

ANALYSING THE COMMUNICATION STRATEGY OF EMALAHLENI LOCAL  
MUNICIPALITY FOR INFORMATION DISSEMINATION ON AIR QUALITY  
IMPROVEMENT

By

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## DEDICATION

I dedicate this dissertation to the Almighty God for His infinite mercy, love, and kindness throughout the research project.

## DECLARATION

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ANALYSING THE COMMUNICATION STRATEGY OF EMALAHLENI LOCAL

MUNICIPALITY FOR INFORMATION DISSEMINATION ON AIR QUALITY

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I declare that the above dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.



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## ABSTRACT

This study aimed to analyse the communication strategy that Emalahleni Local Municipality (ELM) is using to raise awareness on air quality improvement. Analysing the communication strategy of an organisation can play an important role in determining the strength, weakness, opportunities, and threats of an organisation's strategy to communicate and achieve its goals.

Emalahleni, a town in the Highveld of Mpumalanga South Africa was identified as a national air pollution "hotspot" in terms of the National Environmental Management: Air Quality Act (AQA) (39 of 2004). In response to the AQA, Emalahleni Local Municipality (ELM) has been embarking on different air quality management measures including air quality awareness and educational programs to ensure that the residents are acquainted with ways of maintaining air quality and to bring the area in compliance with the national ambient air quality standards.

Few studies have been published on communicating air quality management in South Africa and across the world. Amongst them, few have focused on the comprehensive analysis of communication strategies used by an organisation for community awareness on air quality improvement.

The research was anchored on the diffusion of innovation theory and AA1000 Accountability theory. This is because diffusion of innovation is concerned with communicating new ideas and practices through a social system while the Accountability theory focuses on developing an accountable approach to sustainability which is what this study emphasises.

Exploratory sequential mixed methods were used through semi-structured interviews with the officials from the environmental and waste management department and communication department of ELM. Items for the questionnaires were identified and further tested quantitatively in the second phase with the community members through an online survey. The qualitative data findings were confirmed with those of the quantitative approach.

The study found that community members of Emalahleni are aware of the air quality improvement program and how to maintain air quality. Although, they are aware of this, their behaviour towards maintain air quality standards does not change for the better. Participants outlined that radio and social media were used for information dissemination while respondents postulated that radio, door to door, newspaper, social media, and community meetings were used to raise awareness of air quality in ELM. The most preferred channels as indicated by the participants were radio and social media, but the respondents outlined that radio, social media and community meetings were their most preferred channels.

The study recommends that different communication strategies both the ones preferred by the residents and the ones identified from the literature as capable of transmitting and raising awareness on air quality must be used by ELM for air quality information dissemination. The study further recommends that appropriate communication interventions evaluation is required by ELM to properly ascertain its communication intervention success. This study also recommends that the organisation and other organisations that would like to embark on a similar program should focus on communication interventions for promoting sustainable behaviour change that can lead the public to maintain air quality as it was mentioned that exposing residents to awareness messages does not lead them to maintaining air quality.

**Key terms:** communication strategy, strategy, information dissemination, air quality improvement, air pollution, Emalahleni Local Municipality, community awareness, evaluation of communication outcome, diffusion of innovation theory, AA1000 Accountability Principle.

## Table of Contents

ACKNOWLEDGEMENT.....	ii
DEDICATION.....	iii
DECLARATION.....	iv
ABSTRACT.....	v
1.1 INTRODUCTION.....	1
1.2 Background.....	2
1.3 RESEARCH PROBLEM STATEMENT.....	4
1.4 RESEARCH QUESTIONS.....	5
1.5 RESEARCH OBJECTIVES.....	5
1.6 SIGNIFICANCE OF THE STUDY.....	6
1.8 OUTLINE OF THE DISSERTATION.....	7
1. 9 CONCLUSION.....	7
CHAPTER 2: LITERATURE REVIEW - COMMUNICATION STRATEGY.....	8
2.1 INTRODUCTION.....	8
2.2 OVERVIEW OF COMMUNICATION STRATEGY.....	8
2.3 LEVELS OF STRATEGY.....	10
2.4 COMMUNITY AWARENESS.....	11
2. 5 STRATEGIC COMMUNICATION PROCESS.....	14
2.6 PUBLIC AWARENESS COMMUNICATION STRATEGIES.....	17
2.6.1 <i>Social media</i> .....	17
2.6.2 <i>Mass media</i> .....	22
2.6.3 <i>Billboard</i> .....	25
2. 6. 4 <i>Entertainment education</i> .....	27
2.7 EVALUATION OF COMMUNICATION INTERVENTION OUTCOME.....	30
2.8 CONCLUSION.....	35
CHAPTER 3: LITERATURE REVIEW - INFORMATION DISSEMINATION.....	36
3.1 INTRODUCTION.....	36
3.2 INFORMATION DISSEMINATION AND AIR QUALITY.....	36
3.3 ELEMENTS IN COMMUNICATING INFORMATION.....	41
3.3.1 <i>Goals and objectives</i> .....	42
3.3.2 <i>Target audience</i> .....	42
3.3.3 <i>Information or message type</i> .....	44
3.3.4 <i>Channels of communication</i> .....	48
3.4 THEORETICAL FRAMEWORK.....	50
3.5 AIR QUALITY INFORMATION MANAGEMENT PLANNING.....	54

3.6 CONCLUSION .....	56
CHAPTER 4: LITERATURE REVIEW- AIR QUALITY .....	57
4.1 INTRODUCTION .....	57
4.2 OVERVIEW OF AIR QUALITY .....	57
4.2.1 <i>Indoor and outdoor air pollution</i> .....	60
4.3 RESPONSE TO AIR QUALITY MANAGEMENT IN SOUTH AFRICA .....	63
4.4 ABOUT EMALAHLENI LOCAL MUNICIPALITY .....	70
4.5 AIR QUALITY MANAGEMENT PLAN .....	74
4.5.1 <i>Goal setting</i> .....	75
4.5.2 <i>Baseline air quality assessment</i> .....	76
4.5.3 <i>Air quality management systems</i> .....	77
4.5.4 <i>Intervention strategies</i> .....	79
4.5.5 <i>Action plan implementation and evaluation and follow up.</i> .....	80
4.6 SOURCES OF EMISSION.....	81
4.6.1 <i>Power generation</i> .....	82
4.6.2 <i>Domestic fuel burning</i> .....	82
4.6.3 <i>Vehicular emission</i> .....	83
4.6.4 <i>Industrial emission</i> .....	84
4.7 PRIORITY AREAS AND PRIORITY POLLUTANTS IN SOUTH AFRICA .....	84
4.8 SOUTH AFRICAN NATIONAL, PROVINCIAL AND LOCAL AMBIENT AIR QUALITY AND EMISSION STANDARDS .....	86
4.9 AMBIENT AIR QUALITY MONITORING IN SOUTH AFRICA.....	88
4.10 COMPLIANCE MONITORING.....	90
4.11 EMISSIONS INVENTORY .....	92
4.12 ATMOSPHERIC EMISSION LICENCES (AEL).....	92
4.13 CONCLUSION.....	93
CHAPTER 5: RESEARCH METHODOLOGY .....	94
5.1 INTRODUCTION .....	94
5.2 RESEARCH PARADIGM.....	94
5.3 RESEARCH METHOD .....	97
5.4 DATA GATHERING TECHNIQUES .....	98
5.5 RELIABILITY AND VALIDITY AND TRUSTWORTHINESS .....	102
5.6 POPULATION OF THE STUDY .....	106
5.6.1 <i>Target population</i> .....	106
5.6.2 <i>Accessible population</i> .....	107
5.6.3 <i>Units of analysis</i> .....	107

5.6.4 <i>Population parameters</i> .....	107
5.6.5 <i>Sampling methods</i> .....	108
5.7 <b>ETHICAL ISSUES</b> .....	110
5.8 <b>DATA ANALYSIS AND INTERPRETATION</b> .....	111
5.9 <b>CONCLUSION</b> .....	112
<b>CHAPTER 6: PRESENTATION AND INTERPRETATION OF FINDINGS</b> .....	113
6.1 <b>INTRODUCTION</b> .....	113
6.2 <b>PROCESS OF QUALITATIVE FINDINGS</b> .....	115
6.3 <b>PRESENTATION AND INTERPRETATION OF QUALITATIVE FINDINGS</b> .....	115
The Thematic Map for the study .....	116
6.3.1 <i>Theme: Communication strategies</i> .....	117
6.3.2 <i>Theme: Communication Channels</i> .....	119
6.3.3 <i>Theme: Communicative language</i> .....	122
6.3.4 <i>Theme: Audience Knowledge</i> .....	123
6.3.5 <i>Theme: Campaign outcomes</i> .....	125
6.4 <b>PROCESS OF QUANTITATIVE FINDINGS</b> .....	127
6.5 <b>PRESENTATION AND INTERPRETATION OF QUANTITATIVE FINDINGS</b> .....	127
6.5.1 <i>Channels of Communications used by the Municipality</i> .....	128
6.5.2 <i>Channels preferred by community members to receive air quality awareness messages</i> .....	129
6.5.3 <i>Language used to raise air quality awareness</i> .....	130
6.5.4 <i>Content shared on air quality</i> .....	131
6.6 <b>DISSCUSSION</b> .....	134
6.7 <b>CONCLUSION</b> .....	135
<b>CHAPTER 7: CONCLUSION AND RECOMMENDATIONS</b> .....	136
7.1 <b>INTRODUCTION</b> .....	136
7.1.2 <i>Communication strategies and channels used.</i> .....	136
7.1.3 <i>Communication channels preferred by community members</i> .....	137
7.1.4 <i>Language used</i> .....	137
7.1.5 <i>Community knowledge on air quality</i> .....	138
7.1.6 <i>Communication outcome</i> .....	138
7.2 <b>Recommendations</b> .....	139
7.3 <b>Limitations of the study</b> .....	140
7.4 <b>Future research directions</b> .....	141
7.5 <b>Conclusion</b> .....	141
<b>SOURCES CONSULTED</b> .....	143

APPENDIX A: INTERVIEW GUIDE .....	158
APPENDIX B: SURVEY QUESTIONNAIRE .....	163

## LIST OF FIGURES

<b>Figure 2-1 Strategic communication process .....</b>	<b>15</b>
<b>Figure 4-1 Annual average concentrations of the measured inorganic gases in the Highveld of Mpumalanga.....</b>	<b>62</b>
<b>Figure 4-2 Environmental and compliance sub-structure of Emalahleni Local Municipality .....</b>	<b>68</b>
<b>Figure 4-3 Photographs illustrating the Basa njengo magogo method with high ventilation, medium ventilation, and low ventilation.....</b>	<b>69</b>
<b>Figure 4-4 The map of Emalahleni.....</b>	<b>72</b>
<b>Figure 4-5 The Organogram of Emalahleni Local Municipality .....</b>	<b>73</b>
<b>Figure 4-6 ISO 14001 Environmental Management System.....</b>	<b>78</b>
<b>Figure 6-1 The study thematic map .....</b>	<b>116</b>

## LIST OF TABLES

Table 4.1 Ranges of annual average concentrations (mg/m <sup>3</sup> ) of PM <sub>10</sub> , nitrogen oxides and sulphur dioxide and one-hour maximum average concentrations of ozone for different regions, based on a selection of different data. ....	59
Table 4.2 South African national ambient air quality standards .....	87
Table 6-1 The age, gender, qualification, and position data of the interview participants.....	114
Table 6.2 Descriptive statistics of the biographical and demographical groupings of the questionnaire respondents .....	114
Table 6.3 A representation of the communication strategies within the organisation themes per research Question 1 .....	117
Table 6.4 A representation of the Communication Channels within the organisation themes per research Question 2 and 4 .....	119
Table 6.5 A representation of the communicative language themes per research Question 3.....	122
Table 6.6 A representation of the audience knowledge of air quality within the community themes per research Question 5 .....	123
Table 6.7 A representation of the Campaign outcomes within the organisation themes per research Question 6.....	125
Table 6.8 Descriptive statistics of the channels used (n = 282) .....	128
Table 6.9 Descriptive statistics of preferred channels (n = 282).....	129
Table 6.10 Descriptive statistics of the language used (n = 282).....	130
Table 6.11 Descriptive statistics of the content shared (n = 282) .....	131
Table 6.12 Summary of the factor analysis and iterative reliability analysis procedure .....	132

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## **CHAPTER 1: INTRODUCTION AND CONTEXTUALISATION**

### **1.1 INTRODUCTION**

South Africa is a developing country and is endeavouring to boost its economy. However, the aim of achieving a better economic standing has led the country to engage in economic activities that result in air pollution (Klausbruckner, Annegarn, Henneman & Rafaj, 2016:70). In South Africa, the main contributors to air pollution are emissions from power generation, industrial and mining operations, domestic energy use and vehicular exhaust (Fuggie & Rabie, 2009:189; ELM, 2018).

In Emalahleni, a town situated on the Highveld of Mpumalanga province, South Africa, within the eMalahleni Local Municipality (ELM), air pollution is specifically a pertinent issue (Marais, Nel & Donaldson, 2016). In 2007, the minister of Environmental Affairs and Tourism declared the greater Emalahleni region as a national air pollution “hotspot” called the Highveld Priority Area (HPA) in terms of the National Environmental Management: Air Quality Act (AQA) (39 of 2004). The minister declares an area as “hotspot” when a situation exists in the area which may cause a significant negative effect on the quality of air and the area needs certain air quality management strategies to deal with the-situation. In response to AQA (39 of 2004), the Department of Environmental and Waste Management in collaboration with the Department of Communication in Emalahleni Local Municipality (ELM) have been trying to manage, control, maintain and bring Emalahleni in compliance with the national ambient air quality standards.

Communication, which is part of the organisation’s air quality management plan (Government Gazette 2018; DEA, 2012), is a process where information, knowledge, ideas, feelings, and attitudes are conveyed (Peters & Fletcher, 2004). This enhances the public’s knowledge about issues around them such as the environment and hazards associated with it (Hansen, 2011:9). Communication around air quality must be strategic to inform the public and enhance their knowledge on addressing the issues. Strategic communication is the use of communication to achieve an organisation’s mission (Hallahan, Holtzhausen, van Ruler, Verčič & Sriramesh, 2007:4).

Communication strategy should define how to capture the attention of the target audiences and deliver a compelling message (Raab & Rocha, 2011:18-19; NCVO, 2017). In relation to this, there is a need for careful consideration of communication goals and objectives, the target audience, the type of information and the messages to be conveyed as well as the channels through which the message will be conveyed (Oltra Sala, 2015; Hallahan Holtzhausen van Ruler, Verčič & Sriramesh, 2007:4).

Several studies on the importance of communication strategies have focused on reputation management and branding activities (Waerass & Byrkjeflot, 2012:187) and crisis communication (Utz, Schultz & Glocka, 2013:40). Other studies focused on communication strategies for emission reduction and emphasised the use of mass media, website and flyers (Okwuofu-Thomas, MAgeHith & MacKenzie, 2017:33); mass media, social media and the internet (Oltra & Sala, 2015:365); mass media and internet (Ramirez, Ramondt, Van bogart & Perez-Zuniga, 2019:1); social media (Hua Xu, 2014); billboards, social media and internet (Ratnapradipa, 2012); and entertainment education Reineremann, Lubjuhn, Bouman & Singhal, 2014:176). These studies offered a meaningful insight on communication strategies, however, they have only concentrated on making air quality information available to the public (Oltra & Sala, 2015); air pollution causes, health effects and control (Ramirez et.al, 2019; McLaren & Williams, 2015:478); environmental risk and prevention (Ratnapradipa, 2012; Omanga et.al, 2014:1627; Wang, Sun, Yang & Yuan, 2016); environmental emission of heatwave episodes (Okwuofu et.al, 2017) and communication strategies in promoting sustainable consumption practices (Reineremann et.al, 2014).

Lacking in the literature is the comprehensive analysis of the communication strategy used by an organisation, not only to inform the public but to raise public awareness on how to improve air quality. This study fills this gap.

## **1.2 Background**

Several studies have shown that air pollution has a devastating health impact on human beings (WHO, 2005:7), and impose risks on materials and ecosystems and causes damage to the environment in general (Perez, Sunyer & Kunzli, 2008:284; Vlachokostas, Achillas, Slini, Moussiopoulos & Baniyas, 2011:275).

The air quality impact assessment study conducted by Thomas and Scorgie (2006) regarding the coal-fired power station in the Emalahleni area showed that there are significant health effects associated with exposure to emission from power generation, industrial fuel burning, household fuel burning and vehicle exhaust emission. The study of Klausbruckner et.al, (2016:72) showed that air pollution caused by the Eskom coal power station is leading to at least 20 deaths a year in Emalahleni and could increase to 617 deaths, with 25,000 people hospitalised once all the stations are operating.

Providing information to the public regarding environmental risk is an important feature of air quality management (Hubbell, Kaufman, Rivers, Schulte, Hagler, Clougherty, Cascio & Costa, 2018). Disseminating information on any environmental hazard as part of education programs to the public accomplishes several goals for emergency or environmental planners. Such programs promote knowledge about the risk, enabling the public to identify and understand environmental threats (McLaren & Williams, 2015:479). It also conveys information that enhances people coping skills through discussion of protective strategies and measures (Hubbell et.al, 2018). An efficient and more reliable information dissemination system could enhance public environmental emergency response to take protective measures (Zhang, Huang, Su, Zhao & Zhang, 2014).

For people to better understand pollution-related problems and solutions, public environmental awareness programs are necessary and should be encouraged (Wang et.al, 2016). Wang et.al, (2016) argue that improving public environmental education and making environmental knowledge accessible to residents for pollution prevention is very crucial. Borbet, Gladson & Cromar, (2018:1) argue that increasing public awareness and educating the public on the detrimental consequences of air pollution is very important and has been a strategy to reduce health effects linked with poor air quality. Hodoli, Abubakari & Adzaho, (2018) propose that besides providing awareness and education and access to air quality information, available information must be presented in an understandable language for mutual understanding that will enable the public to take appropriate steps to control air pollution. Therefore, the communication strategy of the municipality must be appropriately planned and applied to improve its communication with the community on managing an environment that is safe and not harmful to the health and well-being of the people.

The study will explore and describe the communication strategy being used by ELM to transmit information on air quality, how the municipality evaluate the outcome of its communication strategy in promoting awareness on air quality improvement, the residents preferred communication strategy for receiving air quality information, the residents knowledge and understanding about the Municipality's air quality improvement program and how understandable is the language used by the municipality on air quality issues.

The appropriate plan and application of the communication strategies by ELM needs to inform, persuade, and deliver a message strategically to raise community awareness regarding managing, improving, and maintaining air quality and encourage compliance with the national ambient air quality standards.

Studies have been conducted on public environmental awareness using the communication strategies as mentioned in the introduction (Oltra & Sala, 2015; Hua Xu 2014; Ratnapradipa 2012; Okwuofu-Thomas, et.al, 2017; Wang et.al, 2016). Few have focused on investigating community awareness on air quality improvement through communication strategies of an organisation. This study intends to investigate communication strategies used by the municipality for raising community awareness on air quality improvement.

### **1.3 RESEARCH PROBLEM STATEMENT**

Communication intervention is part of the air quality management plan of ELM. Its communication must not be haphazard, it must be well planned to engage the community to support the idea of improving air quality. For people to act, they must be aware of the problems, consequences, and ways of avoiding the problems. Different communication strategies must be considered to strategically raise awareness issues so that people are aware of air quality improvement plans. Studies on communication strategies have been conducted, however, very little has been done on the comprehensive analysis of communication strategies to determine community awareness on air quality improvement. Lack of this analysis compromises on endeavours to resolve the air quality improvement plan.

The purpose of this qualitative and quantitative cross-sectional study is to analyse communication strategies aimed at raising community awareness on air quality improvement of Emalahleni local Municipality.

#### **1.4 RESEARCH QUESTIONS**

Question 1: Which communication strategies are used by Emalahleni Local Municipality to promote community awareness about air quality improvement programs?

Question 2: Which communication channels are used by Emalahleni Local Municipality to promote community awareness about air quality improvement programs?

Question 3: How does the Emalahleni local Municipality evaluate the outcome of the communication strategies used to promote air quality awareness?

Question 4: What are the residents' preferred channel of communication for receiving information on air quality improvement?

Question 5: How knowledgeable are the residents about the Municipality's programme to improve air quality?

Question 6: How is the language used by the Emalaheni Local Municipality for information dissemination on air quality improvement to the community understood by the residents?

#### **1.5 RESEARCH OBJECTIVES**

Research objective could be exploratory, descriptive, and explanatory (Terre Blanche, Durrheim & Painter, 2006:44). This study focuses on exploratory and descriptive objectives. Exploratory objectives aim to make primary investigations into an unknown area of study and to look for new insights or to gain understanding about the phenomena by employing a flexible, open, and inductive approach to the study (Terre Blanche. et.al, 2006:44). The descriptive objective, on the other hand, intends to provide an accurate description of phenomena (Terre Blanche, et.al, 2006:44).

Therefore, this study intends to explore the topic in greater depth to gain insight and understanding and to accurately describe the phenomenon to provide a quality measurement of the phenomenon. The following research objectives are relevant in addressing the main research purpose:

- To describe the communication strategies used by Emalahleni Local Municipality to promote community awareness on air quality improvement programs.
- To explore the communication channels used by Emalahleni Local Municipality to promote community awareness on air quality improvement programs.
- To explore how the Emalahleni local Municipality evaluates the outcome of the communication strategies used to promote air quality awareness
- To describe the residents' preferred channel of communication for receiving information on air quality improvement.
- To explore how knowledgeable the residents are about the Municipality's programme to improve air quality.
- To explore how understandable the language used by the Emalahleni Local Municipality for information dissemination on air quality improvement is for the residents.

## **1.6 SIGNIFICANCE OF THE STUDY**

This study is important as the findings will help to optimise future programs of ELM and as well contribute to the global knowledge of organisations who will embark on a similar program on how to appropriately plan their communication strategy to successfully promote community awareness on air quality improvement. This study is also important as it intends to analyse the communication strategy to suggest guidelines and make recommendations on the appropriate communication strategies to employ in communicating air quality information with the community. The knowledge that the organisation will gain regarding appropriate plan and application of communication will help the organisation to get the communities informed about the condition of the environment and measures to take to control air pollution.

## **1.7 METHODOLOGY**

This study used exploratory sequential mixed methods design. Interviews and online questionnaires were the data collection technique of the study. Thematic analysis was used for the interpretation of qualitative data while descriptive analysis was utilised for the interpretation of quantitative data. The population comprised of Emalahleni local municipality officials and the community members of Emalahleni. This study was conducted according to the UNISA code of ethics and guideline and was approved by the UNISA research ethics committee.

## **1.8 OUTLINE OF THE DISSERTATION**

Chapter one comprises of the introduction, the background and the research problem statement, the research questions, the research objectives, the significance of the study and the study outline. The next chapter is the literature review chapter which comprises chapter 2, 3 and 4. Chapter two of the literature review focuses on the overview of communication strategy, chapter three reviews information dissemination and chapter four discusses air quality. Chapter 5 presents the methodology. Chapter 6 focuses on the presentation and interpretation of the research findings. Chapter 7 presents the conclusion that is, the summary of the entire dissertation.

## **1. 9 CONCLUSION**

This chapter gives an overview of the background and contextualisation of the study. It contains the research problem statement, the research questions, the research objectives, the significance of the study and the study outline. The next chapter discusses the literature review.

## **CHAPTER 2: COMMUNICATION STRATEGY**

### **2.1 INTRODUCTION**

The study aims to analyse communication strategies that ELM is using to communicate with the community in raising awareness on air quality improvement. This chapter focuses on a comprehensive analysis of communication strategies suitable to raise awareness on air quality problems and measures imperative to improve air quality. It provides an overview of communication strategy, levels of strategy, community awareness, strategic communication process, public awareness, communication strategies, and the evaluation of communication intervention outcome.

### **2.2 OVERVIEW OF COMMUNICATION STRATEGY**

Strategy is derived from the Greek word *strategia* which means the art of war (Angelopulo & Barker, 2013:34). The strategy concept is rooted in military theory according to the knowledge of scholars concerned with strategic communication (Strachan 2013; Smith, 2018). Strategy is defined as a broad plan of action designed to achieve a predetermined objective (Okigbo, 2014). It is a set of related actions or interventions adopted by managers that have bearing on the performance of their organisations (Jones & Hills, 2010).

Before defining strategic communication, it is necessary to understand what strategic means. Strategic means discovering and leveraging opportunities within the power system (Cox, 2010). According to Cox (2010), being strategic does not only involve communicative efforts of a campaign (message construction and framing) and its mobilisation, but it also involves alignment of these communicative efforts with contingent openings within a system of power and mode of leverage or influence that assists a campaign to take advantage of such openings to accomplish larger effects or outcomes. Conversely, the term “strategic communication is defined as the purposeful use of communication by an organisation to fulfil its mission” (Hallahan, Holtzhausen, van Ruler, Verčič & Sriramesh, 2007:1). Strategic communication is also defined “as coordinated actions, messages, images, and other forms of signalling or engagement intended to inform, influence, or persuade selected audiences in support of set objectives” (Paul, 2011:189).

It is also defined “as the systematic design and implementation of a communication initiative to achieve a pre-defined goal” (Zaharna, 2010:6). Having a look at the discussion of strategy and strategic communication above, it is understood that strategy is concerned with a broad plan that aims to achieve a predetermined objective. Whereas strategic communication focuses on the use of communication in achieving certain objective or mission by an organisation. Therefore, this study is a comprehensive analysis of how communication is used to achieve the objective of raising community awareness on how to improve air quality in the ELM.

Strategic communication has become quite popular in communication science the second decade of the twenty-first century and was initially only used for communication programs in the sphere of national governments and the military (Holtzhausen & Zeffass, 2015:4) Nowadays, strategic communication embraces various goal-directed communication activities mostly covered by marketing, public relations, management, financial communications, health communications, and public diplomacy. The activities and the nomenclature used by these professional disciplines differ but the core concepts behind it are similar, and these include audience analysis, goal setting, message strategy, channel choice, and program assessment (Hallahan et.al, 2007; Oltra & Sala, 2015:361). These concepts are identified and considered relevant by different professional fields mentioned above in terms of communicating strategically to stakeholders. Hence, these concepts are taken into consideration in terms of this study as they can assist the municipality to communicate strategically with the community in achieving a better outcome of its communication effort on air quality improvement programs.

Strategic communication has been used by many corporations, activist organisations, citizen and social movements to reach their goals (Hallahan et.al, 2007). In light of this, strategic communication has been examined for its effectiveness to enhance marketing (Alcinda & Folck, 2012), as a device for health campaigns (Oku, Oyo-lta, Glenton, Fretheim, Ames, Muloliwa, Kaufman, Hill, Cliff, Cartier, Bosch-Capblanch, Rada & Lewin, 2016; Rochon, Ross, Looney, Nepal, Price & Giordano, 2011), a tool for product advertisement (Southard, 2013) and as a tool to encourage environmental activism (Wu, 2013).

A qualitative study conducted from a Health Care Centre in the United States to identify communication strategies that might influence awareness and adherence to health treatment indicated that: media campaign was effective to influence awareness and adherence to health treatment (Rochon et.al, 2011). The study has investigated strategic communication based on improving health. But this study focuses on strategic communication to improve air quality.

An effective communication strategy needs clear, consistent key messages that flow from policy goals (Paul, 2011:7). Organisations must develop effective messages tailored to the needs of a specific audience. Organisations, should also understand the range of available communication interventions to design, implement and assess interventions adequately (Oltra & Sala, 2015:225). Communication which is a two-way communication and involves dialogue or engagement is essential in establishing transparency, legitimacy, and accountability (Caldera & Beckie, 2011) Moreover, influencing the levels of knowledge, towards issues, products or services remain the preferred outcomes for strategic communication (Paul, 2011:8). Therefore, tailored messages, transparency and suitable communication intensions applied by the municipality in communicating with the community can increase the knowledge of the community towards air quality issue and its improvement in Emalahleni.

Many studies have investigated strategic communication from the persuasive, influential and informative perspective. This study explores and describes communication strategy of an organisation from the community awareness perspective, specifically awareness on improving air quality.

The next section discusses different strategy levels developed in organisation based on organisational hierarchies.

### **2.3 LEVELS OF STRATEGY**

Strategy is developed and implemented at different levels in the organisations. According to Angelopulo and Barker (2013:33-34), levels of strategy include enterprise strategy, corporate strategy, business strategy, functional strategy, and operational strategy. Enterprise strategy covers a broad spectrum and is not articulated formally. This strategy focuses on the relationship of the organisation with society.

In other words, it focuses on the mission of the organisation and its role in society and therefore mainly stakeholder oriented. One of the roles of a municipality is to provide a safe environment. With Emalahleni declared an air pollution hot spot, it is the responsibility of ELM to raise awareness on air quality with an aim to keep the municipality in good health in response to the enterprise strategy.

Corporate strategy defines either the range of business opportunities or the business domain in which an organisation operates at a given point in time. At this level, strategy is seen as the top management responsibility. It focuses mainly on the organisations' financial goals. Since a municipality does not operate for financial goals but the goal of legitimacy, Emalahleni's efforts to be transparent about air quality improvement programs are an act of doing right to the community and that allows them to achieve legitimacy.

Business strategy is concerned with an organisation's efforts to maintain a competitive advantage in a certain product, industry segment or market. Municipalities' service delivery mandate is competitive in nature. When a municipality fails to serve its community, it is likely to lose on the next elections. For continuity of a municipality's officer's reign, they need to serve their community, and this includes providing environmental health protection through informing society on how to improve environmental health.

Lastly, the functional strategy is developed in organisational functional areas. The role of the functional strategy is to state what every functional domain must do to support the corporate and business strategies. The study argues that it is imperative for departments in the municipality to support the air quality awareness programmes.

The next section discusses the role of communication in raising community awareness within different strategic levels.

## **2.4 COMMUNITY AWARENESS**

Community is used in terms of a grouping of interacting households that live in the same geographical location, for example, an urban or a village neighbourhood (Raab & Rocha, 201:227).

Awareness in the communication industry is referred to as the act of making a target audience aware of a product, service, or issue, for example, a new law about pollution mitigation or the importance of recycling (Umar & Khamidi, 2013:3).

The purpose of public awareness is mainly to inform people (Umar & Khamidi, 2013:3). The sender of the information needs to engage in a dialogue with the receiver if awareness-raising is the ambition (Elshout, 2007:71), and this should be achieved through two-way information exchange (Hau Xu, 2014:10). Therefore, two-way symmetrical and two-way asymmetrical models of communication are important in this regard. The two-way symmetrical model focuses on building relationship as it aims to react to feedback from the targeted audience to the source, which in turn is the start of a dialogue and interaction between an organisation and its target audience (Grunig et.al, 2002).

Alcinda and Folck (2012:17) examined strategic communication in promoting awareness of a product to potential buyers using the two-way symmetrical and asymmetrical models and the findings indicated that the models provided the opportunity for dialogue, creation of relationship and raises awareness of the product to potential buyers. Hadji (2012:9) investigated government communication strategy in raising community awareness about gender-based violence in Soshanguve, South Africa using the same models and the results revealed that the models improved dialogue between the government and the community and helped to identify and resolve problems. However, very few studies have examined this model in terms of raising awareness on how to improve air quality across the globe and in South Africa specifically. Therefore, this study fills this gap. This study suggests that the adoption of the two-way symmetrical and two-way asymmetrical model can assist the municipality to engage in interaction and dialogue with the community on how to improve air quality in Emalahleni.

Raising awareness needs a communication strategy. When the intention of conveying information is to raise awareness about the environment, there is a need to develop a carefully designed communication strategy and to integrate knowledge in a manner that is relevant and attractive for the public (Elshout, 2014:10). Public awareness is like publicity, it advocates for health issues proposed that publicity is frequently utilised

to develop public awareness, which in turn determines community's level of support (Umar khamidi, 2012:4).

Public awareness has long related to generating support for social issues, causes and solutions as well as support for policies. Literature has proposed that advocate for health matters such as HIV/AIDS (Rochon, Ross, Looney, Nepal, Price & Giordano, 2011; Silvestre, Weiner & Hutchinson, 2016), Alcohol abuse (Muturi, 2016); cancer (Klippen, James, Ward, Buykx, Shamsullah, Watson & Shapman, 2017); gender-based violence (Clark, spencer, Shrestha, Ferguson, Oakes & Gupta, 2017; Hadji, 2012), dengue (a mosquito-borne disease) (Banneheke, Parnavitane, Jayasuriya & Banneheke, 2016); and environmental management (Hau Xu, 2014; Oltra & Sala 2015; Ratnapradipa 2014; Wan et.al, 2016; Okwuofu-Thomas, MAgeHth & Mackenzie, 2017) have all utilised the power of raising public awareness to generate support for their issues.

The purpose of making environmental information generally known is to raise environmental awareness. By so doing, the public is better able to participate in making decision about the environment with more and clear information. It is argued that public environmental participation success is dependent on sufficient awareness of issues (Wang, Sun, Yang & Yuan, 2016:1628). Wang et.al (20216) has documented that increasing public environmental knowledge and awareness is important for the success of pollution prevention. Research suggests that more and more awareness led to action (Cox, 2010:123). That is to say that constant and sufficient air quality communication by the municipality would likely raise residents' awareness in Emalahleni about air quality issues which in turn can lead to action and success in improving air quality.

Conversely, awareness of a social problem that people would have no other means of learning about can be increased through public information campaign (Cox, 2010). An exploratory study was conducted to determine how individuals and organisations interact, as well as the role different communication channels play in the interactions on the Chicago climate change initiative with the focus on reducing carbon footprint and pave a way to a more sustainable future in the community. The finding showed that being exposed to information may increase awareness of individuals and compel

the individuals to take active steps to acquire further information (Holtzhausen & Zerfass, 2015:98). Hence, once awareness takes place, the challenge is to transform information into useable knowledge (Allen, 2016).

Studies in numerous industrialised countries showed a concern about awareness raising of environmental and social problems (Boonman, Huisman, Sarrucco-Fedorovtsev & Sarrucco, 2011; Fairtrade, 2010). Although, low levels of public awareness about air pollution in diverse contexts has been documented by social research (Bush, Moffatt & Dunn, 2001). Lack of awareness and understanding of a problem and the possible ways for dealing with the problem limit the chances for individuals and governments to take considerable and decisive actions towards effective socioecological adaptation (Cox, 2013). Therefore, different communication strategies (both old and new media) should be used in parallel with one another to raise awareness on social and health issues (Fairtrade, 2010); to engage in a two-way information exchange and gain groups cooperation in the society by listening to the group and clarifying how and why decisions are made (Umar & Khamidi, 2012:3).

From the discussion above, it is believed that a proper plan and application of communication by the municipality can contribute to raising awareness to Emalahleni residents and South Africa in general about air quality and such awareness-raising could be a useful pollution mitigation strategy. The following section discusses strategic communication process.

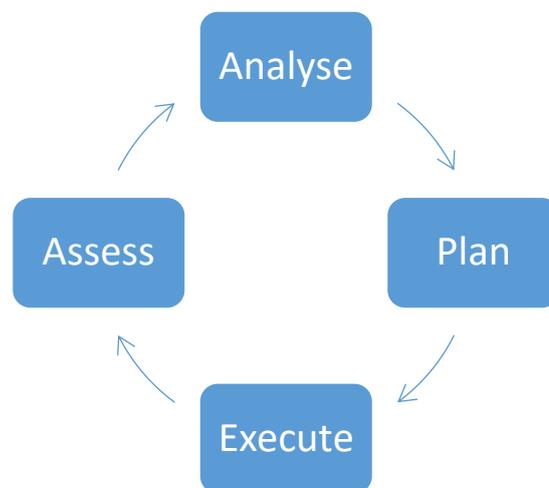
## **2. 5 STRATEGIC COMMUNICATION PROCESS**

Strategic communication process typically is a communication process that follows from an organisation's strategic plan and focuses on the role of communication in enabling the organisation's strategic goals and objectives (Holtzhausen & Zerfass, 2015:4). Communication events should be planned according to the organisation's strategic plan to ensure compliance regarding the organisation's strategic communication (Marius, 2015:46). A well-organised communication activity can directly influence a program or campaign success (Raab & Rocha, 2011:19). Strategic communication has been applied to organisations' planned communication efforts and the planned efforts can lead to achieving organisational goals. Strategic

communication combines planning and execution involving all the organisational abilities and aspects. The components involve comprehensive research, planning, and strategic communication evaluation goals (Holtzhausen & Zerfass, 2015:562).

According to Paul (2011:154), communication is portrayed as a cyclical process of constant iteration and feedback. The process is to analyse, plan, execute and assess. In the analysing phase, the information needed about the prospective audiences is generated including the cultural contexts and how to identify and measure desired change. In the planning phase, all the operations that communicate, message or signal including kinetic and non-kinetic operations are integrated. In the executing phase, message and signal are required both kinetically and non-kinetically. In the assessing phase, the different measures used include the actions and outcomes are evaluated. Figure 2.1 below shows the cyclical process of strategic communication process.

**Figure 2-1 Strategic communication process**



**Source:** (Paul 2011:154)

The typical process of strategic communication is akin to public relations process. The process involves a set of goals and objectives, specific public identification, planning the strategies for every public with the goals of an organisation in mind, strategies and tactics implementation and measuring the strategies and tactics effectiveness for the accomplishment of established measurable objectives and goals (Paul, 2011:155).

The constitutive model of communication involves “a dialogical-dialectical disciplinary matrix” and is concerned with how people and shared meaning is shaped via the process of communication (Craig, 2015). The constitutive model is concerned with the importance of communication to bring about action and actual change.

From this perspective, the role of the strategic communicator is to send information that can act as a point of departure for creating meaning between a communicative entity and its stakeholders, which can result in social action and social change. Strategic communication progressively is concerned with the communication process, which might occur over long periods and stretch over time long after a message has been conveyed, instead of conveying information, with the underlying assumptions that one can control communication conveyed (Holtzhausen & Zerfass, 2015:8).

Moreover, it is necessary for strategic communicators to comprehend and use mediatization, which is a concept used to analyse critically the interrelation between communication and changes in media and on the other hand changes in society and culture (Couldry & Hepp 2013:197). It is imperative for communication practitioners to also recognise how the media are and can be utilised to shape social and cultural realities. Further, media use for a certain communication process, message construction and the target audience should be considered by practitioners.

The convergence of constitutive model of communication and the media from a theoretical perspective sets strategic communication apart from other communication disciplines. Instead of seeing the media as communication channels and audiences as message receivers, there is a need to consider how meaning is shaped in the interaction process involving the media practitioners, stakeholders and how the stakeholders interpret and recreate content of media in the process (Holtzhausen & Zerfass, 2015:8). Therefore, the constitutive nature of communication should be considered necessary in this study as well as by strategic communication practitioners. It is important for the municipality to ensure that shared meanings are created for Emalahleni residents through communication strategies

With the discussion above, communication process of the municipality must be appropriately planned and not haphazard to ensure that its communication is used to achieve its goals. In this case, the organisation’s communication plan must be linked to its strategic plan. Studies conducted on the concept discussed above around

communicating information to raise awareness on air quality improvement through strategic communication are rare. The next section discusses public awareness communication strategies.

## **2.6 PUBLIC AWARENESS COMMUNICATION STRATEGIES**

This section discusses communication strategies indicating how the application of the strategies can assist organisations in South Africa and ELM particularly to communicate with the community to promote its air quality improvement program. It discusses the different communication strategies that are considered most appropriate to engage the community in the issue of air quality management. The communication strategies discussed in this study are appropriate as the strategies are better able to create a platform for interaction and dialogue on the problems of air quality facing South Africa and Emalahleni residents. For the residents to be informed of air quality problems in the area, the various communication strategies must be strategically used in communicating with the community. Various strategies for public awareness are discussed below.

### **2.6.1 Social media**

Since the development of the internet in 1960s there has been an extraordinary diffusion of information of all types of communication. The internet has spawned social media which are internet-related technologies that connect people across geographical boundaries with quicker access to information (Gonzalez-Herro & Smith, 2010:144). Social media as a communication strategy has been an ideal vehicle for orchestrating all types of communications which are used across the globe (Facebook & Population Statistic for Africa 2012:1; Population Statistic & World Internet usage, 2012:1), and has made a key impact across the world from helping in connecting individuals on a day-to-day basis to being a promoter in democratic revolutions. (Holtzhausen & Zerfass, 2015:545). Social media is transformative for democratic societies, revitalising the public sphere as a place where people come together and discuss freely about matters of general interest (Macnamara & Zerfass, 2012:287).

Social media provide communication channels for members of an organisation to share information with a large group of stakeholders at once (Meredith, 2012:90). Despite the enormous potential for information gathering of social media, some

limitations abound: social media are difficult to manage, for instance the uncontrolled freedom of speech has become one of the social media constraints.

In the globalised media era, social media provide an ideal platform to enable organisations to reach transnational audiences and provide the audiences with dialogic communication (Avery, Lariscy & Sweetser, 2010). Social media are described as a vehicle for expression and social participation (Zaharna, 2010:4). In terms of this study, social media are, therefore, an ideal platform for South Africa generally and the municipality and community under investigation to participate in dialogue and express their views on air pollution problems and improvement plan.

Social media are being used by virtually all fields to communicate with several stakeholders. For instance, the business practices and the medical community therein are also tapping into the social media resource to engage the online community to better accomplish their missions (Samuel, 2012). Social media are widely used by people to expand human knowledge and to find information. With the help of social media, collective intelligence is created and made possible (Zaharna, 2010:5).

The major social media breakthrough has led to talk of a new revolution, and these are factors that explain the social importance of the media: Firstly, “there is the emergence of user-generated content that blurs the traditional boundaries between professional and user-produced content”. Secondly, “the use of social media is based on how users themselves retrieve the information they are interested in, instead of information being pushed out to different audiences through traditional media”. Thirdly, “users have the freedom to produce their own story” (Meredith, 2012:90). For instance, viewers can choose the videos or images they want to view on YouTube and Flickr. Social media provide micro parts that consumers can utilise and put together to form their own narrative, rather than being limited to the only composition and narrative that a publisher dictate. Fourthly, “the social interactions that are developed around the content are a key to understanding the importance of user-generated content. Important keys to the success of social media are that several interactions arise through the ability of users to rate, comment and review. These opportunities can also be seen as significant keys to the success of social media. Social media have been described as a media revolution that has had and will have significant impact on how people think, act, and understand the era (Meredith, 2012:91).

Additionally, the following are the proposed five defined attributes of social media: transparency, authenticity, speed and consistent release of information, users' engagement in a collaborative effort and emphasis on decentralisation of authority, (Hart, 2011:180). This means that organisations around the globe need to engage in two-way communication with various stakeholders and not use social media as an additional avenue for one-way information delivery if organisations intend to take complete advantage of social media. This also applies to the organisation under investigation. Social media make it possible for communication responsibility to be decentralised that is, increasing communication between individuals and groups on a horizontal level inside and outside an organisation, instead of traditional top-down communication. With the ability of social media to maintain relationships with various stakeholders, it also makes it easier to quickly respond with information in diverse situations, for instance during a crisis (Hart, 2011). A study by American Red Cross showed that social media sites are the fourth most popular sites for receiving information during an emergency or crisis (American Red Cross, 2013). For instance, the air quality testing campaign implemented by the Non-Governmental Organisation in China showed that social media facilitated the dissemination of information about the condition of the air in China as the campaign's slogan "I gauge air quality for my mother land" spread through social media solidifying participants' and collective identity (Holtzhausen & Zerfass, 2015:546).

Social media, which include social networking, micro-blogs, video platforms and blogs are used to create instant two-way communication between individuals, corporations, and communities. This type of communication between groups has made online services such as Facebook, Twitter, LinkedIn, YouTube, Google+, and Pinterest a part of users' daily lives (Holtzhausen & Zerfass, 2015:546). As of 2013, Facebook users were more than 1.1 billion (Facebook, 2013), Twitter had nearly 21% of the world's internet population using it each month (Smith, 2018), and YouTube users watched 6 million hours of video each month (Bullas, 2013).

The presence of social media will continue to grow stronger as more users access social media mobile through smartphone technology. People are using social media

as an extension of experiencing and participating in society, not only for information and interpersonal communication (Holtzhausen & Zerfass, 2015:547).

Hau Xu (2014) research on air quality testing campaigns found social media to be useful in mobilising social forces that cannot be easily accessible and in creating a sense of community in a virtual context and bring in contributions from unexpected individuals and channels. The same research indicated that social media microblogging makes it easier for people to actively participate, get involve in communication and makes initiatives broader and deeper. The research also found that microblogging enables the dissemination of instant short fragments of information which provides continuous updates on air quality at locations of interest to residents in diverse neighbourhood.

Further, social media promote two-way communication and can be used for both interpersonal and mass communication, therefore, it has a great potential to be used as a tool for strategic communication (Hart, 2011:181). The interactivity features of social media make it more realistic for communication professionals to reach symmetric communication ideal (Grunig, Grunig, & Dozier, 2006:22) and joint decision-making (Combs & Health, 2006).

Social media are unique for the ability to facilitate dialogue with many people in diverse audiences and to observe, identify and map various stakeholders, their opinions, and activities, besides its great potential for dialogue (Briones, Kuch, Liu, & Jin, 2011:38) Additionally, using social media, management of issues is significantly improved. It creates and promotes the emergence of several social networks whose objectives may be to promote knowledge about a particular topic or interest, strengthen special interest of the public and consolidate social identity of people (Briones et.al, 2011:39). Although, research indicated that numerous organisations still do not use the interactive or dialogic side of social media (Avery et.al, 2010:190). However, it is believed that the use of social media in communicating with the community about air quality improvement issues can be advantageous to ELM due to social media interactive features and its ability to facilitate dialogue as suggested by (Grunig et.al, 2006:22 & Briones ,2011: 39).

Moreover, both practitioners and scholars have begun to research the uses and impacts of social media because of its growing tide of interest and activity

(Macnamana & Zerfass, 2012:288; Oltra & Sala, 2015; Meredith, 2012:91; Hau Xu, 2014:366; Marius, 2015:22).

Scholars have started to explore social media's ability to influence different aspects of media, societal norms, organisational or societal culture, politics and even dating. Social media are very essential to strategic communication field. This study explores social media as a strategic communication tool.

From the role of social media discussed above, there is no doubt that the use of social media as a communication strategy engages the organisations and its stakeholders in dialogue and interaction. In this regard, social media is well suited to the task of facilitating meaningful information the organisation could use to reach its strategic communication outcome.

Therefore, the use of social media can lead to the wider diffusion of air quality information to the Emalahleni community. This in turn will lead to community awareness on how to improve air quality. This argument was proved in the studies conducted in Europe and China that examined the availability of information to the public (Oltra & Sala, 2015:366), the effectiveness of information about air pollution in facilitating collective identity and raising awareness (Hau Xu, 2014:1386), as well as the studies by (Ratnapradipa, 2012; Ramirez 2019:1). The results of these studies indicated that web-based information on air pollution specifically social media potentially contributes to the awareness of the public about air pollution.

In South Africa, a study investigated the application of Information Communication Technology (ICT) specifically social media innovation as part of the adaptation strategies to reduce the mining sector's exposure and vulnerability to climate change risks disaster. The finding showed that social media orchestrated changes in patterns of communication that are tailored towards climate change reduction exposure and vulnerability (Aleke & Nhamo, 2016).

Another study examined the application of social media in corporate communication based on South African perspectives. The result showed that social media could influence stakeholder culture through facilitating greater awareness among stakeholders of diverse cultures, due to faster knowledge acquisition and the dissemination of information (Marius, 2015:99). Therefore, studies investigating social

media as strategy used by an organisation to raise community awareness on how to improve air quality in South African context are rare.

### **2.6.2 Mass media**

Communicating to reach a large audience needs the use of an appropriate communication strategy that has a larger reach. The mass media serve as effective vehicles for communicating with a large audience and their main strength is their ability to reach audiences (Hoekstra & Wegman, 2001:83; Zaharna, 2010:48; Bowman & Hanaford, 2015:162). The idea behind this point is that almost everybody in this contemporary age has access to television, radio, newspapers, and magazines. The mass media has been a main public arena for publicising environmental issues and for contesting claims, arguments and opinions concerning the environmental use and abuse since the emergence of the modern environmental movement in the 1960 (Hansen, 2011:7). The source of information about air quality has been recognised to be the mass media (Cisneros, Brown, Cameron, Gaab, Gonzalez & Schweizer, 2017:1). Oltra & Sala (2015) argued that there is a perception that wider air quality information diffusion is required through the mass media. Therefore, this study suggests that the use of the mass media strategy would facilitate the reach of information on air quality improvement program to South Africa and Emalahleni residents specifically.

Numerous studies have confirmed the mass media as the main mechanism for communicating air pollution information and could significantly improve awareness of the public on air pollution (Oltra & Sala, 2015:365; Okwuofu-Thomas et.al, 2017:34). The study by Oltra and Sala (2015) investigated air pollution information services available to the public and Okwuofu-Thomas et.al, (2017) examined communication strategy used to raise awareness of aged care facility residents about heatwave episodes, both studied revealed that mass media were used to raise public awareness of air pollution and awareness of heatwave episodes successfully.

The ability of the mass media to create public awareness and to influence the agenda of the public is valued by communicators (Atwater, Salwen & Anderson, 2015:393) Studies that investigated the media's ability to convey detailed information from the

media to the audience found weak to moderate effect and some found strong to little media effect. This is evidence in the study that investigated the agenda-setting effect by focusing on transferal of gross-level issues for example, education and health, and on specific problems, for example, milk prices regulation which found a weak to moderate effect of agenda setting (Cisneros et. at, 2017:4). In Atwater et.al, (2015:395) focused on tracing audience issue that are important using results on Gallup poll. The result found that unobtrusive issues that is, the ones that did not obtrude into the lives of audience members for instance, pollution, had a strong agenda setting effect whereas obtrusive issues indicated little effect. A similar study on agenda-setting has established that the media can play a potentially great role in setting the agenda for public concern and awareness of environmental issues (Engels, Huther, Schafer & Held, 2013:1019). This is in line with the study which found that viewers who focus on news and documentaries in their television consumption is likely to have higher levels of environmental awareness and concern (Saikia, 2017:3).

Additionally, media coverage research on environmental issues has contributed significantly to the public understanding of why some environmental issues are effectively constructed as issue of public concern. In this regard, studies have offered various systems for categorisation of issues. Specifically, the difference between obtrusive and unobtrusive issues. Obtrusive issues are those issues with which people have direct experience while unobtrusive ones are those issues with which people have little direct experience (Hansen, 2011:8). Therefore, the research findings above have proved media effect on obtrusive and unobtrusive issues. Research has also shown that individuals who are most active on issues of the environment do not always acquire information from the mass media (Hansen, 2018). The most productive focus of the media and communications research has been that of news coverage of environmental issues and controversies. Analysis of news coverage have comprised a wide range of individual and diverse types of environmental issues. The main areas attracting a more sustained research focus have been on pollution, nuclear power, global warming, and climate change (Saikia, 2017).

Furthermore, the mass media has a critical role in any policy concerned with improving environmental quality standards (Zhang & Tang, 2013:389). Although, there is a doubt on the ability of the mass media to really challenge policy because of their integration into established authorities and the definitions of issues of the environment and priority

areas (Hansen, 2018). Studies have supported the relationship between mass media exposure messages and have found mass media as educational tools to raise awareness for HIV/AIDS prevention, contraception use and smoking cessation (LaCroix, Snyder, Huedo-Medina, Johnson, 2013:330; Xiao, Li. Lin & Tam, 2015; Durkin, Brennan & Wakefield, 2012:132); Abiodun, Sotunsa, Ani & Jaiyesimi, 2014:639; Tiruneh, Chuang, Ntenda & Chuang, 2016).

From the above discussion and findings, it is noted that the mass media can play a significant role in communicating information on the environment and is likely to also inform and raise awareness of South Africans and specifically Emalahleni residents about air pollution problems and the improvement measures.

### **2.6.2.1 Environmental media products Limitations**

Some limitations abound about mass media according to researcher: Firstly, there has been negligence to air environmental issues. The state-owned television in India was accused of the failure to air environmental issues and to educate the public on environmental controversial issues (EEA, 2013). This includes the low priority accorded to the environment and the refusal to promote environmental awareness through television (Saikia, 2017:4). Another limitation is lack of appropriate resources and opportunity to back up media messages with positive measures of the environment (Mercado, 2012). The approachable of environmental issues from immediate self-interest of people and the need to target the audience in a manner which is more agreeable to interpersonal communication is also the limitation of mass media (Saikia, 2017:4).

In 1960, there was an irregular pattern of environmental coverage as media executives regarded environmental crisis as real, but relatively not newsworthy. This was evidence in the 1973-74 energy crisis that failed to provoke resource management article. On the contrary, between 1960 and 1970, research found that pollution was made a major news story which inspired dramatic rise in public awareness (Bowman & Hanaford, 2015). Special programs on pollution were broadcasted on television networks, environmental reporters were hired by leading newspapers, environmental paperbacks and magazines devoted entire issues to nature protection. Those issues

were published by book companies and advertising agencies laid emphasis on ecological features of products. Additionally, an information explosion took place in the mass media and accompanied the remarkable rise in environmental concern by the public (Bowman & Hanaford, 2015).

Mass media information on environmental matters is categorised by its exaggeration and partiality by the problem of being transformed into decisive knowledge and meaningful action. The problems in communicating environmental issues stem from the content and format, the type of media used to include the complex and uncertain nature of the kind of information (EEA, 2013; Anderson, 2013). However, to reach the public, media environmental messages must be competitive. In other words, space or time and financial resources including the audiences must be taken into consideration (Dunlap & Mertig, 2014). Conversely, there is a need to include certain news into the mainstream media to gain competitive marginal differences. Adequate coverage of environmental information is restrained by the inflexible formats of the present media. It shows that the lack of regular time or space reduces the scope of environmental mass information to a small number of issues. To keep audiences large and sustain interest, environmental information must be presented in identifiable, entertaining, and attractive way (EEA, 2013). Further, most environmental problems are rarely new and however, news needs to be new. Therefore, it is precisely the novelty or the strange of any information that makes it become news. Therefore, reporters must show novel facts or present environmental problems as new things to attract audiences for environmental discourse (Takahashi 2011; Anderson, 2013).

Moreover, increasing the frequency and number of news cycles on a certain topic might likely make the issues communicated to be in context more adequately. In this case, long periods of exposure to news might probably inspire public awareness in particular destructive trends and might establish the previous necessary situation for an active attitude towards environmental issues (EEA, 2013).

### **2.6.3 Billboard**

A billboard is a good strategic communication tool. It can provide visual expression to passers-by. Its feature of visual expression enables a message to be retained and

recalled which could lead to acting upon the message (Chien, 2011:87). Billboards would be applicable to any person in South Africa and Emalahleni, particularly who will be exposed to information about air quality improvement issues on the billboard. Billboard communication is becoming more popular every year as it has the distinctive ability to display messages 24 hours each day and to communicate in a creative and effective manner.

As people often pass the same billboard messages many times, the impact is likely to increase. Billboard message benefits from the high frequency and reach and is an excellent communication tool and has high recall by the audience if properly designed and can provide the opportunity to communicate creatively with a large audience (Usman & Khamidi, 2012). Billboard serves numerous purposes which include: to communicate and disseminate information, provide an avenue for visual expression, provokes ideas and thoughts, and raise awareness (Chien, 2011:88). Based on the theory of McLuhan of “the medium is the message” the actual message of outdoor communication can be interpreted in the structure itself and it is not relegated to only words displayed for people to read.

Outdoor offers the lowest cost per thousand people reached compared to radio, television, magazines, or newspapers (Chien, 2011:88). Marketing research shows that billboards may be cost-effective because of very high exposure frequency and ability to target specific ethnic groups. It can cover an entire market overnight and provides the opportunity to reach the public with large attention-grabbing colours and movement. The continuous presence of an outdoor sign attracts viewers’ attention and engagement and even to look for new messages (Taylor, Brook, Moran, Stieb, Angel, Karman, Krzyzanowski, McMillan, Stevens, Young & Piche, 2014).

Billboard campaign has long been the chosen medium for several campaigns which are designed to appeal to certain norms, behaviours, characteristics, beliefs, and customs of the target group. Billboard which is also used to market beer, burger and car is as well making a silent statement about air quality (Taylor et.al, 2014).

Previous study that examined air quality management information systems and accessibility of information to the citizens in Europe have identified billboard to increase public awareness of air pollution and the related health risk (Jana & De, 2015:1). Other study investigated billboard advertising as a strategy for campaigns

enlightenment for solid waste management in Nigeria. The result indicated that billboard is an effective campaigns enlightenment for waste management (Akpoghiran Otite, 2013:7). However, literature has not advocated billboard as a communication strategy for the dissemination of information to raise awareness on air quality improvement in South Africa.

#### **2. 6. 4 Entertainment education**

Entertainment education as a communication strategy is the process of deliberately designing and implementing a media message to both educate and entertain, to increase the knowledge of audience member about educational issue, shift social norms, change overt behaviour, and generate favourable attitudes (Reinermann, Lubjuhn, Bouman & Singah, 2014:176).

Entertainment education contributes to the process of directed social change since it can influence audience awareness, attitudes, and behaviour regarding certain practices. The following should be considered for entertainment education to be successful: participatory formative research, solid collaborations between research professionals and media, an understanding of relevant scholarly theory and careful balances between entertainment and education value (Singhal & Rogers, 2011). Effective entertainment education campaigns are carefully premeditated and cooperative programs with a very focused and important purpose in mind and are not randomly thrown together (Singhal & Rogers, 2011). Entertainment education communication strategy has been carried out worldwide to reach audience members, in changing their knowledge concerning sustainable consumption and building an enabling climate for affecting social norms.

More than 100 entertainment-education projects have been implemented worldwide in the past 15 years which have significantly helped in addressing social issues. These ranges from soap opera to Puppet Theatre dealing with educational issues such as family planning, domestic violence, healthcare, gender equality, adult literacy, smoking and environmental preservation (Reinermann et.al, 2014:176). Entertainment education is particularly linked to mass media-based strategies, especially television and radio (Moyer-Guse, Jain & Chung, 2012: 1011).

Entertainment education can also influence the audience external environment and act as an agenda-setter and social mobiliser, influencing policy and public initiatives. An example is the case of role modelling against domestic violence and HIV & AIDS with Soul City in South Africa. The Soul City Institute for Health and Development Communication in South Africa implements a multi-media communication initiative that addresses priority national health issues.

It is a popular primetime entertainment-education drama series that has run on South Africa television modelling a new collective behaviour in the storyline of drama to tackle domestic violence and HIV & AIDS 1999 (Raab & Rocha, 2011:18).

The following soap operas have also shown the role of entertainment education in addressing social issues according to (Singhal & Rogers, 2011): India Taru, a radio soap opera is an entertainment education that revolves around a girl's life in Bihar village in India. It promotes gender equality and reproductive health and was aired twice a week in Bihar from February 2002 to February 2003.

Meena and Sara's entertainment education series reveal the power of animation. Animation as a genre is replicable and sharable culturally and is powerful in reaching and educating different audiences in different countries particularly children and young people (Anis & White 2017).

The Bold and Beautiful is also a popular soap opera entertainment education primetime programme by Hollywood that include pro-social messages. It has a wide reach in almost every country of the world as it incorporates education themes. Nowadays, entertainment education initiative is prevalent, found in almost every country of the world and dealing with various social issues. These initiatives globally are just a few examples that utilise different media channels to effectively use entertainment education as a strategy for social and behavioural change. Entertainment education keeps audience engaged and has a high recall even after the communication activity is over by spurring conversations as it is fun, engaging, exciting and sticky (Singhal & Rogers, 2011).

There has been a lot of evidence that popular media formats such as dramatic serials, soap-operas, serious movies, or games do communicate sustainable consumption practices and environmental issues and do not only entertain. Such radio drama serial

include: “Yeh Kahan Aa Gaye Hum, Callaloo, Oppassen, Goede Tijden, Slechte Tijden and Suche Klima, biete Schutz” Singhal & Rogers, 2011; Reinermann et.al, 2014:181).

A study that analysed the effect of “Yeh Kahan Aa Gaye Hum” a popular radio drama serial in India on communicating environmental and sustainable consumption practice indicated that each episode engaged listeners to listen to radio serial collectively and for post-broadcast discussion which led the listeners to engage in dialogue about the main environmental lessons and to identify possible idea for implementation at local level (Singhal & Rogers, 2011). Several studies conducted, regarding environmental and sustainable consumption practices have shown increased awareness and concern about environment problem (Fairtrade, 2010; Boonman et.al, 2011; Reinermann et.al, 2014, Singhal & Rogers, 2011).

Reinermann et.al, (2014:186) investigated the effect of entertainment education programmes in relation to promoting sustainability consumption practices, raising awareness, and changing behaviours or attitudes. The result showed that entertainment education is likely to communicate messages on sustainability to the public, motivate sustainable practices, and raise awareness and change behaviours or attitudes for the good of the public.

Another study conducted in a different dimension examined how the presence or absence of pregnancy-related humour influenced perceived severity, counterarguing, and intentions to engage in the behaviour of unprotected sex. The result showed that entertainment education message delivered in pregnancy related humour increased viewers awareness and influenced viewers regarding safer sex intentions (Moyer-Guse et.al, 2011:1013).

However, in South Africa, literature has not advocated entertainment education as a communication strategy to raise awareness on how to improve air quality. It is argued that environmental topics can be integrated strategically in highly popular entertainment media formats to reach diverse target audiences and motivate the audiences to adopt more sustainable practices. If the attention of the target audience is to be caught, it is not sufficient to rely only on the rationality of the message but to also use more emotionally engaging communication strategies, for example, by telling a compelling story in a drama series on television, radio, or the internet (Reisch & Bietz, 2011).

Additionally, when social issues are communicated in popular narratives, the establishment and preservation of collective norms can be strengthened, and different kinds of consumers can be supported to find their own identity in existing social structures (Reinermann et.al, 2014:180). Fictional narrations spawn social information, which may lead to awareness and understanding when entertainment formats are harnessed strategically to trigger public conversations (Reinermann et.al, 2014:180; Booman et.al, 2011).

Therefore, when South Africa generally and Emalahleni community specifically are exposed to environmental issues integrated strategically in highly popular entertainment media formats, the people will be motivated to engage in post-broadcast discussion which in turn can lead to engaging in a dialogue and interaction about environmental issues and lessons learnt and even identify the possible solution to improve the environment. In addition, by engaging in dialogue and interaction about the environment, probably awareness about the environment will be created.

With the discussion on various communication strategies used to raise awareness, this study aims to explore and suggest strategies that could be used to raise awareness to Emalahleni residents.

## **2.7 EVALUATION OF COMMUNICATION INTERVENTION OUTCOME**

Evaluation is defined as an assessment of a planned, ongoing, or completed intervention to determine its relevance, efficiency, effectiveness, impact, and sustainability (UNICEF, 2016:45). It is a systematic assessment of a project, strategy, policy, theme, programme, sector, topic, an activity, and performance of an institution or operational area (Raab & Rocha, 2011:261). The purpose of evaluation is to learn lessons for improving the quality of an intervention. Evaluation and assessment are essential to the effective management of any program or campaign (Paul, 2011:190). Having the goals of a program in mind is important and must not be imperfectly measured. It will be much easier to tell if the goals of a program or campaign are met or not if there are clear goals for the campaign or program. To assess and measure what the audience think about a campaign or program should be gauged using surveys, polling, focus groups, media assessment, and media metrics (Paul,

2011:154). Assessment is vital to improving efforts of a campaign or program. Developing the capacity to measure success or outcome and emphasise accountability is imperative to the effectiveness of a program. This requires the identification of indicators for the program's investment and outcomes. These indicators are the evidence of the program achievements and can be used to assess the costs and benefits over time. The indicators are divided into two: Measures of Performance (MOP) and Measures of Effectiveness (MOE).

Measures of Performance focuses on the amount of investment compared to the quantity of product produced by a program whereas. Measures of Effectiveness is concerned with whether a program or a plan is achieving its desired outcome and effect (Paul, 2011:215). In measuring success, emphasis should be placed on accurate measurement of effectiveness as it assists to determine which efforts should be used as templates for future efforts; which efforts deserve continued funding; and which efforts should be adjusted or abandoned. The knowledge of what is working and what is not working can lead to adjustments, corrections, and improvements (Paul, 2011:215).

The following are the common campaign or program outcomes that need to be measured: process evaluation, outcome evaluation and impact evaluation (Gertler, Martinez, Premand, Rawlings & Vermeersch, 2016; Issel & Wells, 2017; Stern, Powell and Hill, 2014:589). Process evaluation focuses on the direct outputs of campaigns or programs, measures the effort, what and how much the campaign accomplished its distribution and reach. This type of evaluation helps to determine why a program did or did not work. Process evaluation is further divided into three: distribution, placement, and exposure (Bonell, Fletcher, Morton, Lorenc & Moore, 2012:2301).

Distribution focuses on what is delivered by a campaign. It normally comprises of type and number of materials disseminated, involving brochures, public service announcement, news feeds and other products of campaign. Placement measures is concerned with the amount of earned or donated media, amount of publicity or press received, downloads of satellite of public service announcement or video or the number of times op-ed were run. Op-ed pieces are editorials written from party other than news outlets to advocate for a position on an issue relevant to the news

organisation and its community (Hansen, 2011:15). Exposure assesses the extent to which the target audience engaged with the campaign, the number of times exposed to the campaign and whether the audience paid attention to the campaign and can recognise or recall it. Exposure is an important element in outcome evaluation, as various exposure levels can be related to a particular outcome to collect essential information on how much dosage is needed to produce the intended effects (Issel & Wells, 2017).

Process evaluation should be part of this study as it is important for the municipality to understand whether its communication effort in disseminating air quality information is yielding better outcomes. Outcome evaluation focuses on the effect that come in the target populations due to the campaign or program. It is divided into eleven: Knowledge/Awareness, saliency, attitudes, norms, self-efficacy, behavioural intentions, behaviour change, skills, environmental constraints, media frames and policy change (Gertler et al 2016). In terms of knowledge/Awareness, the focus is on assessing the knowledge/awareness of a program or campaign through public polling to determine the stands of the public regarding the issues at hand (Stern, Powell, and Hill, 2014:590). Saliency is concerned with how essential and serious an issue is but can be overlooked. There is the perception that if people get educated concerning an issue the people will care more about the issue. Research has shown that issue saliency or important leads to becoming more informed or opinionated (Bryson, Quick, Slotterback & Crosby, 2013:33). Most times, awareness could be high about an issue, but it is not seen as important. A good example is domestic violence. There is high awareness of domestic violence, but few people see it as important (Issel & Wells, 2017).

Attitudes focus on a person's affect in favour or against an object. Attitudes are one of the most common outcomes measured in a program or campaign. If a campaign seeks to change behaviour by trying to affect attitudes concerning the behaviour, the evaluation needs to measure the attitude toward the behaviour to assess if the campaign is working. Social norms are based on the perceived standards of acceptable attitudes and behaviours among somebody's peer group or among the person's important people. This is sometimes the most serious factor in accomplishing behaviour change but unnoticed in a campaign's design and unmeasured in an

evaluation and overlooked in the typical knowledge attitude-behaviour framework (Stern et.al, 2014:592).

Behavioural intentions measure the possibility that somebody will engage in a certain behaviour (Bashir & Madhavaiah, 2015). For instance, The Theory of Reasoned Action opines that somebody's performance of a given behaviour is mainly determined by the intention to perform that behaviour. It also says that attitudes and subjective norms concerning the behaviour influence behavioural intentions.

Behavioural intentions are a common outcome in various campaign evaluations that use the Theory of Reasoned Action as part of their theory base (Montaño & Kasprzyk, 2015:231). Behaviour change measures a person altered behaviour and it is one of the outcomes of campaigns. Behaviour change is difficult to measure as behaviour is commonly captured through self-reports. In public campaign, there is a need to establish some common understanding of the behaviours of citizens, systems, regulators, professionals, and legislators that need to change to achieve the desired results of a campaign or program (Lawrence, Black, Tinati, Cradock, Begum, Jarman, Pease Margetts, Davies, Inskip & Cooper, 2016:147). Skills may be needed to perform certain behaviour; their presence or absence may have an influence on the campaign's results. For instance, a person may need to have the skills on how to use a condom correctly or the skills to negotiate with his or her partner on the use of a condom during sex.

In the case of air pollution individual or companies must have the skills of pollution mitigation (Espada, Morales, Orgilés, Jemmott III & Jemmott, 2015:31). Environmental constraints consider factors based on situation that can make performance of a behaviour difficult or impossible. For instance, the use of birth control might be a constraint for someone who cannot afford to buy it. Moreover, having access to devices that can help a smoker to quit and encouraging consumption of fresh fruits and vegetables where none is available might be constraints to people. Measuring environmental constraints can help diagnose program failure when the program is not implemented as planned (Glasson & Therivel, 2013).

In terms of policy change, the focus on whether policy is present or absent. The challenge about measuring policy is determining if and how a program affected that policy outcome. For instance, the advertising council might know that their public

service campaign has played a part in the development of local laws on the use of safety belts and against drunk driving, but it is difficult to assess what part the campaign played (Russo, Kay, Savolainen & Gates 2014:137; Zhao, Chen, Qi, Chen, Chen, Liang, Ye, Liang, Guo, Li & Li, 2016:435). However, to know whether the media campaign is really affecting public policy it is necessary to determine if the campaign did echo inside governmental institutions and did it have effect on the policy agenda than to determine the number of people that saw the advertising (Zhao et.al, 2016:436).

In terms of the above discussion, outcome evaluation is imperative in terms of this study as the municipality needs to measure its communication effort regarding the effect of its air quality improvement program on the community which is mainly to raise awareness.

Impact evaluation which is the last aspect that needs to be measured about a program or campaign outcomes measures the ultimate aggregate results of a program's outcomes (Gertler et.al, 2016). It tracks community-wide progress toward the program's goals or desired results. Impact evaluation is divided into two: long-term outcome of behaviour and Systems-level outcomes. In terms of long-term outcome of behaviour, a program measures the long-term outcomes of changes if it focuses on whether a campaign is successful in increasing behaviour change in a substantial number of people or if a program can build public will to accomplish policy changes. Systems-level outcome measures the long-term changes in service delivery or coordination, training, or distribution systems. It is the evaluation of a program based on system outcomes. For instance, measuring of a program using oral rehydration therapy to reduce diarrheal infant mortality in Honduras and the Gambia had system outcomes that involved the institutionalisation of oral rehydration therapy in the health and communication systems. Messages can be incorporated into other projects by distributing oral therapy through community outlets and in clinics and incorporating oral therapy into local and national training (Glasson & Therivel, 2013). About impact evaluation, the community needs to measure its communication intervention regarding the progress of the whole towards the program's desired result.

Conversely, based on the aim of this study, raising awareness about air pollution is necessary but it is also important to develop a systematic and evidence-based

approach to communications on air pollution (Oltra & Sala, 2015). By so doing, it is necessary to dedicate time and effort to evaluate the outcome of communication interventions, understand the range of available interventions, and design, implement and assess the communication interventions adequately.

Therefore, the evaluation of communication intervention outcome is considered imperative in terms of this study as it would help ELM to determine the outcome of its communication efforts in raising community awareness about air quality improvement.

## **2.8 CONCLUSION**

This chapter provided a review of communication strategy, levels of strategy, community awareness, strategic communication process, public awareness communication strategies, and the evaluation of communication intervention outcome. It explained how the communication strategies identify in this study can be strategically used to communicate with the community and get the community informed about air quality problem, the possible solutions and measures to improve air quality.

The following chapter discussed a literature review on information dissemination.

## **CHAPTER 3: INFORMATION DISSEMINATION**

### **3.1 INTRODUCTION**

Chapter 3 reviews the role of information dissemination to raise awareness on air quality improvement. This chapter reviews information dissemination and air quality, elements of disseminating information, underlying research work done on the concept, the theoretical framework linked to this study and air quality information management planning.

### **3.2 INFORMATION DISSEMINATION AND AIR QUALITY**

Disseminating information is a very important aspect in terms of the South African constitution which has made provision for the right to information access to South Africans (Government Gazette, 2018:100). In this regard, depriving the public of the right to access information about their environment will not only result in a lack of information and awareness of the public about the condition of the environment they live in, but it is unconstitutional.

Environmental communication is defined as the pragmatic and constitutive vehicle used to shape our understanding of the environment as well as our relationships to the natural world (Cox, 2013). It is a symbolic medium used in constructing environmental problems and in negotiating society's various response about the environment (Cox, 213). Every aspect of implementing an air quality management plan requires information which will also be disseminated to raise awareness to the public and this awareness will significantly support the attainment of compliance with air quality standards (Government Gazette, 2012:54). Hence, information dissemination should be used by the government, civil and private organisations as a tool to raise awareness with communities.

The European Union air quality directives stipulate the need to protect the right of living in an environment that is not harmful to the health and well-being of everyone by making information available and accessible to the public. The directives state the need for public authorities to inform the citizens concerning the environment (Marco & Bo, 2013:55; Government Gazette, 2018:100).

Environmental information does not only deal with informing constituents about the environment. It also focuses on the knowledge, beliefs and values, individual and social options for change as well as complexities and uncertainties which are inextricably linked to taking diverse decisions. Further to this, it regards the costs and benefits of the chosen alternatives, together with inaction (Avouris & Page, 2013). Information on the environment can become a great source of change when it can be integrated into the policy processes and social contexts, in this manner influence considerable decisions on the quality of the environment.

Effective environmental information is decisive in the building of the economic, social, and political action networks, which are required to reverse negative environmental trends and not only in the identification and definition of problems by the public (Avouris & Page, 2013).

Environmental information should emphasise how social, economic, and political institutions affect the ecosystems and not only provide ecological descriptions about how the natural systems work (Schaltegger & Buritt, 2017). Information is one of the elements that is essential to manage environmental problem as well as the economy, social and political issues.

However, environmental information represents a very small percentage with regard to the amount of information provided by the media, when compared to other types of information about the economy, politics and sports (Lodhia, 2012). This is in line with empirical findings from the survey conducted with the European Environmental Journalists as many respondents indicated that environmental information conveyed by the media was insufficient while few indicated that it was sufficient (Lodhia, 2012). Another research by Ramirez et.al, (2019) examined public source of air pollution information, the causes and how to control its health effects and potential disparities in the reach and utility of information. The result indicated that air quality information is lacking and disconnected from the public and the environmental knowledge of the public is generally low. Olayiwola (2014:2), argues that if sufficient knowledge and understanding of environmental problems and solutions are acquired by the public, there can be better public participation in making decision and as part of the solution. Acquiring of better knowledge and understanding by the Emalahleni residents through the sharing of environmental information can contribute to the residents' decision to improve air quality.

Ostman (2014) argues that providing understandable and accurate information about the spatial and temporal air quality distribution at a local scale will encourage people to make decision to improve air quality. Furthermore, regular communication on air quality issues to the public is technically easy and implementing such service would draw public attention to the prevention of air pollution (Weston, 2014). Therefore, consistent communication on air quality issues would be capable of attracting the attention of the public and specifically Emalahleni residents to improve air quality in the area.

Information must be effective in ensuring that the public understands both its rights and responsibilities as environmentally conscious citizens if it is presented in attractive and accessible ways. Ramirez (2019) argues that Individuals' responsibility for their airborne pollutant's emissions should be supported by right information to raise awareness of air quality issues.

Equally, there is a need to disseminate information effectively and appropriately across linguistically and culturally various communities and especially among low-literacy people (Ramirez et.al, 2019:17). Major information should where appropriate be made available in more than one official language of South Africa (Government Gazette, 2012; 2018). Therefore, the dissemination of information in various languages with the communication strategies identified in this study such as social media, mass media (radio, television, and newspaper, magazine), billboard and entertainment education can facilitate the understanding of South Africans, specifically Emalahleni residents on air quality improvement issues.

Rajper, Ullah & Zhongqiu (2018) are in support of the communication strategies that the literature reviewed in the previous chapter and recommended practices against air pollution can be spread by using the internet sources (Blogs/Baidu), social apps (WeChat/Weibo), and both electronic and print media as they are useful tools for information dissemination. Rajper et.al, (2018) further argue that information disseminated through the strategies are educating people, changing their practices and perception towards air pollution, and increasing awareness of air pollution and its adverse health risks (Rajper et.al, 2018).

The strategies discussed in this study have the potential to educate community members in Emalahleni, change their practices and raise awareness towards improving air quality as well as the adverse health risks of air pollution.

Previous research have examined information dissemination based on the effect of information provision to the public (Davila, Ilić, & Bešlić, 2015), public understanding and awareness of air quality information (Smallbone, [sa].), and public perception of a multimodal of air quality information dissemination (Wanner, Nicklaß, Bouayad-Agha, Bohnet, Bronder, Ferreira, Friedrich Karppinen, Lareau, Lohmeyer, Panighi, 2014). Therefore, the aim of this study is to examine community awareness on air quality through the communication strategy that ELM.

It is worth noting that information dissemination is not about making all the information available, but it is also about identifying why is the information needed, who needs to know about the information, what kind of information is needed or what to achieve with the information and where and when to convey the information (Elshout, 2014; Moser,2010:33). The 5W and H are important in the dissemination of information as they cover all the basics the audience needs to know (AG Media, 2018). This 5w and h need to be considered in terms of the dissemination of air quality information to South Africa generally and Emalahleni residents. This will assist in crafting an effective supply of information to the residents.

It is necessary to consider why information needs to be communicated with the audience. It is argued that considering first why information should be communicated to the public is crucial as it is likely to reach an emotional chord with the public that can motivate actions (Grossman, 2018). In addition, why it is important to communicate air quality information to the public must be clearly stated to improve public understanding about environmental air quality (Grossman. 2018). Therefore, ELM needs to know why it is important to communicate air quality information to the residents as keeping this in mind would enhance its communication efforts to improve the residents understanding and knowledge on air quality improvement.

In terms of “what”, the messengers need to think about, what information or message to convey and what is appealing and interesting to the audience (Ferreira, Kostakos & Schweizer, 2017; Moser, 201:33). Stafford and Lamn (2017:232) emphasise that what it takes to craft effective air pollution mitigation communication and what to communicate should be considered to ensure that it will help raise awareness and encourage community to protect air quality.

Considering what and how to communicate with Emalahleni residents can help to improve the communication of ELM in raising awareness on how to improve air quality. Ferreira et.al, (2017) stipulates that the chances that messages stick are enhanced if the people are address in the right way, with the right tone and at the right time. This notion is about what to communicate. Likewise, the preferred way of informing the audience to improve their understanding on air quality issues should be considered (Elshout, 2014:40). Therefore, in order to ehnance the understanding and awareness of Emalahleni resident on how to improve air quality, the preferred way of informing the residents must be considered.

The “who” element is concerned with who is in charge or who owns the message (Stafford & Lamn, 2017:232) as well as the people to reach when communicating information including the dissemination of information on air quality (AG Media, 2018). Since “who” can be the messengers (advocates, politicians, pundits, celebrities, scientists, people of different ethnic or socioeconomic background and of diverse ages, and business people), and should be considered in the dissemination of all kinds of information. In terms of who conveys the information (i.e. the messenger) goes together with the place and context in which the audience receives the information (Elshout, 2014:44). Therefore, considering the audience and the messenger for the dissemination of air quality information is imperative in terms of strategic planning and dissemination of information by ELM to the community members.

In terms of where and when, it is essential to think of the place and time information needs to be conveyed. Where and when information needs to be delivered should be to achieve the desired outcome of communication based on the communication objective. Where is concerned with where information is coming from, the location or venue of communication while when focuses on when communication is required and should be conveyed (Stafford & lamn, 2017:233). As such, the location, and the time to convey such kind of information must be considered (Ferreira et.al, 2017). Therefore, considering when Emalahleni residents would be receptive of air quality information and where to convey such information is utmost important in terms of achieving the desired outcomes in the communication efforts.

The last basics in the dissemination of information is the “how”. This deals with how information is delivered to the public (Moser, 2010:34).

It is about how the messengers communicate messages about a phenomenon and how the receivers might view the issues (Stafford & Lamn, 2017:233). It is also concerned with how information or message is delivered and how the content can be made more accessible and valuable (AG Media, 2018). Content also links to question about information sources [government, non-governmental organisations, scientists, media, industry, and environmental or other civic groups (Ferreira et.al, 2017; Moser, 2010:35)]. Regardless of the information sources, information must be communicated in such a way that it achieved the intended effects (Elshout, 2014:41). Moser (2010:35) opines that it is vital to consider how to successfully convey the right air quality information and the best way to reach the public.

With the discussion above, the role that information dissemination plays in increasing public awareness and how it should be transmitted to engage the audience must be considered. The appropriate plan and application of communication can help South Africa generally and ELM specifically in communicating air quality information strategically with the residents and involving the residents in decision making and raising their awareness on how to improve air quality. Ferreira et.al, (2017) indicated that public environmental information and awareness is required for the public to make decision on environmental issues that affect them and take part in the improvement processes. It is crucial to put emphasis on the elements of communicating information highlighting how proper planning, designing and application of communication strategy can help Emalaheni Local Municipality and South Africa generally to successfully communicate air quality information to the community.

### **3.3 ELEMENTS IN COMMUNICATING INFORMATION**

Information dissemination depends heavily on effective designing and dissemination of a message to accomplish its persuasive objective. This section discusses different communication elements highlighting how ELM can go about designing its information to be able to strategically communicate information with the community and achieve its communication goal of raising community awareness on air quality improvement. The key elements include goals and objectives, the target audience, the type of information or messages to convey and the vehicles or channels through which the message will be conveyed.

### **3.3.1 Goals and objectives**

A goal is referred to as a desired result or an idea of the future that a group of people or an individual plan, envisage and commit to accomplish. Goal directs efforts and attention toward goal-relevant activities (Light & McNaughton, 2014).

Goals are set to assist an organisation to communicate effectively and meet its core organisational objectives. It is important to develop a goal in advance and what is expected to be achieved with it (Raab & Rocha, 2011:46). Setting a goal shows how effective information dissemination can help an organisation to achieve its overall organisational objectives and engage with stakeholders effectively (NCVO, 2017). Any information dissemination should closely reflect the plan of an organisation by looking at the vision, core aims and objectives of the organisation and suggesting how communication can assist to deliver these goals. Organisational goals or objectives should contribute to the achievement of the organisation's objectives. This means that the objectives should be something as fundamental as policy objectives or operational in achieving the mission of the organisation (NCVO, 2017).

Goals can be classified based on the ambition level one wants to accomplish. Dissemination of information on air quality can comprise of different goals which could be to increase knowledge, influence attitude or behaviour change, awareness-raising, information, persuasion, and education. A single communication program or campaign could involve all these goals and may present them in different phases over a certain period (Oltra & Sala, 2015:364). The goals of disseminating air quality information need to be carefully considered and must be made measurable so that the communication effect can be determine afterward. The knowledge of the public regarding air quality issues hardly increase because of conveying unguided information without certain informative goals which has no bearing on public' questions and needs (Elshout, 2014:10). However, the goals of ELM for disseminating air quality information must be clearly specified and measurable.

### **3.3.2 Target audience**

Understanding specifically audiences and generally human dynamics is crucial to identifying messages, themes, and engagement methods that will lead to desired information effects or outcomes (Allen, 2016).

The way people want to receive information will vary as will the kind of information people want to receive and what persuades people. This means that different communication strategies and messages must be developed for a diverse population (Elshout, 2014:10). Determining the target audience is important in this regard. There can be numerous groups of people, but if the group have some common homogeneous characteristics, it will be easier to reach the group with the same means of communication.

Communication is always directed at certain target group. For this reason, the best way to communicate to specific group must be considered. For instance, the best way to sell pop music to youngsters is not through newspaper advertisements. Moreover, alcohol publicity will likely not be shown on a cartoon network and airing cosmetics commercials before or after a football match is improbable (Elshout, 2014:38). It is understood that a message directed to specific group is probable to be more effective than a general message focused on average person (Elshout, 2014:38). Research has indicated that audiences differ in the way they use various media to receive information (Schaltegger & Burritt, 2017). Differences also appear regarding levels of formal education, age, gender, and occupation including previous experiences and knowledge. The extent to which one of these constitutes the key discriminative factor is determined by certain social context in which the information transmission occurs. However, the level of education and the socioeconomic status are typically the factors that best explain various contrasts between non-written and written use of media (Wang et.al, 2016:1628). It is proposed that increasing the levels of education is likely to increase the use of all kinds of media thereby increasing knowledge and awareness of air quality mitigation measure (Sarker, Yeasmin, Rahman & Islam, 2018:29).

Additionally, many educated people tend to have a diverse perception of what is the most believable medium to receive environmental information. Also, Raab and Rocha (2011:160) maintain that it is vital to consider the best way to reach the marginalised group that may not understand national and mainstream language and have no proper access to Television, radio, or internet by using print media to reach the people. It is important to consider the use of diverse communication channels to accommodate the people in various ways they want to receive information.

Specialised media that targets marginalised groups such as print media, radio or television stations that broadcast in minority languages must be considered when determining the target audience in terms of communicating air quality information. Further, it is suggested that low level of educational has impact on people's acquiring of air pollution knowledge and taking preventive measures against pollution. Wang et.al, (2016) conducted a study in China about environmental awareness and smog prevention and the findings indicated that individuals with low level of education have lower ability to acquire knowledge about pollution and less likely to take measures to prevent air pollution. Therefore, messages need to be constructed at the audience's literacy level. Another element to consider when strategically disseminate air quality information and raise community awareness and knowledge is the type of information or message which is discussed in the next section.

### ***3.3.3 Information or message type***

Effective information dissemination is constructed around clear messages with the problem stated, and the solution proposed and the action that should be taken by the audience to reach the goal of the program (Silverstone, 2017). Effective messages tap into mental models that help persons make sense of the problem and equally direct people toward the proper behavioural response (Moser, 2010:39).

A different message is crafted for every target audience in some campaign, while there may be a primary message that also has accompanying sub-messages that are intended for diverse target audience segments in other campaigns (Raab & Rocha, 2011:165). Therefore, messages or information on air quality should be prepared to reverberate with the community members in Emalahleni.

Engaging with diverse audiences with tailored messages that reverberates with, and can bring together, diverse audiences to work in partnership toward a desired common goal has been identified as an important strategic choice (Moser, 2010:40). For instance, parliamentarian, a village elder or a religious leader could understand messages about violence against women differently. However, messages need to be adjusted to be better understood by the target audiences. The key message and communication emphasis must be in harmony with its intent and messages must keep the attention of the audience (Robson & Robinson, 2013).

According to Oltra and Sala (2015:365), environmental information type could be on the level of air quality, air quality alert, and health impact of air pollution and on individual actions to improve air quality or to protect oneself. A single simple message that appeals to one level can be better understood than complex multiple messages. According to Elshout (2014), constant communication of the same message increases the chances of getting the message across. In addition, communication can become ineffective if the message is not the same. Therefore, the ELM should focus on one aspect of the message and repeat the message for impact.

Furthermore, messages can be presented to move people to the direction that someone desires by using the implication of prospect theory. Regarding prospect theory, a typical approach to framing effect, persons are more likely to accept loss-framed (negative outcome-focused) than gain-framed (positive outcome-focused) (Holtzhausen & Zerfass, 2015).

In terms of prospect theory, messages are presented in terms of either the gain or loss, based on the information provider's bias and the intent regarding impacts. Prospect theory describes how people react differently to information, whether messages are framed as potential losses or gains (Hoekstra & Wegman, 2011:83). Message framing is referred to the way a choice problem is strategically phrased in a message (Holtzhausen & Zerfass, 2015).

Frames mobilise some people to action, and rally others to oppositions or resistance and resonate with some individuals, and not with others (Moser, 2010:42). Information is strategically manipulated to make messages more persuasive and increase the likelihood of the audience accepting the message in cases where the audience may be resistant to the messages (Zaharma, 2010). Similarly, the key message in communicating air quality information should be strategically framed to get the community to accept the message and be involved in acting and measures to improve air quality.

Hoekstra & Wegman (2011)' study revealed that communicators can control the decisions and perception of the public by strategically framing the messaging of an issue. The research investigated ways of getting more women to check for changes in their breast tissues to increase the likelihood of early breast cancer detection.

By so doing, brochures were distributed about the subject describing the potential gains which stated that women who check their breast tissue regularly will be more

familiar with their texture which will make it easier to detect any eventual changes. The potential losses stated that women who do not regularly check their breast tissue will be less familiar with their texture which will make it harder to detect any eventual changes. Brochures that did not mention either of the potential gains or losses were also framed. The findings indicated that the message framed in terms of losses yielded the biggest results in contrast to either the gains frame or the neutral brochures (Hoekstra & Wegman, 2011:80). Therefore, message framing may be applicable in the realm of air quality improvement program as well, depending on the intent that one is trying to achieve.

This section continues with the discussion on message variables in the strategic communication process as provided by public relations scholarship which reflect message effects common to public relations. These include informative, persuasive, facilitative, bargaining, coercive and co-operative problem-solving (Kim, Hi, Kim Kim, 2012:154; Werder & Mitrook, 2011; Forster & Werder, 2011; Kim & Gruin, 2011:122). But only four of these message variables relevant to this study are discussed. These are: informative, persuasive, facilitative, and co-operative problem-solving.

An informative strategy is concerned with the presentation of unbiased truths and assumes a rational and inspired audience. Informative messages presume the public will infer correct conclusions from correct data and do not draw conclusions. Informative messages may suggest alternative solutions to problems (Kim & Gruin, 2011:122). This message strategy needs to be applied by Emalaheni Local Municipality in making the community member understand the existing alternative ways of improving air quality. Informative messages are categorised by the adoption of neutral language or natural, and organisational patterns to produce greater ease of understanding. Informative strategy is effective in enhancing the recognition of problem and may be utilised to construct a foundation for future learning. According to the research findings by Holtzhausen and Zerfass (2015:272), frequency of exposure to messages and time-on-task are positively linked to learning.

Holtzhausen and Zerfass (2015:272) also suggest that informative strategy can be effective in raising awareness of a problem and establishing perceptions that a known problem can be resolved. Therefore, this strategy can also be effective in raising awareness of air quality and the related problem and establishing the community'

perception that air pollution problems can be improved.

In terms of a facilitative strategy, this is achieved by making resources available to the public that enable it to act in ways that it is already predisposed to act. These resources might be tangible objects such as money or tools, or direction for achieving certain tasks (Forster & Werder, 2011). Therefore, the use of this strategy by ELM can be effective tool for the dissemination of air quality information that can help the community members in Emalahleni to act in a desired way to improve air quality. A facilitative strategy is useful when a problem is recognised by the public and the public agrees remedial action is required and is open to external assistance and is eager to engage in self-help. Facilitative strategy is most effective when used with a program that raises awareness of the availability of assistance among the public (Kim et.al, 2012:154). Hence, this facilitative strategy can be effective in terms of the air quality management program by ELM which aims to raise the community awareness on how to improve air quality. Example is the “Basa njenjo magogo” which is the alternative way of making fire with the coal to reduce pollution (Makonese, Masekamani, Annegarn & Forbes, 2016:6).

Another message strategy is the persuasive strategy which is categorised by appeals to the emotions or values of the public. A persuasive strategy may involve a selective of information presentation. It may use language that is not neutral and mirrors the importance of the matter and the source involvement in the situation public (Kim etal, 2012; 154). This message strategy is directive, it is a call for action either explicitly or tacitly. A persuasive strategy is utilised when the public does not consider a problem to be important, involvement is low and when a certain solution is not considered to be effective (Forster & Werder, 2011). Therefore, there is need for ELM to apply persuasive message strategy in the dissemination of information on air quality to the community for the community to see the problem of air quality as a problem, get involve in taking action to improve air quality and consider proposed solution as effective in improving air quality.

The last message strategy is the co-operative problem-solving strategy which reflect a readiness to jointly define problems and solutions to problems. Messages derived from this strategy are characterised by an open information exchange that produces a common definition of the problem and leads to the sharing of responsibility and

positions about the matter (Kim & Gruin, 2011:123). Therefore, this message strategy is needed to facilitate the sharing of information between ELM and the community members and to jointly define air quality problems and its solutions.

Also, this strategy mirrors characteristics of (Grunig, 2002) two-way symmetrical model, there is a sense of interdependence among an organisation and its publics. The two-way symmetrical model provides an avenue for dialogue and the exchange of information that would lead ELM and the community members in addressing air quality problem in Emalaheni. Additionally, co-operative problem-solving strategy is effective when there is a sense of interdependency between an organisation and its public and the need for their participation in the identification of problems and finding alternative solutions to the problems (Kim et.al, 2012:155; Kim & Gruin, 2011:123).

Werder & Mitrook (2011) conducted a study to measure strategy use frequency in organisations. The findings indicated that informative, persuasive, facilitative and co-operative problem-solving were the most frequently used strategies by organisation. The coercive strategy was found to be the least used strategy while bargaining strategy was not used at all. The findings also indicated that the frequency of strategy use differs across strategies showing that strategies have unique characteristics as organisations use some strategies more frequently, some occasionally and some not at all (Werder & Mitrook, 2011). The four message strategies discussed above are unique and relevant in terms of this study in the sense that the application of the message strategies by ELM can assist its strategic communication in disseminating information on air quality improvement with the community.

### **3.3.4 Channels of communication**

Communication which is referred to as a process of conveying information and understanding from one person to another, is increasingly used by individual and institutions in their daily activities across the globe. Information needs to be designed and transmitted to the receiver through a certain channel or system (Keyton, 2011).

The identification of communication channels that are likely to reach the audiences is imperative. For effective messaging, communication channels must be selected to frequently and precisely capture the target audiences' attention. One can decide to

use interpersonal channels, community-oriented channels that use social networks and media channels (including mass media such as radio and TV, and new media such as the internet and SMS, and folk media example, traditional cultural performances and storytelling) to reach the audiences (Raab & Rocha, 2011:159). It is important to consider which communication channels and techniques are most probably effective in reaching the audiences.

Moreover, adopting a stakeholder-centered approach assists strategic communicators to utilise a wide range of communication techniques while maintaining consistent messages across communication platforms (NCVO, 2017). These can consist of purchasing media space; acquiring media such as websites, social media, and blogs; and getting media, which refers to retweets, publicity, comments to online postings and Facebook Likes (Holtzhausen & Zerfass, 2015).

By so doing, it will be easier to target individuals and tailor messages to individual stakeholder needs. Research conducted in Chicago in the context of Chicago Climate Action Plan (CCAP) initiative to reduce carbon footprint and to progress to a more sustainable future in the area indicated that an effective information diffusion strategy must take advantage of the communication channels utilised most by the target audiences.

Environmental solutions rely on the strategy to transmit environmental information through the appropriate channels. It is necessary that people have sufficient information about environmental issues, delivered through appropriate channels, to a point where people can provide an opinion and decide about tangible actions. Communication channels that have the greatest chance of producing the intended outcome, for example enhanced knowledge should also be considered (Elshout, 2014; Raab & Rocha, 2011:161). Raab and Roch (2011:161) propose that program message has better chances to be heard if people encounter it in diverse settings.

Oltra and Sala's study (2015:366) evaluated the public air pollution information services in four Spanish cities through interviews with experts and a documentary analysis to determine the experts' beliefs and assumptions about communicating with the public.

The finding showed that mass media and social media are key communication strategies for communicating information to the public about air pollution and can significantly improve public awareness.

Okwuofu-Thomas et.al, (2017:33) employed their study in residents of aged care facilities in four different countries such as United State, Australia, Canada and United State to identify the communication channels that can be used in raising awareness of environmental emission of heat wave episodes. The result found that the media such as radio and television were used to raise awareness of heat wave episodes.

In Ramirez et.al, (2019:5) interview was conducted with expert stakeholders and community members in USA to determine their awareness about the cause of air pollution, its impact and controllability and the sources of air pollution. The findings identified mass media as sources of information on air quality and can raise awareness. Research conducted by Ratnapradipa (2012:28) sampled Environmental Health Practitioners (EHP) in United Kingdom to investigate how the Practitioner incorporate communication channels into their work in communicating to the public on air quality improvement. The result showed that billboard increased public awareness towards improving air quality.

Reinermann, et.al, (2014:191) investigated the effect of entertainment education programmes in relation to promoting sustainability consumption practices, raising awareness. The result revealed that entertainment education is likely to communicate messages on sustainability to the public, motivate sustainable practices, and raise public awareness.

It is important to identify the above communication channels in this study as the channels could contribute to the organisation's communication strategy in promoting community awareness on air quality improvement. Therefore, this study intends to determine community awareness on air quality improvement through the communication strategy that ELM is using to communicate air quality improvement issues. For the strategies to be understood better, theories that ground their implementation are discussed in the following section.

### **3.4 THEORETICAL FRAMEWORK**

The theories that are in congruence to this study include the AA1000 Accountability Principles theory and diffusion of innovation. Different theories can be used to analyse communication strategy. The AA1000 Accountability Principles theory which is the first

theory mentioned above is relevant and congruence in this study. It will help ELM to develop an accountable and strategic approach to its air quality management programme and to understand, manage and enhance the performance and effort of its air quality management.

The AA1000 Accountability Principle is planned for use by organisations that intends to develop a strategic and accountable approach to sustainability. It assists such an organisation to understand, improve and manage the performance of its sustainability (Landrum & Daily, 2012).

The term accountability means recognising, taking responsibility for and being transparent concerning the impact of an organisation's actions, policies, decisions, products, and related performance. It helps an organisation to involve stakeholders to understand, identify and respond to the issues of sustainability and to explain, report and be answerable to stakeholders regarding their performance, decisions, and actions (Gilbert, Rasche, & Waddock, 2011:23). Reporting or disseminating the issues of air quality management by ELM to community members is a form of being accountable.

Accountability also involves the process by which the authority is established from an exclusive relationship between two parties. It has reference to broader engagement to a wider diversity of stakeholders (Gilbert et.al, 2011:24). The AA1000 Accountability Principles theory is divided into three: the Foundation Principle of Inclusivity, the Principle of Materiality, and the Principle of Responsiveness (Accountability Principles Standard 2009; Gilbert et.al, 2011:25; Landrum & Daily, 2012).

The foundation principle of inclusivity is when an organisation commits itself to be accountable to those on whom it has an impact and who have an impact on it and to enable its participation and the stakeholders' participation in issues identification and finding solutions. This principle is based on a defined process of participation and engagement that offers balanced and comprehensive results in actions, plans, strategies, and outcomes that address and respond to issues and impacts in an accountable manner (Landrum & Daily, 2012; Accountability Principles Standard, 2008:10).

This principle of materiality is based on identifying the material issues which are issues that can influence actions, decisions and performance of an organisation and its

stakeholders. This process is based on ensuring that balanced and comprehensive information is input and analysed. An organisation needs to input the right types of information from the right sources, covering an appropriate time and should include information from stakeholders (Accountability Principles Standard, 2008:12).

The principle of responsiveness is concerned with how an organisation shows that it responds to stakeholders' issues that affect the performance of its sustainability and realised through actions, performance and decisions as well as communicating with stakeholders (Gilbert et.al, 2011; Accountability Principles Standard, 2008:14).

It is worth noting that accountability principle theory recognises the engagement, participation and communication of information of both an organisation and its stakeholders in making plans, taking actions, decisions and strategies in addressing a certain problem and finding solutions. The implementation of this theory is necessary to enable interaction, engagement and participation between the municipality and the community through the communication strategies identified in this study in addressing air quality problems and the possible solutions and providing the community with the opportunity to be involved in the process of moving toward to the desired direction for air quality improvement.

Another theory relevant to this study is the diffusion of innovations theory. This theory is also used in this study to fully realise the principles of strategic dissemination of information on air quality. The diffusion of innovation was first introduced by Everett M. Rogers in 1962. This theory pertains to all innovations. This theory enables the study to understand how new practices and ideas spread all through a social system. It also introduces the idea of relative advantage and trial ability of recommended behaviour and the individual adoption decision process, as well as opinion leadership that shapes diffusion through interpersonal channels and social networks through multistep flow (Roger, 2003).

The following are the five key characteristics of a new idea, product or behaviour that contribute toward its adoption: adopting the new idea or product, compatibility of the new idea or product in relation to the existing norms of an individual, complexity of adopting the idea, observability of adopting the behaviour or idea, and trialability which is the act of experimenting the idea or behaviour before adopting it on a sustainable basis (Dingfelder & Mandell 2011:590; Rogers, 2003).

People fall into one of the following categories of adoption: innovators, early adopter, early majority, late majority and laggards or resisters. Innovators are younger, have resources, take risk, and interact frequently with other innovators. Early adopters also have more resources, are opinion leaders, younger and are integrated into communication networks. By applying the diffusion of innovation theory, communicators can identify early adopters, that is people who have already adopted a new idea or behaviour that a programme is trying to promote, and these early adopters will be used to further promote the idea so that it diffuses all through the entire community (Al-Jabri & Sohail, 2012:381). Communicators tend to use various communication strategies or channels to stimulate the early adopters or late adopters. Therefore, the communication strategies identified in this study can assist the ELM to identify early adopters who will be used to further promote the idea of improving air quality to be able to diffuse throughout the whole community.

There is a five-step process of diffusion of innovation: “Knowledge/awareness, persuasion, decision, implementation and confirmation. At the knowledge/awareness stage, people are aware of innovation but know little about it and seek more information. At the persuasion stage, people are interested and actively looking for more information. At the decision stage, the advantages and disadvantages of adoption are weighed, either to adopt or reject the innovation. At the implementation stage, the usefulness of innovation is judged, and people may continue to look for more information. At the confirmation stage, individuals decide whether to continue using the innovation or not (Rogers, 2003; Wani & Ali, 2015:110).

Researchers have applied the theory to renewable energy technologies, the spread of organic farming, sustainable prevention innovations and sustainability-related initiatives (Craig & Allen, 2013:330; Andersen, 2011).

Craig and Allen (2013:330) examined employees in different organisations to determine their information sources and their awareness and knowledge of sustainability-related issues using diffusion of innovation theory. The findings indicated that the employees were knowledgeable about sustainability issues by receiving information from groups such as Urban Sustainability Director Network, Missoula Sustainability Council and WasteCap Nebraska.

With the understanding that diffusion is a process through which innovation is communicated to the society, community or individual through certain channels, the diffusion of innovation theory is relevant to this study which aims to examine community awareness on air. Therefore, the appropriate plan and application of the communication strategies identified in this study can help the municipality for the diffusion of air quality information to the community and to stimulate the community for the adoption of preventive measures to improve air quality.

The next section discussed how air quality information on environmental monitoring and compliance should be managed in ensuring that the public have access to air quality information and the performance of different organs of state in terms of environmental monitoring and compliance.

### **3.5 AIR QUALITY INFORMATION MANAGEMENT PLANNING**

Information management is essential in terms of air quality management and is described as the engine that drives environmental governance towards constant improvements in environmental quality. Air quality information management is one of the requirements in the South Africa's National Framework for environmental air quality management, AQA (DEA, 2012:81).

Section 32 of South African constitution made provision for South Africans right of access to information held by the state or by another person that is needed for the protection or exercise of any rights. Access of Information Act, 2000 was promulgated to give effect to constitutional right of information access (DEA, 2012:81; Government Gazette, 2018:100). The South African national department in collaboration with the South African weather service have developed the South African Air Quality Information System (SAAQIS) to provide support to Air Quality Officers (AQOs) and air quality information to a wider audience.

This was done to uphold this right and address the requirement of air quality information contained in the AQA effectively (Government Gazette, 2018:100; Gwaze & Mashele, 2018). The SAAQIS ensures that the requirements for air quality management and reporting implied by AQA are effectively and efficiently met and that air quality activities, decisions, interventions, and actions are informed by current, accurate and complete information. It also reports the state of the air and ensures that

accurate, complete, relevant, and current air quality information is available to the public and all stakeholders (Government Gazette, 2012). The dissemination of information through SAAQIS is necessary but SAAQIS has a limitation in the sense that not all stakeholders have access to air quality information from SAAQIS. However, there is need for the use of communication strategies and channels that can reach and engage all stakeholders including the communities and get them informed and raise their awareness on air quality issues and how to improve air quality.

In Government Gazette (2018:54), it is proposed that access to information is the main aspect in raising awareness. Therefore, the purpose of this study is to explore and describe communication strategy of ELM to determine community awareness on air quality. There are several typical AQA governance functions regarding information management: One of the functions is to establish and maintain national standards and norms for the monitoring of air quality and air quality information management. To monitor ambient air quality and municipalities performance in executing the AQA. To establish and maintain national standards for data collection and management required to assess compliance with ambient air quality and emission standards. To monitor compliance with the AQA, organs of state performance regarding air quality management plans and air quality management plans for priority areas and the impact. To monitor compliance with air quality management plans and compliance with the obligations of the Republic regarding international agreements and public access to information. To compile and submit annual report involving information on the initiatives undertaken on air quality management during the time of the report, compliance level with ambient air quality standards, measures taken to secure compliance with those standards. Finally, to monitor compliance with any applicable air quality management plans of the priority area and air quality monitoring activities (Government Gazette, 2018:88).

Information gathering, and reporting is utilised to identify the problems of air quality being experienced and to establish interventions of improving air quality. Therefore, the appropriate plan and application of information dissemination by the ELM can help with good information management in ensuring that the community is aware of the national ambient air standards and measure to take to ensure compliance with the standards.

### **3.6 CONCLUSION**

This chapter reviewed information dissemination and air quality, elements in communicating information, underlying research work done on topic, the theoretical framework linked to this study and air quality information management planning. The next chapter presented a review of literature on air quality.

## **CHAPTER 4: LITERATURE REVIEW- AIR QUALITY**

### **4.1 INTRODUCTION**

This chapter provides the overview of air quality indicating the major indoor and outdoor air pollutants. It provides insight into the main cause of air pollution in Emalahleni and South Africa in general. It highlights the legislative and policy measures that have been implemented by the South African government to maintaining the national ambient air quality standards. Further, it discusses how environmental air quality can be improved through the discussion of the elements outlined as follows: the overview of air quality, response to air quality management in South Africa, history of Emalahleni Local Municipality (ELM), air quality management plan, sources of emission, priority areas and priority pollutants in South Africa, South African national air quality and emission standards, ambient air quality monitoring, compliance monitoring, emission inventory and Atmospheric Emission Licences (AELs).

### **4.2 OVERVIEW OF AIR QUALITY**

Air quality is a measure of how polluted or clean the air is. Deterioration of air quality is a serious problem practically affecting all countries worldwide, with some cities presently facing the greatest challenges in developing countries. People in Asia, the Middle East and Africa experience much higher levels of air pollutants than those living in other parts of world. Only one out of ten persons lives in a city that complies with the WHO air quality guidelines (WHO, 2014:15). Air pollution constantly increases at an alarming rate and affects the quality of people's life and economies. The amount of pollution that is discharged into the atmosphere is caused by natural events like eruptions of volcanoes and veld fires (WHO, 2014:15; Cohen, Brauer, Burnett, Anderson, Frostad, Balakrishnan, Brunekreef, Dandona, Dandona & Feighin, 2017:1910). It is also caused by anthropogenic resulting from electricity production, vehicular emission, biomass burning, domestic fuel burning and industrial activities (Klausbruckner, Annegarn, Henneman, Rafaj, 2016:90; Government gazette, 2012). Polluted air is detrimental to the health of people, the environment, and the economy.

Air pollutants effect on humans and the environment occurs through the following mechanisms: inhalation and deposition, formation of smog and reduction of visibility, deposition of acid, water bodies eutrophication, ozone depletion, and global climate change (WHO, 2014:19). "Air pollution is defined as the anthropogenic discharge of matter (gas, liquid or solid) to the atmosphere at levels which have undesirable effects on the human, natural and physical environment" (Fuggle & Rabie, 2009). Anthropogenic activities contribute to high levels of gaseous atmospheric pollutants, which contain the inorganic gaseous species of sulphur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter (PM) and volatile organic compounds (VOCs) such as benzene, toluene, ethylbenzene, and xylene (BTEX) (Cohen et.al, 2017:1915; WHO, 2014:19).

Being exposed to air pollution is related to many effects on the health of human, involving problems of respiration, acute illness, pneumonia, heart or lung disease and premature death. Particularly, children who are still developing lungs and older people who have heart or lung disease are the most vulnerable to air pollution (Chen, Shao, Tian, Xie & Yin, 2017:916; Seinfeld & Pandis,, 2016). Previous studies have investigated the effect of air pollution on human health in different countries. A retrospective study that examined air pollution effect on excess mortality indicated excess mortality due to chest pains, acute illness, cough, pneumonia, and shortness of breath caused by air pollution (Cohen et.al, 2017:1917). Moreover, the finding of a study conducted on a policy and legal analysis of South African climate change and air pollution control strategies showed that air pollution leads to chronic diseases such as asthma, cancer, lung or heart disease, acute respiratory tract infections and pneumonia (Klausbruckner et.a,l 2016:97; To, Shen, Atenafu, Guan, McLimont, Stock, & Liciskai, 2013). Another research finding indicated an increased risk of wheezing for children because of air pollution on a study conducted on the effect of air pollution on child Highveld Priority Area in South Africa (Shirinde, Wichmann & Voyi, 2014:30).

Several studies have investigated air quality issues on various perspectives such as air pollution on public health, its controllability (Ramirez, 2019), governmental policy and technological (Wang et.al, 2016) and on access of information through public information systems (Oltra & Sala, 2015). Limited published research in South Africa have examined communication strategy as key to raising awareness on air quality improvement.

Being exposed to polluted ambient air is one of numerous air pollution and public health concerns that people face (Cohen et.al, 2017:1918). Ambient air pollution comprises of a highly variable and complex mixture of diverse substances, which may take place in the gas, solid or liquid form. A core set of air pollution indicators and criteria pollutants which have been widely used to characterise air quality are developed around the globe by Institutions such as environmental agencies. The selection of these pollutants does not mean that other substances do not pose a substantial threat to the environment and human health. However, these four pollutants are associated with complex, atmospheric chemistry. These indicators include particulate matter, nitrogen dioxide, ozone, and sulphur dioxide (Seinfeld & Pandis, 2016). Some distinct ranges of concentrations of the four indicator pollutants identified in a selection of cities worldwide are shown in table 4.1.

**Table 4.1 Ranges of annual average concentrations (mg/m<sup>3</sup>) of PM<sub>10</sub>, nitrogen oxides and sulphur dioxide and one-hour maximum average concentrations of ozone for different regions, based on a selection of different data.**

Region	Annual Average concentration			Ozone 1-hour average concentration
	PM <sub>10</sub>	Nitrogen dioxide	Sulphur dioxide	
Africa	40-150	35-65	10-100	120-300
Asia	35-220	20-75	6-65	100-250
Australia/New zealand	28-127	11-28	3-17	120-310
Canada/United State	20-60	35-70	9-35	150-380
Europe	20-70	18-57	8-36	150-350
Latin America	30-129	30-82	40-70	200-600

**Source:** (WHO, 2005).

#### **4.2.1 Indoor and outdoor air pollution**

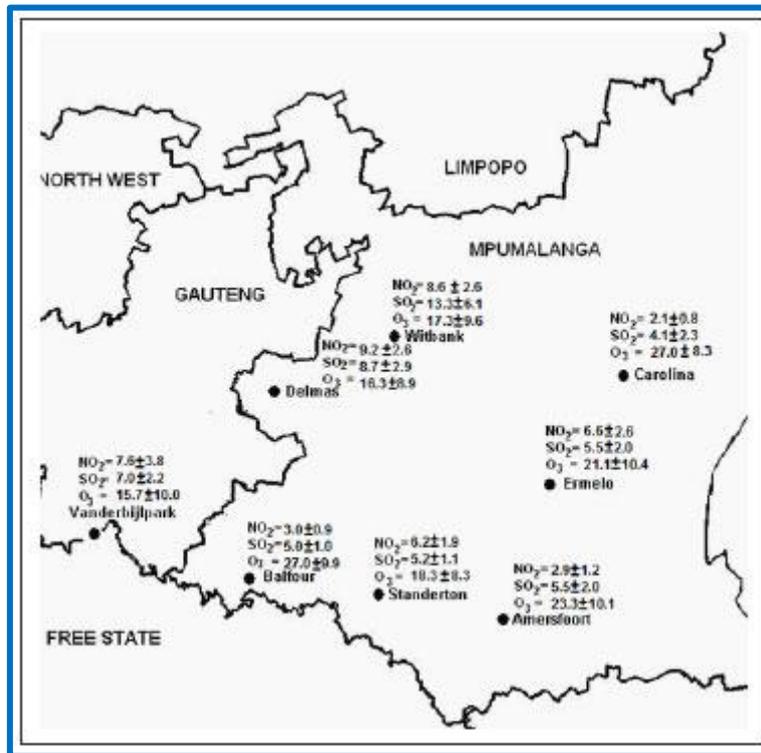
The indoor environment characterises an essential microenvironment in which individuals spend much of their time. Pollutant exposures are notable in the indoor environment where people live, play, work and learn. There are differences in indoor and ambient environments based on exposure durations, pollutant concentrations, populations at risk and the pollutants themselves. The durations of exposure are longer and population at risk larger in indoor than in ambient environments. Indoor air pollution originating from both indoor and outdoor sources is likely to contribute more exposure to people than the outdoor environment (Godish, 2016; WHO, 2014:15). The key indoor pollution sources around the globe include solid fuels indoors combustion, outdoor air pollutants, construction material and furnishing emissions, tobacco smoking, and improper ventilation maintenance and air conditioning systems. The indoor burning of fossil fuels and the related deterioration in indoor air quality is a main public health concern in developing countries including South Africa. Such fuels are used by majority of households that use inefficient device such as metal stove or earthen in kitchens that are not well ventilated, causing a very high exposures (Albers, Wright, Voyi & Mathee, 2015:574). The most significant issue in developing countries for indoor air quality is exposure to pollutants released during indoor solid fuels burning, including biomass (wood, crop residues and dung) or coal used for heating and cooking (Godish, 2016). Makonese, Masekameni, Annegarn (2016) investigated the domestic use of energy in Cape Town and their findings showed that over half of households rely on solid fuel for cooking and heating, with the largest number of the people living in rural and urban communities. Similar studies conducted in Emalahleni and Middelburg of Mpumalanga showed that a number of households still rely on using solid fuel such as wood, coal, gas or paraffin for cooking or heating and has increased since 1996 to over 93.9% in 2011 (Albers et.al, 2015:575; Kasangana, Masekameni & Saliwa, 2017:1). Field investigations and scientific studies on indoor air pollution showed that the air inside homes, schools and offices is contaminated by range of gas and particulate substances that might be present in adequate concentrations that lead to chronic illness (Godish, 2016). Clean sources of household energy predominate in developed countries, advances in energy efficiency have resulted to homes being moderately airtight and ventilation being reduced.

In countries worldwide, and even in developed countries, indoor air pollutants have not been as thoroughly monitored as outdoor air pollutants (Pluschke & Schleibinger, 2018). In South Africa, indoor and outdoor air pollution is perceived as a serious problem resulting to the emission of sulphur dioxide, nitrogen dioxide, ozone, particulate matter, benzene, and VOCs (Albers et.al, 2015:575; DEA, 2014:55; Government Gazette, 2018:43). South Africa has committed to the use of coal to meet its major energy needs in the 21st century. The problems of air pollution being experienced in South Africa are in great measure a manifestation of this form of energy production (Henneman, Rafaj, Annegarn & Klausbruckner, 2016:162). The Highveld of South Africa is known for its different anthropogenic activities which include agriculture, metallurgical and mining operations, power generation, petrochemical operations, and transportation (Lourens et.al, 2011:6). The Emalahleni Highveld of Mpumalanga is a major air pollution source region with elevated emissions. The research finding conducted on conceptions of the impact of the environment in South Africa regarding coal mining showed that Emalahleni's coalfield is one of the most polluted area in South Africa (Singer, 2011:292).

Emissions from Emalahleni are transported to other countries such as Swaziland, Mozambique, Lesotho, Zimbabwe, and Botswana due to its elevated emission from industrial and mining activities. Industrial emissions from Zambian Copperbelt have been also detected in South Africa but the Highveld of Mpumalanga accounts for the main fraction of South Africa's emission (Wernecke, Piketh & Burger, 2015:13).

Research that investigated climate change mitigation and control strategy has shown that of the total 1.1mt of Sulphur dioxide emitted into the country's atmosphere annually, excluding emissions from Zambia, 65% originate in SA and about 90% of the emission is from Highveld of Mpumalanga (Klausbruckner et.al, 2016:98). Satellite 70 also detected Sulphur dioxide (NO<sub>2</sub>) hotspot in the Mpumalanga Highveld from the global map (Venter, Vakkari, Beukes, Van Zyl, Laakso, Mabaso, Tiitta, Josipovic, Kulmala, Pienaar & Laakso, 2015). Industrial areas in the Highveld region are found to have the highest SO<sub>2</sub>, NO<sub>2</sub> and CO<sub>2</sub> concentrations (Wernecke et.al, 2015:14), and highest O<sub>3</sub> level in rural areas (Lourens et.al, 2011:7). The annual concentrations in the Highveld region are shown in figure 4.2.

**Figure 4-1 Annual average concentrations of the measured inorganic gases in the Highveld of Mpumalanga**



**Source:** (Lourens et.al, 2011)

Additionally, report from the World Environment Day adopted by United Nation also found Mpumalanga region as one of the world’s critical air pollution hot spots producing record levels of nitrogen dioxide. Globally, 5 June is declared as the world environment day and is used to stimulate awareness on environmental issues and challenging people to become agents for change. The month of June is declared in South Africa as the National Environment Month. This day was celebrated under the theme “air pollution” in 2019 (SANBI, 2019).

Hence, awareness raising has been one of the air quality management programs that is being embarked on by Emalahleni municipality in South Africa. The purpose of this study is to analyse the communication strategy that ELM is using to raise awareness about air quality improvement. This study suggests that improving and mitigating air pollution can be achieved in South Africa and in Emalahleni by stimulating awareness on how to improve air quality through the strategic use of communication by the municipality.

Several studies that investigated public awareness of air pollution have proved the above argument to be true as indicated in (Wang et.al, 2016:1468; Limaye et.al, 2018; Rajper et.al, 2018). The next section discusses legislative and policy measure which are often the main objectives of air quality management planning in South Africa and across the globe.

### **4.3 RESPONSE TO AIR QUALITY MANAGEMENT IN SOUTH AFRICA**

South Africa has responded to air quality management in different legislative and policy measures. The first approach to air pollution control was the Atmospheric Pollution Prevention Act which focused mainly on industrial pollution (APPA) (Act No.45 of 1965). The APPA was considered as inadequate legislative measure to deal with air pollution effectively due to lack of holistic and proactive management with associated strategic direction from national government. The APPA was reversed and the National Environmental Management: Air Quality Act (AQA) (No.39 of 2004 was promulgated in 2005 as the air pollution control update approach ((Naiker, Diab, Zunckel & Hayes 2012:63; Henneman et.al, 2016:167; DEA, 2012; Government Gazette, 2018:58). This update was done to incorporate the principles contained in broader policy of South African constitution. The constitution is therefore the key piece of legislation that informs all environmental legislation. In terms of environmental right, it was obvious that air quality legislation that incorporated a fundamental drive towards cleaner air quality was required. In this regard, the White Paper on Integrated Pollution and Waste Management for South Africa was published basically for a Policy on Pollution Prevention, Waste Minimisation, Impact Management and Remediation which marked a turning point for pollution and waste governance in South Africa. From the perspective of air quality management, the new policy represented a paradigm shift in approach and required the introduction to a new approach to the management of air quality (DEA, 2012; Cilliers, 2019:2).

The AQA represents a different shift from entirely air pollution control based on source to holistic and incorporated effects based to management of air quality. It is concerned with air pollution adverse impacts on the ambient environment, setting standards for pollutant levels in ambient air and emission standards to minimise the quantity of pollution being discharged in the environment (Government Gazette, 2018:9).

The main objectives of AQA (No. 39 of 2004), which is the new approach to air quality management is based on the main constitutional right to an environment that is not harmful to the well-being or health of people. To protect the environment by providing reasonable measures for the protection and enhancement of the quality of air in the Republic. For the prevention of air pollution and ecological degradation. Lastly, for securing ecologically sustainable development while promoting justifiable economic and social development (DEA, 2012:1; Government Gazette, 2012:72).

In achieving the objectives, the Minister should establish a national framework which must include the mechanisms, systems, and procedures to attain compliance with the standards of the ambient air quality. Also, to give effect to the obligations of the Republic in terms of international agreements, national norms, and the control of emissions standards from point and non-point sources. Further, for the monitoring of air quality, air quality management planning and air quality information management planning (Setia, Abhayawansa, Joshi, Huynh, 2015:397; DEA, 2012:22). The national norms and standards should ensure the opportunities for participation of the public in the protection and enhancement of quality of air and access of the public to air quality information. The national norms and standards should also ensure air pollution prevention and air quality degradation, reduction of discharges that may impair quality of air and air pollution reduction at source. Moreover, it should ensure efficient and effective promotion of air quality management; effective monitoring of air quality; air quality regular reporting and compliance with the obligations of the Republic in terms of international agreements (Government Gazette, 2015:81; DEA, 2012:2).

Other instruments of AQA include Ambient Air Quality Standards, Pollution Prevention Plans, Minimum Emission Standards, Emission Licences and Priority Areas which are other legal measures taken to reduce emission in South Africa (Klausbruckner et.al, 2016:98). Policies that address domestic emissions in South Africa include the National Liquefield Petroleum Gas Strategy, Integrated Household Clean Energy Strategy and Basa njenjo Magogo campaign (Klausbruckner et.al, 2016:98; Government Gazette, 2018:120). To achieve a better outcome of this policy intervention on addressing domestic emission, public environmental awareness must be a priority. It is argued in Meia, Waia & Ahamad (2016:668) that the designing of policy can cause the environmental protection programme to be far from expected outcomes without considering the intervention of public environmental awareness.

Several organs of state are responsible for environmental legislation administration. Government departments under the cabinet minister are responsible at the level of national government. The Department of Environmental Affairs and Tourism and Water Affairs and Forestry are the key players in the environmental sphere. The provincial departments oversee environmental issues at provincial level. At the local level, the local authorities are the relevant authorities for environmental matters (Setia et.al, 2015:398). The organs of state in all spheres of government are bound by the national framework and may assign and set responsibility for the AQA implementation among the various spheres of government and various organs of state (Cilliers, 2019; DEA, 2012:20).

South African government is structured as three separate spheres, with national, provincial, and local government having different areas of responsibility within their jurisdiction. Local authorities have limited functions and powers under the APPA. However, through the promulgation of AQA, local government has been acknowledged as the most suitable government level to execute most control measures (Naiker et.al, 2012:63; Setia et.al, 2015:400). The constitution made provisions for autonomy of local government and details responsibilities where executive authority is given to local authorities. The local government was also given the responsibility to control air pollution under the jurisdiction of department of environmental health. According to the Local Government: Municipal Systems Act 32 of 2000, all municipalities are obligated to prepare an Integrated Development Plan (IDP) through a combined planning process to give effect to constitutional requirements (Government Gazette, 2018:133, DEA, 2012:8). An Integrated Development Plan (IDP) is a document that contains how a municipality will strategically and constantly align all its development objectives and financial plans focusing on improving the communities' development status within its jurisdiction in a certain time frame (Molepo & Maleka, 2018 :761).

Additionally, civil society was given more recourse for action, involving on issues of making decision about the environment by clauses such as those linking to administrative justice, information access and the rule of locus standi (Setia et.al, 2015). However, getting the public involved in decision making on the issues of air quality management is important as decisions can be informed if the public or decision-makers have access to information.

Not only having access to information, progress towards making decisions and achieving the goal of improving air quality needs raising awareness. Therefore, this study investigates community awareness on air quality by the means of communication strategies that ELM is using.

South Africa has implemented several international, regional, and national policies and laws with the aim to control air pollution. The international treaties joined by South Africa include the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Montreal protocol and Stockholm Convention. The aim of joining these treaties was to address three main air quality issues such as greenhouse gases and associated climate change; persistent organic pollutants (POPs) and stratospheric ozone depletion (DEA 2012:9; Government Gazette, 2018:76). The United Nations Framework Convention on Climate Change offers a wide consensus for establishing practices and institutions to address climate change by introducing processes of continuing review, information exchange and discussion. The Kyoto protocol focused on three mechanisms used to facilitate the reduction of GHG emissions. Those mechanism include the international emissions trading, clean development mechanism and joint implementation. The Stockholm Convention focuses on addressing the banning, production and use of POPs for environmental and human health protection (Anand, 2017).

In terms of the regional policy, progress has been made by Southern Africa toward establishing environmental management policy across the region, involving initiatives through the Southern African Development Community (SADC) and the New Partnership for Africa's Development (NEPAD), and African union (AU) (Seitia et.al, 2015; DEA, 2012). African normative law framework has considered both treaty law and soft law. Under treaty law, the most essential process available under international law for countries to collaborate on environmental matters was the conclusion of a Multilateral Environment Agreement (MEA). Approximately, 31 multilateral agreements focusing on a variety of issues relevant to the member states of African Union (AU) has been adopted since the establishment of the AU's predecessor. Some other norms applicable to the environment under treaty law are divided into regulatory norms and rights-based norms.

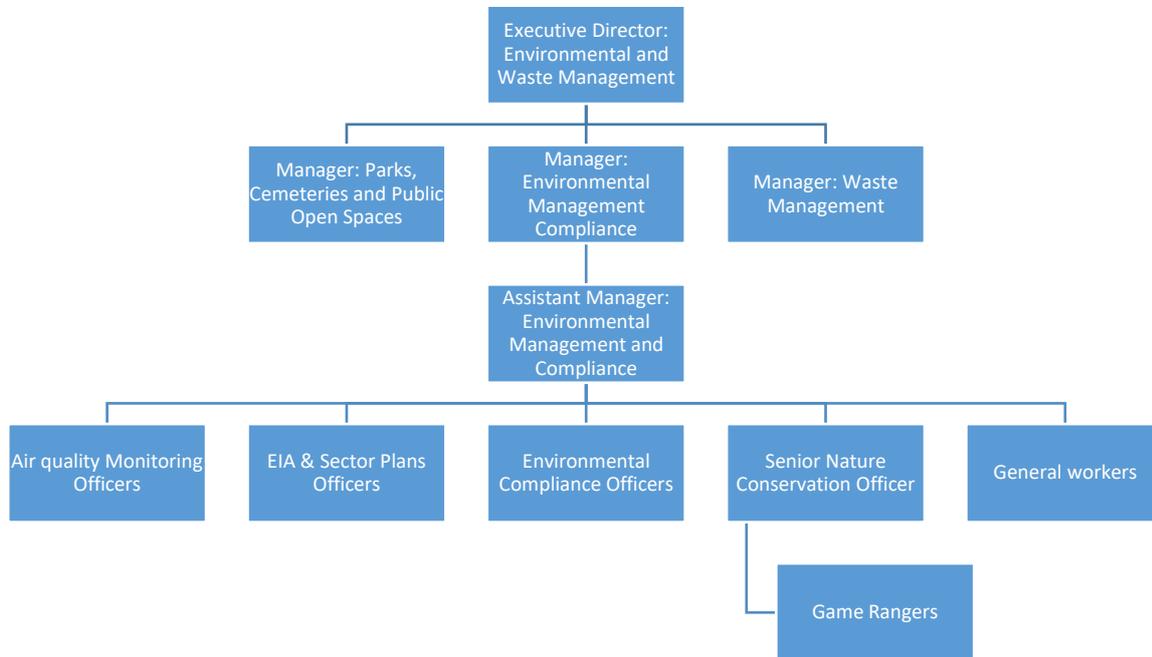
The soft law involves a great body of non-binding law in the form of codes of conduct, principles, guidelines, and goals adopted at both regional and global level to assist government in the strategies and sustainable development of environmental management (Anand, 2017).

The National policy and the National Climate Change Response White Paper present the vision of the government for an effective response on climate change and long-term transition to a lower-carbon economy and society and climate resilient. One of the objectives of the policy is to effectively manage the impacts of climate change through interventions that sustain and build emergency response capacity, economic, social, and environmental resilience in South Africa. Secondly, to make a reasonable contribution to the world's effort to stabilise the concentrations of Greenhouse Gases (GHG) in the environment at a level that avoids hazardous anthropogenic interference with the system of the climate within a timeframe that allows social, economic, and environmental development to proceed in a sustainable way (DEA, 2012:4; Anand, 2017). Other main policy instruments used in South Africa for putting a price on carbon and curbing emissions of Greenhouse Gases (GHG) were carbon taxes and emissions trading schemes. Carbon taxes seeks to generate emissions reductions through directly pricing of emissions, while emission trading schemes limit emissions quantity permissible and price of carbon is established through trade in allowances (Chiu, Kuo, Chen & Hsu, 2015:169; Mbadlanyana, 2013:88).

Furthermore, the policy measures taken by the Emalahleni Local Municipality in terms of the Local Government Municipal System Act include the draft of air quality management By-Laws, waste disposal policy and the draft of system for certificate of approval for people collecting solid waste for commercial purposes and gain (Provincial Gazette, 2016). It also includes the AQMP policy which focuses on reducing the incidence of all forms of air pollution and the potential health risks in the environment linked with air pollution (Emalahleni Local Municipality, 2018).

The Municipality has been involved in many air pollution control teams such as the Implementation Task Team (ITT), Air quality Officers Forum (AQOF) and the Multi Stakeholder Reference Group (MSRG). Moreover, a structure which focuses on environmental management, monitoring and compliance has been approved by the municipality which is shown in figure 4.2.

**Figure 4-2 Environmental and compliance sub-structure of Emalahleni Local Municipality**



**Source:** (Emalahleni Local Municipality, 2015).

Further, two different awareness programmes such as tree planting and “Basa Njengo Magogo (BnM)”, are hosted every year to inform the community on how to control emission. The BnM fire ignition is a local derivative of the top-lit updraft (TLUD) or top-down approach of making fire using coal in such a way that it reduces emission. The sequence of making this fire is to put the main portion of the coal load on the fuel grate and then put kindling (wood chips and paper) on top, and then ignite it, and lastly place a few coal nuggets on top of the burning kindling a few minutes after ignition (Emalahleni Local Municipality, 2015; Makonese, Masekameni, Annegarn & Forbes, 2016:1). Makonese et.al, (2016) conducted a study on the emission factors of domestic coal-burning braziers that compared the level of emission reduction of the top-lit updraft (TLUD) and the bottom-lit updraft (BLUD) of fire ignition in the Highveld of Mpumanlangaa. The finding indicated that top-lit updraft approach is estimated to result in a 70-90 per cent reduction in ambient particulate emissions. Hence, the knowledge of the community regarding this emission reduction method and its application is imperative in terms of reducing emission in Emalaheni. Figure 4.3 below illustrates the BnM fire ignition method.

**Figure 4-3 Photographs illustrating the Basa njengo magogo method with high ventilation, medium ventilation, and low ventilation.**



**Source:** (Makonese et.al, 2016:2).

Informing the community about the condition of the air and the regulations, policies and measures in place for the management of air quality is very important. In addition, the public's right to know about what they are exposed to is the main condition for an effective proactive policy (Meia et.al, 2016:669).

Therefore, there is a need for the strategic application of communication by the municipality to raise awareness of the existing regulations, policies and programmes that deal with air quality management. This awareness could motivate the community to comply with the measures and take mitigating action.

This argument is proved in the study of (Rajper et.al, 2018) which showed that individuals may be motivated to take mitigation action by increasing awareness of air pollution, its causes and the associated health impacts.

#### **4.4 ABOUT EMALAHLENI LOCAL MUNICIPALITY**

Emalahleni municipality formerly known as Witbank was established in 1903 and declared a town in 1910. It was renamed officially as Emalahleni on 3 March 2006. The city was named after the white rock ridge situated near the current railway station. The ridge was a halting place for transport wagons and a trading post in the early years. There is a huge collection of heritage assets in Emalahleni which is presently under threat due to rapid development. The Emalahleni Municipal region, which is known as “the place of coal” comprises of inter alia of towns of eMalahleni, Ogies, Ga-Nala and Kwa-Guqa. Emalahleni municipality is the most industrialised region in Nkangala and its landscape features mostly opencast and underground coalmines (Emalahleni Local Municipality, 2013; 2018). The area housed various coal mining, energy generation and steel manufacturing industries. Coal mining is the largest and oldest industry in Emalahleni. About 80 per cent of the country’s coal is produced in Emalahleni and Highveld coalfield (Eberhard, 2011). Singer (2011:287) investigated the state of the environment and conceptions of environmental impact of coal mining in South Africa. The finding indicated that the most important source of coal in South Africa has been Emalahleni coal industry.

Emalahleni’s growth and fortunes is because of its abundant coal reserves. It produces the electricity that keeps South Africa’s light on for being coal driven. Its mines provide South Africa with raw material for energy creation (Marais, Nel & Donaldson, 2016:63). The abundance of coal mining, steel plant, power generation industries and availability of transport routes have attracted foreign investment and many companies operating in Emalahleni. Such companies are Samancor Chrome, Anglo America, Zenith, Eskom, Komatsu, Joy, BHP Billiton, Exaaro, SABMiller, Shanduka beverages Evraz, Sasol and the Renova Group (Marais, et.al, 2016). There has been environmental impact in the region due to the operation of coal mining, steel, and energy industries according to the Emalahleni’s IDP (Emalahleni Local Municipality 2013).

The same study by Singer (2011) that investigated the environmental impacts of coal mining in Emalahleni found that most of the environmental problems in the region are attributed to the methods of mining which has caused ecological devastation of affected landscapes.

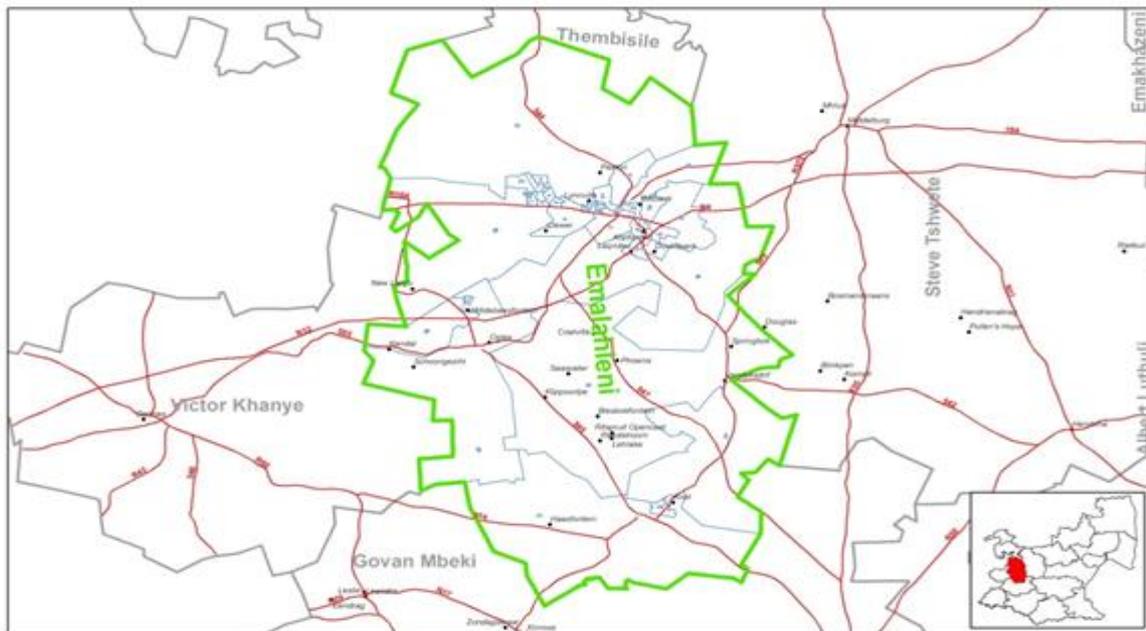
Emalahleni's industrial and mining history is reflected in the heritage places of the area. This comprises elements of industrial and military history, engineering/architectural and graves which should be conserved and protected (Emalahleni Local Municipality, 2018). Among the different problems facing the region are air pollution, water pollution and spontaneous combustion of dumps and mines which release harmful chemicals to the environment (Marais et.al, 2016:71). The declaration of Emalahlehi as a national air pollution hotspot, the Highveld Priority Area in 2007 was a result of the high levels of air pollution found in the area (Lourens, 2011:5; Emalahleni Local Municipalty, 2018).

Emalahleni Local Municipality is situated in the province of Mpumalanga and in the Nkangala District Municipality jurisdictional area. The district is located to the province North-West and is the smallest district in land mass (21%) and has the second biggest population concentration (35%) in the province. It covers an area of about 2677.67 km<sup>2</sup> in extent. The district comprises of six local municipalities. These are: Emakhazeni Local Municipality, Steve Tshwete Local Municipality, Thembisile Hani Local Municipality, Dr JS Moroka Local Municipality, Emalahleni Local Municipality, and Victor Khanye Local Municipality. Emalahleni serves the function of a gateway municipality and town into the province for eight of the nine provinces of the country. Its proximity to Ekurhuleni, Tshwane Metropolitan Municipalities and Johannesburg which jointly created the largest economy in South Africa serve the municipality economically well (Emalahleni Local Municipality, 2013; 2018).

Furthermore, the significance of the municipality in the Industrial Development and Transportation strategies of South Africa are recognised due to the well-maintained road infrastructure connecting the city to the rest of the country. The N4 and N12 join at eMalahleni town, N12 begins at eMalahleni and then the N4 proceeds to Maputo and Nelspruit. A rail line that connects Gauteng through eMalahleni to Maputo is also running parallel to N4. These significant transportation and freight connections are crucial to ensure enhanced trade between South Africa, Namibia, Mozambique, and

Botswana. The rail connections and the roads to the south of the municipality connect Emalahleni to Maputo Harbour and Richards Bay. This offers important logistic opportunities for the coal that must be exported through the Harbours. The southern areas of the Emalahleni are referred to as the Energy Mecca of the country because of its rich deposits of coal reserves and power stations such as Matla, Ga-Nala, Kendal, Duvha and the newly built Kusile which is located to the east of Phola. The rail network and Southward Road connect Emalahleni region to Maputo and Richards Bay harbours, providing export opportunities for the coal reserves. The Municipality area of jurisdiction comprises of the major following towns/settlements, ranked according to population: eMalahleni complex, Phola, Ogies, Rietspruit, Thubelihle and Ga-Nala (Emalahleni Local Municipalty, 2013; 2018). Emalahleni’s map is shown in the figure 4.4 below.

**Figure 4-4 The map of Emalahleni**

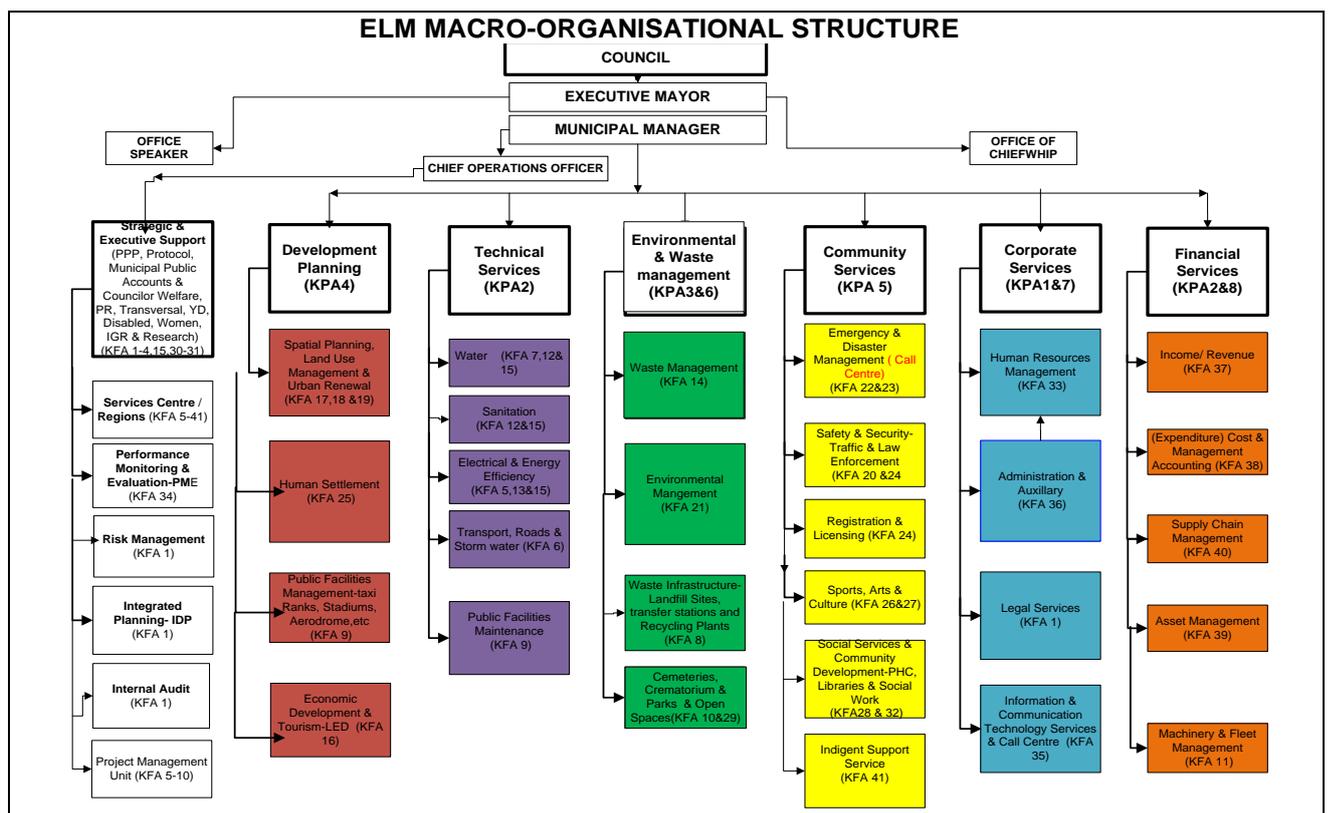


**Source:** (Emalahleni Local Municipalty, 2018).

Emalahleni Municipality has experienced population growth rates higher than its economic growth rates which is not constructive. This affects its GDP per capita and service delivery, infrastructure, and job creation (Emalahleni Local Municipalty, 2013; 2018). Much of this growth has been attributed to South African’ recent economic growth and coal increased demand and immigration to the region by people who are searching for job opportunities in the coal mining industry (Marais et.al, 2016: 72).

The municipal economy mostly emanates from mining. Trade and community services also contribute to the local economy of the municipality. The contribution of Emalahleni to the economy of Mpumalanga is the highest in the province at more than 20 per cent. According to South African national development plan, Emalahleni was listed by the 2006 National Spatial Development Perspectives (NSDP) as a region of mass production and specialised economic concentration that must be precisely targeted for public policy interventions to grow the economy of South Africa by at least 6 per cent per annum (Republic of South Africa, 2012). Moreover, the municipality has committed to providing basic services to the communities. Below is the organogram of the municipality.

**Figure 4-5 The Organogram of Emalahleni Local Municipality**



**Source:** (Emalahleni Local Municipality 2018).

The following section discusses Air Quality Management Plans (AQMP) that are in place in South Africa that deal with the improvement of air quality in polluted areas and the identification and reduction of air pollution negative impact on human health and the environment.

## 4.5 AIR QUALITY MANAGEMENT PLAN

An air quality management plan is a plan in place to rectify the condition of a place declared as national priority area by the minister of environmental affairs believing that the ambient air quality standards are exceeded, and the place needs certain air management action to rectify the condition (Government gazette, 2018). An air quality plan formulation and implementation for improving air quality in polluted areas should identify the emission sources characterisation and assess the contribution of the sources to the ambient concentration levels and identify the sources that must be tackled. The combined assessment of different improvement options such as emission abatement measures in connection to their technical and economic feasibility and their effects on human health and the environment should be considered. It is necessary to ensure that air quality standards are attained within the stated time frame in the AQMP (Miranda, Silveira, Ferreira, Monteiro, Lopes, Relvas, Borrego & Roebeling, 2015:434). Source apportionment methods are often conducted to identify the emitting sources and their individual contribution to air pollutants. The maximum feasible air quality improvement that can be attained by reducing emission from those sources because of the application of emission reduction policies for protection of the environment and human health can be understood through the adoption of these methods (Borge, Lumbreras, Perez, de la Paz, Vedrenne, de Andres & Rodriguez, 2014:811).

Furthermore, in South Africa each government sphere promotes a strategic approach through the preparation of AQMP. Each province or national department responsible for preparing an environmental management plan or implementation plan in terms of the National Environmental Management Act must include an air quality management plan (AQMP). Provincial and National environmental departments integrate AQMP into environmental implementation plan and environmental management plan. AQMP is required to assist government departments in planning the implementation of AQA, including financial provision and control measures (Government Gazette 2018; Naiker et al 2012:63). Additionally, each municipality is required to include AQMP in its Integrated Development Plan. The Municipal Systems act provides the municipalities with principles to follow on how IDP should be created and applied. These principles include community buy-in and involvement with all that are happening on the ground,

public participation, and the establishment of situations with community development projects to be identified by the community (Molepo & Maleka, 2018:761). However, in terms of including the AQMP in the Municipality' IDP, community participation is an integral part in ensuring that the objectives of the Municipality are achieved.

In the domain of the relevant municipality, province, or national department, AQMP must seek to give effect to air quality regarding chapter 3 of NEMA to the extent that it identifies and reduce the negative impact on human health and poor air quality in the environment. Also, it must seek to give effect to air quality to the extent that it is applicable and improve the quality of air. The effects of emission must be addressed from industrial sources, fossil fuels usage in residential applications, and any point or non-point source of air pollution. AQMP must seek to implement the obligations of South Africa in terms of international agreement and give effect to best practice in AQM (Naiker et.al, 2012:66; Cilliers, 2019:5). AQMP must also describe how the relevant municipality, province or national department will give effect to its AQMP and must comply as prescribed by the minister with other requirements Government gazette, 2012; 2018).

The declaration of Emalahleni region as a national air pollution hotspot termed the Highveld Priority Area (HPA) by the minister of environmental affairs and tourism in 2007 requires the national, provincial, and local governments to jointly take responsibility for assessing pollution levels and putting emission reduction plans in place in the area. Moreover, it is the duty of local authority (municipality) to take responsibility of measuring air pollutants and preparing AQMP for the area (Louren et.al, 2011:7; DEA 2012:45). AQMP is a dynamic process that includes the following six steps: goal setting, baseline air quality assessment, air quality management system (AQMS), intervention strategies, action plan implementation and evaluation & follow up (Setia et.al, 2015:412; Government Gazette, 2018; Anand, 2017).

#### **4.5.1 Goal setting**

Goals are referred to the development of interventions to achieve specific AQMP objectives (Government Gazette, 2018). Goals must be defined to reduce or prevent the detrimental effects of air pollution on human health, the natural environment, and the built environment. The air quality management goal is to minimize and control risks of air pollution.

It is essential to design effective air pollution control measures to reach air quality goals which might be to minimise ambient levels of pollutants or to stay below air quality standards. Government must set objectives for air quality with the aim to protect human health, vegetation and to maintain good air quality. Countries indeed need assistance in air quality goals setting that strive for the involvement of all stakeholders including the public in the mitigation of air pollution adverse health effects and goals that are grounded in scientific evidence. The WHO, Europe, North America as well as United State national ambient air quality standards can serve as a guide and will need robust technical guidance from the institutions (Amegah & Agyei-Mensah, 2017:739).

Knowledge of the applicable standards is vital when setting goals for air quality programme or management system and the duty of the Minister is to set air quality standards while the provincial government and the local government may set stricter standards by-laws (Government gazette, 2018:103). Further, public participation in setting air quality management goal would help in setting goals collectively and identifying the preventive measures of the detrimental effects of air pollution. Likewise, in Emalahleni, the success of community environmental participation and goal setting will be based on the community sufficient awareness of air quality issues. This is in accordance with Wang et.al, (2016:1470) study which indicated that public environmental participation success is dependent on sufficient awareness of issues about the environment.

#### ***4.5.2 Baseline air quality assessment***

Assessing the condition of air quality in the region of interest including the incumbent capacity for managing air quality is one of the steps in developing any AQMP. Baseline assessment allows for the understanding and identification of problems associated with air quality that inform the subsequent development of a management plan. It should provide information on the condition of air quality in the environment and detects the conditions and sources causing the air quality problems. It should also summarise the main issues to be addressed in AQMP and the AQM intervention to focus on. The officials who implement most of the responsibility for AQMP implementation must be identified as part of the baseline for AQMP (Government Gazette, 2015; 2018).

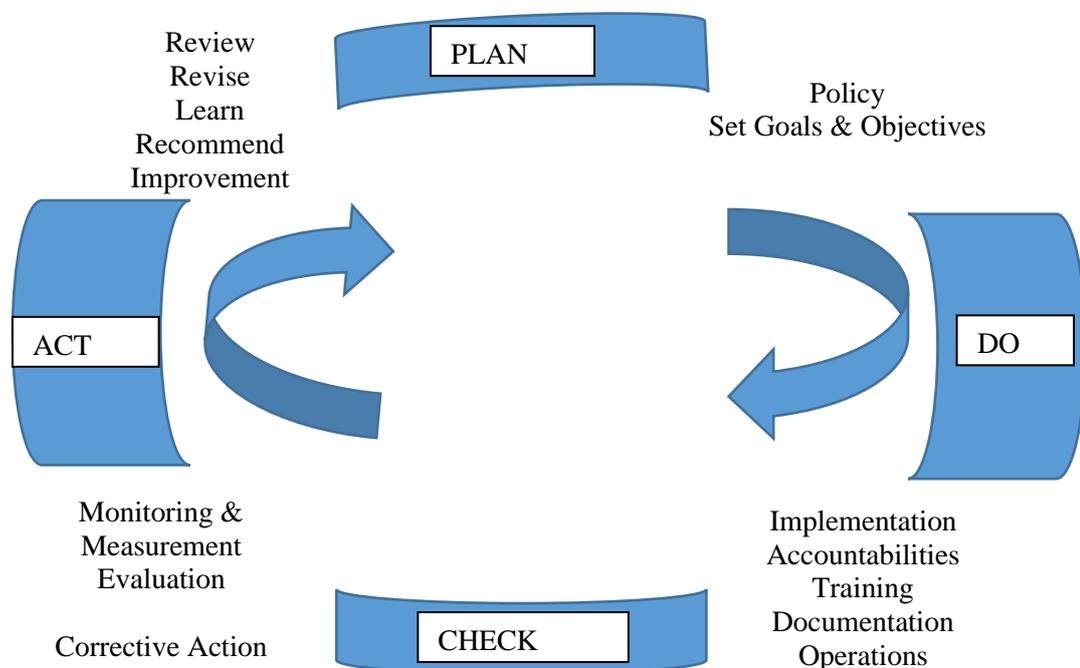
According to Lourens et.al, (2017:6), Emalahleni region has been identified as having the highest  $\text{NO}_2$  concentration in the world. In the Highveld Priority Area, the total annual emissions of particulate matter ( $\text{PM}_{10}$ ) are estimated at 279,630 tons, oxides of nitrogen ( $\text{NO}_x$ ) estimated at 978,781 tons and sulphur dioxide ( $\text{SO}_2$ ) estimated at 1633, 655 tons. The  $\text{PM}_{10}$  emission from the primary metallurgical industry contributes for 17% and 12% of the total emission from power generation while 73% of the total estimated oxides of nitrogen and 83% of sulphur dioxide emissions are from power generation. Assessing the state of air quality in Emalahleni is an important step towards air quality management, however, communicating strategically with the community on the condition of the environment, its detrimental effect and mitigation measures is much more important and can help to facilitate air quality improvement in the area. Limaye et.al, (2018:6), suggested that communicating certain exposure mitigation strategies can facilitate long-term air quality improvement. This study focuses on a comprehensive analysis of communication strategy that ELM is using to raise community awareness about air quality improvement.

#### ***4.5.3 Air quality management systems***

Air quality management by law aims at maintaining the ambient air quality at the acceptable levels for the health and well-being of people and the environment. The management programme should comprise of goals and objectives clearly defined and stated that would meet ambient air quality standards (Fuggle & Rabie, 2009). It must also identify air pollutants and their sources, assess ambient air level of pollutants, and aim to control pollutants that may exceed the permissible levels (Griffin, 2016). A number of air quality management tools and instruments are provided by the AQA and it includes the establishment of Priority Areas where ambient air quality standards may be exceeded. The tool enables effective limited AQM capacity concentration (technical, financial, and human) to deal with the identified problem areas to achieve measurable air improvements in the short, medium, and long term. It also enables cutting edge AQM methodologies implementation that takes all contributors to air pollution problem into consideration that is, air shed level management. It recommends a cooperative governance approach (Government gazette, 2012; 2015). Several basic principles which can be useful when setting up air quality management system are contained in the internationally recognised standards ISO 14001 Environmental Management System (EMS) (see figure 6).

The review of standard can benefit any practitioner considering developing, implementing, and managing air quality programme. An air quality management initiative should be guided by the principles of sustainable development involving the precautionary principle and polluter pays and pollution prevention principles. The interrelationships and the integration with other management programme and state functions should be acknowledged to achieve a successful air quality management programme (Welford, 2016). Furthermore, the inclusion of planning, health, energy, transportation, environmental management, and/or sustainable development by cross-sectional linkages of national, provincial, affected local departments and district should be considered. Programmes relevant and applicable to air quality management should also be considered. Additionally, sharing of information should be encouraged amongst the different stakeholders. The proposed steps should be built upon previous action taken and the interrelationship of different initiatives, strategies and policies should be recognised (Fuggle & Rabie, 2009). This in South Africa should include Integrated Development Plans, different state of energy, transportation, environment, reports for sustainable development and Spatial Development Plans (Woellner, 2017).

**Figure 4-6 ISO 14001 Environmental Management System**



**Source:** (Fuggle & Rabie, 2009)

Air quality management system is another important step that should be considered in terms of air quality management. Therefore, the community needs understanding and knowledge of this measure to facilitate community's support in improving air quality.

#### **4.5.4 Intervention strategies**

Targeting sources that contribute considerably to air pollution is an essential strategy for air quality improvement. Air pollution intervention could be based on technological and regulatory measures. The regulation could be complemented with the implementation of community and individual-level interventions (Giles, Barn, Kunzli, Romieu, Mittleman, Eeden, Allen, Carlsten, Stieb, Noonan, Smargiassi, Kaufman, Hajat, Kosatsky & Brauer, 2011:34).

In terms of technological interventions, it is necessary to identify plainly those technologies which are suitable to the selective removal of pollutants. Technological interventions can help to control emissions of air pollutants from various sources such as vehicle emissions, industrial emissions, domestic fuel burning and power generation. The technologies running costs, capital and operating efficiencies should be considered. Air pollutants emissions can be controlled by numerous technological interventions which could be at the end of the pipe, that is, after the process in which it is generated or at source by modifying the process that cause their formation (Griffin, 2016).

Regulatory measure (stricter air quality standards) is intervention which focuses on reducing health effects of air pollution at community level. Banning certain products such as sale of coal and regulating of practices such as toxic waste disposal are interventions which can be used at community level to reduce environmental health risks. Community level interventions are mainly location specific because the intervention focus on major sources of local pollution (Giles et.al, 2016:34). Individual level interventions are measures that focus on fostering individual change such as reducing exposure to pollution or use of cleaner modes of transportation (WHO, 2014). Individual level interventions are strategies to reduce individual baseline risk of situations associated with increased vulnerability to the effects of air pollution. Interventions aimed at influencing individual towards air pollution play a vital role when the focus is to reduce individual exposure and vulnerable groups to air pollution (Oltra

& Sala, 2015:362). Further, interventions implementation should be precise to the intervention and the targeted source or sources of emission. The rules for sequence of events and implementation must be agreed upon among the experts and participating government departments. Intervention's efficacy must be evaluated through measurement precise to the intervention. Example, emission monitoring for licence or emissions reduction or ambient monitoring for impact on residential sources (WHO, 2014).

The intervention strategies discussed above should be considered as technology can assist in emission reduction as well as regulatory intervention which focuses on reducing effect of air pollution at individual and community level. Therefore, communication can play a significant role in promoting awareness in Emalahleni regarding the intervention strategies and in fostering change on an individual and community level in terms of air quality improvement. Elshout (2014), suggested that communication indeed helps to raise awareness, and eventually can assist to influence people's behaviour and attitudes towards air quality improvement. However, there is need for strategic plan and application of communication by ELM to raise community awareness towards the practices of improving air quality. This study explores and describes communication strategies of ELM on promoting community awareness on air quality improvement.

#### ***4.5.5 Action plan implementation and evaluation and follow up.***

In South Africa when a priority area is declared by the Minister, the national air quality officer, and the provincial and municipal officers of the affected area after consultation with each other must prepare an air quality management plan within six months and submit to the minister for approval. This is called action plan implementation. In this effect, the air quality officers of the relevant provinces after consulting the national air quality officer and the air quality officers of the affected municipalities must jointly prepare air quality management plan for a priority area within six months. This should be as specified by the Member or Minister of the Executive Committee (MEC) and should be submitted to the MEC who was involved in declaring the area as a priority area. A consultative process should be followed that may need the air quality officer to amend the plan within a specified period by the Minister (Amegah & Agyei-Mensah,

2017:738). The air quality management plan must focus on coordinating air quality management in the area and the committee representing relevant role players will be responsible for the implementation of the plan (Bondarouk & Liefferink, 2017:733; Amegah & Agyei-Mensah, 2017:739; Cai, Wang, Zhao, Wang, Chang & Hao, 2017:198).

Action plan implementation needs a support from various stakeholders. Increasing people's awareness level who would be affected by the plan or have a direct impact on the plan is the first strategy in terms of action plan implementation (AlFaris, Juaidi & Manzano-Agugliaro, 2016:795). Therefore, it is necessary to get the community involved in air quality management planning through communication which could enable the community to share ideas and knowledge on the implement plan and the way forward on improving air quality. The next section discusses emission sources depicting how air pollutants are released into the environment.

#### **4.6 SOURCES OF EMISSION**

Understanding and controlling sources of air pollutants is key to good management of air quality. Air pollutants may be either released into the atmosphere which is known as primary air pollutants or formed within the atmosphere itself which is known as secondary pollutants. Primary air pollutants are those that are released from a source such as through suspension of contaminated dusts by wind, factory chimney or exhaust pipe into the atmosphere. Secondary pollutants arise from primary pollutants chemical reactions in the atmosphere, often comprised of natural components of the environment such as water and oxygen (Henneman, Holmes, Mulholland & Russell, 2015:201). Stationary sources comprise of industrial processes which are power station, refineries and smelters, home fires, transportation and naturally occurring sources which are veld fires, blown dust and sea salt. The following are four air emission sources of most significance to the health of human and ecosystem quality that are discussed in this section. These are power generation, Domestic fuel burning, vehicle emissions and industrial emissions (Henneman, 2015:202).

#### **4.6.1 Power generation**

The main source of pollution emissions in most countries is the burning of fossil fuels in stationary combustion plants. The greatest sources of combustion emissions have generally been power stations. In the developed world, much has been done to control the emissions from such sources. Examples are the use of emissions flue gas desulfurization from coal-fired power plants and burners producing low levels of nitrogen oxides (Lelieveld, Evan, Fnais, Giannadaki & Pozzer, 2015:367). Emissions from combustion plants can take place at a wide variety of altitudes, extending from ground level for most domestic boilers to heights of more than 300 metres for large power station chimneys (Lelieveld et.al, 2015:367).

In South Africa, coal has been used to meet the country's basic energy needs. A lot has been done by Eskom to reduce particulate matter emissions from its power station to reduce the impacts on human. However, the cost of addressing environmental impacts both regionally and globally is attributable to its large-scale emission of SO<sub>2</sub>, CO<sub>2</sub> and NO<sub>2</sub> and therefore, far believed to outweigh the damages caused (Henneman et al 2016:205). The single largest air pollutants source from stationary source is coal combustion with over 110 million tons of coal that Eskom used in 2005. The combustion of oil or coal for industrial energy requirements are other processes which fall into this category (including that for steam generation). This also include the combustion of wood chips and bark in the paper and pulp industry and coal gasification for metallurgical coke and syngas production (a combination of carbon monoxide and hydrogen used in the synthetic fuels production in Secunda) (Henneman et.al, 2016:205).

#### **4.6.2 Domestic fuel burning**

Another significant source contributing to poor air quality within residential areas is known to be domestic fuel combustion. It is likely that wood, coal and paraffin are used for cooking and space heating especially during winter by some households within local communities and/or settlements. Pollutants arising from wood combustion comprise of SO<sub>2</sub>, particulate matters and CO (Grobler & Bornman, 2018:17). In South Africa, bulk of residential pollution is a result of domestic coal consumption for space heating and cooking.

Since the advent of democracy, various poor households still rely on coal or wood for cooking, warm water, or space heating, despite the electrification of 2.5 million homes and this has major human health and air quality implications (Karagulian, Belis, Dora, Prüss-Ustün, Bonjour, Adair-Rohani & Amann, 2015:479). One of the four main causes of the burden of ill-health in the country is respiratory disease resulting from domestic fuel burning (WHO, 2014:17). The use of paraffin is still prevalent, with significant, albeit poorly characterized, impairment of indoor air quality. Emissions from domestic cooking and heating can normally be regarded as a ground-level source (Klausbryckner et.al, 2016:78).

#### **4.6.3 Vehicular emission**

Road transport is also the main source within any emissions inventory. Road vehicles emissions are usually thought of in terms of the exhaust. Petrol or diesel fuel combustion causes the production of exhaust gas involving a variety of potentially harmful pollutants (Bigazzi & Rouleau, 2017:112). Vehicle's emission can be grouped into primary and secondary pollutants. Primary pollutants are discharged directly into the atmosphere while secondary pollutants form in the atmosphere due to chemical reactions. Vehicle emission primary pollutants released by internal combustion engines involves SO<sub>2</sub>, CO<sub>2</sub>, NO, Pb and Particulates matters. Vehicle emission secondary pollutants comprise of NO<sub>2</sub> and photochemical oxidants such as ozone, nitrous oxides, sulphate, particulate matter, and sulphur dioxide (Grobler & Bornman, 2018:17) and carbon monoxide and soot in the case of diesel engines (Fuggle & Rabie, 2009). The pollutants spectrum is a function of state of maintenance, vehicle age and fuel type including driving habits (Grobler & Bornman, 2018:17; Bigazzi & Rouleau, 2017:113).

At the beginning of 2005, lead as a petrol additive was completely phased out and sulphur in diesel reduced from 5000 to 3000 ppm down to 500 ppm with ultra-low sulphur diesel available at a maximum concentration of 50 ppm on the Highveld (Kodjak, 2015; Zhang & Day, 2015). In South Africa, roadside checks are occasional and are conducted at random by local authorities monitoring pollution. Any polluter that is caught is given notice to repair the vehicle and make it available at a specified period for inspection.

Legal action is instituted for failure to comply with the notice (Zhang & Day 2015; Kodjak, 2015). Vehicles regulatory limits have been set by the US Environmental Protection Agency, the European Union, the State of California, and Japan. Emission standards of exhaust are set as limits in grams per mile or grams per kilometre of pollutants released over a standard driving cycle (Bigazzi & Rouleau, 2017:114).

#### **4.6. 4 Industrial emission**

Numerous industrial and chemical processes lead to pollution generated by processes other than burning or gasification. Such pollutants like nitrogen and phosphorus compounds from fertilizer production, alkali metals and fluorides from ferro-alloy industries and organic vapours from chemical production should be considered and taken control of (Wang, Zhang, Schauer, de Foy, Guo & Zhang, 2016:1468).

A wide variety of industries and industrial processes cause air pollutants emissions, both the classical pollutants but also more esoteric pollutants that may arise from leakage of an intermediate or from chemical plant product and may be specific to a certain industrial process (Devinny, Deshusses Webster, 2017). The operations of many industries also generate fugitive emissions. These are emissions arising from other less defined sources, typically the wind blowing of raw materials from stockpiles, and however, to quantify these are much more difficult. Example is that of secondary metal smelters, of which many have been operational for many years and led to significant contamination of the site and local area when emissions were far less carefully regulated than at present (Devinny et.al, 2017). The emission sources that are identified and discussed above that contribute to emissions in Emalalheni and South Africa generally must be brought to the attention of the community to be familiar with these sources and what is required to control the emissions.

#### **4.7 PRIORITY AREAS AND PRIORITY POLLUTANTS IN SOUTH AFRICA**

A priority area (hotspot) is an area where long-term average concentrations of one or more air pollutants are constantly high compared to the city's other areas, hence, imposing a potential excess burden of health risk.

A hotspot is categorised by spatially localised increases in concentrations that are quite consistent over time (Moran & Kanemoto, 2016:940). A specific area may be declared as a priority area (hotspot) by the MEC if there is a belief that ambient air quality standards are being exceeded or may be exceeded in the area or is a situation which is causing a significant negative effect on air quality in the area and that the area needs specific management action of air quality to resolve the situation (Government Gazette, 2018:114). Priority air pollutants include: sulphur dioxide, carbon monoxide, particulate matter, nitrous oxides, volatile lead and ground-level ozone whereas hazardous pollutants include volatile organics such as benzene, polycyclic aromatics such as dioxins and furans and heavy metals such as arsenic and mercury (Government Gazette, 2018:114; Moran & Kanemoto, 2016:940).

In South Africa, several areas have been identified as air pollution hotspots, these include the Vaal Triangle, South Durban, and Highveld of Mpumalanga (Naiker et.al, 2012; DEA, 2012:28), and Waterberg Bojanala (Government Gazette, 2018:114; Lourens et.al, 2011:7). The Highveld region in South Africa is linked with poor air quality and high concentrations of criteria pollutants that take place because of concentration of industrial and non-industrial sources (Government Gazette, 2015). The Highveld Priority Area comprises of part of the province of Gauteng and Mpumalanga with one metropolitan municipality, three district municipalities and nine local municipalities. The Highveld declared Priority Areas include: Lesedi, Govan Mbeki, Dipaleseng, Lekwa, Msukaligwa, Pixley Ka Seme, Delmas, Emalahleni and Steve Tshwete municipalities (Government Gazette, 2018:113). In 2007, the Minister of Environmental Affairs and Tourism declared Emalahleni region as national air pollution hotspot called the Highveld Priority Area (HPA), (Government Gazette, 2018:113; Lourens et.al, 2011:8). When the MEC or the minister declared a priority area, an air quality management plan must be prepared within six months of the declaration after the national air quality officer must have consulted the relevant officer of the affected municipality and province. The MEC must follow a consultative process before approving a priority area air quality management plan and may need the air quality officer to amend the plan within a period determined by the MEC. The air quality management plan must focus at co-ordinating the area's air quality management and provide the committee representing the relevant role-players with implementation of the plan (Government Gazette, 2018:113).

It is argued that communication can play a major role in engaging the relevant officers and community members in the implementation of the air quality management plan for Emalahleni as an identified priority area. However, the need of how to communicate strategically by the Municipality to engage and raise community awareness regarding air quality and acting in ensuring air quality improvement in the area must be considered. Therefore, the purpose of this study is to assess community awareness on air quality through the communication strategies that ELM is using to disseminate information with the aim to raise awareness on how to improve air quality.

The subsequent section lays emphasis on the South African ambient air quality standards set at the national, provincial, and local levels.

#### **4.8 SOUTH AFRICAN NATIONAL, PROVINCIAL AND LOCAL AMBIENT AIR QUALITY AND EMISSION STANDARDS**

Provision is made by AQA for the setting of ambient air quality standards and limits of emission at national level which provides the objectives for management of air quality. The AQA as effects-based legislation requires that activities that cause atmospheric emissions be determined with the aim of achieving health-based ambient air quality standards. Each proposal of new development with potential effects on air quality must be assessed regarding additive contribution to baseline ambient air quality and individual contribution (Government Gazette, 2018:80). In terms of national standards, substances must be identified by the minister through concentrations of ambient, bioaccumulation, deposition that present a threat to human health and well-being or the environment or which is believed by the minister to present such a threat in any way. The minister must establish national standards for ambient air quality in respect of each of the substances or mixtures of substances including permissible amount or concentration of each of such substances or mixtures of substances in ambient air. The minister may establish emissions national standards from point, non-point or mobile sources in respect of each of those substances or mixtures of substances (Government Gazette, 2018:81). The national framework for air quality management which aims to achieve the objectives of AQA serves as a blueprint for AQM (Naiker et.al, 2012:65). The South African national ambient air quality standard is shown on table 4.2 below.

**Table 4.2 South African national ambient air quality standards**

<b>National ambient air quality standards in mg/m<sup>3</sup> with the permitted number of exceedances in brackets and compliance dates</b>						
Pollutants	Averaging periods					
	10min	1-h	8 hour running mean	24-h	1 year	Compliance dates
Carbon monoxide		30 (88)	10 (11)			Immediate
Sulphur dioxide	500(525)	350(88)		126(4)	50(0)	Immediate
Nitrogen dioxide		200(88)			40(0)	Immediate
Ozone			120(11)			Immediate
Lead					0.5(0)	Immediate
Particulate matter (PM10)				120(4)	50(0)	Immediate-31 Dec 2014
				75(4)	40(0)	1 Jan 2015
Benzene					10(0)	Immediate-31 Dec 2014
					5(0)	1 January 2015

**Source:** (Naiker 2012:66; Government Gazette, 2009:8).

Regarding provincial standards, substances in ambient air must be identified by the MEC through ambient concentrations, bioaccumulation, deposition that present a threat to health and well-being of people, or the environment in the province or which is believed by the MEC to present such a threat in any way. The MEC must establish provincial standards for ambient air quality in respect of each of the substances or mixtures of substances including permissible amount or concentration of each of such substances or mixtures of substances in ambient air.

The MEC may establish emissions national standards from point, non-point, or mobile sources in respect of each of those substances or mixtures of substances in the province or any geographical area within the province. If national standards have been established for certain substance or mixtures of substances, such national standards may not be altered by the MEC except by establishing stricter standards for the province or any geographical area within the province (Government Gazette, 2018:83; Naiker et.al, 2012:66).

In terms of the local standards, substances or mixtures of substances must be identified by the municipality regarding a by-law, through ambient concentrations, bioaccumulation, deposition that present a threat to health, well-being, or the environment in the municipality or which is believed by the municipality to present such a threat in any way. The municipality must establish emission local standards in the municipality from point, non-point, or mobile sources (Government Gazette, 2018). If national or provincial standards have been established for certain substance or mixtures of substances, such national or provincial standards may not be altered by the municipality except by establishing stricter standards for the municipality or any part of the municipality (Naiker et.al, 2012). The AQA has made provision for local and provincial governments to control pollutants not addressed by national standards, or to develop stricter standards (Government Gazette, 2018:84; Naiker et.al, 2012:66).

Therefore, a strategic plan of communication is required by ELM to promote awareness of air quality and facilitate compliance to South African ambient air quality standards. This study explores and describes communication strategy around awareness raising on improving air quality.

#### **4.9 AMBIENT AIR QUALITY MONITORING IN SOUTH AFRICA**

Ambient and source monitoring is the requirement of AQA. The role of monitoring air quality either ambient or source monitoring is to provide information on air pollution concentrations either in the environment or incoming, or both and for the planners, public, scientists, and policymakers to make better informed decisions about managing and improving the environment (Government Gazette, 2015; 2018:83). The scientific basis for developing strategies and policies, assessment of compliance, setting objectives and planning and supporting enforcement is provided through

monitoring. The determination of hotspot or verification of compliance near a known source can be achieved through air quality monitoring. Monitoring alone does not adequately define the environmental or human exposure to air pollution. But it integrates other assessment techniques, including emissions inventories, modelling, mapping, and interpolation (Marc, Tobiszewski, Zabiegala, de la Guardia & Namiesnik, 2014:4). In South Africa, the local government and industry have invested significantly in monitoring infrastructure of air quality since the mid-1990s due to specific air pollution episodes focusing the attention of the public on the harmful effects of air pollution. This is because of following the enactment of the AQA which promotes monitoring of air quality (Government Gazette, 2018:88). In U.S and other countries including South African, monitoring provides data to determine the National Ambient Air Quality Standards compliance (NAAQSs) for categories of criteria pollutants in air quality control areas or portions thereof (Godish, 2016). It is used to determine long-term trends and human exposures, support the Air Quality Index program and emissions reduction programs. It is also used to determine emission control programs effectiveness and to support environmental assessment including degradation of watersheds and visibility impairment (Godish, 2016).

Additionally, the constant application of monitoring techniques in a country also enables a more fair and rigorous comparison of levels of pollutant in diverse cities, thereby allowing governments to recognise those areas that have the most severe problems of air quality. The monitoring method whether manual, automatic or semi-automatic used for each pollutant should be a reference method or standard or be validated against such methods (Marc et.al, 2014:5). Monitoring networks should be designed for the public and the decision-makers to be informed on the exposures of the population to pollutants.

Air quality monitoring network is designed mainly to ensure effective regulatory compliance in most developing countries. A site located at a clean area in the city of interest should be included in the monitoring networks as the levels of air pollution at the site could be regarded as background levels for the monitored pollutant and therefore may serve as a control (Gulia, Shiva Nagendra, Khare & Khanna, 2015:286). Information provided through monitoring networks can be utilised as an input for assessments of exposure and health impact. `

It can also be used for quantifying trends to identify problems or progress, designing policies, and setting priorities, developing, and validating modelling tools and informing people about air quality (Gulia et. al, 2015:286). Air quality monitoring involves various individual pollutants measurements over time at different locations in organised systematic programs. Measurements of concentration are done from samples of small volumes of ambient air. Moreover, pollutants are collected in a sampling medium or in automated constant systems where the pollutants are drawn through a sensing device to determine concentrations (Marc et.al, 2014:5). There are about 130 government owned monitoring stations in South African. A range of pollutants such sulphur dioxide, particulate matter (both PM<sub>10</sub> and PM<sub>2.5</sub>), ozone, lead, carbon monoxide, oxides of nitrogen and nitrogen dioxide are being monitored by the stations (Gwaze & Mashele, 2018:3). Approximately, 60 stations are reporting live to South African Air Quality Information System (SAAQIS) each month (Gwaze & Mashele, 2018:4; Gwaze, 2017).

In the Highveld Priority Area, the established monitoring stations were located at Middelburg, Emalahleni, Ermelo, Secunda and Hendrina. Unfortunately, the monitoring station established by the municipality at Ferrobank in Emalahleni in the early nineties was vandalised and all equipments were stolen because of lack of security (Emalahleni Local Municipality 2015). In terms of the above discussion, it is understood that monitoring provides information on concentrations of air pollution that enables decision makers and the public to make better informed decision about air quality management. However, the Emalahleni Municipality needs to ensure that air quality monitoring information is strategically communicated to the community to improve community understanding about the state of air quality and be involved in making informed decision on how to improve air quality in the area.

#### **4.10 COMPLIANCE MONITORING**

An essential aspect of the environmental governance is that of ensuring compliance with the requirements of air quality management as specified in the relevant South African legislation. In South Africa, the national, provincial, and municipal government have their responsibilities in terms of environmental compliance monitoring. National responsibilities relate to responsibility regarding international commitments and compliance monitoring with the national Priority Area AQMPs goals and with situations

relevant to air quality contained in the national government issued Authorisations. Compliance monitoring in terms of provincial responsibilities is done by Air Quality Officer (AQO) with the targets stated in AQMP of the province and compliance reporting in the annual report. Regarding municipal responsibilities, compliance monitoring and requirements reporting in terms of AQMP is done by the municipal AQO that are consistent with national and provincial requirements. At municipal level, compliance monitoring deals mainly with Atmospheric Emission Licences and licences are used as key means of ensuring compliance with ambient air quality standards. Compliance monitoring aims to identify any application for an atmospheric emission licence or for variation or transfer or the renewal of such licence to ensure that it does not contain misleading or false information. It ensures that any information provided to an air quality officer does not contain misleading and false information (Government Gazette, 2015; 2018:95)

The determination of compliance with standards and norms is an essential element in environmental management as it aims to identify illegal activities, any reasonable steps to prevent emission, monitor compliance with directives to implement or submit a pollution prevention plan and an atmospheric impact report. Compliance with requirements for emission reporting according to the regulations developed regarding section 12(b) and (c) are monitored. Compliance with notification requirements in terms of mines that are likely to cease operations within five years period and National dust regulation are also monitored. Compliance with the emission standards set out for activities identified as controlled emitters in respect of section 23 and facilities that have been issued with an Atmospheric emission Licence (AEL) are monitored (Government Gazette, 2015; 2018:95).

With the discussion above, one can argue that there is need to accelerate compliance on air quality management requirements in South Africa and Emalahleni in particular. However, there is need for an appropriate plan and application of communication to raise awareness of South Africans and Emalahleni residents specifically on the air quality management compliance requirements which are in place in South Africa.

#### **4.11 EMISSIONS INVENTORY**

Emissions inventory is the main and important tool for air quality management. It is a database of what pollutants are being discharged, by whom, where and when the pollutant is being discharged and in what quantities. It provides information on the emission and the source and helps to monitor progress. It is a modern, comprehensive listing, by source, emissions of air pollutant connected with a particular geographic area for a certain time interval (Olvera, 2019; Griffin, 2016). It contains information on the need for an inventory, emission estimates by source summary, geographic area covered is described and the source that is not involved in the inventory is identified. The major sources in the study area can be identified and have the best solution for clean air action through emission inventory (Olvera, 2019). Also, emissions inventories and emission factors are the fundamental tools for managing air quality. The development of emissions inventories is the main and critical initial step in the management strategy of air quality which include the database of where and when pollutants are being emitted and in what quantity and by whom. Emission factor tries to relate the quantity of a pollutant released to the atmosphere with an activity linked with the discharge of the pollutant (Gulia et.al, 2015:7).

Emission inventory can also be used for the purpose of meeting legal requirements, air quality management plans compilation and for providing input for assessment studies on human health risk (Zhang, Lin, Chen, Zheng, Li & Ding, 2017:222; Griffin, 2016). However, the existence of a robust emission inventory is important for the achievement of an efficient air quality management in Emalahleni.

#### **4.12 ATMOSPHERIC EMISSION LICENCES (AEL)**

A significant control tool for air quality management is the licensing of emitters. The implementation of atmospheric emission licensing system is the obligation of the metropolitan and district municipalities that must perform the functions of a licensing authority. The provincial organ may be regarded as the licensing authority in the municipality if a metropolitan or district municipality has delegated its obligations of licensing authority to a provincial organ of state. The provincial organ may also be regarded as the licensing authority in cases where the municipality is the applicant (Naiker et.al, 2012:66). Licensing is used to regulate emitters that conduct listed activities that produce substantial atmospheric impacts.

AEL stipulates other operation conditions such as review periods and penalties for non-compliance and necessary monitoring procedures. To apply for AEL's, the applicant may be required by the licensing authorities when reasonable to obtain and provide a licence by a certain date and may carry out its own investigation on the possible effect of the proposed licence on air quality. AEL's must also establish time frames for reporting and measurement (Government Gazette, 2018:111).

As the local authorities are responsible for issuing AEL's, monitoring compliance would be effectively implemented locally. Similarly, the community needs to be knowledgeable and aware of any air quality improvement program like AEL's, and more importantly to understand that emitters are regulated on activity that can produce significant environmental impacts. However, the need to examine how ELM plan and employ their communication strategic in ensuring that awareness on air quality improvement is promoted in the community led to embarking on this study.

#### **4.13 CONCLUSION**

This chapter discussed the overview of air quality and the South African legislations and policies which focuses on the issues of air quality improvement. It discussed several measures that have been taken by South African government generally and ELM in ensuring that air quality is maintained to the national ambient air quality standards. The next chapter focused on the research methodology.

## **CHAPTER 5: RESEARCH METHODOLOGY**

### **5.1 INTRODUCTION**

This chapter discusses the research methodology that was used to assess communication strategies that ELM is using to raise community awareness on air quality. It discusses the research paradigm presenting the interpretivist ontological and epistemological assumptions regarding what can be discovered as reality in social science research and what should be known about it. It also discusses the positivist ontological and epistemological assumptions in terms of the nature of reality and what should be known about it. It further discusses the research design, data collection techniques, unit of analysis, population and sampling methods, the validity and reliability, credibility and trustworthiness, ethical issues and data analysis and interpretation.

### **5.2 RESEARCH PARADIGM**

Researchers have their views of what constitutes reality and knowledge. These views shape the way researchers think, their beliefs and assumptions concerning the society and themselves and how they view the world around them, which is called a paradigm by social scientist (Yanow & Schwartz-shea, 2011; Saks & Allsop,2013; Wagner, Kawulich & Garner, 2012:53). A paradigm is informed by assumptions of philosophers concerning three things that define the nature of their enquiry. These are respectively known as “ontology (what is believed about the nature of reality?); epistemology (what can be known about it?); methodology (how should one study the world?)” (Wagner et.al, 2012:53).

The interpretivist paradigm is concerned with studying and understanding the world as it is experienced by others. The interpretivists hold that in order to understand social action the social scientists have to understand the common sense constructs that individual use to make sense of the world and that drives their actions (Yanow & Schwartz-shea, 2011; Saks & Allsop, 2013). Interpretivist paradigm is different from positivist paradigm about assumptions on the nature of truth and what counts as knowledge and their role in the process of research (Saks & Allsop, 2013; Wagner et.al, 2012:55).

Interpretivist uses qualitative method and is concerned with subjective experiences of people, how individuals construct the social world by sharing meanings, interacting, and relating to each other (Yanow & Schwartz-shea, 2011). The interpretivist tries to establish an understanding of experiences and lives of people by capturing the subjective meaning of social actors (Morehouse, 2011). Saks and Allsop (2013) argue that interpretivists believe on the principle that all knowledge derives from people perceptions and therefore research must consider how human subjects understand the world. The interpretivist believes that statement on what is reality or false are bound by culture, context and historically dependent, though some may be universal (Saks & Allsop, 2013; Wagner et.al, 2012:55).

The interpretivist ontological assumption about “the nature of reality holds that there are multiple intangible realities constructed by people and that reality is socially constructed and depends on the mind of the individual (Morehouse, 2011; Wagner et.al, 2012:56). Therefore, based on the interpretivist ontological stance, there will be multiple realities that will be discovered about the research topic based on social construct and on the individual mind or experiences of the participants and cannot be generalised into a single common reality. On the question of what counts as knowledge, the interpretivist epistemological assumption hold that knowledge is subjective and is a social construct and depends on the mind of individual (Wagner et.al, 2012; Arghode & Vishal, 2012:155). Therefore, the study will discover subjective knowledge constructed by the participants based on their personal construct and experiences. The reason for employing interpretivist approach in this study was to understand the participants’ multiple perspectives or experiences of the phenomenon as well as the subjective meaning constructed by the participants as communication should serve to transmit meaning.

The positivists’ paradigm on the other hand uses quantitative method and believe that the only way to establish fact and objective reality is through scientific approach. The positivist researchers aim to gather and interpret social realities scientifically and objectively to ascertain the laws that govern the social life (Saks & Allsop, 2013; Yanow & Schwartz-shea, 2011). The positivist aim is to discover objective realities on the natural world. The researchers are of the view that science is the only foundation for real knowledge (Yanow & Schwartz-shea, 2011; Arghode & Vishal, 2012:156).

The positivist is of the view that knowledge is acquired by discovering the scientific and social laws that govern the world by establishing the realities concerning the phenomenon being investigated and drawing conclusions (Saks & Allsop, 2013). Further, according to the positivist, the techniques, methods, and procedures utilised in natural sciences provide the best framework for studying the social world.

The positivist ontological assumption believes that there is one tangible reality that is constant across time and setting that should be discovered by a researcher (Morehouse, 2011, Wagner et.al, 2012:53). The positivist epistemological assumption holds that knowledge is in-built in the natural science and is those statements of truths and beliefs that can be empirically tested, verified, confirmed, or disconfirmed and are constant and can be generalised (Wagner et.al, 2012; Arghode & Vishal, 2012:157). The positivist assumption also hold that knowledge is objective and does not depend on the researcher's interest and feelings (Wagner et.al, 2012:53). Based on the positivist ontological assumption, one can say that employing scientific method facilitated in discovering an objective reality in this research which can be generalisable. In terms of the positivist epistemological assumption on what counts as knowledge, one has to say that the use of scientific method through empirical testing of the research assisted to achieve objective knowledge and reality of the phenomenon without the researcher's interest and feelings. Therefore, the positivist approach was used to investigate the phenomenon scientifically to discover a single objective truth and knowledge about the research and to ensure that accurate inferences are drawn from the results of the research.

There are many research paradigms, however, the two paradigms discussed above are most appropriate to this research. This is because the paradigms are considered as the best way of investigating the topic under study. The paradigms are also most closely related to the way the researcher think about the study. The school of thought that combines these two paradigms is called critical realism. born out of the contention between positivists and interpretivists.

### 5.3 RESEARCH METHOD

There are various research methods used in social research which could be multi-method research or mixed methods research (Creswell, 2014; Wagner et.al, 2012:161). This study employed mixed methods research. Mixed methods is known as the research in which the researcher gathers and analyses data, integrates the findings and draws conclusions using both qualitative and quantitative methods in one study (Creswell & Clark, 2011; Wallace, Clark & White, 2012; Creswell, 2014; Wagner et.al, 2012:162). Priority can be given to either qualitative method or quantitative method or to both (Johnson & Christensen, 2017). It involves the combination of data at one or more stages in the research process (Creswell, 2014; Schoonenboom & Johnson, 2017; Johnson & Christensen, 2017). In mixed methods research, data can be collected sequentially or concurrently (Creswell, 2014; Creswell & Clark, 2011).

In this study, an exploratory sequential mixed methods design was used which is referred to as an approach where qualitative and quantitative data are gathered one after the other (Johnson & Christensen, 2017; Creswell & Plano, 2011). This is when a researcher tries to explore qualitatively first and then test the exploration with a huge quantitative population' sample (Creswell & Clark, 2011; Wallace et.al, 2012; Schoonenboom & Johnson, 2017). Qualitative data was gathered and analysed in the first phase and then the results were used to identify items for a questionnaire that was tested further quantitatively in the second phase (Schoonenboom & Johnson, 2017; Given, 2012:527). This method was employed to follow up on the first exploratory findings (Creswell & Clark, 2011). Also, the findings of the qualitative data informed the quantitative data gathering in conjunction with literature (Creswell, 2014; Schoonenboom & Johnson, 2017).

An exploration is required when variables are not known or when no guiding framework is available (Wallace et.al, 2012). It is added that it is appropriate to identify variables to test quantitatively when the variables are not known (Saint & Fetters, 2011:310; Schoonenboom & Johnson, 2017). As such, priority was given to qualitative method as it helped to establish the variables that were unknown, and which were tested through quantitative method (Johnson & Christensen, 2017). Therefore, a sequential mixed methods design was chosen to develop better instruments to measure the phenomenon as the exploration of the study qualitatively first and further

tested it quantitatively helped to confirm qualitative findings with that of quantitative findings. This research methods led to better validity of the research as the study collected data that was supposed to be collected and can yield the same results when retested in the same conditions. It also ensured the transferability of the study to another context by also testing it qualitatively.

By employing sequential mixed methods, interviews and questionnaires were used in this study for the following reasons: The research purpose and the research questions required the use of interview and questionnaires to provide in-depth description and quality measurement of the topic under investigation (Schoonenboom & Johnson, 2017). Therefore, one has to say that in terms of the interview, interpretivist approach which uses qualitative method was utilised to gather rich and in-depth information and establish understanding of the participants' experiences through capturing various subjective realities and knowledge of the participants regarding the phenomenon. In terms of the questionnaire, positivist approach which uses quantitative method was employed as it enabled accurate description and quality measurement of construct and discovering of objective reality and knowledge by empirical testing of the respondents using scientific method.

#### **5.4 DATA GATHERING TECHNIQUES**

This study used survey method in form of interviews and questionnaires as the data collection methods. Survey research is frequently used to collect data from large groups of individuals in a quite short period of time (Wagner et.al, 2012:100; Eleftheriou, 2013). Only survey questionnaires were administered to the community members while interviews were conducted with the officials of ELM. The reason for the choice of conducting interviews only with the ELM officials was because of the nature of the research questions which was directed to the officials that will need in-depth collection of information from the officials based on their experiences, personal construct, and knowledge of the topic. Another reason was due to time constraints. Regarding interpretivist approach, qualitative method and the related data collection instrument helped to establish and understand subjective meaning and personal construct of the officials and helped to provide in-depth description and explain awareness of the community on air quality by means of communication strategies that ELM is using.

That is to say that findings of the study generally relied on detailed descriptions that assisted in explaining the phenomenon being investigated based on the personal construct and meaning that was provided by ELM. In addition, the meanings communicated by the participants about the phenomenon was understood by exploring participants with a conversation like approach.

For the quantitative data collection method, online questionnaires via WhatsApp application were utilised in this study. The questionnaire was designed using Google Form and administered through WhatsApp application. Since positivist paradigm rely on objectivity in data gathering, the quantitative instruments that were utilised in data collection were selected to reduce potential bias and error thereby providing accurate description and consistent data and truthful findings.

The online questionnaire that was designed using Google Form was administered to the community members via whatsapp application. This type of quantitative data collection technique was chosen because it enabled an immediate high return rate (Aziz, Nawawi & Ariff, 2018:2). According to Devellis (2016), whatsapp application is an appropriate data gathering method that results to high quality data that can lead to data accuracy and consistency. It automatically captures data which can be analysed immediately without the danger of errors. It is also more cost effective, saves time, and reduces bias (Sekaran & Bougie, 2013; Szolnoki & Hoffmann, 2013; Hair, Ringle & Sarstedt, 2016; Wagner et.al, 2012). Also, this method of data collection reduces missing data. This means that the customised forced menu in online tool makes it possible to answer a particular question before moving on to another question (Hair, Ringle & Sarstedt, 2016).

Moreover, the choice of designing the questionnaire using Google Form and administer via WhatsApp Application was on the basis that the study by Wood, Moorhouse and Knight (2019:2) have identified that 1.2 billion people are active users of whatsapp worldwide since the past three decades. Research conducted in Malaysia on the perception of facility managers through instant message via Whatsapp Application indicated that the application dominates consumers' smartphone in Malaysia as 60% of the population uses Whatsapp (Aziz et.al, 2018:4). The same study by Wood et.al, (2019:3) that conducted research on the use of whatsapp as an alternative means of learning to enhance the access of clinicians to specialised

management on cases of HIV and TB in South Africa found Whatsapp as an effective technique of communication. Another survey study that collected data via Whatsapp Application showed that it is very easy to interact with the sample at any time when necessary (Plana, Escofet, Figueras, Gimeno, Appel & Hopkins, 2013).

Additionally, the online questionnaires are more appropriate to this study now due to covid-19. In response to South African Disaster Management Act: government regulation of social distancing and Unisa covid-19 research ethics committee guidelines, online questionnaires were applicable for this study (South African Government, 2020; University of South Africa, 2020).

The questionnaires had closed-ended questions with a 7-point Likert scale format ranging from strongly disagree, disagree, somewhat disagree, neither agree nor disagree, somewhat agree, agree, and strongly agree which was administered to adult community members that were recruited individually from community WhatsApp Group by the group administrator (Formplus Blo, 2020; Cummings, Kohn & Hulley, 2013; Zohrabi, 2013). Several studies have revealed 7-point Likert scale to be more accurate and easier to use and a better reflection of true evaluation of respondents (Ong 2012; Huang, Bowling, Liu & Li, 2015; Finstad, 2010).

The questionnaire was developed from qualitative results and by reviewing and generating questions from the literature. It comprised the list of interesting things reported in the literature that needed to be known. The questionnaire containing Likert-scale questions made provision for other responses.

To ensure participants' confidentiality and anonymity of information that was provided, the researcher approached one of the councilors of Emalahleni for permission letter and when it was granted the researcher approached the Whatsapp group administrator who shared the questionnaire debriefing to the people in their personal Whatsapp inbox and recruited the people. The Whatsapp administrator also shared information sheet and consent form to the people. After that, the link of the questionnaire was sent to the administrator who forwarded it in the personal inbox of the people that agreed to participate in the study. When the people were done completing the questionnaire and click the submit button their responses went straight to the researcher's Gmail account.

The administrator distributed a total of 385 questionnaires to the recruited community members. Section 5.6.4 below showed how the sample size was calculated. A similar study conducted in Kenya on community perception and awareness of air quality used a sample size of 384 which is almost the same sample size with this study (Omanga, Lisa, Zekarias & Michael, 2014).

Online questionnaires were sent to at least 385 respondents who were recruited from three towns of Emalahleni. The Emalahleni main towns consist of eMalahleni, Ogies, Ga-Nala and Kwa-Guqa. The URL link to the online questionnaires which comprised of 20 questions linked to the research questions was sent to the respondents. The questionnaires were developed in line with the research questions and the literature.

For the interviews, semi-structured telephone interviews were utilised in this study, they were conducted with the Municipality officials. By using semi-structured type of interview, interview guide was formulated that enabled the researcher to set a list of basic questions that describe the line of inquiry, but participants were allowed to respond in their own way (Wagner et.al, 2012:102). Interview questions were formulated considering items that need to be investigated and from literature review.

This type of interview was chosen as it enabled the gathering of large amounts of data in a shorter period. This means that it took less time to discover a deeper insight within a short period (Priority Metrics Group, 2020; Wagner et.al, 2012:102; Szolnoki & Hoffmann, 2013). It also allowed probing and the gathering of more responses and in-depth information from the participants' experience by treating the question just like a discussion (Priority Metrics Group, 2020; Devellis 2016).

Semi-structured interviews with open-ended questions were conducted with participants from officials of ELM in the department of environment and waste management and communication department, respectively. The open-ended question enabled the participants to respond flexibly in their own words (Cummings, Kohn & Hulley, 2013; Newcomer Hatry & Wholey, 2015). The questions made provision to elicit other responses. The officials were approached before the research proposal was written and were informed about the study, the aim of the study and that participation in the study is voluntary. To ensure participants' confidentiality and anonymity of information that was provided, the researcher approached the manager of Emalahleni local Municipality for permission letter and contact details of participants.

When permission was granted, the researcher approached the manager of environmental and waste management department who shared the interviews debriefing and recruited the participants for the researcher. The researcher then sent information sheet and consent form to the manager's email who forwarded them to the participants. After that, the researcher went to the manager's office and collected the completed consent form and made arrangement with the manager for the day of interviews with those who agreed and completed the consent form to participate in the study. The researcher got the phone numbers of the participants from the manager and phoned the participants for interviews.

Seven questions were developed in line with the research questions in conjunction with literature. The questions of the interviews and questionnaires started from demographic information and end up with specific to general questions.

Before the actual questionnaires administration and conducting of interviews, pre-testing of the questionnaire and the interview were conducted to ascertain if there will be any problem with the research questions. A pilot study was conducted with small group of the interview participants and survey respondents to identify the potential problem with the research instruments. On the day of the interview, the participants were reminded again about who the researcher is, the topic of the study, the aim of the study and were assured of their confidentiality and that they will not be harmed in any way, although these have been addressed in the consent form and information sheet. After conducting the interview and questionnaires, data was securely saved in the dropbox using a password. Also, after the collected data was transcribed, it was entered into an excel spread sheet and was saved using a password.

## **5.5 RELIABILITY AND VALIDITY AND TRUSTWORTHINESS**

Reliability and validity which are mainly linked with quantitative research as well as credibility and trustworthiness which are associated with qualitative research must be considered in a research to ensure truthful, accurate and dependable measurement (Heale & Twycros, 2015:66; Middleton, 2019). In quantitative research, data are collected through measuring scales and observations but depends on whether the methods of collecting data are gathering the data that is intended to be gathered and

whether the data will yield the same results every time it is used under the same situations with the same respondents. This is about research reliability and validity in quantitative research. (Wagner et.al, 2012:80; Heale & Twycros, 2015; Drost, 2011:67). Reliability is concerned with consistency of measurement and/or the degree to which findings are repeatable. A measurement can be considered reliable if the same result can be consistently achieved by employing the same methods under the same situations (Middleton, 2019; Wagner et.al, 2012:80; Walliman, 2011:179). This applies both to entire outcomes of the study and to scores on measures of individuals. Reliability is a very valued criterion that shows the conclusiveness and accuracy of results in relation to the positivists who believe in studying a constant and unchanging truth (Drost, 2011:105).

Validity focuses on measuring what is supposed to be measured and the extent to which research conclusions are sound ((Heale & Twycros, 2015:67; Middleton, 2019; Wagner et.al, 2012:80; Drost, 2011:105). It is concerned with accuracy of measure. Middleton (2019) asserts that a research that has high validity shows that it yields results that correspond to true characteristics, properties variations in the social or physical world.

Experimentalists and quantitative researchers usually plan studies by recognising a set of certain validity threats in advance, and then adjusting for these. Such researchers usually employ experimental arrangements, tested, and tried measures and statistical method to ensure that truthful inferences can be drawn from the findings of the research (Middleton, 2019; Drost, 2011).

Two different types of validity which are relevant to this study are discussed further: internal validity and external validity. Internal validity is the extent to which observed findings represent the fact in the population studied (Patino & Ferreira, 2018:183) It is also the degree to which causal inferences can be drawn (Terre Blanche et.al, 2006:90). The study achieved internal validity through having no error on the research methodologies. The research was planned very well; this includes the appropriate selection of data collection techniques, data analysis methods and appropriate selection of sampling size. Also, a relevant population was studied. External validity is the degree to which it is possible for research results to be generalised from the context of the study and from the data to the larger populations and settings (Pandey

& Patnaik, 2014:5743; Terre Blanche et.al, 2006:90). This study ensured larger inclusion criteria of the sample that can represent the population in order to increase the generalisability of the findings to the population.

Regarding credibility and trustworthiness of the research, qualitative researchers focus on accurate measurement and use the terms credible and trustworthy rather than valid and reliable. In qualitative research, the main criteria that ensures credible and trustworthy are credibility, dependability, transferability, and confirmability (Noble & Smith, 2015:34; Wagner et.al, 2012:137). Qualitative researchers argue that some study is better than the other, and the researchers propose that research can be assessed according to its credibility.

Credibility uses persistence observation, peer debriefing, and prolong engagement and triangulation to ensure credibility (Wagner et.al, 2012). Credible research yields results that are believable, convincing, dependable and transferable to other context and people (Heale & Twycros, 2015:67; Middleton, 2019). To ensure the credibility of this research finding, other researchers were utilised to examine its credibility by looking at the aspects that may remain implicit in the mind of the researcher through peer debriefing. Dependability in qualitative research refers to different strategies used to ensure that what the study presents as the findings of research is credible and trustworthy.

It considers the use of different sources of information, various data collection instruments and different researchers to measure the same thing to increase the trustworthiness and credibility of the research findings (Wagner et.al, 2012; Anney, 2014:278). Therefore, to ensure the dependability of the research, the researcher held a discussion with other researchers and colleagues about the research findings; this helped to identify things not covered in the study. Confirmability focuses on making sure that results are grounded in the data and assessing the degree of biases present to prove that the data and results were obtained from events and not from the construction of the researcher (Wagber et.al, 2012). Confirmability can also be ensured through an audit trail. This enables a researcher to trace findings of the research step by step and record all the things that are done from the start to the end of the research (Amankwaa, 2016; Abshire, Prichard, Cajita, DiGiacomo & Himmelfarb. 2016:340).

Therefore, all the materials, raw data and records are kept very well as a confirmation that the findings are not the researcher's construction nor the researcher's judgement. Transferability refers to the degree to which one set of results can be applied to another context (Saks & Allsop, 2013; Moon, Brewer, Januchowski-Hartley, Adams & Blackman, 2016:3). Qualitative research focuses on understanding certain phenomenon and then look at the potential transferability of these understandings to other context. It also focuses on providing a thick description and maintaining all versions of the data in their original forms (Wagner et.al, 2012:243). The transferability of this study was achieved by ensuring that the data collected was understood and maintained in their original forms and thick description of the data was presented. The stance of this study concerning validity and reliability as well as the credibility and trustworthiness of the research are discussed below:

The use of sequential mixed method enhanced the validity and reliability as well as the credibility and trustworthiness of this study. In the first place, employing sequential mixed methods helped to confirm qualitative results with that of quantitative results. The study yielded the same results under similar situation. Therefore, results of the study can be retested and the same result will be found.

The inclusion of the community members and the Municipality officials enhanced the reliability of the study. Measuring the study constructs with ELM officials using qualitative instrument increased the reliability of the study as it yielded the same results when measured with the community members using quantitative instrument.

Moreover, the reliability and validity of quantitative instrument of this study was achieved through a pre-test of the questionnaire in form of a pilot study that was administered to a smaller group of respondents before the actual questionnaire administration.

Regarding the qualitative instrument, the credibility and trustworthiness of this study was ensured. Since the interpretivists believe on subjectivity in discovering the social world, the qualitative instruments helped to provide in-depth information of the situation being studied depending on the experiences and subjective meaning of the participants, thereby increasing credibility and trustworthiness of the research findings. Also, questions were treated like a conversation during the telephone interviews and participants felt a more degree of anonymity over the phone and probably responded

to questions with honesty which ensured the credibility, transferability, confirmability and dependability of the research findings. Furthermore, the interpretivist believe on the existence of multiple subjective truths. Therefore, this study employed subjective stance in gathering of the qualitative information and the findings relied on multiple individual construct, opinion and experiences which was presented and analysed in a way that the results were credible, dependable, confirmable and transferable to another context. The trustworthiness and credibility of the qualitative instrument was well achieved through a pilot study with few participants before carrying out the actual interviews.

## **5.6 POPULATION OF THE STUDY**

The following are the populations that are in relation to this research project: target and accessible population and population parameters. Population is defined as an entire group about which some information is required to be ascertained (Asiamah, Mensah & Oteng-Abayie 2017:1607). Two different populations were used in this study which were deemed as the groups that information can be gathered from to ascertain the research problem. The populations comprised of the community members and ELM officials. The interview population was the officials of ELM while the questionnaires population was the community members. The community members were selected as one of the populations and were considered suitable because the community in general is not only the victim of poor air quality but substantially contributes to pollution and should be part of the solution (Emalahleni Local Municipality, 2018).

The South Africa's 2016 census revealed that around 26% of households still use fuels for cooking daily other than electricity (Statistics South Africa, 2016). The ELM officials as the interview population were considered applicable for the study since the officials were the people who oversee the issue of air quality management and air quality awareness programs and have knowledge of the research topic.

### **5.6.1 Target population**

Target population is the group of individuals or objects to which the researcher intends to generalise the findings of the study (Asiamah, Mensah & Oteng-Abayie, 2017:1608,

Pernecky, 2016). The target population for the questionnaires were the community members made available by the Whatsapp group administrator. The target population for the interview were the officials of ELM in management positions. Both populations and the sample sizes for the interviews and questionnaires are shown in section 5.6.5 below.

### **5.6.2 Accessible population**

Accessible population is the portion of the target population to which the researcher has access to or a subset of the target population (Asiamah et.al, 2017:1609). The accessible population for the study survey was adult community members on the Whatsapp group who had access to the internet. The accessible population for the interview was the ELM officials in management positions in the Department of Environment and Waste management and Department of communication respectively.

### **5.6.3 Units of analysis**

A unit of analysis is the main subject that is being analysed in a study (Alsharari, 2016:588; Terre Blanche et.al, 2006). The unit of analysis for the questionnaires were individuals selected from community members while the unit of analysis for the interview were individuals selected from the ELM officials. This is because the study analysed communication strategy based on individual's perspective. Investigating individuals were suitable in this study as there was need to understand different personal construct, opinion and experiences and different individual perspectives regarding the study. As such, it was necessary to identify and investigate the appropriate individuals who can provide better understanding and accurate information based on the research goal.

### **5.6.4 Population parameters**

Population parameter is the summary explanation of a certain population (Thompson, 2013). A population parameter can also be defined as "a characteristic of population by which the nature and features of a population can be estimated" (Panti-May, Hernández-Betancourt, Ruíz-Piña & Medina-Peralta, 2012:77; Chegg, 2020). The

population parameters for the study interview were those who work in the department of environmental and waste management and communication department respectively who have knowledge on air quality management and awareness programs. The population parameters for the questionnaires were those who are permanent residents in three towns of Emalahleni such as eMalahleni, Ogies, and Kwa-Guqa and over the age of 18 because they understand the issue of air pollution in the area better.

#### **5.6.5 Sampling methods**

Purposive sample and convenience sample which are non-probability samples were used in this study. The possibility of selecting participants due to the accessibility and availability was considered when thinking of the appropriate sampling method to be used in this study.

In terms of purposive sampling method, which is a non-probability sampling, the researcher selected participants in such a way that the participants were recognised to be representative of the population and normally uses certain selection criteria to ascertain the most suitable people based on the researcher's experience or ingenuity (Etikan, Musa & Alkassim, 2016; Wagner et.al, 2012:93). The use of purposive sampling in this study was motivated by the intention to make good decision concerning the individuals to include in the sample with understanding of the topic and can provide meaningful and in-depth information.

The ELM officials were purposively sampled, they were identified as the most suitable people that would best inform the study according to the researcher's knowledge. The participants from the accessible population were sought in a purposeful manner. Out of 77 officials in the Municipality, 4 participants from approximately 8 officials in management positions in the Department of Environment and Waste management and Department of communication who were considered as the appropriate individuals with the knowledge of the study topic and who were available to participate in the study were included through SMS. This study involved officials with the knowledge on issues of air quality management and dissemination strategies from environmental and waste management department and communication department respectively.

The total population of officials in the municipality was 77 while the population of the officials with the knowledge on issues of air quality management and dissemination strategies in the two departments was 8. Therefore, four (4) officials were sampled from the population of 8 officials in the two departments which means that four interviews were conducted. The interview sample size was 4 and was guided by data saturation.

The reason the 4 participants were chosen from the officials for interviews was because it is important to select a small sample size when individual interviews are conducted as it will be hard to provide an in-depth and meaningful analysis of data when too many samples are included in the study (Wagner et.al, 2012:89). Moreover, 3-5 participants should be used for case study research as recommended by (Creswell, 2002). Also 4 is 50% of the purposively samples population which is representative.

In terms of convenient sample, it is a sample where individuals who are available and willing to participate in a study are selected (Wagner et.al, 2012:92; Etikan, Musa & Alkassim, 2016:3). Therefore, adult community members who had access to the community whatsapp group and were willing to participate in the study were selected.

In determining the sample for the respondents, Statistic South Africa on Community Survey 2016 estimated the population of Emalahleni to be 455 228 and approximately 72% of the population comprises of the adult (Statistics South Africa 2016). So, the sample of this study was selected from adult community members which is 72% of the population in Emalahleni. Therefore,  $(0.72 \times 455\,228 = 327764)$ .

Since the population of the adult in Emalahleni was 327764 (which is greater than 10,000), the desired minimum sample size (n) was obtained using the equation adopted from (Omanga et.al, 2014:377) who investigated a similar study in Kenya on community risk perception, awareness of air pollution and relationship between variables.

$$\text{Sample size } n = \frac{Z^2 p(1 - p)}{e^2}$$

Where

Z is critical value for the desired confidence level,

P is proportion in the target population estimated to have characteristics being measured, and

e = desired level of precision (margin error).

Assume p = 0.5 for maximum variability. Setting confidence level to 95% and margin error of 5%, then the sample is determined as:

$$\text{Sample size } n = \frac{Z^2 pq}{e^2} = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2} = 385$$

From the above calculation of the sample, the total population in Emalahleni is 455228 and the study included people from 18-60 years old. The population of the age 18-60 was 327764 which was 72% of the total population. Therefore, the anticipated sample size is 385 which is (0.72 x 455 228 =327764). Participants who were willing and available to participate in the study were included.

Regarding the sample size for the interview and sample size for the questionnaires, it is known that it is not compulsory for the sample size to have proportional relationship to the population size from which it is drawn (Pernecky, 2016; Blumberg, Cooper & Schindler, 2011:241). However, the sample size is a function of the variation in the population parameters being examined as well as the precision that the researcher needs. It is considered that the greater the variation within the population the larger the sample should be to provide estimation precision. (Keyton, 2011:123; Pernecky, 2016). It is also known that “the larger the sample, the more representative it is of the population; this increases the generalisability of the results to the population (Wagner et.al, 2012)”.

## **5.7 ETHICAL ISSUES**

The ethical issues considered for the purpose of this study were informed consent, deception, privacy and confidentiality and anonymity. In terms of the informed consent, participants were informed of being involved in the study without force, and the aim, method and the potential uses of the study was made known to the participants

(Wagner et.al, 2012:64). Participants were made aware of the purpose of the research through the consent form and that it is for degree purpose. With regard to privacy and confidentiality, the researcher ensured that the identity of participants and any information disclosed by participants that may harm or embarrass participants were not revealed in any way (Richards & King, 2014:393). Regarding accuracy, this study ensured that data was reported factually. In terms of anonymity, this study ensured that personal identities of participants were omitted especially during the writing up of the finding (Bashri 2018:265). Data was gathered online to ensure participants were protected from the covid harm. Further, in order to ensure that these ethical issues were maintained, approval was obtained from the Municipality and community representative and UNISA. The study also adhered to UNISA's code of ethics and guidelines.

## **5.8 DATA ANALYSIS AND INTERPRETATION**

This study used descriptive statistics for the analysis of quantitative data while thematic analysis was used for qualitative data analysis. Questionnaire data was analysed using SPSS (Statistical Packages for the Social Scientist) for the descriptive statistics to compare variables and identify sample data characteristics. Descriptive statistics was employed to be able to describe and summarise the sample data characteristics. Descriptive statistics was applicable in this study to describe characteristics of a sample systematically (Rovai, Baker, & Ponton, 2013).

Descriptive statistics are utilised to describe the data set from a sample (Bickel & Lehmann, 2012). It also helps to describe the information that was collected and can be done graphically and numerically (Wagner et.al, 2012:176). Descriptive statistics use mean, standard deviation, frequencies to examine the research problem. Moonstats was used to capture and analyse data in a statistical way. Data that was collected from questionnaires was coded, categorised, and presented in numerical and graphical form (Bettany-Saltikov & Whittaker, 2014:1524; Wagner et.al, 2012:177). Information on the demography was presented in table in the quantitative section. In terms of analysing the qualitative data, thematic analysis was used. Thematic analysis is the general method of analysing qualitative data that entails recognising patterns or themes in the data (Belotto, 2018:2623; Clarke, Braun & Hayfield, 2015:230).

Thematic analysis was used for qualitative data to describe the data that was collected by illustrating the common themes that were found in the data and to examine data set for a pattern (Friese, 2012). There was notes taking for the interview as it was conducted over the telephone. Atlas.ti computer-based software was used which helped for coding, analysing and managing data. It also helped to retrieve code words, segments and phrase and attached notes, incorporated material, systematised material and delivered output including reporting visual and text format (Friese, 2012).

The interviews were transcribed, coded, categorised and analysed using thematic analysis for recurring themes that were identified in the data and from literature (Wagner et.al, 2012:231; Friese, 2012). Information on the demography was presented in table in qualitative section. Finally, qualitative data was compared with quantitative data after coding, categorisation, and analysis and data interpretation.

## **5.9 CONCLUSION**

This chapter discussed the research methodology that was used to assess community awareness on air quality through the communication strategies that Emalahleni local Municipality (ELM) is using. It discussed the research paradigm, the research methods, data collection techniques, unit of analysis, population and sampling methods, the validity and reliability, credibility and trustworthiness, ethical issues and data analysis and interpretation techniques. The next chapter focused on data presentation and interpretation of findings.

## **CHAPTER 6: PRESENTATION AND INTERPRETATION OF FINDINGS**

### **6.1 INTRODUCTION**

In the previous chapter, the research methodology used in this study was presented. This chapter starts with the presentation of biographical and demographical data collected with the semi-structured interviews followed by the biographical and demographical data collected with the questionnaire.

Secondly, the chapter presents the results of qualitative data analysed thematically followed by the results of the quantitative data collected.

The semi-structured telephonic interviews were conducted with four officials from the Environmental and waste Management Department and Communication Department in Emalahleni Local Municipality. Telephone interviews were conducted as a result of adhering to the South African Covid-19 regulations of keeping social distance and Unisa covid-19 Research Ethics Committee guidelines. As managers they play a significant role in the design and dissemination of air quality awareness information and their participation informed this study. The notes that were taken during the interviews were further transcribed, coded, categorised and analysed using Atlas.ti software

Online questionnaires via whatsapp application were administered to 385 Emalahleni community members but 282 were returned yielding a response rate of 73%. The questionnaire data which was captured using Moonstats was coded, categorised and presented using normal distribution parameters, mean, mode and standard deviation. Prior to conducting the interview and the administration of the questionnaires, pilot study was conducted with 2 participants and 20 respondents. There was no problem found with the research questions. After the presentation and interpretation, qualitative data was compared with quantitative data.

**Table 6.1 Descriptive statistics of the biographical and demographical groupings of the interview participants.**

Qualification	Age Groups	Gender	Position		
			Manager	Assistant Manager	Grand Total
Diploma	21 -30 years	Unknown	0	0	0
B-tech	31-40 years	Male	1	1	2
		Female	1	1	2
		Bisexual	0	0	0
Masters	41-50 years	Unknown	0	0	0

The age and position group findings as presented on Table 6.1 above show that the interview participants are between 31 and 40 years of age. All in the position of a B-tech qualification. The study was able to include equal population size of males and females.

**Table 6.2 Descriptive statistics of the biographical and demographical groupings of the questionnaire respondents.**

Gender	Frequency	%	Cumulative %
Male	62	21,9	21,9
Female	220	78,1	100,0
Total	282	100,0	
Race	Frequency	%	Cumulative %
Black	250	88,6	88,6
Whites	32	11,4	100,0
Age	Frequency	%	Cumulative %
18-28 Years	56	20,0	20,0
29-49 Years	133	47,1	67,1
50-60 Years	93	32,9	100,0
Total	282	100,0	
Occupation	Frequency	%	Cumulative %
Lecturer	46	16,3	16,3
Nurse / Doctor	46	16,3	32,6
Business Owner	98	34,7	67,3
Other	92	32,7	100,0
Total	282	100,0	

Education	Frequency	%	Cumulative %
Matric	72	25,5	25,5
Diploma	141	50,0	75,5
Masters	38	13,5	89,0
Doctorate	31	11	100,0
Total	282	100,0	

The biographical and demographical data of the survey participants as reflected on Table 6.2 reveals that 78.1% of the participants are female and 21.9% are male. 88,6 was made up of the black population while 11,4 comprised of the white population. Of these participants, 47,1% are middle age. This seems to be a very young labour force. Those who are academic or medical experts to the issue amount to 32,6%. 74,5% of the study's respondents hold a tertiary qualification, putting them in a better position to understand the concepts of the study.

## 6.2 PROCESS OF QUALITATIVE FINDINGS

Interviews were conducted with four Municipal Mangers, two from the communication directorate and 2 from the environmental Compliance directorate. Four interviews which lasted for about 30-45 minutes with each participant were conducted in two consecutive days after permission was granted. Interview guide which comprised of 7 questions developed in line with the research questions was used to ensure that the interviewees were asked similar questions. Data was transcribed and thematically analysed . Transcripts were coded to find the recurrent patterns and themes in the responses. The qualitative instruments used in this study ensured that rich and in-depth information was gathered from the participants which enhanced the understanding of the phenomenon and the transferability of the qualitative findings.

## 6.3 PRESENTATION AND INTERPRETATION OF QUALITATIVE FINDINGS

With the view to gain some understanding about community awareness and adherence to keeping air quality standards in Emalahleni which has been identified as a hot spot of air pollution, the following research questions that are linked with the

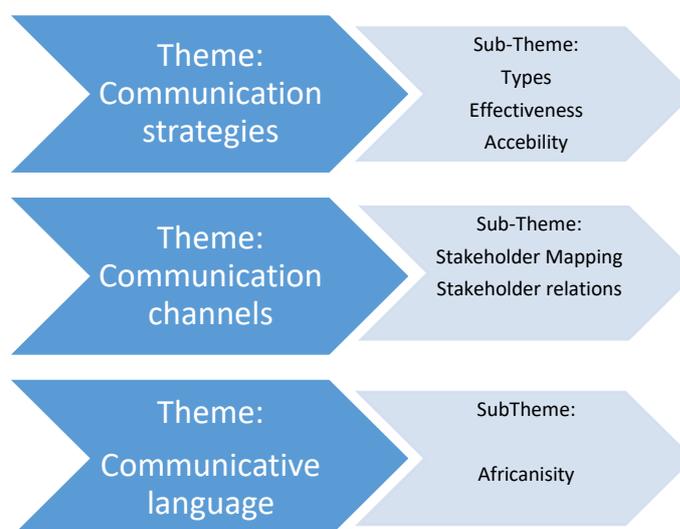
Questions from the interview guide were defined:

1. Which communication strategies are used by Emalahleni Local Municipality to promote community awareness on air quality improvement programs?
2. Which communication channels are used by Emalahleni Local Municipality to promote community awareness on air quality improvement programs?
3. What are the residents' preferred channel of communication for receiving information on air quality improvement?
4. How is the language used by the Emalahleni Local Municipality for information dissemination on air quality improvement understood by the residents?
5. How knowledgeable are the residents about the Municipality's programme to improve air quality.
6. How does Emalahleni local Municipality evaluate the outcome of the communication strategies used to promote air quality awareness?

### The Thematic Map for the study

The data collected was analysed using a thematic analysis with the support of a QDA miner light software program. Based on similarities within the collected data the following thematic map, as presented in Figure 6.1 below, was created that forms the structure of the thematic findings of the study:

**Figure 6-1 The study thematic map**





### 6.3.1 Theme: Communication strategies

The thematic analysis revealed communication strategies of the organisation as the theme emerges in Table 6.3 below.

**Table 6.3 A representation of the communication strategies within the organisation themes per research Question 1**

Codes	Category	Emerging Theme
Language used	Stakeholder mapping	Communication strategies
Literacy level		
Communication methods		
Accessibility		
Change	Stakeholder behaviour	
Stagnation		
Inclusive	Stakeholder relations	
Power structure		

The main theme communication strategies of the organisation are presented in three sub-themes that measure how the strategy used contribute to stakeholder management. It is important to explore how these strategies of awareness campaign nurture the relationship management of the municipality and citizens.

### **Sub Theme: Stakeholder mapping**

It was found that stakeholder mapping is prior to designing strategies used so that they align with the needs of the recipients.

*“Two languages are used for information dissemination on air quality management which are English and IsiZulu. This is to ensure that everybody understands the information being disseminated on air quality improvement”. But majority of people in Emalahleni use IsiZulu.”* – Participant 1.

*“We use awareness and education campaign through the media platforms such as newspaper and radio which can reach almost all residents.”* – Participant 4.

These two statements are supported and confirmed by other participants that strategies used are designed to cater the needs of residents. Both language needs and media access needs are considered when campaigning.

### **Sub Theme: Stakeholder behaviour**

Participants indicated that the reason strategies of air quality awareness campaigns are in place is to see change in the behaviour of residents when it comes to air pollution practices.

*“Yes, resident do understand and are knowledgeable about our program on air quality improvement as they share ideas and information in any awareness campaign that we conduct* – Participant 3.

*“No, their behaviour are not changing as most households are still engaging in air pollution activities”.* – Participant 2

The data collected reveals that communication strategies used do not result in the change of behaviour amongst residents. It could, therefore, be said that mutual understanding is not achieved with these communication strategies. Literature reveals that feedback which is the behaviour of respondents in this study is the measure of the success of communication (Steffens, Fonseca, Ryan, Rink, Stoker & Pieterse, 2018:1).

Therefore, it is necessary for the municipality to establish some mutual understanding for the residents' behaviours to be changed to achieve the intended results of its campaign or program.

**Sub Theme: Stakeholder relations**

It was reported by the participants, that strategies used to raise awareness encourage a good relationship with residents. One-on-one meetings and Imbizo sessions are utilised to build and nurture relationships with residents. This findings correlate with the literature which states that the two-way communication focuses on building relationship as it intends to react to feedback from the message source to the receiver (Alcinda and Folck 2012).

*“The outcome of our communication strategies is normally evaluated during stakeholders meeting. We conduct continues monitoring and report on them and results are interpreted and communicated with community members and suggestions will be given on ways to do better to improve air quality in Emalaheni”*.- Participant 1.

*“We do use public participation process, media platforms through radio, newspaper and face to face education and awareness programs to promote community awareness about air quality improvement. So, ward committees facilitate the process of community engagement as the most common way in which ELM get the community members to be informed and to participate in making decision on issues about air quality improvement”*. -Participant 3

**6.3.2 Theme: Communication Channels**

The thematic analysis revealed Communication Channels of the organisation as the theme emerges in Table 6.4 below.

**Table 6.4 A representation of the Communication Channels within the organisation themes per research Question 2 and 4**

Codes	Category	Emerging Theme
Face-to-face meetings, newspapers, radio	Types of Communication Channels use	Communication Channels

WhatsApp, Telegram, face-book, door to door campaigns		
Mutual understanding lacks	Channel Effectiveness	
Limited feedback		
Resources to by data	Accessibility	
Members do not read messages		
Information is readily available and on time		

The main theme communication channels are presented in three sub-themes, namely, communication channels used, channels effectiveness and channels satisfaction.

### ***Sub Theme: Types of Communication Channel***

Participants reported that there are several communication channels used to disseminate messages to the community that includes traditional media and modern social media channels. Traditional communication channels used are face-to-face meetings, newspapers, radio, and door to door campaigns. The participants mentioned that in recent years the municipality started to use the modern social media channels such as WhatsApp, WeChat, Emails, and face-book, that are more convenient and cheaper than some of the old communication channels.

*“There are a number of channels used to transfer messages, the most common one is face-book and radio because they are either cheaper or accessible by community members” - Participant 3.*

*We use awareness and education campaign through the media platforms such as newspaper and radio which can reach almost all residents. - Participant 2.*

The radio and the social media channels are the most preferred as managers mentioned. Through the social media, they can form groups and send messages instantly to all community members and most of them are cheaper than traditional media. Moreover, these channels have enabled communication between the municipality and the community to be satisfactory. Literature reviewed that the use of

communication channels that are most probably to effectively reach the audience is necessary for effective messaging (Keyton 2011).

### ***Sub Theme: Channel effectiveness***

These channels are regarded as effective and even efficient because they are clear, and messages are received as intended. With meetings, members of the community can all gather and listen to the air quality officials, ask questions, get clarity, and respond accordingly.

*“Public participation meetings and Imbizo are preferred for receiving information by the residents as everyone gets to be fully engaged with the council on matters affecting the community and other priority programmes of the municipality” - Participant 2.*

It was found that communication channels used in the municipality foster two way symmetrical communication as officials say they ask questionings and receive responses. These channels provide a platform for dialogue and interaction and response to feedback. The findings correlate with the literature in this study. Alcinda and Folck 2012 revealed that the two-way symmetrical communication focuses on building relationship and aims to react to feedback from the target audience to the source which in turn is the start of dialogue and interaction between the target audience and the source.

### ***Sub Theme: Accessibility***

It was found that sometimes community members cannot access messages sent to them on social media immediately.

*“Members of the community sometimes have no data to access urgent messages about air quality programmes” - Participant 4.*

Community members put their mobile data off, which means they do not get messages send via communication channels that require the use of data. Other members complained that they do not have data and therefore cannot receive messages. When there is no accessibility to information, communication is not effective. This means that messages maybe misinterpreted, or delayed, which will cause communication to be

ineffective. This, therefore, means that lack of accessibility must be avoided for messages to be delivered correctly (Arins, 2013:14). The literature revealed that excellent media quality leads to excellent informal horizontal communication, inaccessibility therefore, hinder excellent media quality between the municipality and its residents.

### **6.3.3 Theme: Communicative language**

The thematic analysis revealed communicative language within the organisation as the theme emerges in Table 6.5 below.

**Table 6.5 A representation of the communicative language themes per research Question 3**

Codes	Category	Emerging Theme
Locality	Africanisation	Communicative language

The main theme communicative language by the municipality is presented in one sub-theme that measure how the language used accommodates different African languages of residents. For community members to listen and adhere to awareness campaigns of the municipality, they should be able to understand the language used.

### **Sub Theme: Africanisation**

It was found that different languages are used by ELM to present messages of air quality awareness campaigns to the residents.

*“Two languages are used for information dissemination on air quality management which are English and IsiZulu. This is to ensure that everybody understands the*

*information being disseminated on air quality improvement". But majority of people in Emalahleni use IsiZulu."* – Participant 1.

*"The language is not ambiguous, it is clear and understood by almost everybody and people get to ask questions and are answered during any community meeting and public participation meetings. This shows that the language we use for disseminating information is not ambiguous"* - Participant 3

*"Three official languages are used for the dissemination of information on air quality improvement which include English, Isindebele and Sepedi. Three languages are used to ensure that everybody understands our messages on how to improve air quality".* - Participant 4.

These statements are supported by all the participants that confirm that different African languages are used to ensure that all residents are knowledgeable and understand the issue of air quality. These results correlate with the literature in this study. It is revealed that there is need to disseminate information effectively and appropriately across linguistically and culturally different communities (Ramirez 2019), and in understandable languages for the people to be able to take appropriate steps to maintain air quality (Hodoli et al 2018).

Therefore, it is vital to present information appropriately in different languages due to language diversity of residents to ensure that the residents understand the information and to take reasonable step to improve air quality.

#### **6.3.4 Theme: Audience Knowledge**

The thematic analysis revealed campaign outcomes within the organisation as the theme emerges in Table 6.6 below.

**Table 6.6 A representation of the audience knowledge of air quality within the community themes per research Question 5**

Codes	Category	Emerging Theme
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Transparency	Content shared	Audience Knowledge
Participation		
Educational approach		

The main theme community knowledge shows that the residents are knowledgeable about the municipality air quality improvement program as indicated by all the participants. The main theme community knowledge is presented in one sub-theme, namely, content shared.

### **Sub Theme: Content shared**

Participants reported that the residents of Emalahleni are knowledgeable about the air quality issues as the municipality takes on an educational approach to teach them about these issues. The municipality is transparent with them in terms of what air quality is, how it should be preserved and which activities are to be avoided to maintain air quality. Residents have knowledge to a level that they are able to participate in air quality improvement meetings, they make suggestions and share ideas that shows that they are informed. Content shared with them also includes the reveal of ELM air quality standard, the danger and good of the standard currently in.

*“Yes, resident do understand and are knowledgeable about our program on air quality improvement as they share ideas and information in any awareness campaign that we conduct”. – Participant 1*

*“Yah I believe that residents understand and are knowledgeable about the air quality improvement programs. It is communicated to them with different channels and strategies and we usually involved them in meeting when air quality management issues are discussed”. – Participant 2*

*“The residents understand and are knowledgeable about the air quality management program that we conduct”. This participant who is from communication department continued: “all information has been put through various communication platforms and is also readily available at the municipal offices. Communication is a strategic function of the municipality. It is our responsibility to ensure that our processes and activities are communicated to community members as it improves our transparency in all activities, actions and development projects”. - Participant 3*

*“The residents understand and are knowledgeable about our air quality management programs as we do conduct air quality awareness and education programs from time to time”. Participant 4*

### **6.3.5 Theme: Campaign outcomes**

The thematic analysis revealed campaign outcomes within the organisation as the theme emerges in Table 6.7 below.

**Table 6.7 A representation of the Campaign outcomes within the organisation themes per research Question 6**

<b>Codes</b>	<b>Category</b>	<b>Emerging Theme</b>
Face-to-face meetings,	Stakeholder Engagement	Campaign outcomes
Imbizo		
Comment box		

The main theme communication outcome is presented in one sub-theme, namely, stakeholder engagement.

### **Sub Theme: Stakeholder engagement**

Participants reported that they measure the outcome of their communication intervention during meetings with residence, ward committees, imbizo's and through reading feedback placed in the municipality's comment box. Through these stakeholder engagements, the municipality is able to get feedback on how their awareness program has enlightened residents, how it has made them aware of issues around air quality and that feedback is bench marked with the intentions of the campaign to see if they align, if not more measures are put in place to bridge the gap what was not achieved.

*"The outcome of our communication strategies is normally evaluated during stakeholders meeting. We conduct continues monitoring and report on them and results are interpreted and communicated with community members and suggestions will be given on ways to do better to improve air quality in Emalaheni". – Participant 1*

*"We evaluate the outcome of our communication strategies via stakeholders meetings and during Imbizo program. That's the way we determine the outcome of our communication interventions in raising community awareness". – Participant 2*

*"Emm, we evaluate our communication strategy outcome through stakeholder meetings and Imbizo. Complaints and feedback are received from the residents on air quality related matters during these meetings. Yah, that's how we get to know that our communication interventions is achieving success in terms of promoting community awareness". -Participant 3*

*"The outcome of our communication strategies is evaluated through public participation process. During this process comments are made and shared with everybody. Residents would raise comments and request for more information and clarity. So, through this platform we get to understand that our communication is achieving success regarding our aim to promote community awareness about air quality improvement". - Participant 4.*

The findings shows that there are different platform used by the municipality to

evaluate its communication intervention outcome which shows that residents are aware of the air quality issues and way of maintaining it. But, it could be said that there is no proper evaluation of the communication intervention outcome of the municipality to understand whether the awareness is leading the residents to maintaining air quality standard or not. Literature reviews that to determine if a program or a campaign has achieved its intended outcome, there must be polling, survey, follow-up campaign or a reminding campaign. This is done to learn lesson for enhancing the communication interventions quality (Paul, 2011:194; Umar & Khamidi, 2012:4).

The above has presented and analysed the results of the qualitative phase. Following the sequential mixed method, the next section presents and interprets results from the quantitative phase.

#### **6.4 PROCESS OF QUANTITATIVE FINDINGS**

Online questionnaire via Whasapp was administered to 385 adult community members with 282 responding yielded a response rate of 73%. The completion of the questionnaires took about 10-15 minutes. A broad inclusion criteria was used which enabled the study findings to be generalisable to the total population. That is to say that the results may be representative of the population. The statistical methods used ensured the reliability and validity of the research findings.

#### **6.5 PRESENTATION AND INTERPRETATION OF QUANTITATIVE FINDINGS**

In this section the findings of the quantitative analysis are presented. Findings present channels and strategies, channels preferred and language used for air quality awareness raising in ELM. These questions addressed the 20 questions from the questionnaire. Respondents were asked to indicate their level of agreement with different items using a seven-point Likert scale (1 to 7) where 1 = Strongly Disagree, 6= Agree and 7 = Strongly Agree. The normal distribution parameters, the mean, mode, and standard deviation was used to describe the data distribution of the selected questions.

### 6.5.1 Channels of Communications used by the Municipality

The descriptive statistics of the channels used by the municipality to raise air quality awareness is reflected in Table 6.8 below.

**Table 6.8 Descriptive statistics of the channels used (n = 282)**

	N	Mean ( $\bar{x}$ )	Median	Mode (Mo)	Std. (SD)	Skew	Kurt
ELM uses community meetings to promote community awareness on air quality	282	3,8	4,0	6	1,58	-0,15	-1,62
ELM uses pamphlets to promote community awareness on air quality	282	2,9	4,0	6	1,07	-1,83	1,97
ELM uses Billboards to promote community awareness on air quality	282	3,0	4,0	6	1,13	-1,30	1,49
ELM uses radio to promote community awareness on air quality	282	<b>4,2</b>	4,0	6	1,56	-0,15	-1,62
ELM uses newspaper to promote community awareness on air quality	282	3,9	4,0	6	1,03	-1,73	2,97
ELM uses social media to promote community awareness on air quality	282	3,8	4,0	6	1,13	-1,40	1,59
ELM uses door to door campaign to promote community awareness on air quality	282	<b>4,2</b>	4,0	6	1,06	-1,27	1,21
ELM uses their website to promote community awareness on air quality	282	3,7	4,0	6	1,11	-1,21	0,72

Respondents were asked to indicate their level of agreement with different items using a seven-point Likert scale (1 to 7) where 1 = Strongly Disagree, 6= Agree and 7 = Strongly Agree. As reflected on Table 6.8 the mean score for the items of channels used to raise air quality awareness in the range neutral to agree (3 – 4). The two questions with the highest mean scores are Questions on the use of door-to-door campaigns and radio ( $\bar{x} = 4.2$ ,  $Mo = 6$ ) and Question on the use of newspaper, social media and community meetings ( $\bar{x} = 3.9$ ,  $\bar{x} = 3.8$ ,  $Mo = 6$ ).

Channels of communication are elements that contribute to the success or failure of a communication episode (Karim & Noor, 2017:89). It is crucial to identify the channels that are most likely to effectively reach the audience (keyton, 2011), and can precisely capture the attention of the target audience (Raab & Rocha, 2011). The community of Emalahleni is aware of channels used to raise air quality awareness, this means that the channels are reachable. However, the use of diverse communication channels that have the maximum chance of generating the desired outcome of improving awareness towards adherence to keeping air quality should be considered. Raab and Roch

(2011:161) propose that program or campaign message has better chances to be heard if people encounter it in diverse channels. ELM uses radio, meetings and social media as channels accessible to the community, this aligns with what the municipality officials shared. ELM uses radio, meetings and social media as channels accessible to the community, this aligns with what the municipality officials shared.

### **6.5.2 Channels preferred by community members to receive air quality awareness messages**

The descriptive statistics of the channels preferred by the community to receive air quality awareness messages is reflected in Table 6.9 below.

**Table 6.9 Descriptive statistics of preferred channels (n = 282)**

	<b>N</b>	<b>Mean (<math>\bar{X}</math>)</b>	<b>Median</b>	<b>Mode (<i>Mo</i>)</b>	<b>Std. (<i>SD</i>)</b>	<b>Skew</b>	<b>Kurt</b>
I prefer to receive information on air quality improvement via radio	282	<b>4,0</b>	4,0	7	1,55	-0,36	-1,09
I prefer to receive information on air quality improvement via social media	282	<b>3,9</b>	4,0	7	1,32	-0,53	-1,12
I prefer to receive information on air quality improvement via sms	282	3,5	4,0	7	1,40	-0,37	-1,32
I prefer to receive information on air quality improvement via newspaper	282	3,0	4,0	7	1,50	-0,67	-1,10
I prefer to receive information on air quality improvement via community meeting	282	<b>4,0</b>	4,0	7	1,41	-0,45	-1,23
I prefer to receive information on air quality improvement via a call	282	3,5	4,0	7	1,39	-0,43	-1,21

Respondents were asked to indicate their level of agreement with different items using a seven-point Likert scale (1 to 7) where 1 = Strongly Disagree, 6= Agree and 7 = Strongly Agree. As reflected on Table 6.9 the mean score for the items of the preferred channels in the range neutral to agree (3.5 – 4.0). The two questions with the highest mean scores are Questions on the use of radio and community meetings ( $\bar{X}$  = 4,0, *Mo* = 7) and Question on the use of social media ( $\bar{X}$  = 3.9, *Mo* = 7).

The success of the organisation among other elements lies on stakeholder inclusivity emphasised by the accountability theory (Greer & Egan 2019). Stakeholder inclusivity is when the views of stakeholders are included in the design and implementation of the organisation’s strategy. Therefore, the study argues that, ELM should adhere to community’s preferred channels of receiving information from the municipality for the

success of their communication efforts. The community prefers radio and meeting, literature outlines that meeting have an advantage to inform, educate and remind (Oku, Oyo-lta, Glenton, Frethelm, Ames, muloliwa, Kaufman, Hill, Cliff, Cartier, Bosch-Capblanch, Rada & Lewin, 2016; Calder & Beckie, 2011). Radio provokes emotional and cognitive responses of the people (Klippen, James, Ward, Buykx, Shamsullah, Watson & Chapman, 2017), it also conveys educational messages and provides a good opportunity for individuals to interact and express their views on a certain topic or issue (Benneheke et.al, 2016).

### 6.5.3 Language used to raise air quality awareness

The descriptive statistics of the language used when raising awareness on air quality is reflected in Table 6.10 below.

**Table 6.10 Descriptive statistics of the language used (n = 282)**

	N	Mean ( $\bar{x}$ )	Median	Mode (Mo)	Std. (SD)	Skew	Kurt
The language used by ELM to raise air quality awareness is my mother tongue	282	3,8	3,0	6	1,48	-0,01	-1,52
The language used by ELM to raise air quality awareness is my ambiguous	282	2,0	3,0	6	1,47	0,02	-1,50
The language used by ELM to raise air quality awareness is my understandable	282	3,0	3,0	6	1,48	-0,06	-1,51

Respondents were asked to indicate their level of agreement with different items using a seven-point Likert scale (1 to 7) where 1 = Strongly Disagree, 6= Agree and 7 = Strongly Agree. As reflected on Table 6.10 the mean score for the items of the language used is neutral. The Mode, that indicates the set of numbers that occur most often in a data set are 4. The two questions selected mean scores is the Question on the use of mother tongue in message transmitted to community members ( $\bar{x}$ = 3.8, Mo = 6). One of the hindrances to the success of communication is semantic noise where the encoder and decoder do not assign the same meaning to a message, language is one of the contributing elements to semantic noise. When language used to design and transmit a message is understood by audience, messaging becomes a success. Therefore, the use of a mother tongue to raise awareness on air quality in ELM is excellent for achieving mutual understanding.

#### 6.5.4 Content shared on air quality

The descriptive statistics of the content shared when raising awareness on air quality is reflected in Table 6.11 below.

**Table 6.11 Descriptive statistics of the content shared (n = 282)**

	N	Mean ( $\bar{X}$ )	Median	Mode (Mo)	Std. (SD)	Skew	Kurt
The awareness campaign informs me what air quality is.	282	3,8	3,0	6	1,48	-0,01	-1,52
The awareness campaign informs me which activities to avoid to maintain air quality.	282	4,0	3,0	6	1,47	0,02	-1,50
The awareness campaign informs me how to maintain air quality.	282	3,9	3,0	6	1,48	-0,06	-1,51
Awareness campaign messages makes me to change my behaviour on air pollution activities	282	2,0	3,0	6	1,05	-0,02	-1,37

Respondents were asked to indicate their level of agreement with different items using a seven-point Likert scale (1 to 7) where 1 = Strongly Disagree, 6= Agree and 7 = Strongly Agree. As reflected in Table 6.11 the mean score for the items of the language used is neutral. The Mode, that indicates the set of numbers that occur most often in a data set are 4. The question selected mean scores is the Question awareness campaign informing residents on activities to avoid to maintain air quality ( $\bar{X}$  = 4,0, Mo = 6). The Question on changed behaviour of community members after being exposed to the air quality awareness messages is low in mean ( $\bar{X}$  = 2,0, Mo = 6).

Messages should answer all 5 w and h for mutual understanding to be achieved (Bowe, Martin & Manns, 2014; Burger, Goodman, Kampanakis, & Zhu, 2014). The results reveal that the municipality informs residents on what and how to maintain air quality, which is a great quality in a messaging. Although the municipality informs residents, their feedback in behaviour is low. This is a concern and calls for a need to a further study of why is the behaviour not changing and what could be done to encourage change in behaviour.

#### **Factor analysis of strategies used.**

Suitability of the inter-correlation matrix for factor analysis was confirmed with Kaiser-Meyer-Olkin (KMO), which measured 7,1 i.e. above the recommended value of 6 (Hair, Black, Babin & Anderson 2010). Bartlett's Test of Sphericity Chi-square value was statistically significant ( $\chi^2 (561) = 3907.25; p \leq .001$ ), therefore indicating the appropriateness of the data for factor analysis.

Four factors that explained about 86.18% of the variance in the factor space were postulated according to Kaiser's (1970) criterion and extracted by means of Principal Axis Factoring.

The rotated and sorted factor matrix was rotated and sorted by means of a varimax rotation. Four distinct factors (channels and strategies used, channels preferred, language used and content shared) were extracted.

The results obtained from the iterative reliability analysis of the extracted factors are as follows: Factor 1, channels and strategies used (measured by eight items), yielded a Cronbach Alpha of .90, indicating an acceptable reliability. Factor 2, channels preferred (measured by six items), yielded an acceptable Cronbach Alpha of .79. Factor 3, Language used (measured by three items), yielded a Cronbach Alpha of .70, indicating an acceptable reliability. Factor 4, Content shared (measured by four items), yielded a Cronbach Alpha of .70, indicating an acceptable reliability. There were some cross-loadings between items of the sub-scale depersonalisation and emotional exhaustion.

### **Reliability analysis of the strategies used**

The measurement accuracy is a function of two things: (a) the extent to which the items measures what it sets out to measure (define as validity), and (b) the precision with which the variable are measured (define as reliability) (Malholtra, 2010; Blumberg, et.al 2011:344). A summary of the factor analysis procedure and iterative reliability analysis results is presented in Table 6.12 below.

**Table 6.12 Summary of the factor analysis and iterative reliability analysis procedure**

Item per dimension	Cronbach's Alpha if Item Deleted	Dimension reliability
--------------------	----------------------------------	-----------------------

ELM uses their website to promote community awareness on air quality	,936	<b>Channels used</b> Cronbach's Alpha 0,93
ELM uses community meetings to promote community awareness on air quality	,905	
ELM uses pamphlets to promote community awareness on air quality	,905	
ELM uses Billboards to promote community awareness on air quality	,912	
ELM uses radio to promote community awareness on air quality	,912	
ELM uses newspaper to promote community awareness on air quality	,936	
ELM uses social media to promote community awareness on air quality	,905	
ELM uses door to door campaign to promote community awareness on air quality	,905	
	<b>Cronbach's Alpha if Item Deleted</b>	
I prefer to receive information on air quality improvement via radio	,926	<b>Preferred channels</b> Cronbach's Alpha 0,92
I prefer to receive information on air quality improvement via social media	,891	
I prefer to receive information on air quality improvement via sms	,936	
I prefer to receive information on air quality improvement via newspaper	,881	
I prefer to receive information on air quality improvement via community meeting	,876	
I prefer to receive information on air quality improvement via a call	,927	
	<b>Cronbach's Alpha if Item Deleted</b>	
The language used by ELM to raise air quality awareness is my mother tongue	,961	<b>Language used</b> Cronbach's Alpha 0,96
The language used by ELM to raise air quality awareness is my understandable	,971	
The language used by ELM to raise air quality awareness is my ambiguous	,970	
	<b>Cronbach's Alpha if Item Deleted</b>	
The awareness campaign informs me what air quality is.	,989	Content shared

The awareness campaign informs me which activities to avoid air quality.	,989	Cronbach's Alpha 0,99
The awareness campaign informs me how to maintain air quality.	,989	
Awareness campaign messages makes me to change my behaviour on air pollution activities	,990	

As reflected in Table 6.12 the results obtained from the iterative item reliability analysis of the four scales yielded the following Cronbach Alphas. Channels and strategies used Cronbach's Alpha 0,93; Preferred channels Cronbach's Alpha 0,92; language used Cronbach's Alpha 0,96 and Content shared Cronbach's Alpha 0,99 indicating acceptable internal consistency reliability (Pallant, 2016).

## 6.6 DISSCUSSION

The results outlined that different age groups and different expertise have been included in the study, giving the results various perspectives in the presented results. The study intended to explore and describe communication strategies that are used to raise air quality awareness in Emalahleni.

The results reveal that the municipality uses both traditional and online media to acquaint residence with information on air quality. The primary communication channels used are social media related (WhatsApp and face-book), radio, newspapers, and meetings. The residents are aware of communication strategies and channels used for conveying air quality information. The language used is understood by the residents.

The interviews participants mentioned many channels and strategies preferred by the respondents which can be reached by the community members of Emalahleni. But the questionnaire respondents indicated specifically that they preferred radio, community meetings and social media. Therefore, ELM must communicate with the residents with the channels preferred. The municipality showed that there were a number of platforms used to evaluate its communication outcome, but they generally agreed that stakeholders meetings were used to evaluate its communication outcome.

The results also revealed that the municipality informs residence about what air quality is, how to maintain it and what to do to avoid air pollution. It is unfortunate that the residence behaviour on air quality does not change although they are knowledgeable about air quality. The behaviour of residents is said not to be changing after the exposure to the awareness messages which is a concern the study wished to make recommendations on.

## **6.7 CONCLUSION**

This chapter presented the results of the qualitative and quantitative data collected. Qualitative data was collected by interviewing 4 out of the 8 managers managing departments that are relevant to the study (communication and environmental and waste management departments), this was 50% of presentation of the target population. Quantitative data was collected through survey questionnaires. 385 members of the community members were given the questionnaire and only 282 were usable, making the response rate to be 73%. The main findings that were obtained from this study was presented.

Descriptive statistics of biographical and demographical data were presented. This was followed by a presentation on qualitative results using thematic analysis. Then followed the presentation on quantitative results, which were presented through the frequency distribution table.

The exploratory sequential mixed methods used allowed the study to confirm quantitative findings with that of qualitative findings. The reliability and validity as well as the trustworthiness and credibility of this study was ensured by studying the personal construct and experiences of participants and examining the respondents through scientific method. The reliability and validity as well as the trustworthiness and credibility of this study was also ensured using software to ensure objectivity of results.

The results allowed the achievement of all the objectives of the study making the study a success. But, it seems that the municipality focused on improving awareness as required by South African national ambient air quality regulations. But there is still progress to be made. For example, there is need to consider communication interventions that can focus on promoting sustainable change of behaviour. There

must be a proper evaluation of communication outcomes or interventions in terms of promoting behaviour change that can lead to maintaining air quality. The next chapter discusses the conclusion which is the summary of the entire study, the research findings, and recommendations.

## **CHAPTER 7: CONCLUSION AND RECOMMENDATIONS**

### **7.1 INTRODUCTION**

The purpose of this study was to analyse the communication strategies used in raising community awareness on air quality improvement. This chapter presents the summary of the main conclusions derived from the research findings of the empirical study. It presents conclusions derived from interview as well as survey findings. It also presents the recommendations of the study followed by the study limitations and possible directions for future research. The following is the summary of the conclusions from both qualitative and quantitative findings which focused on the main research questions.

#### ***7.1.2 Communication strategies and channels used.***

This research question required participants to indicate the communication strategies and channels used to promote air quality awareness. The participants showed that there are many strategies and channels used as per research question 1 and 2. The participants listed many traditional and modern communication strategies and channels used which include radio, newspaper, public participation, stakeholders meeting, face to face community meetings, door to door campaigns, Imbizo and social media (face-book and Whatsapp). This study found that the common media used to promote air quality awareness was the radio and social media as indicated by all the interview participants. This finding is supported by the literature which states that the media specifically the radio and the social media are the main communication channels used for communicating air quality information to the public and can significantly improve awareness ((Hau Xu, 2014: 1386; oltra & Sala, 2015:365; Ramirez et.al, 2019:5). This was verified with the survey respondents which found that radio and social media were used to raise air quality awareness by the ELM although

newspaper, door to door and community meetings were inclusive. The questions with the highest mean score were questions on the use of door to door and radio ( $\bar{x} = 4.2$ ,  $Mo = 6$ ) and questions on the use of newspaper, social media and community meetings ( $\bar{x} = 3.9$ ,  $\bar{x} = 3.8$ ,  $Mo = 6$ ). Therefore, the community members are aware of the communication strategies and channels used to raise air awareness, this means that the channels are reachable.

### ***7.1.3 Communication channels preferred by community members***

In this research question, participants were required to mention the communication channels preferred by the community for receiving information. As per question 4 several channels were mentioned as preferred by the residents to receive information which are radio, newspaper, and face to face awareness campaign, Imbizo, public participation meetings and social media (WhatsApp). This study found that the interview participants had general agreement that the radio and social media were preferred by the residents for receiving information. The preference of radio and social media was confirmed by survey respondents although they also mentioned that they preferred community meetings as shown in table 6.9 in the previous chapter, the questions with the highest mean score were questions on radio and community meetings ( $\bar{x} = 4.0$ ,  $Mo = 7$ ) and social media with the mean ( $\bar{x} = 3.9$ ,  $Mo = 7$ ). Based on the survey findings, this study argues that ELM should adhere to community's preferred channels of receiving information for the success of its communication efforts. Organisation's success among other things lies on inclusivity of stakeholders. This is when stakeholder views are included in the design and implementation of the strategy of the organisation (Greer & Egan 2019).

### ***7.1.4 Language used***

The research question measured the types of language used by the municipality and whether the language is understood by the Emalahleni residents as per question 3. It was found that participants had common agreement that different African languages are used and are understood by the residents. This was confirmed with the survey respondents who outlined that mother tongue is used which is one of the African languages and is understood by the residents. On table 6.10 of the previous chapter,

the question with the highest mean score is the question on the use of mother tongue in conveying messages to residents ( $\bar{x} = 3.8$ ,  $Mo = 6$ ). This findings corroborate with the literature. Ramirez et.al, (2019) propose that air quality information need to be conveyed effectively and appropriately across community with diverse language and culture. South African air quality regulations also stipulated that air information should be made available to the public in more than one official languages (Government gazette, 2018).

Further, Hodoli et.al, (2018) argue that it is important to present information in understandable language for the public to be able to take appropriate steps to maintain air quality. Therefore, the language used is understood by the residents and when language used to design and convey a message is understood by the audience, messaging becomes a success and would help the audience to take reasonable step to improve air quality.

#### ***7.1.5 Community knowledge on air quality***

The study found that the residents are knowledgeable about the municipality air quality improvement program as all the participants had common agreement on this. It was confirmed with survey respondents, the question with the highest mean score ( $\bar{x} = 4.0$ ,  $Mo = 6$ ) is the question that showed that awareness campaign by the ELM informs the residents on the activities to avoid and to maintain air quality but the question on changed behaviour of community members after being exposed to the air quality awareness messages is low in mean ( $\bar{x} = 2.0$ ,  $Mo = 6$ ). The findings show that the residents are knowledgeable about the program and what to avoid maintaining air quality as they participate in meetings, ask questions, and share ideas and are thought through the educational campaign approach by ELM. Literature reveals that disseminating information on the environmental risk as part of education programs to the people accomplishes numerous goals for environmental planners and such programs improve knowledge on the risk, allowing the people to identify and comprehend threats in the environment (McLaren & Williams, 2015).

#### ***7.1.6 Communication outcome***

This research question focused on how ELM measures the outcome of their communication strategies in raising awareness. The participants listed various ways, mainly being the use of stakeholder meetings to evaluate their communication outcome. The participants indicated that they get to know that their communication interventions are achieving success through this platform where they raise questions and are answered and share ideas with community members. This question was not addressed by the survey as it was directed to the ELM experts who have the knowledge on communication evaluation within the organisation.

## **7.2 Recommendations**

This study made the following recommendations:

There was substantial evidence made by the participants and the respondent that many traditional and modern communication strategies and channels are used to promote air quality awareness. Specific communication channels were preferred by the respondents for receiving awareness messages, these were radio, social media and community meetings. These channels must be used for conveying information by the ELM to the community to ensure inclusivity of community members. This is a form of being accountable when an organisation considers stakeholders' participation in the organisation's matters, and how it can impact the stakeholders and the impact of the stakeholders on it. Also, an effective information diffusion can take place when channels mostly preferred by the audience are used.

Furthermore, ELM should consider the use of different communication channels and strategies including billboard and entertainment education identified in this study literature for being capable and effective in the transmission of information and raising air quality awareness. It is found that various informational needs require various communication channels to achieve efficient and effective communication (Elshout 2014). Additionally, adopting the strategy of increasing the frequency and number of news cycles on air quality improvement programs by the municipality's radio stations for instance is likely to motivate the community's awareness of the destructive trends of air pollution and to act towards improving air quality.

Regarding the behaviour of residents on maintaining air quality, it was evident from both the interview participants and survey respondents that exposing the community to awareness messages does not change the behaviour of the resident towards maintaining air quality. Therefore, ELM should consider communication interventions that focus on promoting sustainable behaviour change that can lead the residents to maintaining air quality.

In terms of communication outcome evaluation, this study argues that appropriate communication interventions evaluation is important regarding the program or campaign by ELM as it can help the municipality to determine the success of its program regarding achieving its intended goals of raising community awareness towards the practice of maintain air quality. Gertler et.al, (2016) argue that outcome evaluation which is concerned with the effect of a program or campaign on the target audience in terms of enhancing knowledge, behaviour change and policy change has to be conducted through public polling or follow-up campaign to determine the stand of the public with issues at hand. Therefore, proper communication evaluation has to be constantly conducted by the municipality to ascertain its communication intervention quality.

### **7.3 Limitations of the study**

The following limitations are presented regarding the study qualitative and quantitative phases.

The researcher aimed to obtain huge data from both qualitative and quantitative data. But due to the inclusion of only experts in management position in the municipality the interview results cannot be representative of the entire population and therefore cannot be generalisable. The survey results could be representative of the entire population and therefore can be generalisable, although it was conducted in the context of covid-19 which resulted to the survey's low response as 385 questionnaires was sent to respondents but only 73% was returned.

The researcher embarked on interview and the distribution of questionnaire, it should have been a good idea to conduct document analysis that should further be confirmed

with that of the interview and questionnaire. The researcher could not involve herself in the interview setting neither had complete control over interviewees as the interview was telephonic due to South African covid-19 regulations of social distancing and Unisa covid-19 research ethics regulations. The researcher also distributed online questionnaires because of covid-19 regulations instead of paper-based questionnaires which should have resulted in high response rate.

This study involved experts who are in charge of air quality management information delivery and community members. It should have also involved industries and mining sectors who are the major air polluters in Emalahleni city. Therefore, the study used a relatively small but statistically acceptable sample because of time and budget constraints.

#### **7.4 Future research directions**

The following are the directions for future research:

Evaluation of communication should focus on assessing the quality or success of communication interventions. Also, communication interventions should focus on examining the impact of communication on promoting sustainable change of behaviour.

#### **7.5 Conclusion**

The purpose of this study has been to analyse the communication strategy of ELM in promoting community awareness on air quality improvement. Promoting community awareness on air quality management is a very crucial issues. This study has extensively reviewed the literature on the study topic indicating the role that communication can play in raising community awareness on air quality improvement. The main findings of the study were presented. Recommendations were made for ELM in particular and organisations globally that might want to embark in a program of communicating to promote public awareness on air quality improvement. The study limitations were also presented and possible future research directions. It is believed

that the knowledge gain by ELM will help to improve its communication strategies in communicating to raise awareness on how to improve air quality.

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## APPENDIX A: INTERVIEW GUIDE

Dear participant

My name is Constance Ugo Nnachi and I am doing research with Mrs. Mabusela, a lecturer in the Department of Communication Science towards a master's Degree at the University of South Africa. We are inviting you to participate in a study entitled Analysing the communication strategy of Emalaheni Local Municipality for information dissemination on air quality improvement.

I am conducting this research to find out awareness of the community on air quality by means of the communication strategies that Emalaheni Local Municipality is using to communicate information on how to improve air quality.

As an integral part of this research, I would like to invite officials in environmental and waste management department and Communication department of Emalaheni Local

Municipality to participate in this study. I chose this particular group as participants as they are the ones who have knowledge of the research topic and can inform the study.

The study involves interview and will last for about 20-45 minutes. If you decide to participate you will be given information sheet to keep and be asked to sign a written consent form.

The researcher will ensure that any potential level of inconvenience and/or discomfort are avoided and must be conscious to weigh the potential understanding from the findings against possible harm that may be caused to participants. The information you will convey in this study and your identity will be kept confidential. To ensure anonymity, your name will not be recorded anywhere and no one will be able to connect you to the answers you give. Your answers will be given a code number and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings. You can withdraw at any time without reprisal or giving a reason and participation in this study is completely voluntary.

Please can you tick the following box to indicate that you are providing permission to participate in this research. Your identity as well as all the information you provide will be kept confidential.

Yes I am willing to partake in this study

No I am not willing to partake in this study

1. Which communication strategies are used by Emalahleni Local Municipality to promote community awareness about air quality improvement programs?

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Please, elaborate -----

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2 Which channels of communication do you think residents prefer for receiving information on air quality improvement?

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Please elaborate -----

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3. Is the language used by the Emalaheni Local Municipality for information dissemination on air quality improvement to the community their mother tongue?

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Please elaborate -----

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4. Is the language used by the Emalaheni Local Municipality for information dissemination on air quality improvement to the community not ambiguous?

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Please elaborate -----

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5. Do you think that the residents understand and are knowledgeable about air quality improvement program of the Emalaheni Local Municipality?

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Please elaborate -----

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6. How does the Emalaheni local Municipality evaluate the outcome of its communication strategy in terms of achieving success concerning the aim of its air quality improvement program?

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Please elaborate -----  
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7. Is the behaviour of the residents of the Emalahleni Local Municipality changing towards practices of air quality?

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Please elaborate -----  
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Please I would like to know your demographic details:

Indicate your gender?

How old are you?

What is your race?

What qualification do you have?

What is your occupation?

Thank you for participating.

## APPENDIX B: SURVEY QUESTIONNAIRE

Dear Prospective participant,

You are invited to participate in a survey conducted by Constance Ugo Nnachi under the supervision of Mrs. Queen Mabusela, a lecturer in the Department of Communication Science towards a master's Degree at the University of South Africa.

The survey you have received has been designed to study the communication strategy of Emalaheni Local Municipality for information dissemination on air quality improvement.

I would like to invite community members of Emalaheni aged 18-60 years to participate in this study. You were selected to participate in this survey because it is considered that the age group from 18-60 years will inform this study and will also help to keep the study manageable. You will not be eligible to complete the survey if you are younger than 18 years. This study involve online questionnaire survey. By completing this survey, you agree that the information you provide may be used for research purposes, including dissemination through peer-reviewed publications and conference proceedings.

It is anticipated that the information we gain from this survey will help us to know if community members are aware of air quality by means of the communication strategies that Emalaheni Local Municipality is using to communicate information on how to improve air quality.

You are, however, under no obligation to complete the survey and you can withdraw from the study prior to submitting the survey. The survey is developed to be anonymous, meaning that we will have no way of connecting the information that you provide to you personally. Any identifying information that is obtained in connection with this survey will remain confidential and will be disclosed only with your permission or as required by law. If you choose to participate in this survey it will take up no more

than 15 minutes of your time. You will not benefit from your participation as an individual, however, it is envisioned that the findings of this study will assist Emalahleni Local Municipality on the appropriate plan of their communication strategies in order to achieve success in promoting community awareness on air quality improvement. We do not foresee that you will experience any negative consequences by completing the survey. The researcher undertake to keep any information provided herein confidential, not to let it out of our possession and to report on the findings from the perspective of the participating group and not from the perspective of an individual.

The records will be kept for five years for audit purposes where after it will be permanently destroyed and the electronic versions will be permanently deleted from the hard drive of the computer. You will not be reimbursed or receive any incentives for your participation in the survey.

The research was reviewed and approved by the Research Ethics Review Committee of Unisa. The primary researcher, Constance Ugo Nnachi can be contacted during office hours at 0834572671 or 0790549851 or email [constanceugonnachi@gmail.com](mailto:constanceugonnachi@gmail.com). The study leader, Mrs Queen Mabusela can be contacted during office hours at 0124298895 or email: mabusqs@unisa.ac.za. Should you have any questions regarding the ethical aspects of the study, you can contact the chairperson of the Research Ethics Review Committee of Communication Science, Mr Mfuphi, email: mfuphsm@unisa.ac.za

Alternatively, you can report any serious unethical behaviour at the University's Toll Free Hotline 0800 86 96 93.

You are making a decision whether or not to participate by continuing to the next page. You are free to withdraw from the study at any time prior to clicking the send button.

Please can you tick the following box to indicate that you are providing permission to take part in this research study. Your identity as well as all the information you provide will be kept confidential.

Yes I am willing to partake in this study

No I am not willing to partake in this study

Indicate your demographic details by placing a cross over the box that indicates your choice

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Sex	Male	<input type="checkbox"/>	Female	<input type="checkbox"/>				
Age	18-30	<input type="checkbox"/>	31-40	<input type="checkbox"/>	41-50	<input checked="" type="checkbox"/>	51-60	<input type="checkbox"/>
Race	White	<input type="checkbox"/>	Black	<input type="checkbox"/>	Coloured	<input type="checkbox"/>	India	<input type="checkbox"/>
Qualification	Matric	<input type="checkbox"/>	Diploma	<input type="checkbox"/>	First degree	<input type="checkbox"/>	Masters' degree	<input type="checkbox"/>
	Doctorate	<input type="checkbox"/>	Others(specify)	<input type="text"/>				
Occupation	Business	<input type="checkbox"/>	Students	<input type="checkbox"/>	Doctors/Nurses	<input type="checkbox"/>	Lecturers	<input type="checkbox"/>
	Others(specify)	<input type="text"/>						

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Please, place a cross over the box that indicates your choice.

1. Emalahleni Local Municipality uses the radio to promote community awareness about air quality improvement programs.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree
<input type="checkbox"/>	<input type="checkbox"/>			

Agree                      Strongly agree

2. Emalahleni Local Municipality uses newspapers to promote community awareness about air quality improvement programs.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree
<input type="checkbox"/>	<input type="checkbox"/>			
Agree	Strongly agree			

3. Emalahleni Local Municipality uses social media platforms to promote community awareness about air quality improvement programs.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree
<input type="checkbox"/>	<input type="checkbox"/>			
Agree	Strongly agree			

4. Emalahleni Local Municipality uses door to door campaigns to promote community awareness about air quality improvement programs.

<input type="checkbox"/>				
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Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree
<input type="checkbox"/>	<input type="checkbox"/>			
Agree	Strongly agree			

5. Emalahleni Local Municipality uses community meetings to promote community awareness about air quality improvement programs.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree
<input type="checkbox"/>	<input type="checkbox"/>			
Agree	Strongly agree			

6. Emalahleni Local Municipality uses their website to promote community awareness about air quality improvement programs

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree
<input type="checkbox"/>	<input type="checkbox"/>			
Agree	Strongly agree			

7. Emalahleni Local Municipality uses pamphlets to promote community awareness about air quality improvement programs

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree
<input type="checkbox"/>	<input type="checkbox"/>			
Agree	Strongly agree			

8. Emalahleni Local Municipality uses billboards to promote community awareness about air quality improvement programs

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree
<input type="checkbox"/>	<input type="checkbox"/>			
Agree	Strongly agree			

9. Emalahleni Local Municipality uses other channels to promote community awareness about air quality improvement programs

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree

Agree

Strongly agree

10. I prefer to receive information on air quality improvement via radio

Strongly disagree

Disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Agree

Strongly agree

11. I prefer to receive information on air quality improvement via sms

Strongly disagree

Disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Agree

Strongly agree

12. I prefer to receive information on air quality improvement via social media

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree
<input type="checkbox"/>	<input type="checkbox"/>			
Agree	Strongly agree			

13 I prefer to receive information on air quality improvement via local newspapers

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree
<input type="checkbox"/>	<input type="checkbox"/>			
Agree	Strongly agree			

14. I prefer to receive information on air quality improvement via community meetings

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree

Agree       Strongly agree

15. I prefer to receive information on air quality improvement via a call

Strongly disagree       Disagree       Somewhat disagree       Neither agree nor disagree       Somewhat agree

Agree       Strongly agree

16. I prefer to receive information on air quality improvement through other channels

Strongly disagree       Disagree       Somewhat disagree       Neither agree nor disagree       Somewhat agree

Agree       Strongly agree

17. I am well aware of ways to improve air quality

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree
<input type="checkbox"/>	<input type="checkbox"/>			
Agree	Strongly agree			

18. The language used by the Emalaheni Local Municipality for information dissemination on air quality improvement is my mother tongue.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree
<input type="checkbox"/>	<input type="checkbox"/>			
Agree	Strongly agree			

19. The language used by the Emalaheni Local Municipality for information dissemination on air quality improvement is ambiguous.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree

Agree

Strongly agree

20. The language used by the Emalaheni Local Municipality for information dissemination on air quality improvement is understandable.

Strongly disagree

Disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Agree

Strongly agree

Thank you for participating in this study.

