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**An Exploration of Indigenous Knowledge Systems and Environmental
Conservation Towards Climate Change.**

By

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FOR THE DEGREE OF

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IN THE

FACULTY OF HUMANITIES

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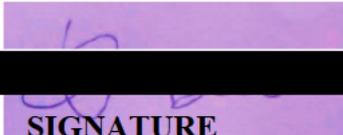
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DEDICATION

This Dissertation is dedicated to my father Philip Feliziwe Mzobe and Joanne Lee Olivia who passed away a month apart in 2007. To the different aunties that took care of me, I thank you for the encouragement and the motherly roles provided at all times. My biggest gratitude goes to my legal guardian and family through the love and support of Thoko Maureen Mathebela including other relatives. Christof and Marguerite Spies as well as the entire Spies family for supporting me through my academic career from finances to spiritual guidance. Lastly and most important this dissertation is dedicated to marginalised groups across the globe and those afflicted by mental health issues of which I am a victim. May you find strength in your immediate community and live-in freedom. To the people I have met during my study, a very big thank you for the encouragement and support provided.

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ABSTRACT

This dissertation looks to examine the feasibility of environmental conservation methods and approaches used in the Global North to the sustainability of Indigenous communities and their environments in the global South. The study provides a platform for continued efforts and approaches toward Indigenous knowledge systems and Indigenous communities. The study then draws on environmental conservation discourse, methods, and contributions to tackling environmental issues and concerns that directly and indirectly affect not only Indigenous peoples but their larger societies. There is vast array of literature that might help and further the discourse of environmental conservation and discourse beyond their socio-economic regions. With the adoption of the 2030 Agenda for Sustainable Development, the international community is committed to addressing a substantial number of challenges. Among those emphasised by the Sustainable Development Goals (SDG) are highly relevant for Indigenous groups. Education, poverty, access to justice and climate change are only just the tips of the issues affecting Indigenous people's lives. Yet, Indigenous groups are not passive actors. Despite being at the mercy of climate hazards and misleading political decisions, the knowledge system they have developed throughout the centuries has helped them to successfully respond to ecological and development challenges. The study used desktop research, which is qualitative. It used secondary data to examine studies and efforts toward improving the environmental conservation methods and approaches that are directed towards improving the lives of Indigenous communities. The study examined a variety of data, studies, organizational contributions, and projects. The study showed that before any workable progress can be reached, methods and approaches to environmental discourse and actions need to be aware of the unique requirements of Indigenous communities both in the Global North and South.

Keywords: Indigenous Knowledge Systems, Indigenous Communities, Global North, Global South, Environmental Conservation, Sustainable Development, Feasibility, Discourse, Aboriginal, Ecosystem.

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LIST OF ABBREVIATIONS AND ACRONYMS

- AIKS - African Indigenous Knowledge
- CIKARD - Centre for Indigenous Knowledge for Agriculture and Rural Development
- CIRAN - Centre for International Research and Advisory Networks
- DST - Department of Science and Technology/ DSI- Department of Science and Innovation
- IIED - International Institute for Environment and Development
- IIRR - International Institute of Rural Reconstruction
- IK - Indigenous Knowledge
- IKS - Indigenous Knowledge Systems
- IP - Intellectual Property
- IUCN - International Union for the Conservation of
- NOIKS - National Office on Indigenous Knowledge Systems
- NRF - National Research Foundation
- TEK - International Program for Traditional Ecological Knowledge
- TRIPS - The Agreement on Trade-Related Aspects of Intellectual Property Rights
- UNESCO- United Nations Educational, Scientific and Cultural Organization
- UNO - United Nations Organisation
- WIPO - World Intellectual Property Rights Organisation
- WK - Western Knowledge

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

It is recognized that in parts of the world, Indigenous communities are at the forefront of conservation, according to a recent report supported in part by United Nations Environment Programme (UNEP). In the Democratic Republic of Congo, the Bambuti-Babuluko community is helping to protect one of Central Africa's last remaining tracts of primary tropical forest. In Iran, the semi-nomadic Chahdegal Balouch oversee 580,000 hectares of fragile scrubland and desert. And in Canada's far north, Inuit leaders are working to restore caribou herds, whose numbers had been in steep decline (Nenquimo, 2021).

Nenquimo (2021) further elaborates that including Indigenous peoples and local communities in environmental governance and drawing from their knowledge enhances their quality of life. It also improves conservation, restoration, and the sustainable use of nature, which benefits society at large. Indigenous groups are often better placed than scientists to supply information on local biodiversity and environmental change and are important contributors to the governance of biodiversity at local and global levels, The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) report noted.

Despite that, Indigenous groups often see their land exploited and dispossessed and struggle to have a say in what happens in their territories. "Governments need to recognize that cultural heritage and traditional knowledge of Indigenous peoples and local communities significantly contribute to conservation and can enhance national and global action on climate change," says Drissi (2021). A key part of that process is recognizing Indigenous land claims and embracing traditional ways of managing land (Nenquimo, 2021).

This study then links Indigenous Knowledge Systems (IKS), groups and the environment as being important to understanding the discourse that is clear for nations in the Global North and those in the South. Using the case studies of South Africa and Canada in a comparative way

highlights the success and failures of both nations in efforts to protect Indigenous knowledge, and peoples, and question the effectiveness of environmental conservation efforts and approaches beyond these regions (Goebel, 2007).

The research also recognizes the challenging task of comparing the histories of European occupation and later dispossession, oppression, and struggles for the liberation of Indigenous/Aboriginal peoples. The question that arises is how one can compare a country with a vast majority of Indigenous peoples who won independence from former European colonialists with a country where the Indigenous population is a tiny minority with no agenda to defeat the government or a developing nation with a member of the G8?

European colonists assumed the right to impose governance structures were none (that they recognized) seemed to exist. However, how this was done differed. Two key differences in this preliminary period are the issue of slaves and other labour relations, and the role of treaties in the land alienation processes. In the case of the Cape Colony in South Africa, the Dutch were already involved in the slave trade when they arrived at the Cape, and they brought large numbers of slaves with them. This contributed to the shape of the race and labour hierarchy that appeared in the Cape and later played a crucial role in the development of South Africa. In North America, by contrast, although there were slaves in New France, there were few, and the economy did not require a large labour force (Fairweather, 2006).

In Canada, early relationships with Aboriginal peoples were primarily for trading purposes (the fur trade especially), and encroachment on their land was more gradual than in the Cape. In the Cape, the aggressive take-over of Khoikhoi cattle and land from 1652 was quickly followed by the eastward expansion of the Dutch, who then met the Zulu and the Xhosa in the interior where violent wars were waged in the nineteenth century. While peace treaties were tried in the middle part of the nineteenth century, African chiefs were suspicious of them, nor did they serve the interests of the colonialists; have put aside in 1848, when the colonial government claimed all land for the colony. A similar process occurred in the Boer Republics faced with large Indigenous populations and scarce land. By contrast, in North America, treaties were used extensively and far more usefully, given the vastness of the land and the small numbers of Indigenous peoples. Treaties typically granted Aboriginal peoples the rights to their hunting

and fishing grounds and demarcated "reserves" for their perpetual use in exchange for land for white settlement. Treaties effectively avoided war, and after the War of 1812 (between Britain and the United States) when European settlement intensified in Upper and Lower Canada, treaties helped keep the peace. Aboriginal people were actively involved in treaty negotiations, seeing them as the best available means to protect their interests (Fairweather, 2006).

The new global threat of climate change which goes beyond the colonial past, and the ghosts of history that have been brought by industrialization is affecting the livelihoods of more than just the oppressed but all members of society and the environment. These are then not only challenges for policy but how the knowledge around this threat being given and how it in turn will change the most vulnerable.

Environmental conservation discourse will help by being a guide that will secure or destroy the futures of these communities - how their contributions affect this discourse is important in understanding the roles and relationships to protect, regulate, and access how they have been included as Indigenous peoples and their knowledge into the overwhelming western discourse of conservation.

1.2 DEFINITION OF CONCEPTS

Indigenous Knowledge: These are bodies of knowledge, aptitudes, lessons, and convictions created locally by individuals in their particular social communities and situations, to preserve and make strides in their profession. They are also known as community knowledge, traditional knowledge, and natural knowledge (UKZN, 2019).

Indigenous Knowledge Systems (IKS): This alludes to the long-standing conventions and practices of Indigenous communities. It envelops the inquiry about ability, advancements, intelligence, lessons, encounters, convictions, dialect, and bits of knowledge of the individuals delivered and collected over a long time and connected to preserve or advance their communities and lives (UKZN, 2019).

Environmental Conservation: This is an umbrella term that characterises anything we do to ensure our planet preserves its natural assets so that each living thing can have an improved quality of life (Rinkesh 2019).

Scientific Knowledge and Systems: Scientific knowledge alludes to the understanding of an individual which should focus on the strategies and methods of science instead of subjective conviction or an unsupported hypothesis. The individual must have ample grounds for his/her belief (Billet, G., Clunet-Coste, B., & Maneuf, B. (1998). U.S. Patent No. 5,839,900. Washington, DC: U.S. Patent and Trademark Office., 2019).

Discourse: A speech or piece of writing about a usually serious subject (Cambridge Dictionary, 2022).

Aboriginal: being the first or earliest known of its kind in a region (Meriam-Webster, 2022).

1.3 BACKGROUND TO THE STUDY

Environmental conservation and IKS are both diverse concepts that filter into an array of issues and topics, they can go as far as to speak on issues of human and environmental rights, development, and the economy. However, the purpose of this study is to explore the links that the discourse about how Indigenous knowledge in South Africa and Canada can contribute to the mitigating concerns of environmental conservation which are rooted in the issue of climate change.

IKS denotes complicated information structures assimilated over generations by populations, as they interrelate with the environs. It incorporates scientific, financial, metaphysical, knowledge and governance structures. It speaks of experiential facts and philosophies passed along age groups of long-standing populaces of an exact locality, by traditional communication, about the connection of people amongst each other and their surroundings (Warren, 1991).

Researchers and institutions can rarely consider IKS in development based on assumptions that the tools used by Indigenous communities do not have complete Western or scientific

applications and are locally derived. The issue is then how can environmental conservation methods of the Indigenous be integrated beyond the western comprehension of knowledge? How can they be efficiently applicable to harness the ability of IKS, and communities? This is to have meaningful contributions and a role in transforming the conditions not only for the Indigenous but advancing the current knowledge base on techniques of environmental conservation for sustainability.

The concern is whether the current and available discourse, approaches and methods, as well as policies are sufficient in addressing issues related not only to environmental conservation but to form an understanding of the current conditions of Indigenous communities and the impact that they have on any sustainable solutions that might exist in improving their environment and contributing holistically to the inquiry around conservation and the climate change challenge that is fast destroying communities.

The study also briefly delves beyond just literature on environmental conservation, but it also analyses the outcomes and approaches of the two nations as a cornerstone of the global perceptions about Indigenous communities, the effectiveness of the policy, approaches, discourse, and the ultimate involvement of Indigenous communities and the likes in making an impact beyond environmental conservation.

This study is motivated by the growing demand for new methods and approaches to environmental conservation, translating and interpreting environmental phenomena on behalf of the marginalised and Indigenous peoples across the board. Discourse that is fair and holistic and acknowledges the weight of colonialism and imperialism, and their continued effect on not only Indigenous communities but also those who are marginalised, are issues that need to be firstly addressed to find more sustainable solutions for contemporary and immediate action. The aim is to seek approaches and methods, which echo not only the Western dichotomy but also those of other societies, as it will help to promote the integration of knowledge that can take place beyond localities.

1.4 PROBLEM STATEMENT

Indigenous knowledge systems are a body of knowledge, or bodies of knowledge of the Indigenous people of geographical areas that they have survived on for an exceedingly long period of time. IKS may be defined as local knowledge that is unique to a given culture or society. They are knowledge forms that have failed to die despite the racial and colonial onslaught that they have suffered at the hands of western imperialism and arrogance. IKS are forms of knowledge that have originated locally and naturally (Altieri 2011). According to Ermine (cited in Hammersmith 2007), they are linked to the communities that produce them. He observes that those natural communities are characterised by complex kinship systems of relationships among people, animals, the earth, and the cosmos, from which knowing emanates. These knowledge forms are known by other names, and among them are indigenous ways of knowing traditional knowledge, Indigenous technical knowledge, and rural knowledge as well as ethnoscience (or people's science) (Altieri 2011). Indigenous knowledge systems manifest themselves through different dimensions.

Indigenous, local, and traditional knowledge systems and practices, including Indigenous peoples' holistic view of community and environment, are a major resource for adapting to climate change, but these have not been used consistently in existing adaptation efforts (IPCC, 2014). Indigenous knowledge, observations, and interpretations are significant for understanding livelihoods, security, and well-being, which is essential for adaptation (Green and Raygorodetsky, 2011). Integrating Indigenous and traditional knowledge with existing practises increases the effectiveness of adaptation (IPCC, 2014:19). Indigenous peoples are becoming recognized as "agents of change" in achieving strong and meaningful climate action (ILO, 2019).

Attempts in creating a space where the knowledge sets can be collected, stored, documented, and virtually disseminated to the rest of the world, where communities can contribute to the development and conservation of the environment should be contained in the discourse on IKS. There is scepticism about IK or the methods and approaches of Indigenous people and their experience. Furthermore, there is a selection of mainstream understanding and techniques rather than indigenous expertise and communities. It posits importance in specific IK that is favourable to the West and draws from sectors such as agriculture, ecology or biomedicine. It will then set the scale of the devaluing of knowledge, such as the spiritual and philosophical.

The world is fast trying to adopt approaches and methods, which can reach sustainability and achievable demands brought on by globalisation. It then would include development, eradicating poverty, creating sustainable infrastructure, and the need for sustainable development in all aspects of economic growth. For environmental conservation, IK and communities do well in understanding their environments and the local conditions. Global warming is on the rise, and there is a desperate attempt by researchers, and other experts in the field to use “new methods.”

1.5 FIELD OF STUDY

IK/ IKS and environmental conservation can be valuable areas of study; they have also been an area of concern for practitioners in various fields. However, with the significant interest by Anthropologists and Sociologists, it has been able to rise over the decades in differing forms. Indigenous studies came as an area of interest through the fascination with the “Other,” meaning non-Western or First nations. Prior relationships between the interest of the knowing insiders and the Indigenous have shaped the type of role that each of the two plays. This connection in contemporary capitalism, segregation, and apartheid, placed the Indigenous communities on the brink of extinction, such as the Native Americans, the Aboriginals, and communities in the Amazon that faced recent death due to deforestation.

The ownership of land by the Indigenous and its appropriation by colonialists and imperialists continues to be a contention in contemporary times. Research embraced since colonisation on Indigenous land ownership, focused on indigenous individuals, has resulted in the phenomenon that indigenous individuals are the first to be asked. Until recently these investigations continue to focus on indigenous individuals and communities on land ownership and management. Land dispossession, erosion of their culture and knowledge systems, the substitution of western forms of governance and devastation of their social organisation continue to impact Indigenous people’s livelihood (Battiste and Henderson, n.d.)

Additionally, different research investigations and inquiries into IKS, have contributed little to the livelihoods of Indigenous people, to the point that development projects fail to understand the situation on the ground (Mugambi, 2002). Their failings have had a negative result on Indigenous people and their knowledge, so much so that their land rights; their religious

freedoms are in instances in conflict with state and international laws. For example, the Ilongots (Carlson, 2003). This is an ethnic group based in the Philippines, who have aggressive social practices such as beheading for sport. Their emotional well-being and social positioning would conflict with modern morality.

In places on our planet, Indigenous knowledge plays a key role in disaster risk clarification, disaster preparedness, disaster mitigation, and disaster-related policies/plans implementation (Hiwasaki et al., 2014b; Nakashima, 2010). Sometimes, Indigenous knowledge is found to perform even better than modern science and technology (Rasid and Paul, 1987; Zhang et al., 2010; Basak et al., 2015; Dewan, 2015). Unfortunately, due to its inherent local relevance, the direct application of Indigenous knowledge to places other than its origin is questionable and risky even if it works well at a low cost for a specific community under certain natural and social conditions. Reviews and typical examples of Indigenous knowledge are reported in works of literature such as Rasid and Paul (1987), Dekens (2007), Shaw et al. (2008), UNESCO (2009), Mercer et al. (2010), and Hiwasaki et al. (2015).

As the working mechanisms of such knowledge are mostly not well explained or validated scientifically, Indigenous knowledge is regarded as inferior to modern science and technology. In various parts of the globe, Indigenous knowledge is either under threat or the use of Indigenous knowledge is considered as an alternative or temporary way for the development of poverty-stricken areas where modern science and technology are not affordable. On the other hand, as Indigenous knowledge is historied wisdom from nature, it is promising to provide more environment-friendly solutions compared with modern science and technology. Therefore, it is important to clarify the rationales and underlying processes behind Indigenous knowledge, to understand its implications, potentials, and limitations, as well as to incorporate it into the latest science and technology.

Globally, there are all types of Indigenous knowledge in terms of both structural and non-structural forms. The former is physically visible technical knowledge and presents the concrete aspect of local knowledge, while the latter is not easily recognizable such as those related to environmental, agricultural, sociocultural, and historical knowledge (Dekens, 2007). Among them, Indigenous knowledge for disaster risk reduction has received increasing attention since the 1990s, and the 2004 Indian Ocean Earthquake and Tsunami have been

recognized as a turning point when specialists and scientists began to show interest in such knowledge (Hiwasaki et al., 2014a).

1.6 OBJECTIVES OF THE STUDY

- To compare the links between IKS and environmental conservation.
- To examine if IKS can make an impact on Environmental Conservation.
- To examine the influence of IKS on global environmental management discourse.

1.7 RESEARCH QUESTIONS

- How do structural and non-structural forms of IK/IKS work?
- Do the current policies on the environment give enough consideration and protection to Indigenous people?
- How can IKS be integrated, accommodated, and promote environmental conservation?
- How does climate change impact the current policies towards IK/IKS?
- Is there a relationship between IKS and environmental conservation?

1.8 ASSUMPTIONS WHICH ARE PRESENT IN THE STUDY

The study focussed on the distinct roles of IK/IKS discourse and communities to understand the emerging and urgent need to find solutions to issues around environmental conservation. This is motivated by the constant increase of climate change, and a threat it poses for not only just Indigenous peoples but the larger global ramifications such as flooding, tropical storms/ disasters, drought, famine, and more prominently food security. The study assumes that along with vast collections of literature, research, reforms, and policy aimed at integrating Indigenous knowledge and peoples it would have been discoursing enough to understand these on an environmental conservation level or lack thereof. Inter-generational knowledge has proved beyond doubt that IK and IK communities have survived the most challenging climates. They survived floods and other natural disasters during the colonial and contemporary periods that communities have endured. There is an alternative voice that suggests that IKS has potential for development and change in the way of the indigenous lifestyles.

1.9 SCOPE OF STUDY

The depth of the study draws upon works and sources primarily focused on global South. States in the South have vastly contributed, advocated, and attempted to integrate policies and laws on behalf of Indigenous people and their protection as well as integration of these groups. Their collection, storing, documenting, integration, and dissemination of their knowledge is vital for the preservation of these communities.

The study recognizes the colonial, and imperial conditions of the two regions and states. They are represented to highlight as well as being in consideration of the role's scientific, colonialism, imperialism, and other western forms of discourse. They have continued to drown out the indigenous voices and their knowledge besides the “ceremonials” of dialogue, and ineffective policy that still leave the Indigenous powerless and in bureaucratic limbo. It also introduces the already existent but re-emergent Eastern Paradigms (Chinese and Indian), in the more massive case of other developing nations, such as those in Africa and Post-Colonial regions such as Jamaica.

This study hopes to help re-evaluate the way research on indigenous inquiry, and research attitudes towards IK and their inherent system changes, and how their broader societal perspective has changed and adapted from the local to the global level. The study will continue to echo the need for Indigenous communities and their knowledge to fully participate in the discourse of not only environmental conservation but other areas of interest. Delivering various local insights and expertise towards the global spaces of environmental conservation will reshape the perspectives and bargaining powers of Indigenous knowledge groups. Discourse that focuses on leveraging contemporary understanding of the Indigenous peoples in South Africa and Canada can be the cornerstone of understanding perspectives and actions towards the latter.

Relationships between varying forms of knowledge and insight are shown to be significant analysis in promoting change to achieve more holistic solutions to the areas beyond just environmental conservation. The subject require an approach which promotes integration and a sense of cooperativeness. To reach the above an acknowledgement of the colonial and imperial histories can be derived from environmental conservation. Increasing community-

focused research is needed, and full community organising, and participation should be integral to researchers, professionals, organisations, governments, and the local and global society.

1.10 SIGNIFICANCE OF STUDY

The study is important in understanding, climate change intervention in South Africa and Canada beyond western methods and implementations. Added to this discourses is the foundation on environmental conservation with the intersection that exists between Indigenous knowledge and Western forms of knowledge. It can relay communities' input in meeting the challenges climate change has presented in the forms of deforestation, famine, droughts, flooding, and environmental policies to list very few covered in the literature. The role of pre-existing institutions as well as laws to aid or dismiss indigenous discourse, peoples, and their participation. The lenses and prospects from South Africa and Canada can be fundamental in understanding the impact and foundations of global discourse towards Indigenous people and their contribution to the environmental conservation discourse. IK is more universally appealing without compromising on its validity and reliability and its authentic nature. Indigenous groups usually are too far away for the researcher to be able to access and therefore require spending a tremendous amount of funds and time to be able to conduct detailed research. Achieving well-rounded knowledge of IK and the communities in this study, data will be dependent on multiple disciplines in the social sciences and sciences, more specifically the work of anthropologists as sociologist as well as other disciplines.

Across the literature, there has been an attempt to find common ground between IKS/IK and environmental conservation through the understanding of scientific discourse in which it is rooted at present. It can present a challenge when trying to find solutions to transform IK communities' conditions under environmental conservation. They can be a result of extreme climate change, land right issue, or deforestation - thus, the study is a bridging mechanism between the Indigenous and scientists to move forward with the methods, policies and research that are a universal area of environmental conservation.

1.11 PRELIMINARY CONSIDERATIONS

The research posits a study of Indigenous communities and their links to environmental conservation and the contemporary climate change challenges, by using South Africa and

Canada as a basis and foundation for the literature reviewed in the research. This helped to draw further links to understanding the conditions of Indigenous people, and their knowledge. This is an attempt to understand discourse for the development of a solution to environmental conservation challenges in the global South and North. It Combines knowledge and discourse of both regions to gain a global consensus for sustainable environmental conservation knowledge as well as approach.

Historical conditions imprinted by colonialism, interventionism, 'Othering' ideologies and other Western concepts, perspectives, and attitudes towards IK and people, are necessary to highlight in finding new methods and approaches to both scientific and indigenous inquiry. Indigenous participation in their development and progress is vital to further applications that are urgently needed for development, environmental conservation, and economic growth as Indigenous people and their knowledge are well-suited inserts to their environments.

1.12 GENERAL STRUCTURE OF STUDY

This study makes up six sections divided into chapters.

Chapter One: Introduction

The introductory chapter, introduced the research topic, supplied the background to the research problem statement and further reasoning for it. It gives reasons why there is a need to study the trends in the Global South. (The significance of the study, the problem statement, the aims, and the research questions are also covered in this chapter.

Chapter Two: Literature Review

This section comprises an introduction to the literature review on understanding environmental conservation as the catalyst to understanding and acting toward climate change. It delves into understanding the integral role that nation states have played for IKS and IK communities in their localities and beyond. In the chapter, an overview of the contemporary conditioning towards IKS and Indigenous communities is presented. As a part of improving the current climate conditions, the literature delves into promoting sustainable agriculture, sustainability, and rural livelihoods for the betterment of climate action. It also echoes literature that promotes

integration. Knowledge transfer is an important part of the literature review which promotes IKS integration to tackle emerging issues around climate change.

Chapter Three: Theoretical Framework

The theory adopted in the study was Sustainable Development which is well suited to understanding the discourse of climate change and finding an actionable solution to the issue. IKS is capable of supplying sustained solutions at the community level which through transfer and integration can be transferred solutions for knowledge sharing and participation so that the global Souths indigenous work can be promoted.

Chapter Four: Methodology

This chapter consists the methodology and the research questions mentioned earlier. It further elaborates on the methods and how it was suited and fitted into the study. The chapter also lays out the data analysis, procedures, and research design used in the study. The methodology adopted for this study is Desktop Research. It aided in filtering the existing literature through electronic sources, and books. However, sources were incorporated from a combination of materials sourced through books, journal articles handbooks, and documentaries.

Desktop Research is made up of two types. The first is ‘ internal desk research’ in which the information is viewed through the existing IK centres available in the institution and other parts of the global South Indigenous knowledge centres and networks. Another branch of the desktop research process is ‘external desk research,’ which is the use of an external source of information, whether through the internet or other available sources.

Chapter Five: Analysis and Interpretation of Data

In this chapter, data for the study were analysed and interpreted. Data was gathered using desktop research, which reviewed different works of literature on the topic under investigation. The analysis of the literature and the critical points raised is presented for the presiding chapters. The study then suggested globalisation for future research and testing of the data collected. A two-state comparative approach was used to provide validity.

Chapter Six: Summary of Findings, Recommendations and Conclusions

The results from the literature review and other data collected were discussed and summarized in this chapter. Based on the data analysis, methods, interpretation, and a summary was used to arrive at the recommendations and conclusions of the study. The study was able to generate guidance and findings from the questions and objectives. It highlights in brief, the results found in the research process summing up all the resultant collected data. The study also provides recommendations for future research.

1.13 CONCLUSION

This chapter introduced the study by supplying a detailed mapping of the structure of the study. In the introduction, an overview of the historical contexts of the research topic was laid out. A definition of concepts that are a prominent feature in the study is defined and highlighted such as IKS, discourse, and Aboriginals as these are a constant in the research. The background, problem statement, and significance of the study are important to give motivation and context for the chosen study as they laid the foundation for formulating the study. By doing the above it gave a structure to the layout of the study that is presented.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter provides an overview of previous research on Indigenous knowledge and environmental conservation in the global South. It introduces examples that comprise a vast collection, of research, contribution, participation, institutions, and inputs on the protection and inclusion of Indigenous knowledge as well as their communities. Environmental conservation on the part of both the global South and North is relevant for this study as the literature review focused on IKS and IK contributions which can impact the contemporary issues around climate change, deforestation, policies, institutional inputs, and outputs utilized within both regions. It follows these and the discourse contained in them to evaluate what their greater impact means for environmental conservation and IK communities as well as the knowledge that it postulates for the management of environments locally as well as their global output.

The context of the literature review is important in understanding environmental conservation and Indigenous knowledge towards climate change which is postulated in the following way:

- Environmental Conservation as a catalyst for the literature review and study.
- An explanation of why the global South and North are integral for understanding IK/IKS when it comes to environmental conservation.
- The literature comments on the previous treatment of the topic on IK and IKS concerning environmental conservation.
- The literature highlights the role of sustainable agriculture and rural livelihoods which underpin the discourse on IKS.
- Environmental Conservation in the context of food security and Indigenous knowledge.
- It provides the importance of education for the transfer of a sustainable knowledge system towards the environment.
- The study presents reason to the importance of integrating Indigenous knowledge and modern practices.

2.2 ENVIRONMENTAL CONSERVATION AS A CATALYST FOR INDIGENOUS IMPACT.

Due to their subsistence economies and spiritual connection to lands and territories, most Indigenous peoples suffer disproportionately from loss of biological diversity and environmental degradation. Their lives, survival, development chances, knowledge, environment, and health conditions are threatened by environmental degradation, large-scale industrial activities, toxic waste, conflicts and forced migration, as well as by land-use and land-cover changes (such as deforestation for agriculture). These challenges are further exacerbated by climate change.

It helps to mitigate measures that can increase the threat to Indigenous peoples' territories and coping strategies as in the case in biofuel initiatives. While biofuel initiatives are meant to reduce greenhouse gas emissions, they may affect the ecosystems, water supply and landscape on which Indigenous peoples depend, ultimately leading to an increase in monoculture crops and plantations and a consequent decline in biodiversity, food, and water security.

When the rights of Indigenous peoples are protected—and particularly their rights to land, territories, and resources—their culture thrives, and so does nature. Drissi (2021) notes the following: Indigenous peoples' contributions are essential in designing and implementing solutions for ecosystems. Traditional knowledge and heritage can contribute to environmental assessments and sustainable ecosystem management. For example, the sustainable production and consumption of indigenous and traditional food has invaluable benefits for natural resources and ecosystems, contributes to a sustainable and healthier diet, and helps mitigate climate change. UNEP will further promote the use of traditional crops and pastoralism.

Environmental degradation and biodiversity loss are some of the major challenges experienced worldwide with cities being the most affected places. The worst is feared if this challenge is not addressed with urgency. The assertion by Oliver et al (2014) substantiates that the environment should be used sparingly bearing in mind that the earth is fast reaching its carrying capacity. Ngara and Mangwizvo (2013) attribute this disaster to a lack of 'self-imposed restrictions on the management of natural resources that are community specific. This assertion is akin to the argument by Fehling et al. (2013) that Millennium Development Goals (MDGs) failed because of a lack of localisation in formulation and implementation because they were

presented as a panacea to this diverse world. In as much as the entire world is experiencing the same challenge of environmental degradation, solutions should be crafted and implemented from the grassroots level guided by enacted policies for land use. This means that the concerned local authorities will play a key role in advocating for sustainable use of the environment within their communities. To achieve this, Buckton (2014) notes, that appropriate environmental behaviour needs to be inculcated. Local governments should therefore work hand-in-glove with their people from policymaking and implementation for sustainable use and management of the environment.

A landmark 2019 report by the United Nations backed by Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES) found that the natural world is declining at a pace unprecedented in human history. The three quarters of the planet's dry land has been "significantly altered" by human actions, which has imperilled crucial ecosystems, including forests, savannahs and oceans while pushing one million species towards extinction (UNEP, 2020).

According to Nenquimo (2020). "While the ecological decline is accelerating in many Indigenous communities, it has been "less severe" than in other parts of the world, the report found. Experts say it is due in part to centuries of traditional knowledge and, in various communities, a prevailing view that nature is sacred. This knowledge, "encompasses practical ways to ensure the balance of the environment in which we live, so it may continue to provide essential services such as water, fertile soil, food, shelter and medicines,".

Including Indigenous peoples and local communities in environmental governance and drawing from their knowledge enhances their quality of life. It also improves conservation, restoration, and the sustainable use of nature, which benefits society at large. Indigenous groups are often better placed than scientists to provide information on local biodiversity and environmental change and are important contributors to the governance of biodiversity at local and global levels, the IPBES report noted (UNEP, 2020).

Nenquimo (2020) states that "Because their lives are often intimately tied to the land, Indigenous communities have been among the first to face the fallout from climate change. From the Kalahari Desert to the Himalaya Mountains to the Amazon Rainforest, droughts, floods, and fires have beset communities already struggling with poverty and incursions onto

their land. That makes it all the more imperative for the outside world to acknowledge the rights and practices of Indigenous communities”.

Apart from ecosystem and biodiversity depletion, the entire environment the world over is under threat. Naome et al, (2012) argue that sustainable management of the environment beyond just the physical surrounding includes land, water, air, and animals. Pollution and solid waste management in urban areas have emerged as the major challenges requiring urgent attention. In support of this assertion, Mafume et al. (2016) state that waste management remains a great challenge in developing countries aggravated by limited resources. Modern technology has been adopted but proven helpful due to inappropriate equipment and facilities. What remains unexplored is whether or not IKS will also be useful in managing waste in Zimba. The Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) program established to conserve wildlife at the community level, (Balint and Mashinya, 2008). However, it yielded less, or no results compared to expectations due to a lack of community participation. Similarly, the lack of Indigenous people’s participation has exposed water sources to more danger regardless of efforts made by local authorities to conserve them. In research undertaken on Pungwe river (Mozambique) basin management, Nyikadzino (2014). concludes that in as much as locals were part of the stakeholders responsible for the management of the Pungwe River basin no engagement was done at a lower level. All these examples reveal that numerous and fruitless efforts of including IKS in managing natural resources. Thus, Indigenous knowledge is always overridden by modern influence.

Environmental Impact Analysis (EIA) may be a process by which the benefits of development are weighed against its shared environment where it has taken a toll. Since Indigenous communities are the outstanding natural stewards of their land, it is reasonable that they are consulted and play an integral role in the EIA process. Their input can amend an incoherent examination that distorts the adjacent setting in which it is also associated. The idea is supported by Principle 10 of the Rio Declaration on Environment and Development 2019, which says ecological matters are best controlled by all involved. Principle 22 then provides for the practical collaboration of intrinsic individuals and their communities (Jones, 2012).

Indigenous peoples’ participation in environmental management is expanding universally, due to recognition of their rights, interests, and the worth of their Indigenous Environmental

Knowledge (IEK) (Hill et al. 1999; Houde 2007; Nakamura and Steinsson, 2008). Noteworthy and recent advances in viewing natural management as an angle of complex social-ecological system dynamics have found that integration of IEK with Western science can improve system traits associated with sustainability. In Australia, Indigenous peoples engage in environmental management with multiple partners (governments, researchers, producer groups, conservationists, and others) through an extension of instruments in natural resource management (Roughley & Williams 2007); securing native title deeds (Slope 2006, Agius et al. 2007); and aid with the co-managed protected regions, endangered species initiatives and water management processes. Subsequently, understanding approaches to knowledge integration within the different Australian examples may help build universal understandings of the functions of IEK and western science integration to manage sustainability (Hill, 2012).

Jeffrey McNeely (1995:73) hinted that preservation was linked to the general intellect about natural life. Regardless, the earth consists of a very few more-or-less anthropogenic environments occupied by people who have developed social approaches to overseeing the assets of their local biological systems sustainably (Verschuuren et al 2010:73-91). These indigenous individuals are the repository of understanding which is misplaced by urban and industrial social orders. They sketch the kinds of life that are possible through the reasonable utilisation of renewable assets—reliant totally on the resources, on the greater awareness of the importance of conservation, and of urban dwellers no matter how conscientious. Therefore, those interested in preserving biodiversity must be equally concerned about keeping cultural diversity and marshalling this variety for all sustainable forms of development.

2.3 INDIGENOUS KNOWLEDGE/ INDIGENOUS KNOWLEDGE SYSTEMS TOWARDS ENVIRONMENTAL CONSERVATION

The South African Indigenous knowledge bill was set up to encourage the new development of cross-cultural knowledge transactions as well as the protection of Indigenous knowledge. “The conservation of cultural diversity is then considered to be a precondition for the conservation of biological diversity. Therefore, Indigenous knowledge can help to meet the broader aims of society, for instance conserving the environment, developing sustainable

agriculture, and ensuring food security, while its protection encourages the maintenance of traditional practices and lifestyles” (Suchanandan, 2018).

In addition, the Indigenous knowledge bill is an enabling instrument for the Indigenous communities of South Africa to exercise their sovereign and inalienable rights, formal and/or informal, over their Indigenous knowledge and related intellectual and cultural knowledge. These rights are also exercised through Indigenous and customary laws, practices, and values (Suchanandan, 2018).

Indigenous knowledge has become crucial in the past decade as the country is on the path of seeking sustainability beyond just development and the economy. Global discourse and concern for the future of our planet and the impending environmental crisis seem to get worse. These are clear in the recent droughts of 2014- 2016 which contributed to water across the nine provinces. “Droughts occurred over South Africa during the summer seasons of 2014/2015 and 2015/2016. At the same time, the Pacific Ocean was warmer than normal starting in 2014 and leading to the extraordinarily strong 2015/2016 El Niño” (Mashoene, 2017).

The wetter than normal conditions in northeast South Africa, Botswana and Zimbabwe during December 2014 are unfamiliar for an established summer El Niño event over southern Africa. Anomalous cooler than normal Sea Surface Temperature (SST) occurred over the west coast and south coast during December 2014 and February 2015, while it is usually warmer during El Niño. Additionally, the colder than normal SST on the south coast during February 2016 and Namibian and West Coast during March 2016 does not mimic the canonical El Niño patterns. However, this did not influence the El Niño-like warmer seasonal SST average during 2015/2016. The lower than-normal pressure anomalies over the subcontinent during December 2014 and January 2015 were not portraying a canonical El Niño pattern but the other months were. The seasonal larger than normal pressure at 500 hPa over the subcontinent was more typical of El Niño during summer 2015/2016 and acted to suppress rainfall. Secondly, the study uses the Standard Precipitation Index (SPI) at different time scales (3 months duration, 5 months duration and 17 months duration) to assess the severity of the 2015/2016 summer drought compared to the other droughts of the 20th and 21st century (1921 to 2016) and to analyse the relationship between droughts and El Niño-Southern Oscillation (ENSO) (Mashoene, 2017).

According to Engelbrecht (2022), KwaZulu-Natal's April 2019 floods and mudslides should have been a reminder of how vulnerable the province is to heavy rains. Many communities live below flood lines along riverbanks and on steep slopes. Rivers such as the Mgeni and Mvoti that transverse the larger Durban area have long been known to cause severe flooding during periods of heavy rainfall.

He further added that this situation isn't unique to the province. A recent risk assessment in Tshwane revealed that more than 35 000 dwellings – half of these informal – are located below the indicative flood line. Population growth, unregulated informal growth, a lack of land-use zoning enforcement and inadequate stormwater systems all contribute to growing flood risks.

South Africa has experienced over 40 flooding disasters in the past 40 years, killing on average 46 people annually. During this period, floods cost the country R35 billion in direct losses, such as infrastructure damage. Wide-ranging indirect losses of informal homes, assets and other livelihood assets are undercounted and often uncompensated (Engelbrecht, 2022).

Despite these historical vulnerabilities, South Africa lacks collective memory about disasters since it doesn't have a reliable disaster loss and damage database. Local, provincial, and national governments haven't been initiative-taking in planning and building resilience, and the current early-warning systems and flood mitigation measures are inadequate and outdated.

According to Ndreu (2016), local government has an intermediary role between the people and their central government where the needs of the people are delivered to the government and likewise the government's policies are made known to the people through local governments. Put differently, the environmental management goal can be achieved if dealt with at the local level. It goes, without saying, that local governments have and are still adopting modern systems for effective service delivery including environmental management services for development (Berkes, 2012).

Alongside climate change, South Africa faces the growing exposure of vulnerable communities. Cities are proliferating and 24 million more people will be living in urban areas by 2050. Much of this growth will be informal, unregulated, and likely on unsafe, high-risk vacant land. Uncontrolled urbanisation and a lack of land-use zoning enforcement are

compounding climate risks. Every second city and town are projected to experience increased flooding by mid-century.

The country needs a two-pronged response to these challenges. The first – improving early-warning systems – is short-term, given the high-levels of current vulnerabilities. Climate science is well-advanced, and such systems can provide reliable warnings one to three days ahead of major floods. Local authorities must urgently develop contingency plans that include the relocation and evacuation of thousands of people in days. Municipal facilities should be ready to serve as emergency shelters during flooding and for cooling centres in extreme heatwaves.

The second part of the response is to reduce systemic vulnerabilities through climate change adaptation. High-risk land exposed to natural hazards must be identified and indicated on land-use schemes. Zones designated unsuitable for development must be adhered to and enforced. Local governments should guide development, even if informal, onto safe and well-located land. High-risk communities must be consulted and educated about the risks and alternative housing sites provided for relocation.

At-risk infrastructure must be identified and protected through flood control mechanisms. New infrastructure investments should consider extreme rainfall events and climate adaptation needs in the planning, design, and construction phases. All of society must be involved in these responses. Adaptation financing will be needed to spearhead them, and it must be directed towards measures that reduce flood risks and increase communities' resilience. Without the necessary action, flooding will continue to cause widespread devastation.

2.4 ENVIRONMENTAL CONSERVATION CONTRIBUTIONS TO THE STRUCTURAL AND NON-STRUCTURAL FORMS OF IK/IKS

The UN Declaration on the Rights of Indigenous Peoples requires that free, prior, and informed consent of Indigenous peoples be obtained in matters of fundamental importance for their rights, survival, dignity, and well-being. Moreover, consultations to obtain this consent must respect local governance and decision-making processes and structures; must occur in

Indigenous languages and on Indigenous peoples' time frames; and be free of coercion or threat.

The UN Permanent Forum on Indigenous Issues and Expert Mechanism on the Rights of Indigenous People are important policy instruments for Indigenous peoples to voice their concerns and advocate for policy change within the UN.

At national and local levels, however, Indigenous peoples continue to be marginalized. In response, UNEP has established a policy to promote the protection of environmental defenders through which it will denounce attacks, torture, intimidation, and murder of environmental defenders; advocate for better protection of environmental rights and the people standing up for them; support responsible management of natural resources; and request accountability for events in which environmental defenders have been affected.

With the Interfaith Rainforest Initiative, UNEP also engages with religious leaders and communities to collaborate with Indigenous peoples. The focus is on the mutual recognition of the sanctity of life and nature, and the equality among the beliefs of the world's religions and the traditional spiritualities of Indigenous peoples. In doing so, it is hoped to contribute to the safeguarding of traditional knowledge, while healing our planet by facilitating the reconciliation of historical conflicts between religions and Indigenous peoples (Drissi, 2021).

South Africa and Canada's structural environmental contributions are guided by policies with the law which not only focuses on the basic human need but also has various focal areas such as law, human rights, and environmental issues. Oversight through various organizations and bodies to ensure the protection of the plant and all its resources and people.

Organization such the International Union for Conservation of Nature (IUCN), consisting of 400 NGOs, sixty states and 130 government agencies in 120 countries, is a major conservation body. IUCN works to care for the soils, lands, forests, waters, wildlife, and air of the planet-the essential natural resources that without there is no human future (Verschuuren et al, 2010:73-91).

IUCN observes that rural people have a better knowledge of their environments than those who live in urban settings. Their involvement ensures the smoothest development efforts. They are

well suited to adapt to the various constraints of their ecosystems. They have long worked out methods and measures to work through these constraints. In the eighties, IUCN in partnership with the United Nations Environmental Programme, and the World Wildlife Fund, currently the Worldwide Fund for Nature, and in collaboration with the United Nations Education, Scientific Cultural Organization (UNESCO) and the Food and Agriculture Organization of the United Nations (FAO), published the World Conservation Strategy (Warren et al 1995).

Wildlife Conservation Society (WCS) and their central theme on development-action that changes the environment so that it caters more successfully for human needs-which is essential for the world to be distant from poverty and griminess. Still, that advancement must be based on assets that recover naturally and can meet human needs inconclusively. ‘It is absurd to devastate tomorrow’s institutions and developments to meet today’s needs (United Nations, 2002) Also, it recognises that development and conservation are not opponents and have an abiding interest in the relationship between traditional people and the preservation of ecosystems. The fight against environmental degradation can be further achieved through the techniques and management skills used to manage the environment and its resources and these techniques can be adopted and studied by Indigenous communities (WCS, 2019).

These environmental strategies can be useful for managing the environment and its resources, which produces satisfactory results for development, and a striving healthy economy. Further discourses and dissemination of such knowledge, such as the Indigenous, can be passed from one generation to the next by word of mouth. It provides space for that knowledge to be distorted and devalued, as a system like the broken-telephone effect, can take place or even be lost in translation through the discourse of modern research, dichotomy, and dialect.

Indigenous communities are there to provide credible expertise to the environment and resources, as they are in constant contact over centuries of adaptability and change to their techniques and management methods in the changing environment. Efforts to protect the gradually dilapidated area of Indigenous communities (Obiora & Emeka, 2015), are a global concern. For instance, the United Nations International Strategy for Disaster Reduction (2009) goals are that ecological exploitation must be contested to curb the dangers as well as to reduce the destruction of the globe and sustain societal and ecological objectives and requirements (Poverty and the Environment, 2019) says that if not directly tended to, the consequences of

ecological ruin may result in the extinction of environs that will lead to underdevelopment and economic disparities.

Culture has played a notable role in preserving the environment. Different social orders practice collection, taboos and tokenism, characteristic culture, crop alternation and intercropping. The blessing of water supplies and conventional ability are the tools of natural preservation amidst the Tonga, a group and kingdom that makes up six groups spread over the Pacific (Tongans are Polynesians, and the populace is moderately homogeneous) and other Indigenous communities across the globe. The obligation is then upon governments, policymakers, and environmentalists to supply conservation techniques used by Indigenous people to prominence for environmental sustainability (Kanene, 2016).

Ngara and Mangizvo (2013), noted that innate information is created by social order across age groups, existing in intimate proximity to nature. Such information includes standards, a natural asset classification structure, empirical beliefs of the indigenous environs and a self-administration network overseeing supply management (Kanene, 2016).

Indigenous people have valuable historical knowledge of the environment and resources they use and hold. This historic advantage provided a knowledge base for managing resources, and the environment and maintaining balance in drought, famine, and floods (Kanene, 2016)

Lassozi (2012) assumes that African societies hold valuable ecological values that can be implied by turning to their mythologies, prohibitions, tales, maxims, and creeds closely by watching their images and customs. For instance, among native African peoples, the affiliation of certain creatures and plant life with spirits has empowered natural durability (Forde, and Lorenzo, 1998). Among the Igbos of Nigeria, prohibitions are presently related to waterways and woodlands to defend them from contamination, exploitation, and misuse (Obiora and Emeka, 2015). There is also a stringent observance of proper succession among customary social orders where individuals watch over very few environmental principles, for instance not eliminating waste close to drinkable water. It is also accepted that disdain for this ban draws strict permission from the divinity who has possession of the course of the water (Obiora and Emeka, 2015 cited in Kanene, 2016).

United Nations Conference on Environment Development (UNCED, 1992) promoted the reconstruction of the ethos of devotion and admiration for the planet and individual's existence as fundamental to their significance. Cooper and Palme (1980) reinforce this perspective, who asserts that innate individuals have existed in 'unity' with their environment. These folks are living inside of the background utilizing a demeanour of reverence conducted via their biological intelligence (Cooper and Palmer, 1998). Their durability is reflected in traditional forms of agriculture, to be specific, changing development, mixed cultivation, and agroforestry (Wolfgram, 2006) cited in (Kanene, 2016).

2.5 SUSTAINABLE AGRICULTURE AND RURAL LIVELIHOODS

Agriculture comprises the largest collection of Indigenous practices worldwide. Farmers and pastoralists grew crops and kept animals in the humid, boreal, arid, or temperate locations, developing production systems that were adapted to these locations and the gradual development of these systems to respond to changes in the environment (Boehmer, 2015). These systems were sustainable only under "low-input–low-output" regimes. The introduction of mechanization, fertilizers and phytomedicines has turned these systems into high-input–high-output systems which are only sustainable through external support. However, a considerable number of these high-input systems were either not sustainable or did not produce the high outputs that were first expected (Boehmer 2015).

While the political environment was often a factor constraining primary producers from capitalizing on these new systems, most commonly through market restrictions or land use rights, another common constraint was inappropriate technology transfer (Duri and Mapara 2007). Examples include (a) the use of few cultivars for a variety of environments; (b) the introduction of tillage developed for temperate locations often resulting in loss of organic matter and erosion in humid or tropical soils; (c) disease, pest-plagued plants, and animal breeds that had not developed immunities or resistance.

The modernization of agriculture and other land-use changes have also brought about a reduction in genetic variability (Ranger, 1999). Researchers and producers are counteracting this trend by re-introducing indigenous species back into the gene pool of domestic crops and livestock. While efforts in this direction are increasing, the funding available for research is

minimal, given the lack of resources for public agricultural research in general. However, an increasing number of national agricultural research institutions in developing countries include the study, development, and commercialization of Indigenous knowledge-based production practices, especially plant products with a promising future for medicinal, nutraceutical or industrial use (Ranger, 1999).

The benefits of modernized agriculture and the green revolution are gaining traction around the world that they can hardly feed more than six billion people (Nyota and Mapara 2017). Although evidence suggests that in the event of severe shortages of the major staples, communities in Africa revert to a short-term subsistence farming. Survival mechanism of “traditional” plants and crops have received but a fraction if at all, of the research attention of the major crops. This indicates an underutilized potential worth exploring, to raise the understanding of communities’ responses to livelihood challenges (Nyota & Mapara, 2007).

In this context, three major questions arise: In what ways have Indigenous knowledge and practices and innovations enhanced livelihood in a manner that is ecologically sustainable, economically viable and socially acceptable, and more specifically.

- What way have IK contributed to the three most crucial factors in food security: availability, access, and utilization?
- Who are the drivers of IK innovation or adaptation?
- What are the circumstances that foster or constrain them, in support of or as challenges to the scaling-up of successful practices?

The existent IK in this collection demonstrate local approaches that may provide answers to these questions. An overriding principle in indigenous responses to the challenges of rural life appears to be a comprehensive approach that extends beyond the “purely technical” (Dixit et al., 2014). Instead, the community approach is embedded in a general response to issues relating to poverty, household food and nutrition security, health, sustainable agriculture, off-farm employment, participation, social and human capital formation, and access to institutions and social networks.

2.6 RURAL DEVELOPMENT, FOOD SECURITY, AND INDIGENOUS KNOWLEDGE

IK notes that agriculture, food security and rural development respond to the three questions raised in the introduction to this article is reflected in the contribution of IK to food security and rural livelihoods, drivers of the rural innovation process and enabling conditions (Prakash, 2013). The contribution the Indigenous knowledge and farmers' innovation made in the context of food security cannot be underestimated (Prakash, 2013).

IK discussions on agriculture and food security or rural livelihoods as a whole reveal that the primary drivers for local change are a deteriorating natural resource base (loss of natural habitat, deforestation, soil degradation), declining agricultural productivity, loss of Indigenous cultivation practices, and conflicts over access to and the utilization of natural resources. Ecological sustainability of the improved practices has been at the centre of innovations (Muchena et al, 2015).

While the cited examples do not allow for an assessment of the long-term impact of IK on livelihoods, immediate and mid-term effects are apparent in all cases. The drivers of innovations and change are mostly individuals, often acting in or through groups (women, youth, farmers, participants of an adult literacy training, and so forth) established through a common concern or interest, rather than a formal structure (Duri and Mapara, 2007). In most instances, the “innovators” have had contact with “global knowledge” to the extent that they could also better appreciate the knowledge and experience available within the environment and realize the potential of change from within. This finding is important for the role of external agents, such as donors, agricultural research, extension, and other actors in the rural space with a mandate to assist communities to improve their livelihoods (Duri and Mapara, 2007).

These institutions have changed their roles from being delivery systems of centrally formulated recommendations to partners of communities, understanding or valuing Indigenous knowledge is often not part of their mandate (Berkes, 2019). An environment that is conducive to the valuation and promotion of Indigenous knowledge practices not only enables institutions to utilize IK more rationally and efficiently but also signals to the communities that their

contributions to science and technology are valuable, inducing more innovative creativity. For example, the National Agricultural Research Organization (NARO) in Uganda has recently developed an approach to incorporate Indigenous knowledge into its activities in support of the National Program to Modernize Agriculture. By adopting a simple, yet effective decision flow matrix, Indigenous practices were screened and either disseminated subject to further studies or rejected. Based on this matrix, the organization can decide quickly where to allocate resources, where to link with outreach and where to advise against undesirable Indigenous practices (Berkes, 2019).

For example, the approach of NARO (in conjunction with other actors in Uganda) has initiated a process in Uganda that fosters the study and use of Indigenous knowledge and innovations and their eventual scale-up (Thaman et al, 2013). In the context of a national strategy for the sustainable development of IK and its integration into the national poverty eradication process, Uganda provides a framework in which practitioners, as well as researchers, are encouraged to promote the use and the dissemination of Indigenous practices. At the same time, legislation has been drafted that looks to protect the innovators of Indigenous knowledge (Thaman et al, 2013).

2.7 EDUCATION TO TRANSFER OF SUSTAINABLE KNOWLEDGE SYSTEMS

In South Africa, educational institutions have used the indigenous dialect as a method to promote the standard of education, within the initial three years of learning. In future classes, the requirements in the Curriculum of 2005 and the Dialect in Education in the Policy Archive (DoE, 2002) are vague and perplexing. National Curriculum 2005 affirms that the proposal is to retain the domestic dialect ("is sustained") up until "the learner can learn successfully in the dialect of learning and teaching. The local dialect should continue alongside the supplementary dialect if possible" (Department of Education, 2002:5). In addition, the changed educational programmes underline that "the curriculum gives solid foundations for those learners who will use it, to begin with, an extra dialect as a dialect of learning and teaching" (Department of Education, 2002:4).

The above articulation indicates that the approach recognises that domestic dialects are not used as vernaculars of learning and educating after vast reviews. Direct work in country and settlement schools in the Eastern and Western Cape affirms such a good reaction, the

circumstance remaining indeed in the homogeneous sample, in South African Xhosa-speaking lessons is the approved means of teaching in English, not Xhosa. Besides, all reading materials and every examination are in English. On the contrary, the instructors make use of code-switching or code-mixing (Brock-Utne, 2005a:88), where Xhosa is most frequently utilised to clarify the subject material within the knowledge field, in contravention of the controls from the teaching professionals. It may be a reasonable arrangement in terms of intellectual progress but initiates difficulties when the identical students sitting at the examination desk and must respond in English. The ability to learn under these circumstances is profoundly flawed (Butler et al 1998: 21).

As stated by Rollnick in 1998, the science learning dialect may be central to all learning. Extraordinarily little thought has been put into the teaching of science, as there is a conviction that the scholar's meaning will come through despite challenges. Dialect cannot be ignored because it violates the studying of science in imperative aspects associated with both behaviour and understanding (Butler et al 1998:28).

2.8 USING COMMUNITY DEVELOPMENT CORPORATIONS, COMMUNITY DEVELOPMENT ORGANISATION, AND INDIGENOUS COMMUNITIES FOR THE ENHANCEMENT OF CONSERVATION

Community Development Corporations (CDC) developed out of the eagerness and hope of the 1960s, with federal anti-poverty funds as the incentive that moved concerned communities in every state to take initiatives. These initiatives of infinite variety have reproduced corporations in neighbourhoods large and small where they sought to utilise government funds for production, employment, human services, and housing, self-determined community action that centres on health, entrepreneurship, and education (Murphy & Cunningham, 2003:1-38).

Community Development Organisations (CDOs) work around the world to use local resources for the common benefit of nearby inhabitants. In doing this work, CDOs have profited from critical philanthropic support. They have become models for the use of civil society organisations, to encourage economic development and are innovators in envisioning better approaches of organising and supporting nearby socio-economic relations. Owing to their prominence and success, CDOs are the subject of critical debate that goes to the heart of the

importance of community, development, and compassionate society (Philips and McQuarrie, 2010).

CDC activities include increasing the neighbourhood's quantity and quality of affordable housing, helping existing local commercial /industrial firms to thrive, export, creation of jobs, assisting the survival of neighbourhood retail shops and service businesses and finally mid-wiring small new enterprises (Murphy & Cunningham, 2014:38). Community development marks an innovative approach to moving forward IK groups. These varied and locally run happenings afford a means for vibrant clusters to declare possession of their communities via collaboration (Geboe, 2014:1-4).

As a strategy, community development is proving dependable, and it is critical to recall that there is not one recognised technique to start ventures or enrol populations. Essential to this may be that design and implementation should include the lion's share of dependable communal participants and should happen where they reside rather than being executed by employees from far away from the concentrated organisation. Through community-driven development, this approach gives a novel opportunity to characterise their victory (Geboe, 2014:1).

Policy uses in community development is a device for empowering Indigenous communities by improving their stability in all facets of development as a means of engagement that will focus on stimulating community development. It will, in succession, assist native groups to improve local resources that can be used to advance themselves (Geboe, 2014:1-4).

Jack Stevens, interim executive, at the Office of Indian Energy and Economic Development IEED, The United States State Department of Interior Affairs, talked about their grant programme for indigenous research and communities that has existed since 2007. This financing is offered to benefit and safeguard that Ethnic groups finance cost-effective achievable ventures. One positive illustration financed by this programme is an iron ore manufacturing park, which intended to provide admission to a train route. The Iron Horse Indian Line is today the original Indian railroad in the US. Four nations are in talks to get leases used for this business park. Such expansion was subsidised by means of viable subsidies by means of a suggestion's procedure. It is anticipated that an overseas commerce region will create opportunities for communities to trade in, export and evade charges and to gain marketplace gain. Subsidy for viability findings is founded on the project's possibility for

employment. An Additional primary concern is the reproducibility of the methodology (Organisation for Economic Co-operation and Development, 2017:1-22).

The Waubetek Business Development Corporation is Indigenously held, and they offer commercial funding and financial expansion facilities to First Nations and Aboriginal industries situated all through North-Eastern Ontario. Public leaders have consulted the establishment on what to concentrate on: i) tourism; ii) fishing; ii) mining and mineral development – were the top three economic strategies. In 1997, a leisure industry approach was assumed with the teamwork of 27 communities involving 50,000 people (the Great Tourism). Its programme has been fruitful; it linked the city to tourists from all over the globe, led to the growth of environmentally friendly accommodation and tourist centres, hotel convention establishments and has produced a projected surplus of 30 million dollars (about \$0.09 per person in the US) in economic activity (Organisation for Economic Co-operation and Development, 2017:1-22).

There are some notable examples throughout Canada of how those decisions to recognise Indigenous communities and drive efforts to correct various policies, to integrate IK and IK people. A key question is how revenue will be distributed. A forum to share best practices will help address these issues and provide better information to communities about generating benefits from significant projects. The Department of Inter-Cultural Affairs, Peru, documented shared trials associated with the involvement of Native individuals in financial progress, for example, the requisite to classify and safeguard Native plans in the marketable practice of IP. Peru has approved a nationwide statement for a physical ethnic inheritance, but this does not provide superior lawful security. Governments can assist communities in building scope and facts concerning the marketplace. However, ultimately, they must select marketplace prospects and what they want to do with their resources (Organisation for Economic Co-operation and Development, 2017:1-22).

Moreover, Chris McDonald, OECD, put forward to the OECD's study on local and pastoral progress, and Native groups in Latin America, North American and the Arctic. He defined the OECD's local expansion structure and various significant procedure matters that might include detecting development incentives in pastoral regions, expanding involvement in Global Value Chains and increasing appeal in these areas. Improving urban-rural connections: tackling place-based deficiency and societal omission and confronting extended period trials may for example

improve amenity delivery (planning, ICT) and adjustment to weather transformation. Indigenous societies are critical to local and nationwide well-being (Organisation for Economic Co-operation and Development, 2017:22-25).

They have a distinctive linkage to the homeland, as well as legitimate acknowledgement/privileges and management of earth, ocean, and assets and are critical participants in determining trade-able divisions and capital spending climates. They possess exceptional commercial and work prospects, eco-tourism, foodstuff, and crop growing and raw material administration that can expand local markets. Nevertheless, there continue to be considerable obstacles to financial involvement, and indigenous individuals are inclined to experience economic and societal consequences (well-being, learning, shelter, and work). This suppresses capacity which is crucial to accomplishing comprehensive progress (Organisation for Economic Co-operation and Development, 2017:22-25).

2.9 CONCLUSION

Evident in the literature review is that Canada and South Africa over the years have made significant contributions to the recognition and continued advocacy for IKS and IK communities, respectively. However, this advocacy has been met with various challenges such as the inadequate assimilation of these various communities, their slow recognition, the insufficient leg room to encourage their full protection and participation due to unclear policies, histories, and linguistics to name a few.

Therefore, in order to adequately transform the role of Indigenous people and their systems in environmental conservation and towards better climate change solutions the call will remain evidently the same which is for the full participation, integration, and localization of knowledge as well as solutions that are best suited for these communities.

Climate change and environmental conservation discourses as well as any form of implementation or practice around these, need to aim to be sustainable as the effects of climate change can impede on the efforts of environmental conservation. They are constantly producing new challenges; therefore, a single prong approach is futile hence the involvement

of locals as experts with their natural environment based on the techniques as well as experience to guide new policies, developments, analysis, and implementations.

As a part and motivator for funding towards climate change action and environmental conservation efforts, CDCs, CD and CDOs should be used as tools and methods that promote community self-reliance, empowerment, and growth in areas concerning development, environmental conservation and meeting the new climate change challenges that are affecting local and global communities. It will then be evident that communities have an actual and intricate understanding of their conditions. It will then translate to comprehensive and informative strategies for researchers, experts, scholars, and other agencies and agents of change, through focused and participatory community engagement that involves Indigenous people as experts, rather than subjects for development, environmental conservation, and economic growth that will transcend geographies.

CHAPTER 3

THEORETICAL FRAMEWORK

3.1 INTRODUCTION

A theoretical framework reflects the researcher's view of the world and thus, in research context, how the researcher orients his/her study. This suggests that the theoretical framework points to the theoretical outline that provides guidelines for investigating the proposed phenomenon. This, as elevated by Creswell (2014; (2009:208), may bring frameworks and ideas to the inquiries in question. This highlights Swart and Pettipher's (2011: 9) view on the usefulness of a theory in terms of its ability to provide a set of organised principles that, together with contextual knowledge, may generate insights into a specific situation, theory.

3.2 SUSTAINABLE DEVELOPMENT THEORY BACKGROUND

Sustainable development centres on assembling the need to endure support with no conceding capacity of impending age groups to sustain their requirements. The idea of durability consists of three columns: financial, natural, and societal, moreover identified casually as benefits/revenues, planet, and individuals. Sustainability has risen as an element of business integrity in reaction to alleged communal dissatisfaction over the lasting harm done by cantering on temporary benefits. The motivation for sustainability is apparent in areas, such as power production, where the emphasis has been placed on discovering innovative guarantees to outperform the depletion of remaining assets. Power corporations, for example, now openly express aims for power production from maintainable bases such as wind, hydro and solar (Kenton, 2018).

Preceding research reveal that there is a debate on conceptualising sustainable development in isolation of sustainability. Some scholars believe that there is no difference between the two. According to Salaz-Zapata (2011: 75), sustainability is an individual's ability to resist or adapt to change in a given environment. Its main concern is meeting the present needs with less concern about the future. Ayres (2008) further explains that sustainability alludes to the availability of ecological and necessary mechanisms that support people's life.

Parker (2008) takes a different dimension and views sustainability as meeting the needs of the present generation without infringing those of the future. This matches UN's definition of sustainable development. From this definition, one can deduce that economic development is inevitable, what is crucial is to strive towards enhancing sustainable development (Barker, 2006; Haase, 2013; Stoddart, 2011). In this case, information through IKS plays a vital role in promoting environmental management, a key indicator for sustainable development. The overall success of sustainable development, Morelli (2011) notes, is measured by the long-term stability of the economy, thus sustainability is a result of sustainable development. Regardless of the above stated debate on differentiating sustainable development from sustainability, Fenn (2012) makes a strong argument that the two are useful in appreciating the importance of responding to environmental and biodiversity concerns. This study, therefore, summarises sustainable development as a cautious consumption of the environment sparing some for the future. With that in mind, information derived from IKS was proven to be a necessary catalyst for managing the environment for sustainable development in Bulawayo.

For instance, the International Union for the Conservation of Nature and Natural Resources clarifies that "for development to be sustainable it must take account of social and ecological factors. Fiscal ones of the living and non-living resource-base; and of the long term as well as the short-term advantages and disadvantages of alternative actions" (IUCN, 1980:23). The classification cited, on the other hand, emanates from the World Commission on Environment and Development (1987), that refers to the sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

3.3 SUSTAINABLE DEVELOPMENT THEORY IN ENVIRONMENTAL CONSERVATION

The concept of sustainable development does not have a long historical background, but the concept of sustainability has long historical connections either religious or socio-cultural beliefs on protecting natural settings and adapting the natural way of life. Ene et al. (2011) defined sustainable development as a fusion between economics and ecology that is not considered a doctrine or a theory. They further stated sustainable development as “a new term for an old idea: there is no viable economy without natural resources and no resources management without economic rationale” (Ene et al., 2011).

After the rapid industrialization in the western countries, these countries started to observe the change in climatic variation and realized the change in natural environmental settings. The publication of “The Limits to Growth” in 1972 by Donella H. Meadows and her team, the Club of Rome, was a great milestone to analyse the future predictability of the environment and earth system. Using system dynamics theory and a computer model called “World3,” the book presented and analysed twelve scenarios that showed different patterns and environmental outcomes of world development over two centuries, from 1990 to 2100 (Meadows et al. 2003).

Scientifically, it introduced Jay Forrester's newly established computational approach of system dynamics modelling and quantitative scenario analysis into the environmental and sustainability analysis. The theoretical framework for sustainable development was developed through a series of international conferences on the environment, nature conservation, and biodiversity.. In 1983, the UN organized the World Commission on Environment and Development (WCED) and formed the commission chaired by Norwegian Prime Minister Gro Harlem Brundtland. The commissions comprised preventative measures from both developed and developing countries, to address the growing concern over the “accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development” (WCED, 1987).

The commission formally defined the term “sustainable development” through the landmark publication of “Our Common Future.” The report popularized the definition of sustainable development: “development that meets the needs of current generations without compromising the ability of future generations to meet their own needs” (WCED, 1987). Brundtland’s concept

of sustainable development became popular and widely used at academic, experimental, organizational, global, national, and local levels, although it is very much vague and not easily measurable. On this ground, UNECE/OECD/Eurostat's joint report states that 'Sustainable development is a popular and important concept, but one that is difficult to define with precision and, therefore, difficult to measure' (UNECE/OECD/Eurostat WGSSD, 2008). Jingping et al (2022) explained the interconnectedness of three sectors: economic, and social environmental as three pillars of sustainable development that could maintain a reasonable level of balance to achieve sustainable development.

The way and progress of sustainable development are observed through the indicator sets available at the global, national, and regional, levels or either in quantitative or qualitative formats. Nevertheless, it is exceedingly difficult to measure the goal of sustainable development through absolute measurable terms. Therefore, a country or community has its set of indicators based on a predefined framework that will forecast the level of progress towards sustainable development, which is based on available national, regional, or local policies. Progress is measured with a compilation of indicators that will give the possibility of formulating strategies to bring out priority areas of anxiety that will create attention on the pathway to achieving sustainable development goals in the future (Escarra et al. 2007).

Shi and Gill (2005) explored the overall sustainability of ecological agricultural development at the local level through the case study of Jinshan County in China. They developed a system dynamics model, the 'Agricultural-Institutional-Social-Ecological Economic Model' (AISEEM), to assess the long-term relations and dynamics of politics, economics, and environment involved in the ecological agricultural development (Shi and Gill, 2005).

3.4 CONCLUSION

The chapter and study postulate that to achieve any significant impacts and actions towards climate change approaches to environmental conservation need to be sustainable. This sustainability can be achieved through the transparent involvement of Indigenous communities as they are the experts of their environment. This is then further enhanced through the integration of existing western models and approaches towards issues around climate change and environmental conservation methodologies that not only benefit the environment but have a larger impact on the sustainability of developmental projects in Indigenous local communities with great economic output through land preservation, agriculture, ecological biodiversity, technology, and education.

As an actionable theory sustainable development theory is key to meeting the needs of Indigenous communities for programmes towards managing climate change issues that result from flooding, droughts, famine, ecological management, and other adverse natural disaster impacts. Indigenous communities and their longstanding knowledge of their environments then play an integral part of this theory as they have sustained themselves through challenging weather conditions and are usually the first point of contact in situation of disaster. It calls and encourages innovative approaches to understanding and interpreting conditions through the participation of Indigenous communities.

CHAPTER 4

METHODOLOGY

4.1 INTRODUCTION

This chapter shall discuss the methodology used in this study. The research design, sources of data, collection methods, reliability and validity and the study's limitations shall be discussed in this chapter.

4.2 RESEARCH DESIGN

This study takes into consideration pluralism, multiculturalism, transdisciplinary and holism in its discussions on the integration of modern science and Indigenous knowledge systems as concepts that are consistent with the Indigenous knowledge systems. It was hoped that this would help to reintroduce the missing aspects of being and knowing into knowledge construction. This, in fact, is the reason why, as an epistemology of hope, was deemed to be an appropriate concept for the purposes of this study in as far as bringing back the missing holistic human element in the production of knowledge.

4.3 RESEARCH DESIGN

The research utilized Qualitative Desktop research which enables a flexibility of methodologies. The said methodological background and approach to the research explains the choice for selecting desktop research as the research design for the study. Desktop research may be defined as secondary research which is research that involves the gathering of existing data that has already been produced. The data required in this study was collected through the internet, newspapers, reports, journal articles, policy documents and library catalogues. The focus of this study was on the integration of IKS into the curriculum for basic development.

Accordingly, the study was located in a paradigm that would appeal to and be suited to the Indigenous community in South Africa and elsewhere in terms of its sustainability. It was hoped that the sustainability of the study would appeal to the Indigenous communities in terms of the "now" and "then" where knowledge development is concerned. However, the relation to

the anticipated sustainability of knowledge for the Intellectual Property (Ips) Rigley (1999:119) cautioned that “Indigenous knowledge, interests, and experiences must be at the centre of research methodologies and construction of knowledge about Indigenous people”. This assertion may be said to give direction to the purpose of sustaining knowledge for the IPs for future purposes with a particular aim in mind.

The research methodology used in this study used a research approach, research design and research questions which were deemed appropriate to investigating the gap between the South and Northern experiences with environmental conservation through discourse, their IK communities and the IKS itself when it relates to climate change and the preservation of the environment in order to reach development that is sustainable for all. As already mentioned, the study used desktop research as a method because of the flexible nature of this method which made room to access more sources that speak to environmental conservation, Indigenous knowledge systems within the space of climate change and the attitudes and approaches contained towards this global issue within the context of long histories for indigenous advocacy. Gibbs (2007) highlighted that it does not only reveal the range of subject matter about which people are talking but it also recognises and analyses the ways in which they frame and mould their communications.

4.4 FIELD OF STUDY

IK and environmental conservation can be a valuable area of study; they have also been areas of concern for many practitioners in various fields especially in contemporary times with the concern over the future of our planet and humankind brought about by climate change which is a result of rapid human advancement and growth, negatively impacting on their environments. However, with the significant interest by Anthropologists, Environmentalist, and Sociologists, it has been able to rise over the decades in differing forms. Indigenous studies came as an area of interest through the fascination with the “Other,” meaning non-Western or First nations (Juneja, 2015). Prior relationships between the interest of the knowing insiders and the Indigenous have shaped the type of role that each play and paths intersect. This connection is by contemporary capitalism, segregation, and apartheid, which placed the Indigenous communities on the brink of extinction, such as the Native Americans, the Aboriginals, and some communities in the Amazon faced recent death due to deforestation. The ownership of

land by the Indigenous and its appropriation by colonialists and imperialists continues to be in contention in contemporary times. Research embraced since colonisation, on Indigenous land ownership, focused on indigenous individuals, has resulted in the phenomenon that indigenous individuals are the first to be asked. Until recently, most of these investigations continue to focus on indigenous individuals and communities, on land ownership and management. Land dispossession, erosion of their culture and knowledge systems, the substitution of western forms of governance and devastation of their social organisation continue to impact Indigenous people's livelihood (Battiste and Henderson, 2016.)

Additionally, different research investigations and inquiries into IKS, have contributed little to the livelihoods of Indigenous people, to the point that development projects fail to understand the situation on the ground. Their failings have had negative results on Indigenous people and their knowledge, so much so that their land rights; their religious freedoms are in some instances in conflict with state and international laws. For example, the Ilongots (Carlson, 2003:1-60). This is an ethnic group based in the Philippines, who have aggressive social practices such as beheading for sport. Their emotional well-being and social positioning would conflict with modern morality.

The last 23 years of indigenous research have produced many approaches to studying and interacting with Indigenous communities and their knowledge (Smith et al., 2013). It has also created models and established many networks and centres to help in the storing, documenting, and disseminating of IK. Secondly, although it has been difficult, it has been pivotal in advocating for the protection of IK and communities through policies and continued research.

Thirdly, indigenous voices have been scarcely heard, they have been victims of cultural appropriation as well as many issues relating to the development and depletion of their environments and other resources. Fourthly, Indigenous communities and knowledge should be viewed as a continued fight against colonialism and at present globalisation, and not be a threat to existing knowledge but as an alternative, with challenging historical and empirical understanding that can be a driver for development and change (Smith et al., 2013).

Lastly, indigenous research and inquiry should advocate for the full participation of Indigenous people as valid knowledge holders of their environment and knowledge. It will help facilitate the innovative and adaptive potential of communities to the fast-changing global system and

interaction. It will contribute to the knowledge basin of the world that is not only diverse in the modern circle but also beyond.

4.5 RESEARCH METHODS

As indicated in the introduction to this chapter, the nature of this study warranted the desk research approach. Desktop research was used as the primary method as accurately as possible to explore IKS and environmental conservation efforts, contributions, and action towards climate change. Various sources of material were perused within the literatures and publications that spoke to issues under investigation. Further sources in within global North and South contexts were added to give a grounded and holistic approach. Some of the study further utilized documents from indigenous centres that curate information on IKS also serves as a source of information for this study. For example, the Centre for IKS research at KwaZulu-Natal University served as an important repository of study material. Websites of international Centres of IKS were perused to gain a global understanding of this form of knowledge. Other source material from bodies and organizations affiliated with the United Nations such as UNESCO, WSC, UNDP, and other institutions that are concerned with the work of environmental conservation and understanding climate change have been consulted.

External desktop research allowed for sourced materials from external sources, such as the internet, published articles and books. It allowed a broad examination of the background of literature and knowledge on the topic researched in this dissertation, which also spanned various disciplines in the Social Science and Science, to address and evaluate the relationship or potential integration of these Western disciplines for knowledge with those that fall outside the parameters of these two disciplines.

4.6 VALIDITY AND RELIABILITY

Reliability alludes to the degree to which the same answers are clear, utilising the same methods more than once. Trustworthiness may be a worry each time the single spectator is the means of information since we have no guarantee against the influence of that observer's prejudice" (Babbie, 2010:158). Wilson (2014) states that consistency concerns are generally related to bias and when an analyst takes a prejudiced slant towards the investigation, at this point the integrity of the work cannot be trusted.

The validity of an inquiry can be clarified to a degree where conditions follow a logical research method that will produce objective research findings. Oliver (2010) deliberates authenticity, to be a prerequisite for all kinds of investigations. At hand, various methods of investigation of legitimacy and principles are found in Cohen et al. (2007), to be subject matter for validity, construct validity, concurrent validity, criterion-related validity, external validity, internal validity, and face legitimacy. One of the strengths of documentary accounts is their potential to yield sets of indicators with strong content validity based on the in-depth nature of the information provided. Criterion validity is established by comparing a measure to a known standard or criterion. The two measures should show the same pattern However, it also revealed where scientific methods in contemporary times include but are not limited to development, expansion of industry, economic activities of industries, poor natural disaster management tools and planning can contribute to harming environments. Governments need to monitor activities that can be harmful and have a negative impact on their environmental conservation efforts and involve their larger communities in planning for the worst.

4.7 LIMITATIONS

Limitations to the study are that all information gathered through the desktop method using internal and external sources of data. The study is heavily dependent on secondary sources of information which were selected to update the study. Given such an approach, the reliability and validity of documentary analysis can be questionable. Cost considerations to undertake primary data collection and analysis were one of the considerations that restricted the scope of the study.

Added to the above would be that IKS is regionally based in their reasoning and innovation and contribution to the larger bodies of knowledge, due to historical conditions of colonialism and in the post-colonial period. Their distribution is limited due to the mistrust brought on by historic conditions. This disadvantages them from contributing effectively to combating climate change and environmental conservation as their approaches and methods might be seen as backward or innovative. This is still the negative view despite countries like South Africa and Canada contributing so much to the advocacy for Indigenous peoples and their knowledge systems. It is therefore, overcoming the historical burden of worldviews and perspectives about the other not only in academia and research but the larger human interaction and knowledge basin of the contemporary world. They are in remote areas which denies them the opportunity to demonstrate, and speak out for their rights, protection, and integration. What makes it disputable is that in most cases in this study would have universal appeal, but it brings to attention IK and IKS abilities if their relationship is mended.

4.8 CONCLUSION

This chapter focussed on the methodology used for this study through desktop research. Using desktop research allowed for information to be collected using various sources and materials. A range of documents was reviewed to ascertain whether IKS contributes to environmental conservation and climate change. The validity of the information derived from desktop research was assessed based on the credibility of the source of information. The chapter acknowledges the limitation of the study and gaps in the source materials used.

Considering the above limitation, the gaps and constraints are that the spiritual and moral knowledge of Indigenous and marginalised groups who have a deep connection to nature were not covered in the research. However, future research can be pursued in this regard to echo the knowledge system of Indigenous people in these fields beyond just having it done on paper and unfulfilled policy. The result is that the colonial and imperial past and conditions impacted adversely to the kinds of contributions IKS, and IK communities can make beyond just climate change and environmental conservation. Unlike the universality applied in Euro-Western research, there is no universal interpretation beyond imperialism and colonialism.

CHAPTER 5

FINDINGS AND RESULTS

5.1 INTRODUCTION

This chapter will present the key findings and conclusions derived from the study. Results will be presented in the same order that compliments the analysis of literature in order to address the research questions. The chapter looks to provide an understanding of the questions and objectives presented in answering the discourse of environmental conservation and climate change. It seeks to establish whether links were made within the study to answer the larger research question and what effect these contributed to the larger knowledge body. The findings of this study are secondary data.

Any indigenous inquiry has to accept that colonial and imperialist hegemonies have either destroyed or appropriated IKS and IK. Countries in the North have a rich colonial history that has impacted on their local indigenous populations in varying ways. What has been evident is that these countries have tried to amend their pasts through reconciliation, policies, and engagement with these communities. This is then easier to acknowledge as the attitudes towards Indigenous people and their knowledge is influenced by the above hence inequality exist in the attempts to integrate them is weakly advocated and does not make past constitutional hall or bureaucratic innuendoes. As much as countries in the North have been advocates for the Indigenous along with countries such as Australia, Argentina, New Zealand, and others, Indigenous participation is still limited and is more ceremonial. The research like many others calls for realistic and meaningful participation of Indigenous people and their knowledge. This historical context in the 21st Century continues to shadow the advancement of this form of knowledge. Therefore, in order to have sustainable solution to climate change our environmental conservation efforts need to be conscious of the value of Indigenous knowledge and people as echoed in the study they are the most affected, they have the knowledge on the ground and are experts of their natural environments, they have developed long-standing methods and insider information for survival.

5.2 OVERVIEW OF THE STUDY

The primary goals of the study were grounded in comparing the links between IKS and environmental conservation within the context the global South. It then further examined if IKS can make an impact on Environmental Conservation as these nations have a long history of advocacy for Indigenous knowledge and peoples. It also evaluated whether South Africa and Canada influence on global environmental management discourse using IKS in order to contribute to climate change and action efforts beyond their nation states.

5.3 MAJOR FINDINGS

5.3.1 STRUCTURAL AND NON-STRUCTURAL FORMS OF IK/IKS WORK

It is evident that countries in the South have established institutions that are well versed in the advocacy for Indigenous knowledge and peoples from formal institutions to informal ones. These institutions are found in the parliamentary system of nations and in the university, and other informal sectors such as advocacy groups and non-profit organisations that call for decolonization and inclusion of indigenous knowledge in their development programmes. These bodies of institutions can be said to be upheld by the United Nations, ICUN, UNESCO, to name a few, mentioned throughout the study. In the study it can be concluded that other national and international structure then intersect as environmental groups and their institutions also recognize the importance of indigenous involvement and participation. Climate change has called for sustainable methods and techniques to the work of environmental conservation and in this respect IKS/IK can be a good provider for this with many examples found in the South from the sectors of medicine to agriculture as well as education to name a few.

In concurring with what is happening in the international fora, South Africa for instance has also sought to protect and promote IKS through its laws and legislations. To this end, the South African government has adopted a policy on Indigenous knowledge systems (South Africa, 2004a). To assert the importance of Indigenous knowledge, South Africa placed IKS in the Department of Science and Technology (DST). Locating IKS in the Department of Science and Technology stimulates and strengthens the position of IKS in the social and economic development of South Africa.

Further, in accordance with the DST 's objectives, the National Research Foundation also takes into consideration the need to show recognition and respect for the holders of Indigenous knowledge by funding projects that _require joint or active participation and equal ownership between scientists and IKS knowledge holders who must be clearly designated as principal investigators or coinvestigators in the application. This is to make Indigenous people active participants and beneficiaries of research done in their communities and on their Indigenous knowledge system. This is contrary to previous research on Indigenous knowledge systems where researchers from outside would come to Indigenous communities and get information without any compensation or acknowledgement of the holders (Smith, 1999).

As in many developing countries, the value of its Indigenous knowledge system, is something which is now evident in commercial ventures to benefit indigenous communities. A well-known example is the case of the Khoi and San communities in South Africa and its Council for Scientific and Industrial Research (CSIR) who share benefits from the patent of hoodia. Hoodia is an indigenous plant historically used by the Khoi and San people to suppress appetite. CSIR developed hoodia into a drug used for weight management (Masango, 2010). The sharing of benefits was agreed upon in 2003 after negotiations between the two parties; initially the CSIR had registered a patent on P57 (the appetite suppressant component of hoodia) and sold the licensing rights to an English biopharmaceutical firm, Phytopharm, in 1997. Phytopharm then sold the licence to American pharmaceutical giant Pfizer for 25 million dollars without having consulted with the San people.

5.3.2 CURRENT POLICIES ON THE AND THEIR CONSIDERATION OF INIDGENOUS PARTICIPATION

A series of literature on specific cases of development from countries in the North and South on environmental conservation as well as IKS were reviewed. Cross-examining these nations provided a deeper insight into how the more developed parts of the world have responded to issues of climate change and natural disaster as well as environmental conservation with their local communities.

Participation of Indigenous peoples in the design, monitoring and implementation of social protection policies and strategies, as well as in specific schemes and programmes, is particularly important to ensure the respect for their rights, the cultural appropriateness of the measures and approaches proposed, as well as the relevance to their needs and aspirations. This is also crucial, in many cases, to overcome communities' mistrust of state institutions and 'external' interventions. Lessons learned from global experiences also suggest that benefit levels should consider the higher opportunity costs faced by members of Indigenous communities, due to socio-economic and geographical factors. Complementary actions focusing on strengthening Indigenous peoples' institutions and livelihood strategies could accompany these transfers. The involvement of Indigenous communities and institutions and flexible modalities of implementation, including the use of mobile teams for the delivery of services, could be explored to address some of the more recurrent barriers to access. Strengthening staff's capacity in intercultural approaches and their awareness of the histories, cultures and rights of Indigenous peoples is critical for avoiding discriminatory attitudes.

Overall, when addressing structural obstacles to Indigenous peoples' access to social protection, there is a need for strong coordination of social protection measures with broader human rights-based development strategies, including those regarding their right to health. Extending the supply of benefits and services and increasing their quality is required to ensure effective access and adequacy, as is valuing, and strengthening Indigenous peoples' occupations, securing their rights to land and natural resources, facilitating the transition from the informal to the formal economy and enhancing formal employment. Tailored programmes to tackle specific livelihood risks faced by Indigenous men and women, including those caused by climate change, or to reward environmental stewardship of indigenous communities in the framework of combined social-environmental schemes can be part of such broader interventions designed with the participation of the peoples concerned.

Indigenous potential driven by adequate participation in development related processes is limited. It is due entirely to the ways in which development has been approached both at national and regional levels. Perspectives and conceptions about Indigenous communities must consider prehistoric and post-historical narratives and discourse about the "Other."

5.3.3 SUSTAINIBLE INTEGRATION OF IKS IN ENVIRONMENTAL CONSERVATION

IK can be sustained through development as it supplies an expanded view of the concept and meanings behind traditional methods as well as philosophies. For example, African ideas explain that the duty of the current age group is to investigate outside of the situation to the age groups yet to come and to reflect on the history and respected descendants. Conveyed in the customary African concepts is that the human population is made up of three components - those who went before us, those who are with us here and now, and those who have yet to come. The three jointly create the social group of people, and if there is an oversight on any one of these parts of the triad, you then get an unequal assessment of human effort. This is a basic idea, which can lend a hand to protecting the environment as well as reinforce the values fundamental to maintainable improvement (Domfeh, 2007:44).

Many environmental experts acknowledge that Indigenous communities are profoundly aware of their surroundings and ecosystems, which could be another underutilised knowledge system for the greater global good. It is claimed that connecting with Indigenous knowledge could provide a vital part in safeguarding a maintainable prospect for our earth. “History is full of examples of development interventions that have either failed or undermined the institutions, resources and cultures of Indigenous people,” (Tauli-Corpuz, 2014). The United Nations’ exceptional commentator on the human rights of Indigenous persons also called for “diversification of development paradigms and strategies and the construction of new models for partnerships with indigenous peoples.” (Pasquini, 2016).

Global institutions and governments need not remind Indigenous people and themselves of the urgency in protecting the environment as they consider themselves capable of managing their territories and resources. However, the risk comes in the form of development projects that deprive Indigenous communities a share and authority over their knowledge by protecting their biodiversity.

The Amazon rainforest, for instance is the only existing rain forest that not only supports the local tribes and communities, but also the rest of the world is dependent on it for its survival. The guise of development, by interested agencies and states, has managed the recent and

previous devastation of these rainforest communities and destruction of local ecologies for monetary gains. The disposal of harmful waste in the Amazon River to deforestation at global and mass scales, is an illustration of damage to local ecologies.

Tropical rain forests are vital to modern humankind, owing to the immense variety of biopharmacological assets and their impact on the worldwide ecosystem. Eighty percent of the earth's biological diverseness lies inside humid rain forests. These distinctive environments occur within 28° north or south of the Equator, creating an abundant atmosphere in which ecological lifecycles flourishes. Rain forests are particularly vulnerable to severe weather variations and intemperate weather conditions (Manson et al. 2017).

An understanding of flooding, droughts, landslides, and forest fires from both the scientific and indigenous system paradigms can help mitigate the management of disasters. Preventions, management tools and approaches are needed to manage both natural and manufactured disasters.

With rising CO₂ levels, the destruction of rainforests is one of the many natural disasters. When trees burn, they also release CO₂ emissions, which are already at significant levels across the world, affecting more than just the local communities. Further, it posits that more inclusive research needs to study conditions and allow stringent regulations on MNCs and other Corporations that work in these regions. However, protected areas that are supported by governments limit the local Indigenous communities who rely on the forests for food and cheap forms of medicines and other uses of plants. Land and property rights escalate into serious socio-political and economic issues as MNCs, and other agencies buy and sell land that is overrun by some legal, linguistic agreement that disfavours the Indigenous community.

The name Traditional Ecological Knowledge (TEK) consists thorough and comprehensive information of plants, animals, ecological happenings, and the improvement and usage of customary skills (Mathooko, 2000). The quantity of TEK in Africa is huge, and its impact is spanning a variety of societies, nations, countryside, eco-areas, and eco-zones. The information that stems from a long-standing link with the environment allows anglers, for example, to vie with huge, profitable fishing businesses that do not have a complete appreciation of indigenous zones and places (McGoodwin, 1990 cited in Domfeh, 2007:44-5). IK is the accumulative form of information related to environmental connections, which is passed along throughout the ages

by Indigenous people. TEK has previously afforded understanding into ecological transformation, natural world populace checking, viable reaping habits, behavioural environmental science, biological interactions, and so much more. For instance, numerous significant ecological vicissitudes in the Arctic because of climatic variations, and their information of bow-head whale behaviour aided scientists to review their investigation techniques to enhance population magnitude approximations (Popp, 2018).

For example, Chiefs of the Heiltsuk First Nation in British Columbia documented two kinds of wolves - coastal and interior, formerly not recognised by Western scientific ways. Along with such confirmed importance of merely limited examples, makes one envisage how TEK can additionally update science (Popp, 2018).

Despite its utility, TEK has an uncertain future amongst populations in the South. This information should be documented and assessed by individuals who have the suitable experience in environmental science, asset supervision, social sciences, and biology. They should have relevant cultural information translating skills so that other cultures and social actors can understand it (Domfeh, 2007).

There is a danger of assimilation in externally created agendas while simultaneously; typecasts and judgement persist to highlight Indigenous people's improvement plans. One illustration, involves the improvement of educational or physical conditions that incorporate customary understanding (Pasquini, 2016). Economic approaches and policies, as well as organisations, need to be considerate of the indigenous conditions. Their ability to bring forth new and innovative financial solutions and create new markets has been the case in biomedicine, where the use and research of herbs and medicines will curve and fight off illness.

According to Abdelmonem and Cordone (2014) when scheduling interferences, progress players need to consider the precise manner in which Indigenous communities administer property and terrains. For example, where people are just integral shareholders of their environment and equivalent to more "stakeholders," as well as the woodlands, waterways, or wildlife. It means that for the duration of the operation, it does not only secure "free, prior and informed consent," but then again similarly not moving into societies with a "ready-to-use" plan. However, partnerships with indigenous organisations are nonetheless a test for growth

association and their workforce. It is also frequently challenging to ascertain which organisations to join with and which agents to involve in discussion (Pasquini, 2016).

Additionally, researchers have a duty to Indigenous communities to uphold pro-active and legally permitted research that is receptive to global standards of ethical inquiry and criticism. There should be a system in place to ensure that all legalities of research ethics are secured and transparent as well as efficiently coherent enough for Indigenous communities to understand and participate.

The IKS policy for instance adopted by South Africa in November 2004, affords an official structure that can be used as a valuable illustration for more nations (Republic of South Africa, 2004). Acknowledging that IKS involves functional coordination and controlling procedures in administration divisions and components, the formation of a National Office on Indigenous Knowledge Systems (NOIKS) is an opportunity. The main purpose of such an organisation is to ensure that IKS is recognised as a knowledgeable body and promoted in different sectors of government. NOIKS provides for the establishment of an Advisory Committee on IKS. The Advisory Committee's task is to advise the government on all issues concerning the identification, endorsement, improvement, safeguard and confirmation of IK and information schemes agencies (Domfeh, 2007:50).

While acknowledging IKS on its provisos, the strategy aims to promote a clearer consideration of the historic and traditional setting, and values of Indigenous groups. It will have to be a firm policy that brings together key drivers for the improvement and financial feasibility of owners and specialists of IKS. This represents a plan which can react clearly to a hastily altering atmosphere, and through which Indigenous groups and persons can share justifiably in the societal and financial prospects that present themselves (World Intellectual Property Organization, 2006:2).

The basic reality is that indigenous information has permanently been and remains to be, the main issue in the existence and wellbeing of the majority, as in the case of South Africans. Its strategy strives to identify this, sustain it, mature it, and support, and defend the guardians and specialists of this information. Strategy in the requirements, specifically the creation of a National Office, the Advisory Committee, IKS Laboratories, are central and vital trials that needs to be upheld by countries in the South. It seeks from the IKS strategy: improved technical

development and actual profits for owners and specialists of IKS (World Intellectual Property Organization, 2006:2).5.3.4 Impact of Climate Change on Policies toward IKS

Disaster management is construed as, a continuous and integrated multi-sectoral, multi-disciplinary process of planning and implementation of measures aimed at preventing and reducing the risk of disasters; mitigating the severity or consequences of disasters; emergency preparedness; rapid and effective response to disasters; and post-disaster recovery and rehabilitation.

Climate change is projected to have a negative effect on food security and the attainment of sustainable development goals (SDGs) in Southern countries. Its impact is expected to be extremely severe in regions of Africa that depend on rainwater agriculture and have limited resources to mitigate and adapt to climate change. Climate awareness on climate change comes from models or scenarios that face certain degrees of uncertainty. The knowledge of local and Indigenous peoples, commonly mentioned as local knowledge systems (LKS) or Indigenous Knowledge Systems (IKS), is gradually being recognized as an imperative source of information for climate mitigation and adaptation. Policymakers must draw on the best available knowledge in the face of global climate change.

IPCC (2018a) defines adapting to climate change as a procedure of changing to real or predictable weather conditions to exploit valuable opportunities. Foreseeing and expecting changes in climate elements through IKS forecasting is a significant and prerequisite ideology in areas directly experiencing changes (Mulubrhan et al. 2019). Both Acharya (2011), and Mulubrhan et al. (2019), recognise that native societies predict biological and physical sentient and non-living objects to predict upcoming and present atmospheric changes that physical senses cannot understand. Chisadza et al. (2015) alludes that these predictions supply the prospect of successful adaptation insights to local communities. Incorporating seasonal forecast reduce the vulnerability of farmers in rainwater agricultural systems to the effects of drought (Siyakumah 2006). By integrating IKS into climate change policies, sustainable adaptation strategies will be developed. Further studies in Africa have shown that farmers can use the IKS of weather systems such as thunderstorms, windstorms and solar to develop adaptive crop management strategies (Ajibade and Shokemi, 2003; Mugabe et al., 2010; Soropa et al., 2015). The climate change adaptation approaches those farmers can use, vary

depending on existing weather provocation as well as alternative weather conditions. Socio-economic and established programs must be considered at the community level when deciding on adaptation strategies. Jiri et al. (2016), advocate actions to reduce vulnerability such as early warning systems, as communities can adopt preventive adaptation through the use of IKS in climate forecast.

The frequency and severity of climate change-induced disasters have significantly increased in recent years. The level of destruction to infrastructure and livelihoods has also been unprecedented. This calls for a shift in approach to humanity's response to climate change probably by focusing on the integration of Indigenous knowledge and modern science. IKS and scientific approaches must be viewed as complimentary in climate change forecasting, mitigation, and adaptation. Nyong, et al. (2007), claim that Indigenous African populations have always experienced unreliable and unpredictable climate events, developing, and implementing adaptive strategies to reduce their vulnerability to climate change and variability. The 2010 UNFCCC conference adopted the Cancun Adaptation Framework (CAF) whose guiding principles are for climate change adaptation based on and guided by the best available and proper science such as IK.

Before this conference Indigenous knowledge-based climate change observations and assessments were not considered in the IPCC process but was exclusively on scientific documentation and peer reviewed publications (Mafongoya & Ajayi 2017). The 2014 IPCC assessment report embraced the CAF principles and had a chapter on human security focusing on the potential and known benefits of IKS. In integrating formal climate science and IKS in its assessment report IPCC buttressed the significance of combining the two approaches in trying to understand climate change dynamics.

IKS is of importance in predicting seasons and climate hazards. Since there is no method to evaluate the validity of IKS in predicting climate hazards, modern scientific methods can be of use in supporting or discrediting IKS. Ziervogel and Opere (2010) point out that one way to increase the acceptance of Indigenous knowledge climate indicators among the scientific community is through validation by comparing them with scientific climate forecasts. Validation would initially include monitoring Indigenous knowledge climate indicators to establish the link with known scientific parameters. However, where the two methods converge it capacitates the ability of local communities to withstand their vulnerability to climate change.

According to Odera (2011), IKS-based climate prediction, mitigation and adaptation methods are informed by astrology; vegetation, birds, and the wind while formal science methods include climate modelling and seasonal climate forecasts.

However, climate change challenges and recurrent extreme weather events cannot be solved by IK or formal science alone (Huntington, et al., 2005). Sustainable and effective mitigation and adaptation strategies to climate change require relevant and best knowledge irrespective of the source. Co-production of new knowledge by integrating IKS and scientific climate monitoring methods can be the panacea to climate change risks and uncertainties. Indigenous knowledge holders and scientists can collaborate to produce such knowledge.

5.4 CONCLUSION

To reach attainable climate action goals, it is clear based on the above findings that environmental conservation, its experts, and practitioners need to find holistic solutions. These solutions need to be guided by inclusive policies and approaches that integrate science and IKS to mitigate the impacts of climate change. They also need to be mindful of the impact of colonial histories in cooperation and approach to IKS and IK communities.

Climate change has not only affected the environments of people but also has a larger and broader impact on the potential for sustainable growth in the economy, development, and livelihoods of communities whilst most of all those who are marginalized face greater threats of food insecurity amongst other factors perpetuated by rapid climate change.

IKS and Scientific knowledge collaboration will foster and pave the way for sustainable knowledge production that has a greater impact on climate change as well as brings about improved environmental conservation methods and efforts. The cornerstone to attaining these mentioned in the earlier chapters can be found in reforming environmental conservation through; tighter environmental laws, policy, and implementation, improving attitudes towards IK and IKS, and the integration as well as evaluating all knowledge that seeks to contribute to environmental conservation and climate action.

CHAPTER 6

GENERAL CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter summarises the main findings of the study, interprets the findings, and makes recommendations based on the results. The main goal of the study was the exploration of Indigenous Knowledge Systems and Environmental Conservation towards climate change.

The study called for experts to be aware of colonial hegemonies when conducting research and dealing with Indigenous people as these hegemonies are reflected in the attitudes towards IKS and IK communities. It then limits the ability for meaningful IK and IKS engagement with the larger basin of knowledge which is contemporarily Western and scientific. A larger call by the research and literature presented for inclusivity, cooperation, and participation of IK communities with their IKS in order to achieve sustainable approaches to the impending climate change phenomenon.

As an example of the IKS inclusionary efforts through their efforts in trying to set-up policies, and other efforts IKS and IK community inclusion, recognition, and participation of these marginalized communities through a process aimed at reconciliation of past environmental imbalances. However, it is clear that with this many efforts still remain a limitation of outputs.

Climate change as devastating as it has shown that using every available resource of knowledge to combat climate change can be possible through the adoption of local knowledge and combining it with scientific environmental conservation methods given the chance for testing and implementing.

Three sub-goals followed the main aims of the study, which were:

1. To compare the links between IKS and environmental conservation
2. To examine if IKS can make an impact on environmental conservation.
3. To examine the global environmental management discourse using IKS.

IKS has a range of institutions and global networks focusing on various aspects of development, environmental conservation (agriculture and ecological studies) and the

economy. Still, the vast pool of literature evaluates IKS through the lenses of agriculture and other ecological knowledge and is the driver of their interest. Development needs to go beyond agriculture, biomedicine, and ecology to achieve a rounded development.

A seldom highlighted point in the literature is that development and environmental conservation should complement each other. It is noted that literature does encompass both aspects; however, they tend to be presented as separate phenomena. The idea here is to emphasise that when development projects take shape, they should have the people, environment, and economics in mind.

People: Assist in the knowledge base for development professionals. They should be encouraged to take part, observe, contribute, and further develop new and old knowledge, both Indigenous and scientific, for further dissemination and usefulness of projects and initiatives for development. They should also be able to express their experiences to researchers and experts without fear of being oppressed. Reconciliation among researchers, governments, organisations, and institutions should be respectful of past relationships concerning Indigenous people.

Environment: Assesses environmental conditions, knowledge, resource management, environmental protection, ecological scope, and local environmental knowledge. It should consider the environmental impact and analysis of all aspects, such as people, animals, and the wider environment. Resources and their management are seen through the perspectives of the local and Indigenous people to achieve sustainable environmental solutions.

Economy: Researchers may ignore environmental concerns and other protections and regulations. Knowledge should be profitable to its holders, protected from economic infringement and misuse and other forms of knowledge exploitation and embezzlement. Knowledge systems should allow financial creation and not be a tool for profit or oppression. Financing for Indigenous communities and knowledge will allow innovation, survival, and smoother integration. Policies should supply achievable approaches that are useful and equitable to gain an overview driven by rational-legal protection of indigenous knowledge systems. IKS has been associated with its function of encouraging social and economic development. The Global South needs to find a balanced benefit in the use of an intellectual

property rights regime. This is to ensure that the adverse effects of legal recognition of IK in the public area can be found.

The above will encourage and build a space for innovation to take place, which will, in turn, contribute to social and economic development. It calls for countries, more specifically those in the Global South, to stay true to their membership and signatories in these global regimes. They need to fast track their policies to protect and include Indigenous communities and IKS. There is still much to do to enforce the law to supply genuine safeguards of IP. Increasing the usage of customary remedies as direct medication and less as a substitute, needs the safeguard of such products as they become more commercialised.

6.2 RECOMMENDATIONS

The recommendations will aid to improve or accelerate the call for the promotion of Indigenous Knowledge Systems in efforts towards environmental conservation and climate change at the global level.

1. IK and IKS communities need to be treated as experts of their own knowledge.
2. Set local goals to integrate IK and IKS into the contemporary body of knowledge while recognizing the fragmentation of historical impacts of colonialism and post-colonial colonialism.
3. Enforcement of legal standards, policies, and Intellectual Property of IK communities. Follow through in pursuit of those who violate and profit from infringement of any kind.
4. Integrating, interpretation, documenting, and dissemination of IK and IKS should be a driving force in socio-economic and environmental policies.
5. Reshape perspectives about IKS and IK communities to cure the historical effects that are clear in unequal or misplaced policies without IK consultation.
6. Innovation and Sustainability should be the core focus for environmental conservation efforts towards climate change.
7. Creating tighter environmental laws and taxes to discourage large scale environmental degradation from the private sector. And discourage private sectors individuals from environmental disconcert.

8. Address dialectical challenges in academia, low levels of education, policies, and laws etc

6.3 CONCLUSION

Sustainable policy goals are difficult without indigenous consultation and participation. This requires all members of society and their knowledge and innovations to be tested and proper policy goals formulated. Therefore, taking lessons from the various policy initiatives towards their IK communities and the IKS that they hold can bring about transformative and sustainable solutions to challenges that go beyond environmental conservation efforts that will greatly affect the quality of climate change approaches that have long withstood the test of the elements. Further, added to this is then the question of the flexibility of scientific methods in adapting and changing to accommodate IKS insight in trying to find sustainable climate solutions.

Both IKS and science based seasonal climate prediction indicators have their strength and shortcomings. However, bringing the two approaches together is not easy at all. The integration of IKS and scientific forecasts is important for better decision-making considering that 60-70% of Africans in the global South still depend on IKS for seasonal climate forecasting. Moreover, IKS is readily available in all parts of Africa compared to scientific forecasts which are often costly to issue and rarely reach some communities. In cases where meteorological climate forecasts are regarded as external and irrelevant the use of IKS becomes indispensable. However, with changing climate, IK climate indicators might not be as dependable as it used to be. Meteorological/scientific climate forecasts taken over a long time can be important in creating frameworks which are vital in developing climate change adaptation and mitigation strategies.

There is a continued call in the study and other literature, for integrated and equal participation of IKS and IK communities to find innovations that mitigate climate change impacts and are able to be sustainable in the continued efforts of environmental conservation. This requires local cooperation that is aligned to global goals such as the policy efforts of the Sustainable Development Goals (SDG) that can filter into climate change and food insecurity that exist in the Global South and creeping into the Global North due the adverse effects of climate change.

This will then require clearer policies for the protection, documentation, and continued dissemination of IK and IKS. Reconciliation of professional and social relations by restoring trust for academics and other experts who engage with IKS and IK communities. This involves an acknowledgement of historical conditions that have shaped the imbalance in the discourse of IKS and IK communities, so that policies can move away from discussions and continuous amendments, so IKS can assume its role in the global arena of knowledge and progress.

REFERENCES

- Acharya, S. (2011). Presage biology: Lessons from nature in weather forecasting. *Indian Journal of Traditional Knowledge*, 10, 114–124.
- Ajibade, L.T. & Shokemi, O. (2009). Indigenous approach to weather forecasting in Asa L.G.A, Kwara State, Nigeria. *Indilinga: African Journal of Indigenous Knowledge Systems*. 2(1). October. 2009. doi: 10.4314/indilinga.v2i1.46981.
- Altieri MA, Lana MA, Bittencourt HV, Kieling AS, Comin JJ, Lovato PE (2011) Enhancing crop productivity via weed suppression in organico-till cropping systems in Santa Catarina, Brazil. *J Sustain Agric*35:855–869. doi:10.1080/10440046.2011.588998.ARC downloaded from <http://www.daff.gov.za/daDev/sideMenu/links/Digest4.htm> 15 July 2022 study: Hoodia Cactus. n.d downloaded from <http://www.ipngos.org/NGO%20Briefings/Hoodia%20case%20of%20benefit%20sharing.pdf> on 15 July 2022.
- Ayres, L. (2008). Thematic Code Analysis. *The Sage of Encyclopaedia of Qualitative Research*.
- Babbie, E. (2010). *The Practice of Social Research* Wadsworth Cengage Learning. *International Edition*.
- Barker, D., & Beckford, C. (2006). Plastic yam and plastic yam sticks—perspectives on Indigenous technical knowledge among Jamaican farmers. *Tijdschrift voor economische en sociale geografie*, 97(5), pp. 535-546.
- Battiste, M. and Henderson, J. (2016). *Protecting Indigenous knowledge and heritage*.
- Berkes, B.(2019). A Kurua Gyakorlat. *Acta Humana*. doi: 10.32566/ah.2019.3.7.
- Billet, G., Clunet-Coste, B., & Maneuf, B. (1998). *U.S. Patent No. 5,839,900*. Washington, DC: U.S. Patent and Trademark Office., 2019.
- Boehmer, E. (2015). *Colonial and Post-Colonial Literature*. Second Edition. Oxford and New York: Oxford University Press.
- Butler, C. C., Rollnick, S., Kinnersley, P., Jones, A., & Stott, N. (1998). Reducing antibiotics for respiratory tract symptoms in primary care: consolidating 'why' and considering 'how'. *British Journal of General Practice*,48(437), pp. 1865-1870.

- Cambridge Dictionary. (2022). Definition of Discourse. [online]. Available: <https://dictionary.cambridge.org/dictionary/english/discourse> Accessed: 28 June 2022.
- Chisadza, B., Tumbare, M., Nyabeze, W., & Nhapi, I. (2015). Linkages between local knowledge of drought forecasting indicators and scientific drought forecasting parameters in the Limpopo River Basin in Southern Africa. *International Journal of Disaster Risk Reduction*, 12, 226–23 doi: 10.1016/j.ijdrr.2015.01.007
- Cresswell, J.W. (2014). *Research design: Qualitative, quantitative, and mixed methods approach*. 4th ed. Thousand Oaks, California: SAGE Publications.
- Department of Education. (2002). *Education Statistics at a Glance 2002*. Department of Education. Pretoria. 5-15 [Online] Available: <http://www.dhet.gov.za/DHET%20Statistics%20Publication/DoE%20Stats%20at%20a%20Glance%202002.pdf> (Accessed: 10 August 2019).
- Department of Science and Technology. (2004). *Indigenous Knowledge System*. Pretoria: DST.
- DST (2004). *The Indigenous Knowledge Policy of 2004*. National Department of Science and Technology.
- Drissi, S. (2021). *Indigenous People and The Nature They Protect*. Available: <https://www.unep.org/news-and-stories/story/indigenous-peoples-and-nature-they-protect> (Accessed: 19 July 2022).
- Domfeh, K. A. (2007). Indigenous knowledge systems and the need for policy and institutional reforms. *Tribes and Tribals*, 1 pp. 41-52.
- Duri, F., and J. Mapara. 2007. Environmental Awareness and Management in Pre-colonial Zimbabwe. In *Zimbabwe Journal of Geographical Research*. Volume 1, Number 2. pp98-111
- Escarra, P.D., Sorman, I., Blount, C.G., and Woods, N. (2007). *Fibre-Optic-Enabled Coiled-Tubing Operations on Alaska's North Slope*. All Day.
- Eurostat-OECD. (2017). *Compilation Guide on Inventories*. OECD. DOI: 10.1787/9789264283060-en.
- Fairweather, J.G. (2006). *A Common Hunger: Land Rights in Canada and South Africa*. Calgary: University of Calgary Press, pp. 150-167.

- Fenn, P. (2012). *Commercial Conflict Management and Dispute Resolution*. Routledge. DOI. 10.4324/9780203852217.
- Forde, B. & Lorenzo, H. (1998) *The nutritional control of root development*. *Plant Soil* 232, pp. 51-68.
- Geboe, B. (2014). *An Overview of Community Development Initiatives Engaging Indigenous People in Australia, New Zealand, and the United States of America*. Institute for Study of International Development (ISID). Canada. pp. 1-33.
- Gibbs, G. R. (2007). *Thematic coding and categorizing. Analysing qualitative data*. London: Sage Publications.
- Gondwe, M., & Longnecker, N. (2015). *Objects as Stimuli for Exploring Young People's Views about Cultural and Scientific Knowledge*. *Science, Technology, & Human Values*, 40(5), pp. 766-792.
- Goebel, A. (2007). *Common Imperialisms: Comparing South Africa and Canada*. Available: <https://www.h-net.org/reviews/showrev.php?id=13521> (Accessed: 08 July 2022).
- Green, D. and Raygorodetsky, G. (2011). *Indigenous knowledge of a Changing Climate*. Springer Science and Business Media. Vol. 100(2). pp. 239-242. DOI: 10.1007/s10584-010-9804-y.
- Hammersmith, J.A. (2007). *Converging Indigenous and Western Knowledge Systems: Implications for Tertiary Education*. Unpublished Doctoral Thesis. Pretoria: University of South Africa (UNISA).
- Hill, R. G. (1999). *U.S. Patent No. 5,880,132*. Washington, DC: U.S. Patent and Trademark Office.
- Huntington, H., Fox, S., Berkes, F., Krupnik, I., Whiting, A., Zacharof, M., & Brubaker, M. (2005). *The changing Arctic: Indigenous perspectives*. *Arctic Climate Impact Assessment*, 64.
- IPCC (2014) *Climate Change 2014: impacts, adaptation, and vulnerability*. IPCC Special Report, WGII.
- IPCC. (2018). *Summary for Policymakers Global Warming of 1.5 °C. An IPCC Special Report on the Impacts of Global Warming of 1.5 °C above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global*. IPCC.

- International Union for the Conservation of Nature (IUCN). (1980). Conserving Africa's natural heritage: the planning and management of protected areas in the afro tropical realm: proceedings of the 17th meeting of IUCN's Commission on National Parks and Protected Areas, Garoua, Cameroon, 17-23 November 1980.
- Jaccard, J., & Jacoby, J. (2010). *Theory Construction and Model Building Skills: A practical*
- Jingping, H.E. Duplessis, L., & Barton, I. (2022). Heap leach pad mapping with drone-based hyperspectral remote sensing at the Safford Copper Mine, Arizona. *Hydrometallurgy*. Elsevier. 211. DOI: 10.1016/j.hydromet.2022.105872.
- Jiri, O., Mafongoya, P., Mubaya, C., & Mafongoya, O. (2016). Seasonal Climate Prediction and Adaptation Using Indigenous Knowledge Systems in Agriculture Systems in Southern Africa: A Review. *The Journal of Agricultural Science*, 8(5), 156–172. doi:10.5539/jas.v8n5p156
- Juneja, P. (2015). *Managmentstudies.com*. [Online] Available: <http://www.managmentstudies.comhttps://www.cia.gov/library/center-for-the-study-of-intelligence/csi-publications/books-and-monographs/psychology-of-intelligence-analysis/PsychofIntelNew.pdf> (Accessed: 10 June 2019).
- Kanene, K. M. (2016). Indigenous practices of environmental sustainability in the Tonga community of southern Zambia. *Jâmbá: Journal of Disaster Risk Studies*, 8(1).
- Kenton, W. (2018) *Sustainability*. [Online] Available: <https://www.investopedia.com/terms/s/>.
- Lssozi, A. (2012) 'Values and participation: The role of culture in nature preservation and environmental education among the Baganda', *The Journal of Sustainability Education* 7(3), pp. 88–99.
- Mafongoya, P., & Ajayi, O. (2017). Indigenous Knowledge Systems and Climate Change Management in Africa. CTA.
- Mafongoya, P., & Ajayi, O. (Eds.). (2017). Indigenous Knowledge Systems and Climate Change Management in Africa. CTA.
- Manson, L. E., van der Wouden, C. H., Swen, J. J., & Guchelaar, H. J. (2017). The Ubiquitous Pharmacogenomics consortium: making effective treatment optimization accessible to every European citizen. *Pharmacogenomics*, 18(11), 1041–1045. <https://doi.org/10.2217/pgs-2017-0093>

- Masango C.A., (2010). Indigenous traditional knowledge protection: prospects in South Africa 's intellectual property framework? *SA Jnl Libs & Info Sci* 2010, 76 (1) pp. 74-80.
- Mathooko, J. M. (2000). The status and future of African traditional ecological knowledge in the sustainability of aquatic resources. In 2nd Pan-African Symposium on the Sustainable Use of Natural Resources in Africa 2ème Symposium panafricain sur l'utilisation durable des ressources naturelles en Afrique (pp. 43-75).
- McKiernan, P., & Merali, Y. (1995). Integrating information systems after a merger. *Long Range Planning*, 28(4), pp.4-62.
- McNeely, J. A. (1995). Coping with Change: People, Forests and Biodiversity. *The George Wright Forum*, 12(3), pp. 57-73. George Wright Society.
- Merriam Webster. (2022). Definition of Aboriginal. [Online]. Available: <https://www.merriam-webster.com/dictionary/aboriginal>. (Accessed: 29 June 2022.
- Meadows, C.T. (2003). Information Science. Wiley-Verlag GmbH & Co. {KGaA}.
- Muchena, K. C., Howcroft, G., & Stroud, L. (2015). A psych-biographical analysis of Dambudzo Marechera's personal development through his writings. *Journal of Psychology in Africa*. Vol. 25. No.5. DOI: 10.1080/14330237.2015.1101269.
- Mulubrhan, B., Selam, B., Chao, F., & Wu, L. (2019). Indigenous weather and climate forecasting knowledge among Afar pastoralists of north-eastern Ethiopia: Role in adaptation to weather and climate variability. *Research. Policy & Practice*, 9(1), 8. doi:10.118613570-019-0143-y
- Murphy, P. W., & Cunningham, J. V. (2003). *Organising for Community Controlled Development: reviewing Civil Society*. Sage Publishers Inc. California. pp. 1-102.
- Ngara, R., & Mangizvo, R. V. (2013). Indigenous knowledge systems and the conservation of natural resources in the Shangwe community in Gokwe District, Zimbabwe. *International Journal of Asian Social Science*, 3(1), pp. 20-28.
- Nenquimo, N. (2021). How Indigenous Knowledge Can Help Prevent Environmental Crises. United Nations Environment Programme 09 August 2021. [Online] Available: https://www.unep.org/news-and-stories/story/how-indigenous-knowledge-can-help-preventenvironmentalcrises?fbclid=IwAR3OeP_bfgXzBwy2RK65AspEN_0C6edjQnmNYfIZ_NlrdgHvFMbdUFDOj0 (Accessed: 9 July 2022).

- Nyota, S and Mapara, J. (2007a). Language as Indigenous Knowledge. Monograph Series No. 69. Cape Town: CASAS.
- Nyong, A., Adesina, F., & Elasha, O. (2007). The value of Indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel. *Mitigation and Adaptation Strategies for Global Change*, 12(5), 787–797. doi:10.1007/11027-007-9099-0
- Obiora, A. C., & Emeka, E. E. (2015). African Indigenous knowledge system and environmental sustainability. *International Journal of Environmental Protection and Policy*, 3(4), pp. 88-96.
- Oliver, V. (2010). *301 smart answers to tough business etiquette questions*. Skyhorse Publishing Inc.
- Organisation for Economic Co-operation and Development (OECD). (2017). Linking Indigenous Communities with Regional Development Project Kick-off Workshop Hotel Musee Primere Nations, Wendake First Nation Quebec City, September 19-21, 2017. Canada. [Online] Available: <https://www.oecd.org/regional/regional-policy/Indigenous-project-launch-Proceedings.pdf> (Accessed: 25 August 2019).
- Pasquini, E. L. (2016). 4 Ways to involve Indigenous communities in development projects. 4 Ways to involve Indigenous communities in development [Online] Available: <https://www.devex.com/news/4-ways-to-involve-indigenous-communities-in-development-projects-85696> (Accessed: 25 September 2019).
- Phillips, B. and Mcquarrie, E. F. (2010) Narrative and Persuasion in Fashion Advertising October 2010. *Journal of Consumer Research* 37(3):368-392 DOI: 10.1086/653087
- Popp, J. (2018). How Indigenous knowledge advances modern science and technology. *The Conversation*, Academic rigor, journalistic flair 2. January 2, 2018, 6.03pm EST
- Prakash, G. (2013). Writing post-orientalist histories of the Third World: Perspectives from Indian historiography. *Comparative Studies in Society and History*, Vol.32(2), 383–408.
- Ranger, T.O. (1999). *Voices from the Rocks*. Harare: Baobab Books.
- Shi, T. & Gill, R. (2005). Developing effective policies for the sustainable development of ecological agriculture in China: the case study of Jinshan County with a systems dynamics model. *Ecological Economics*. Elsevier. 53(2). doi: 10.1016/j.ecolecon.2004.08.006.

- Smith, L. T. (1999/2013). *Decolonizing methodologies: Research and Indigenous peoples*. London and Dunedin: Zed Books Ltd and University of Otago Press.
- Simonds, V.W., and Christopher S. (2013) *Adapting Western Research Methods to Indigenous Ways of Knowing*. *Am J Public Health*. 2013 December; 103(12): 2185–2192. Published online 2013 December. doi: 10.2105/AJPH.2012.301157.
- Siyakumah, M. (2006). *Climate prediction and agriculture: Current status and future challenges*. *Climate Research*, 33, 3–7. doi:10.3354/cr033003.
- Soropa, G., Gwatibaya, S., Musiyiwa, K., Rusere, F., Mavima, G., & Kasasa, P. (2015). *Indigenous knowledge system weather forecasts as a climate change adaptation strategy in smallholder farming systems of Zimbabwe. Case study of Murehwa, Tsholotsho and Chiredzi districts*. *African Journal of Agricultural Research*, 10(10), 1067–1075. doi:10.5897/AJAR2013.7205.
- South Africa, Department of Science and Technology, (2004a). *Indigenous Knowledge Systems*. South Africa. Downloaded from [http://www.biodiversityexplorer.org/people/IKS_Policy%20PDF \[1\].pdf](http://www.biodiversityexplorer.org/people/IKS_Policy%20PDF%20[1].pdf) on 15 July 2022.
- Suchanandan, T. (2018). *Mail and Guardian: Protecting and preserving Indigenous knowledge*. [Online] Available: <https://mg.co.za/article/2018-02-02-00-protecting-and-preserving-indigenous-knowledge> (Accessed: 14 October 2019).
- UKZN. (2019). *The University of KwaZulu-Natal*. [Online] Available: [ukzn.ac.za: http://aiks.ukzn.ac.za/iks-faq](http://aiks.ukzn.ac.za/iks-faq) (Accessed: 27 February 2019).
- United Nations Conference on Environment and Development (UNCED), (1992). *International Council for adult education*, UNCED, Rio de Janeiro.
- United Nations Department of Economic and Social Affairs. (2009). *Millennium Development Goals Report 2009*. [Online] Available: <https://www.un.org/en/development/desa/publications/2009.html>.
- United Nations International Strategy for Disaster Reduction (2009). *United Nations International Strategy for Disaster Reduction (UNISDR) Secretariat Evaluation Final Report (2010)*.
- Van Rensburg, G.H., Alpaslan, A.H, du Plooy, G.M., Gelderblom, G., van Eeden, R. & Wigston, D.J. (2010). *College of Human Sciences: Research in the Social Sciences*. Pretoria, University of South Africa

- Venter, S. L., van Rensburg, W. J., Vorster, H. J., den Heever, E. P., & Zijl, J. P., (2007). Promotion of African Leafy Vegetables within the Agricultural Research Council-Vegetable and Ornamental Plant Institute: The Impact of the Project. *AJFAND*, 7 (4), pp.1-12.
- Verschuuren, B., Wild, R., Oviedo, G., & Mcneely, J. (Eds.). (2010). *Sacred natural sites: Conserving nature and culture*. Routledge.
- Warren, D. M. 1991 "Using Indigenous Knowledge in Agricultural Development"; World Bank Discussion Paper No.127. Washington, D.C.: The World Bank.
- Warren, D. M., Slikkerveer, L. J., Brokensha, D., & Dechering, W. H. (1995). *The cultural dimension of development: Indigenous knowledge systems*. Intermediate Technology Publication Ltd. London. pp.426-479.
- Wilson, J. (2014). *Essentials of business research: A guide to doing your research project*. Sage.
- World Conservation Society (WCS), (2019) *World Conservation Society; Strategy 2020*. [Online] Available: <https://www.wcs.org/our-work/2020-strategy>. (Available: 10 August 2019).

Annexure A: Ethical Clearance



Mr Vukani Vincent Mzobe (212540255)
School Of Social Sciences
Howard College

Dear Mr Vukani Vincent Mzobe,

Protocol reference number: 00003086

Project title: Can Indigenous Knowledge Systems be used to promote environmental conservation, development, and economic growth beyond local geographical scales?

Exemption from Ethics Review

In response to your application received on 1 October 2019, your school has indicated that the protocol has been granted **EXEMPTION FROM ETHICS REVIEW**.

Any alteration/s to the exempted research protocol, e.g., Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through an amendment/modification prior to its implementation. The original exemption number must be cited.

For any changes that could result in potential risk, an ethics application including the proposed amendments must be submitted to the relevant UKZN Research Ethics Committee. The original exemption number must be cited.

In case you have further queries, please quote the above reference number.

PLEASE NOTE:

Research data should be securely stored in the discipline/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours sincerely,


Prof Uma Mahesvari Naidu
Academic Leader Research
School Of Social Sciences

UKZN Research Ethics Office
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Website: <http://research.ukzn.ac.za/research-ethics/>

Durban Campus Edgewood Howard College Medical School Pietermaritzburg Westville

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Annexure B: Turnitin Similarity Index

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Annexure C: Letter from the language Practitioner



One Stop Solution
24 Firenze Gardens
Warbler Road
Cotswold Ext
Port Elizabeth
6045

www.onestopsolution.co.za

TO WHOM IT MAY CONCERN

I, Lesley Venter, declare that I have done the language editing for the thesis of:

Name: VUKANI VINCENT MZOBE

Student no.: 212540255

entitled:

CAN INDIGENOUS KNOWLEDGE SYSTEMS BE USED TO PROMOTE ENVIRONMENTAL CONSERVATION, DEVELOPMENT, AND ECONOMIC GROWTH BEYOND LOCAL GEOGRAPHICAL SCALES?

Submitted in fulfilment of the requirements for the degree of Master of Social Science in the Faculty of Humanities at the University of KwaZulu-Natal.

I cannot guarantee that the changes that I have suggested have been implemented nor do I take responsibility for any other changes or additions that may have been made subsequently.

Any other queries related to the language editing of this thesis may be directed to me at 076 481 8341.

Signed at Port Elizabeth on 28 December 2020



LM Venter