education was never a priority.

Q1b. To what extent do you take Policy development?

		Count				
		always	**frequently**	**occasionally**	**never**	**Total**
Q1. Sex	Male	33	34	36	35	138
	Female	14	21	15	12	62
Total		47	55	51	47	200

Table 5.7

The results represented a high frequency of men looking at the policy development as occasionally and a high number of female respondents showing high-frequently. The researcher noticed that women may notice the importance again of policy development compared to men.

Q1c. To what extent do you take communication?

Count

		To what extent do you take communication?				Total
		Always	Frequently	Occasionally	Never	
Q1. Sex	**Male**	30	28	39	41	138
	Female	10	14	16	22	62
Total		**40**	**42**	**55**	**63**	**200**

Table 5.8

Table 5.8 shows a high-frequency representation of men looking at the communication as occasional and a high frequency for female respondents showed frequently. The researcher noticed that women noticed the importance of communication by the company to the community compared to men.

Q1d. To what extent do you take Risk Assessment?

Count

		Always	Frequently	Occasionally	Never	
Q1. Sex	Male	36	35	25	42	138
	Female	11	14	18	19	62
Total		**47**	**49**	**43**	**61**	**200**

Table 5.9

Results represented a high frequency of men looking at risk assessment and a high frequency of female respondents showed a never option. This could have been to the fact that men work with this risk so they may have been aware of it more often than the women.

When asked whether their lives had been affected by Maamba Collieries Limited's mining activities in any way, two multiple-choice options were given and these were clearly shown in the diagram below:

Q2. Is your life in any way affected by Maamba Collieries Limited's mining activities?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	97	48.5	48.5	48.5
	No	103	51.5	51.5	100.0
	Total	200	100.0	100.0	

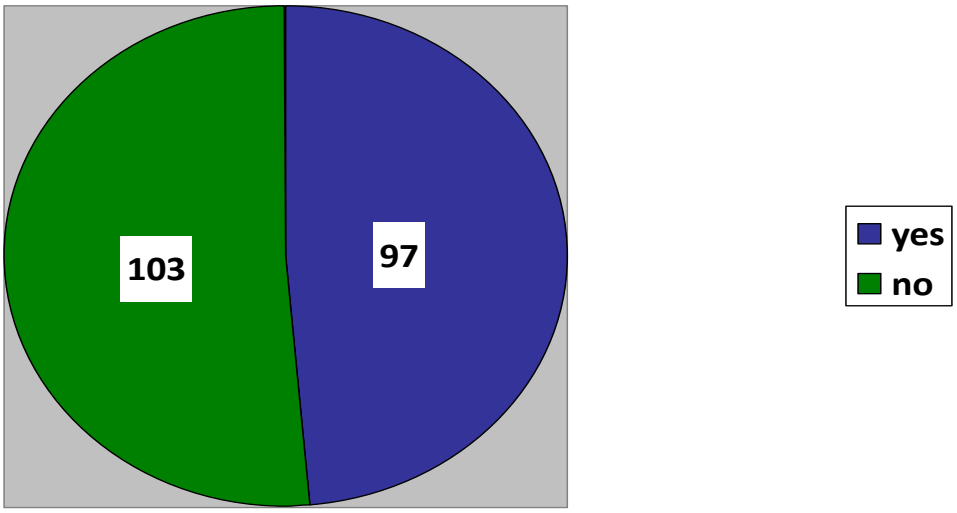


Table 5.10

A simple yes and no options were given and one can notice that 103 respondents out of 200 samples taken said no and 97 answered affirmatively. This showed a high respondent percent of 51.5 showing that people felt their lives were not affected by Maamba Collieries Limited's mining activities, here notice a good number of people don't mind the MCL's activities as long as their lives go on.

Q2. Is your life in any way affected by Maamba Collieries Limited's mining activities?

Chart 5.10

The research further queried, how life has been affected in any one of the given areas as a result of Maamba Collieries Limited's mining activities, three options were given and data were presented as follows:

Chart 5.1

Q3. How has your life been affected by Maamba Collieries Limited's mining activities?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cleanliness	68	34.0	34.0	34.0
	Health	67	33.5	33.5	67.5
	Pollution of air or land water	65	32.5	32.5	100.0
	Total	**200**	**100.0**	**100.0**	

Table 5.11

Q3. How has your life been affected by Maamba Collieries Limited's mining activities?

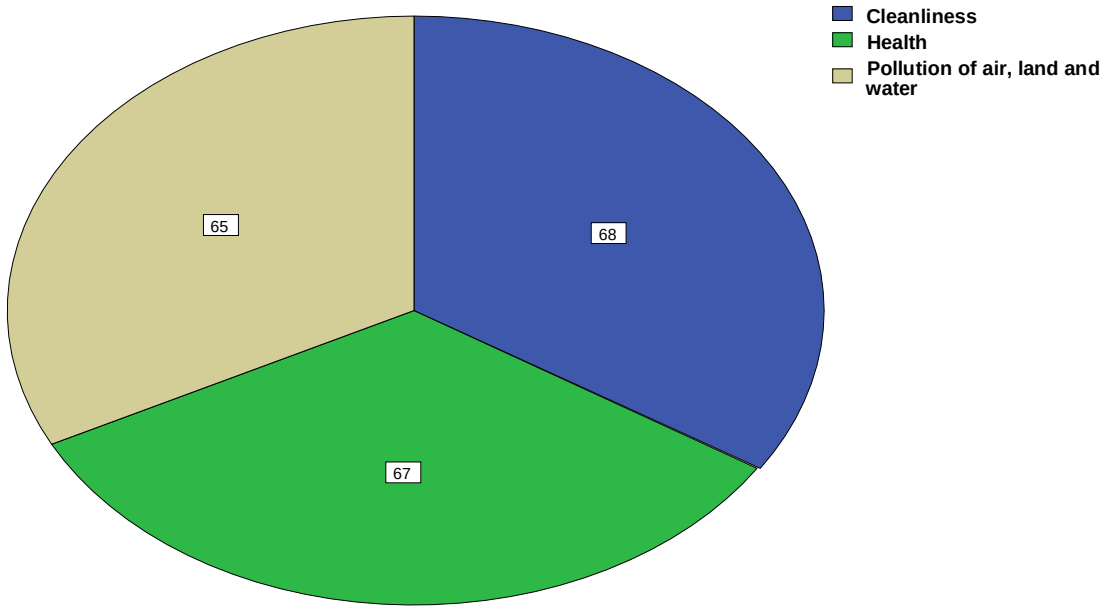


Chart 5.2

5.5 Systematic Internationalization Process

To extract systematic internal risk communication or communication on risk information that will lead to the challenges, the study provided five questions. According to the responses, 65(32.5%) answered in favor of general liability; 61(30.5%) for damage to personal health, and 74(37%) for pollution. With this data, the researcher concluded that most respondents felt that pollution was their major risk in the area, and this was because of Maamba Collieries Limited's mining activities. The results were presented as follows;

Q4. Which of the following do you see as a major risk?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	General liability	65	32.5	32.5	32.5
	Damage to personal health	61	30.5	30.5	63.0
	Pollution of air, land water	74	37.0	37.0	100.0
	Total	200	100.0	100.0	

Table 5.12

Represented by a histogram table as follows:

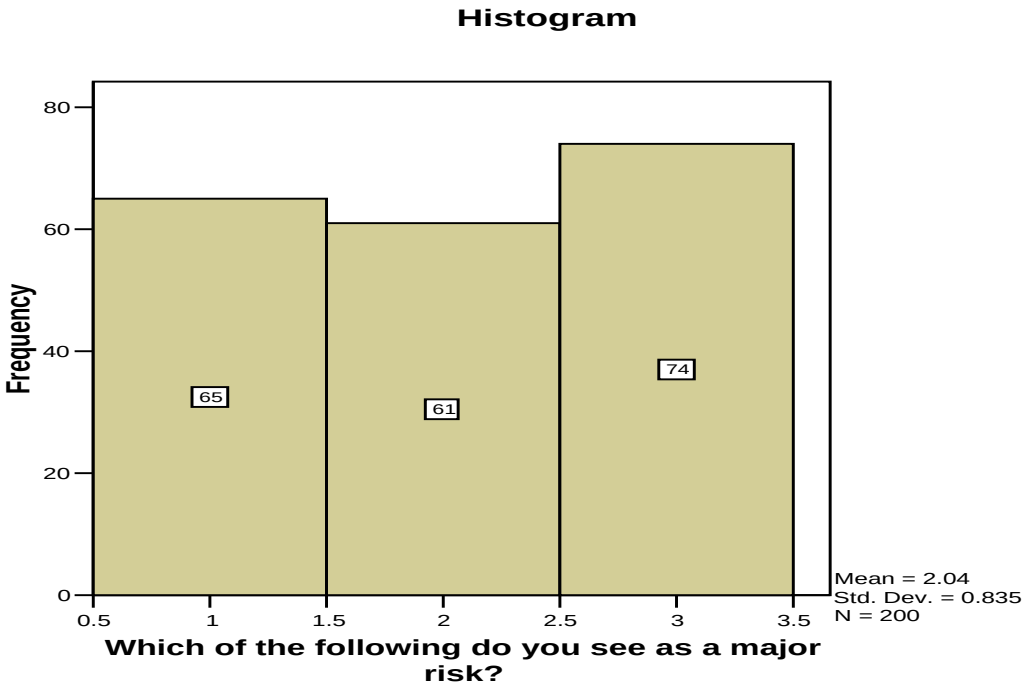


Chart 5.3

The general finding was that pollution from mining coal was the alleged source of risk to Maamba Collieries Limited as can be seen here represented by 74 percent of respondents in the histogram above.

5.6 Bottom Line Measures

To see how intangible assets (communication skills) play a role in developing the company, let us look at our data collected to assess the bottom-line measures. Two questions were presented to respondents with four hard options and one required respondents' involvement and thoughts. 15(30%) have laid down policies to measure the contribution of risk communication skills; 5(10%) did balance government regulations with company policy measures that underpinned value creation derived from communication skills, and 5(10%) fund their R&D programs. When asked how business relations were between Maamba Collieries Limited and the community, no response was given from respondents. This part of the questionnaire looked at alliances that organizations had, whether they were learning processes, value creation, or just a spring bolt to failures.

Q1. Can you measure the risk you are exposed to by MCL against their risk communication policy?

Cross tabulation

		Q1. **Can you measure the risk you are exposed to by MCL against their risk communication policy?**		Total
		Yes	No	
Q1. Sex	Male	68	70	138
		73.9%	64.8%	69.0%
	Female	24	38	62
		26.1%	35.2%	31.0%
	Total	92	108	200
		100.0%	100.0%	100.0%

Table 5.13

The rationale of this question was to establish whether respondents knew the risks they were exposed to and at the same time establish their knowledge of Maamba Collieries Limited's risk communication policy. On average, both males and females did not know. This meant that; there was a lot to be done by Maamba Collieries Limited.

Q2. Are there measures the Government of Zambia has put in place to protect you as a citizen that you are aware of?

Cross tabulation

		Q2. **Are there measures the government of Zambia has put in place to protect you as a citizen that you are aware of?**		
Q2	sex	Yes	No	Total
	Male	62	76	138
		75.6%	64.4%	69.0%
	Female	20	42	62
		24.4%	35.6%	31.0%
	Total	82	118	200
		100.0%	100.0%	100.0%

Table 5.14

The rationale for this question was to establish whether respondents were aware of any Government Policy or measures put in place to mitigate the risk caused by Maamba Collieries Limited. Equally, it was established that there was a need for the government to sensitize Maamba residents in line with any risk mitigation policy put in place.

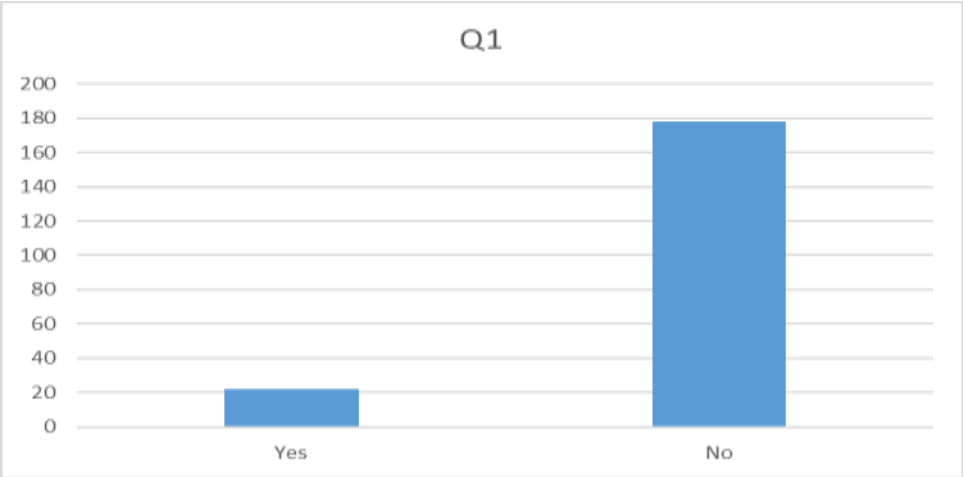
5.7 Experience

This section looked at establishing the experience of the Maamba Collieries Limited mining activities and also the spillover of the coal production whether good or bad, to know whether the perceived risk was just people driven or can be experienced and other sets of questions were given both good and bad, and the following were the findings and data presented. Only a few questions were considered:

Q3. Do you know of any risks associated with coal mining in Maamba town?

Cross tabulation

		Q3. Do you know of any risks associated with coal mining?		Total
		Yes	No	
Q3. Sex	Male	20	118	138
		90.9%	66.3%	69.0%
	Female	2	60	62
		9.1%	33.7%	31.0%
Total		22	178	200
		100.0%	100.0%	100.0%



Line graph 1

Tabulating positive and negative responses

Table 5.15

It was necessary to get the views of the community on whether they were aware of the risks involved to derive the true lived experiences of the people. Results showed a lower number of respondents, 22, both female and male, new and the larger number, 178, had no clue.

Q4. If yes to question 3, list some of the risks that you know

Crosstab

		Q4. If yes, list some of the risks that you know						Total
			Chest complications	Coughing	Dysentery	Eyesore	Sneezing	
Q1. Sex	Male	119	4	5	1	1	8	138
		66.5%	100.0%	83.3%	100.0%	100.0%	88.9%	69.0%
	Female	60	0	1	0	0	1	62
		33.5%	.0%	16.7%	.0%	.0%	11.1%	31.0%
Total		179	4	6	1	1	9	200
		100.0 %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0 %

Table 5.16

When asked to list some of the risks exposed to, the respondent cited chest complications, coughing, dysentery, eyesores, and sneezing. The findings revealed that sneezing had the highest number of respondents; this might be owing to air pollution.

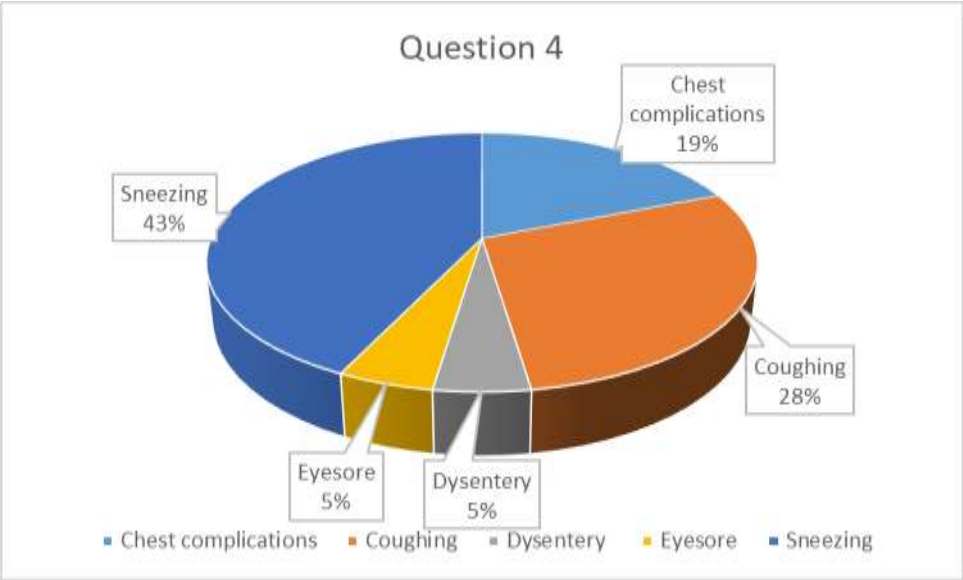


Chart 5.3

Q5. How much information on coal mining-related risks have you received from Maamba Collieries Limited?

		Q6. How much information on mining coal-related risks have you received from MCL?		Total
		None	Little	
Q1. Sex	Male	78	60	138
		78.0%	60.0%	69.0%
	Female	22	40	62
		22.0%	40.0%	31.0%
Total		100	100	200
		100.0%	100.0%	100.0%

Table 5.17

The table shows findings were leaning towards nonresponse, for men and little for females. This shows that at the time Maamba Collieries Limited is carrying out its community sensitization, men are either not at home or are at work.

5.8 Policy Guidelines

The third research question aimed at establishing policies that Maamba Collieries Limited has put in place in enhancing risk communication for the Maamba community in Sinazongwe District. This section of the study presents a document review of the mining policy. The findings generally indicate that Maamba Collieries Limited has a significant policy in place that is mainly targeted towards enhancing Safety, Health, Environmental, and Quality (SHEQ). As stated above the said policy included the policy of risk management which risk communication is a component.

6. DISCUSSION OF FINDINGS

6.1 Introduction

This section of the paper shows the discussion of the findings. The first part presents the discussions according to the research questions. The discussions are coupled with some literature review to show how the study's findings relate to other study findings. This project explored four sets of research questions, thus:

i. Does Maamba Collieries Limited undertake any risk communication to the neighboring mine communities?
ii. Do residents of Maamba town understand the risks associated with living around the mining area?
iii. What are community perceptions of risks and attitudes towards such risks?
iv. What mitigation measures have been employed by Maamba Collieries Limited to combat the perceived risks?

For us to understand the influence each respondent had over the discussions and how they interpreted the questions, we should know something about the categories of the respondents. In this case, the chapter was divided into three sections that corresponded with the sets of research questions above. Each section addresses any changes made to the data for discussion and interpretation of the data presented in chapters four and five, the specific analytic techniques employed, and the results pertinent to the question at hand.

The bulk of the data analyzed for this project was collected utilizing a structured questionnaire; questionnaires were completed in Maamba of the Sinazongwe District as described in Chapter 4. The questionnaire was divided into six major themes:

The findings are presented in six parts in chapter four and analyzed in chapter five, starting with section **A**, which covered demographic aspects of the study; it helped us understand the relationship of the respondent to risk communication. Section **B** covered the intent of the study on the internal communication strategies used to induce external communication on whether Maamba Collieries Limited considered the community in its risk communication efforts. Section **C** focused on reinforcing factors that helped the researcher identify behaviors between the four variables intended to identify how the risk communication strategies have resulted in activities.

The researcher also presented the data in section **D** which showed the systematic process taken by Maamba Collieries Limited to implement the risk communication strategies available. The report further looked at section **E** to identify the bottom-line measure which compared resource use to results on the communication strategies employed. Lastly, the research looked at section **F** to expose the experience of the respondents to both the risk communication strategies employed and the risk experienced. For consistency of presentation, however, descriptive results are grouped based on the situational factors outlined in chapter four: demographics, internal communication factors, reinforcing factors on risk information infrastructure, systematic process, bottom line measuring factors, and Experience. Outcome factors include understanding of risk, communication-related uncertainty, threat perception, and general and event-specific meditative behavior.

6.2 The General Perceptual and Behavioral Influences

The conceptual framework for this research was outlined in Chapter 2. The general results for this set of questions were organized by the five situational and cognitive factors illustrated in chapter five. These include demographics, experience, and knowledge of risk factors; risk assessment and mitigation factors, and risk communication infrastructure. The relationships presented below are not bivariate correlations, but predictive associations that stood out when controlling for the other variables. At least in this data set, these relationships were the most important, not simply extant.

6.3 Demographics

On the demographic data capture, the distance was not correlated to any of the outcome variables, likely due to the presence of risk control structures, so it was not necessary to capture it but simply state the location as being Maamba. However, this result contradicts those of Greene et al., (1981) and Montz (1982). Location status was associated with both general mitigate activities and event-specific behaviors. The relationship of location status to event-specific behavior was not consistent in direction and depended on other variables like community residence, pre-evacuation information, and correct estimation of risk status.

6.4 Experience

The severity of experience was the most important factor in the research as it would link to validate the effectiveness of the strategies used and activities carried out. It would both answer whether residents understand the risk associated with living around a mine and also the perceptions and fears that arise from various experiences. After the research, it was understood that men were at a higher rate of experiencing risk, as they were directly linked to mining coal than women. The increased severity was linked to appropriate risk perception and higher relative concern as well as each of the general and event-specific behaviors tested. Though the indicators were weak, impact severity is likely generally predictive of understanding of risk-related uncertainty as well. These results support the linkage of outcome experience to perception and behavior (Bandura, 1994), to more accurate risk perception (Burton and Kates, 1964), and the increased likelihood of mitigation behavior (Kunreuther, 1978; Burby, 1988; Mileti and Darlington, 1997). Frequency of experience appeared to be less important, though it did have a negative relationship to lack of consideration or mitigation.

6.5 Socio-Economic Factors and knowledge factors

Three socioeconomic variables were predictive of risk perception, knowledge, and/or first-hand experience of the effect. Education was linked to understanding what risk would entail and what it is, intending to reduce and identify the risk Maamba Collieries Limited is exposing the respondent to. However, higher income was not associated with increased rates of insurance purchase as a direct behavior linking the perception and or fear of the risk perceived; regulatory boundaries appeared much more important in the communication policy of the firm. Sex, as it has been in other studies (Cutter et. al, 1992; Gustafson, 1998), was predictive of a higher perception of risk, the study showed a high percentage of men at 90 compared to women's 9.1 understood the risk associated with coal mining, which was a relationship linked to the social-economic factor of education, there were more men educated compared to women as has been an African syndrome; girls are to do home chores while boys are at school. Age was consistently and negatively associated with both risk perception and evacuation.

6.6 Assessment and Mitigation Factors

Grasmuck and Scholz (2005) have associated higher ambient worry with increased threat perception of specific hazards; the same relationship was found in this study area. A more internal locus of control decreased the likelihood of a person understanding risk-related uncertainty as was measured here. General control was not linked to any other perceptual or behavioral variables in this analysis. Increases in the level of self-reported knowledge were predictive of property protection, but also of higher relative concern, a result that contradicts research by some researchers. The analysis also weakly supported drawing a link between higher relative concerns and increased seeking. Most researchers found an association between mitigation and seeking behavior, but not between seeking and higher risk perception.

6.7 Risk Communication Infrastructure

Depth and breadth of risk communication infrastructure or strategies used by Maamba Collieries Limited; was the only clear predictor of understanding of uncertainty. Risk Communication infrastructure was also linked to increased odds of a community location. Additionally, specific types of information (pre-evacuation information and evacuation orders) were linked to evacuation and protection of community property (depending on hazardous risk status). Event-specific pollution risk levels were not linked to these behaviors,

and it seems that most did not look for information from multiple sources before evacuating, not that it ever occurred, a result that contrasts with the experience of Dow and Cutter (1998). This probably has to do with differences in the speed of event onset and locations, maybe even the type of risk involved. No clear relationship was found between understanding risk-related uncertainty and either threat perception or mitigating behavior. However, there was some evidence that perceptions of risk influenced relative concern. Besides, potential relationships were found between threat perception and behavior. Table showing question six in chapter five, which was in response to communication levels between Maamba Collieries Limited, and the community, showed that findings were leaning towards nonresponse, at 78 percent for men and little response at 60 percent for females. Hence, the behavior of men not attending community meetings at which Maamba Collieries Limited disseminates the information was a direct link to a perceived communication failure.

6.8 Judging Relative Effectiveness

As did the general regression results, comparative analysis of effectiveness indicated that understanding of uncertainty and persuasion were not necessarily connected. Sjoberg (2000), has also found this to be the case, and these results support researchers who have questioned the linear association between understanding, attitude, and behavior (e.g. Tierney, 1993; Mileti and Peek, 2002).

6.9 Improving Risk Communication

In response to direct questioning, participants most frequently cited flood levels or a combination of levels and frequency of flooding as most concerning. Potential damage was the third most common answer. Less than ten percent chose frequency alone, a result consistent with other studies (Bell and Tobin, 2007). However, qualitative data indicated that issues of timing were a motivating factor in relative concern associated with specific descriptions. Additionally, quantitative analysis showed no clear relationships between the risk description chosen as most concerning and perceived relative size or likelihood.

One-on-one participant(s) made several suggestions for improving the communication of both specific and general risks. Two separate conceptualizations of understanding were put forth and emphasized the importance of communicating what pollution or hazardous refuse might do to a person and a person's community, as well as (or instead of) how often pollution could occur. Recommendations focused on regulatory practices and the creation of a suggestion box. A suggestion box would in turn make it more feasible to use a relation to past events as a description of possible or imminent risk. Their specific ideas reflected suggestions made in the literature and included emphasizing personal damage and health-related issues. Respondents also recommended discussing collections of individual and public experiences and community issues.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

The last chapter of the study presents the study summary and conclusion. The first part of the study chapter presents the summary of the study, while the second part of the chapter outlines the suggested recommendations based on the findings.

The successes and failures of enterprises are largely influenced by capabilities and capacity building. To-risk communication; is based on the premise that knowledge is power. It is the power to create closer ties to customers and the community; it is the power to analyze corporate information and apply it to new uses; it is the power to create processes that enable firms worldwide to access and apply information to capture new behaviors (Kasperson, 1992). Importantly, in conjunction with the international risk management processes and tools, there must be cultural changes and management initiatives designed to capture, cultivate, transfer and refresh the knowledge that the company needs to make better decisions faster. These are the fundamentals of the success of enterprises. Without these, foundations, there may be no incentives for success for enterprises at all levels; be it start-ups, medium, large and regional multinationals; to share and

capitalize on knowledge assets is progressive (Kasperson, 1992). Therefore, communities cannot be shut off from the activities of the company as they bring development to the community itself. Any enterprise that strives within these fundamentals is likely to succeed; if not, it will fail or have done it already.

A concise but well-vested summary has been provided to try and answer some of the research questions set out earlier in the study and analyzed on the presentation of data, namely:

I. Does Maamba Collieries Limited undertake any risk communication to the neighboring mine communities?
II. Do residents of Maamba understand the risks associated with living around an active mine?
III. What are community perceptions and attitudes towards such risks?
IV. What risk assessment and mitigation measures have been employed by Maamba Collieries Limited to combat the risks?

This study brought out a lot of useful information for both the researcher as well as the respondents.

7.2 Major findings

I. 48.8 % of the respondents stated that pollution was the major perceived risk associated with the mining of coal in the area.
II. 51.2 % of the respondents alleged that they did not understand the risk associated with living around an active mine.
III. 30 % of the respondents confirmed that Maamba Collieries Limited has been carrying out community sensitization over the risks associated with mining activities.
IV. Some sections of the community allege that there is no risk communication policy on the perceived risk despite the organization's robust communication policies.
V. The implementation of risk associated with mining in Maamba was not all-inclusive.
VI. The community has no access to Government risk management policies governing mining activities in general.
VII. The study confirmed that Maamba Collieries Limited has policies to manage risks among others as required by the local laws. Further, the study confirmed that Maamba Collieries Limited has implemented significant risk and environmental management measures within the acceptable limits by frequently monitoring water quality, dust amount and dust destination, air, and vibration within the community as provided for by Zambia Environmental Management Agency guidelines.

7.3 Conclusion

The study was aimed at assessing the contribution of Maamba Collieries Limited in risk communication in Maamba of the Sinazongwe District of Zambia. They defined risk communication and provided vast models of risk communication and established that; the challenges of risk communication are too significant to be left to chance or unattended to by concerned people. Organizations that put in place strategies, policies, practices, and tools to manage operations on all platforms (be it domestic or international markets) are more likely to succeed than those that do not (Lies, 1998).

Though Maamba Collieries Limited has acted within the limits of the local laws, it is recommended that the organization may further the implementation of relevant policies and take advantage of the benefits of risk communication (Grunig, Pavik & Hunt, 1983). Lack of knowledge, inability to apply knowledge, the cost associated with risk, and lack of appropriate tools are some of the reasons enterprises in Zambia might result in a failure to grow and sustain their operations effectively (Fisher, 2004). It must be noted that there is a need to have the right attitude, commitment, and a shared vision for risk communication strategies to be successful (Hovland and Weiss, 1951).

Finally, the researcher has provided many recommendations and the reasons impinging on the challenges of risk communication of subject study case and clear consent on the reasons to succeed, and or fail in

business. It is useful to mention here, that a company's risk communication strategy fundamentally relies on the willingness of its people to share and to learn from across cultures; such a culture is defined or denied by the actions of senior managers (Leiss, 1998). The research found out that Maamba Collieries Limited has some signify activities to communicate the risk; however, this may not have been recognized significantly by the community as shown in chapter five above. Strategies can be there, but if not appreciated by the beneficiaries they may prove to be insignificant resulting in no measured performance, and also may be a risk to community conflict (Grunig, Pavik & Hunt, 1983).

7.4 Recommendations

Based on the study findings, the following are suggested recommendations to the various stakeholders:

7.4.1 Maamba Collieries Limited

Based on the findings, the researcher;

I. Encouraged Maamba Collieries Limited to largely have an inclusive process in the identification of risks associated with mining activities and those risk-mitigating strategies may be shared with stakeholders.

II. Recommends that the negative attitudes exhibited by some sections of the community on risk perceptions be managed well to avoid negative impacts on the well-built reputation of and compliance with local laws by Maamba Collieries Limited.

III. Recommends that Maamba Collieries Limited may consider enhancing a specific risk communication policy that could further be jointly implemented in collaboration with the community through Community Social Responsibility projects.

7.4.2 Government

It is recommended that;

I. The government, through its line ministries, may ensure that risk communication is enhanced by respective investors and that the local community within the locality of the investment activities are adequately informed as well as accorded a chance to be part of the implementation process.

7.4.3 The Community

The study also encourages and recommends the community to;

I. Support Maamba Collieries Limited's efforts in implementing company policies including.

II. Understand the risks associated with mining activities.

III. Take interest in investment activities.

7.4.4 Further studies

Further research is in order to ensure that the knowledge gap is filled. The following is recommended for further study.

I. Further study should be done on the comparative analysis of the risk communication implementation in communities by mining companies. While this study only concentrated on Maamba Collieries Limited, other mines may be considered in this study.

II. And that further study should be done to assess the mines' guiding framework for risk communication among the communities. This is important in establishing the most effective guidelines for risk communication.

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APPENDICES

Appendix A: CONSENT FORM

I am Longwani Henry Chaile, a postgraduate student at Gideon Robert University studying for Ph.D. in Risk Management. My topic of research is Risk Communication in Zambia: Community Perception and lived experiences; Maamba residents living around the Maamba Collieries Limited mining area in Maamba of Sinazongwe District of Zambia. I am requesting your voluntary participation in the study. Please read the information below and ask for clarification about anything you may not understand before you decide whether to participate or not.

I. Participation in this study is highly voluntary.
II. All responses will be appreciated, kept strictly and treated confidential, and used for academic purposes.
III. There is no risk in taking part in this study. It is my sincere hope that you will participate in this study as its views is important.
IV. It is also nice to know that there are no correct or wrong answers here. At this time, do you want to ask me anything about the research?
V. If you have any questions regarding this study, you may contact me at +260-975-585661. If you agree to be interviewed, please sign the consent form below.

CONSENT

By signing up below, I confirm that I understand that participation in this research is entirely voluntary. The material in this consent has been explained to me, and my questions were answered to my satisfaction. I freely and voluntarily choose to participate and I understand that my rights and privacy will be maintained.

I hereby give my consent to participate in the study; Effectiveness of Internal Communication.

Name of Participant (BLOCK LETTERS).

Signature of Interviewer…….. Date……

Appendix B: PERSONAL INTERVIEW GUIDE

The guide is comprised of eight (8) Oral Questions as follows:

a. What would you say are the benefits that have accrued from Maamba Collieries Limited's mining activities in Maamba?

b. Do you think that Maamba Collieries Limited does a good job at educating the community on its operations and risks associated with its mining activities?

c. Do you believe that most people living around Maamba Collieries Limited's mining area are aware of the adverse reaction of the emissions from production?

d. Do you think Maamba Collieries Limited has better risk communication channels and policies?

e. Has Maamba Collieries Limited contributed to this community to ensure sustainable development?

f. Do you think Maamba Collieries Limited has put measures to evaluate its performance on risk communication?

g. Do you think the current mining legislation is good enough to protect citizens against sabotage, pollution, and hazardous emissions?

h. What do you think needs to be done for Maamba Collieries Limited' to be more community-led than bottom-line?

Appendix C: Plc Self- Administered Questionnaire

Risk Communication in Zambia: Community Perception and lived experiences of Maamba residents living around the Maamba Collieries Limited mining area in Maamba of Sinazongwe District of Zambia.

Plc: Self-Administered Questionnaire

INSTRUCTIONS

Name (Optional)……

Questionnaire NO……..

SECTION A: Social Demographic Information (tick the appropriate answer)

1. Sex of respondent

a. Male

b. Female

2. How old are you? indicate years ……

3. What is your current marital status?

a. Married.

b. Never married

c. Divorced

d. Separated

e. Windowed

f. Engaged

4. What is the highest level of education you have attained?

a. Grade 7

b. Grade 9

c. Grade 12

d. Tertiary college

e. University

f. None of the above

5. How did you attain the education?

a. Mine sponsorship (trade schools)

b. Government sponsorship

c. Self-sponsorship

d. International scholarships

6. What is your employment status?

a. Permanent and pensionable

b. Contract

c. Casual basis

d. Sub-contracted

7. How has Maamba Collieries Limited helped to sharpen your skills?

a. Through job on training

b. After being sent to trade school

c. Through inductions at work

d. Through aptitude tests

8. What should Maamba Collieries Limited do to promote the academic and professional status of employees?

a. Provide refresher courses

b. Send employees to trade schools

c. Send employees to Universities

9. What have Maamba Collieries Limited employees done to enhance your professionalism at work
a. Impacted skills through tertiary education
b. Induction courses
c. Through exchange programs
d. Through job on training
10. How do you rate Maamba Collieries Limited on the following?
a. Small Enterprise
b. Medium Enterprise
c. Multinational Enterprise
d. Global Enterprise
11. What type of Business are you dealing in?

(a). Family (b). Financial service
(c). Insurance (d). Production of goods
(e). Health care (f). Education
(g). Consultancy (h). Food industry
(i). NGO (j). Manufacturing
(k). Accommodation (l). other specify……

12. Are you a Resident of Maamba? YES ☐ NO ☐

If yes, please state how long you have lived in Maamba……

SECTION B INTERNALISING

1. Do you think Maamba Collieries Limited is doing the right thing by mining coal in your community?
a. Strongly agree with
b. Agree
c. strongly disagree
d. Other specify……
……
……

2. What is the benefit of Maamba Collieries Limited to your community?
a. Provides employment equally
b. Gives money to community
c. We don't know
d. both (a) & (c)
e. Other specify……
……
……

3. How do you know that Maamba Collieries Limited's mining activities affect you?
a. We just know
b. We have a knowledge department
c. Maamba Collieries Limited has been educating us
d. Other specify……
……

4. How has Maamba Collieries Limited helped your community to develop?
……
……

5. Which of the following do you see as a major risk?

a. General liability
b. Damage to personal health
c. Pollution of air, land, and water
d. Other specify……

……

……

6. Does Maamba Collieries Limited carry out community education concerning its operations to the community?

a. Sometimes
b. Always
c. Once in a while
d. Does not exist

7. How do you describe Maamba Collieries Limited?

……

……

……

……

……

SECTION C: REINFORCING FACTORS

8. To what extent do you take any one or all of the following in the community?

Level of commitment		**Variables**	**Level of Commitment**	
ALWAYS	**FREQUENTLY**		**OCCASIONALLY**	**NEVER**
		Educating community		
		Policy development		
		Communication		
		Risk Assessment		

9. Is your life in any way affected by Maamba Collieries Limited's mining activities?

(a) Yes
(b) No
(c) To some extent
(d) Other specify……

……

……

……

10. How has your life been affected in any one of these areas as a result of Maamba Collieries Limited's mining activities?

(a) Cleanliness:
(b) Health:
(c) Pollution air/land/water:
(d) Other specify……

……

……

11. In your own words can you explain how Maamba Collieries Limited's mining activities have affected you?

……
……
12. Has Maamba Collieries Limited ever done any one of the following in your community?
(a) Risk assessment surveys
(b) Sensitization of the dangers of its operations
(c) Provision of protection to any risk perceived
(d) None
13. Given a chance what would you rather see Maamba Collieries Limited do to implement the sustainable future growth of your community?
……
……
……
14. What challenges have you faced in communicating the effects of company activities to Maamba Collieries Limited?
……
……
……

SECTION D: SYSTEMATIC PROCESS

15. Which of the following do you see as your major risks?
a. General liability
b. Damage to personal Health
c. Air/water/land pollution
d. Not above specify……
……
16. Do you know the department at Maamba Collieries Limited responsible for risk communication and management?
Write……
17. Do publishing the Risk levels surveyed as a result of its operations a means of communicating to you the dangers expected?
a. Not at all
b. Sometimes
c. Yes
d. Always
18. Does Maamba Collieries Limited has contractors or facilities in the following categories who provide services to your community for free?
a. Health Care
b. Social Workers
c. Legal Advisors
d. None
19. Are you aware if Maamba Collieries Limited has a compensation plan or insurance policy in anticipation of any risk that you may be exposed to?
a. Yes
b. I don't know
c. Not at all
d. What is that

SECTION E: BOTTOM LINE MEASURE

20. Can you measure the risks you are exposed to by Maamba Collieries Limited against their Risk Communication policy?

a. Yes
b. We try
c. No
d. Other specify……

……

……

21. Are there measures the government has put in place to protect you as a citizen against risks associated with mining activities in Maamba in the Sinazongwe District of Zambia?

a. No
b. Yes
c. I don't know
d. Other specify……

……

……

22. What kind of relationship and alliances do you have with Maamba Collieries Limited?

……

……

……

……

……

……

……

Section F: EXPERIENCE

23. Do you experience pollution in Maamba town?

Yes ☐ No ☐

24. If your answer is yes to question 23? Please indicate the type of pollution. Tick one or more answers

Description	None	Low	Moderate	High
Air pollution				
Contamination of soil				
Chemical pollution overall				
Pollution of drinking water				
Dust emissions				
Others please specify				

25 Do you know of any risks associated with coal mining in Maamba town?

Yes	
No	

N/A	

26. If the answer to question 25 is yes, list some of the risks you know

……..

……

……

27. In what ways has pollution affected the health of community/family members? Tick as many as possible

Coughing	
Sneezing	
Chest complications	
Others specify	

28. In what ways has pollution affected the environment of your community?

Dust	
Air pollution	
Water pollution	
Contamination of soil	
Chemical pollution overall	
Pollution of drinking water	
Others please specify	

29. How much information on coal mining-related risks have you received from Maamba Collieries Limited?

1. None	2. Little	3. moderate	4. high

30. Do you know if Maamba Collieries Limited has a policy targeting pollution mitigations?

a. Yes ☐ b. No ☐

31) If the answer to question 30 above is yes, what are your views about the policy?

……

……

32). As residents have you engaged Maamba Collieries Limited in reducing pollution?

a) Yes ☐ b) No ☐

33) If the answer is yes to question 32 is yes, how successful have you been in engaging Maamba Collieries Limited?

1. very successful	2. successful	3. moderate successful	4. unsuccessful

34) If the answer to 33 is unsuccessful, why has the community failed?

Lack of knowledge by community members on the risks	
Community members feel their voices won't be respected	
The Community feels MCL has the right to pollute the environment	
The community has reported to environmental agencies	
Community members feel it's the government's responsibility	

Thank you, for your corporation please call me for any queries on +260-975-585661or +260-963-46851

Appendix D: PROPOSED RESEARCH BUDGET 2020 -2022

NO	ITEM	QTY	UNITY	TOTAL
A	**STATIONARY**			
	USB	2	100	200
	Reams of paper	10	50	500
	Pens	200	10	2000
	Pencils	50	4	200
	Envelopes	100	3	300
	Writing pads	200	20	400
	Printer	1	5,500	5,500
	Printer accessories	20	500	10,000
B	**PILOT RESEARCH**			
	Lodging	N/A		
	Transport	1	10,000	10,000
	Food	1	5,000	5,000
C	**DATA COLLECTION**			
	Transport		2,000	2,000
	Airtime		5,000	1,000
	Lodging	N/A		
	Food	N/A		
D	**DATA ANALYSIS**			
	Data entry, process, and analysis			
	Consultation		25,000	25,000
	Lodging	N/A		
	Food	N/A		
	Airtime		12,000	12,000
E	**CONTINGENT FUNDS**			10,000
	TOTAL			**70,300**

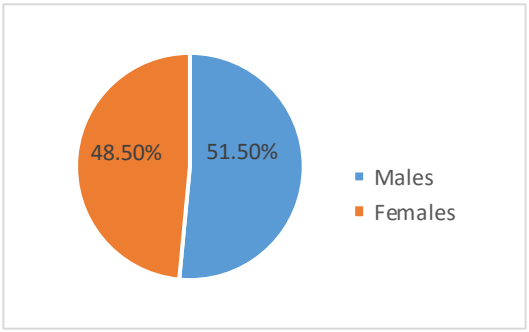
Appendix E: RESEARCH PLAN

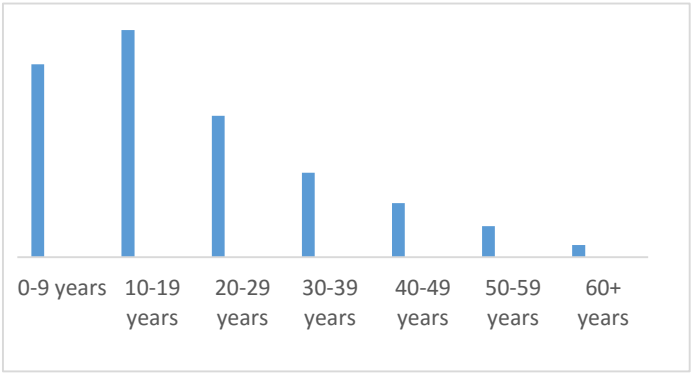
S/N	Actual Activity	Time Frame	Months-2020-2022
1	Topic identification, formulation of research proposal Title/consultation from the supervisor	1 Month	Jan 2020
2	Testing through piloting and fine-tuning of the data collection instrument	3-Months	Feb-April 2020
3	Data collection from the sites and through interviews	6-Months	May-Oct 2020
4	Data entry and analysis	2-Months	Nov-Dec 2020
5	Report writing of Research findings	3- Months	Jan-March 2021
6	Proofreading, preparation, and submission of the first draft	6- Months	April-Sept 2021
7	Oral and Poster presentation	5- Months	Oct 2021- March 2022
8	Submission of the final draft of the thesis for examination	3-Months	April-June 2022

APPENDIX F: PHOTOS OF SURROUNDING VILLAGES WITHIN THE MINE AREA

Map of Zambia showing Sinazongwe and Maamba Location

Maamba population (2010) Zambia Central Statistics





Population by sex (C 2010)

Males	4,967
Females	5,282
Area	66.26km2
Density	154.7/km2
Total	**10,249**

Age by age group (2010)

0-9 years	2,662
10-19 years	3,132
20 -29 year	1,949
30-39 years	1,167
40-49 years	746
50-59 years	427
60 + years	166


Sikawili
Chiyumpe
Kalomo Boma
Tara
Mwempe
Ushimba
Singani
Nachibanga
Saye
Siabunga
Siamasusu
Simanyanga
Mwemba
Sikaputa
Sikanakashaka
Kalomo
Chinkumbe
Sinamalima
Namwianga
Siavwima
Siasikabole
Sikaputa
Sinanjola
Maliko
Singombe
Sinazeze
Kanchindu
Chief S
Miritan
Nkandabwe
Masuku
Maamba
Dimbwe
Sinazongwe
Sipatunyana
Kanchele
Namuswa
Namukamba
Kajonja
Chipantangeli
Simulyamana
Sikalonza
Njabalombe
Tenkanya
Siabaswi
Siatwinda
Sibalia
Sulwegonde
Maiba
Sikuteka
Simche
Kabanga
Chief
Simwatachela
Siakabanze
Siamusale
Muka
Impampa
Binga
Siameja-Zilunda
Nyanga
Ndengeza
Madyongo
Siawaza
Siawaja
Chizarira National P
Sianzovo
Siansalama
Lake Kariba


Siamujebwe
Choma
Dembera
Tamatira
Chombo
Chiboboma
Siambunda
Sinafwala
Sikwaba
Namashova
Silukutula
Slukutia
Siabunga
Siabenzu
Ushimba
Tara
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Siavwima
Siasikabole
Sikaputa
Sinanjola
Sengwa
Chief Sinanga
Village
Chief Simupas
Village
Maliko
Singombe
Sinazeze
Sinazongwe
Miritan
Nkandabwe
Masuku
Vwavwa
Dimbwe
Sinazongwe
Namuswa
Namukamba
Kajonja
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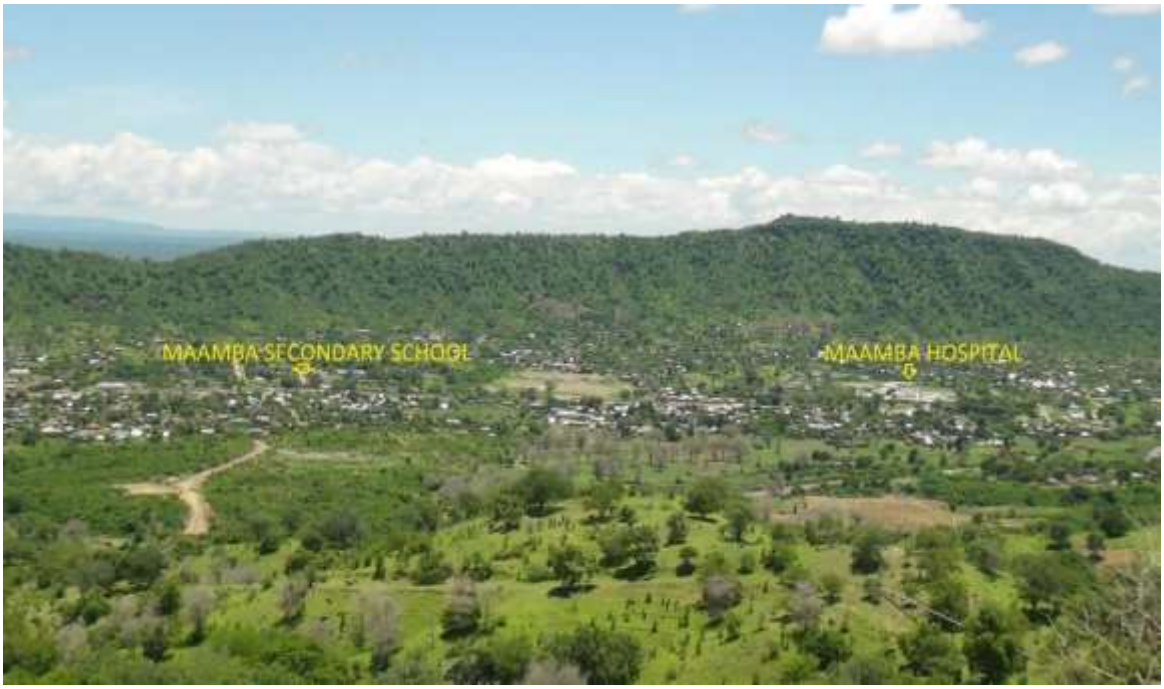
Siabaswi
Siatwinda
Sibalia
Simchembo
Siabuwa
Sulwegonde
Maiba
Sikuteka
Chief Sinasenkwe
Kabanga
Simwatachela
Siakabanze
Siamusale
Muka
Impampa
Binga
Siameja-Zilunda
Nyanga
Ndengeza
Madyongo
Siawaza
Busi
Lake Kariba

Maamba Town aerial view

Maamba Town Central Business Center

Maamba Town Central business center



Sipumina village

Siankoddombo village


MKALONZO VILLAGE


MAAMBA NEW TOWNSHIP