

Beyond the Extractive Paradigm: Appraising Indigenous Knowledge in South African Environmental Governance

James Ojochenemi David

College of Law, School of Criminal Justice, University of South Africa, South Africa

Received November 14, 2024; Revised February 17, 2025; Accepted July 15, 2025

Cite This Paper in the Following Citation Styles

(a): [1] James Ojochenemi David, "Beyond the Extractive Paradigm: Appraising Indigenous Knowledge in South African Environmental Governance," *Environment and Ecology Research*, Vol. 13, No. 4, pp. 459 - 471, 2025. DOI: 10.13189/eer.2025.130401.

(b): James Ojochenemi David (2025). *Beyond the Extractive Paradigm: Appraising Indigenous Knowledge in South African Environmental Governance*. *Environment and Ecology Research*, 13(4), 459 - 471. DOI: 10.13189/eer.2025.130401.

Copyright©2025 by authors, all rights reserved. Authors agree that this article remains permanently open access under the terms of the Creative Commons Attribution License 4.0 International License

Abstract This study provides a critical examination of the integration of Indigenous Knowledge Systems (IKS) into environmental governance (EG) in South Africa, emphasising both the potential benefits and the challenges posed by the existing extractive paradigm. This research uses postcolonial Indigenous theory and a qualitative narrative methodology to analyse the implications of relegating Indigenous people to peripheral roles within stakeholder frameworks. It critiques the reductionist approach that treats IKS as supplementary to contemporary governance structures, which often undermines the comprehensive contributions of Indigenous values, spirituality, and leadership to sustainability initiatives. Drawing comparative insights from Canada, this study contextualises the specific difficulties faced by South Africa in effectively incorporating IKS into EG frameworks. The key findings suggest that epistemic neo-colonialism and a narrowly utility-driven emphasis obstruct the meaningful integration of IKS, thereby marginalising its cultural and spiritual dimensions. Consequently, the study advocates for a holistic approach that prioritises Indigenous self-determination and recognises the intrinsic value of their knowledge systems. The conclusions emphasise the necessity for transformative policies that transcend tokenistic inclusion and enable IKS to authentically inform sustainable practices. This research contributes significantly by reframing IKS as a substantial framework for achieving ecological balance and

intergenerational equity. It highlights practical implications for policy reform, particularly the need for governance models grounded in Indigenous philosophies such as Ubuntu. Additionally, the study addresses social implications, including promoting cognitive justice and equitable participation in environmental decision-making processes. The limitations of this research include the narrow scope of case studies and the requirement for empirical data to supplement the theoretical analysis. Overall, this study enriches the discourse on decolonising environmental governance and underscores the importance of confronting structural barriers to the ethical and effective integration of IKS in South Africa and beyond.

Keywords Indigenous Knowledge, Extractive Paradigm, Environmental Governance, Sustainability, Ubuntu, South Africa

1. Introduction

Academics, policymakers, and practitioners are increasingly advocating for the integration of Indigenous knowledge (IK) in various sustainability challenges, recognising its relevance in addressing growing environmental issues such as climate change [1]. These integration efforts are evident in natural resource

management, sustainability education, and environmental sustainability [2], among others. The growing recognition of Indigenous knowledge systems (IKS) as a legitimate research agenda stems from its potential as useful alternative to the dominant Western model that heavily focuses on science and technology as the primary drivers of progress. IKS is seen as an integral path to sustainable development at local, regional and global levels, given its holistic approach to nature [1,2].

However, the dominant Western epistemic paradigm within which sustainability is primarily discussed and operationalised presents a significant challenge to the effective and ethical integration of IKS environmental governance (EG). The hierarchical and compartmentalised systems of modern governments and organisations make such integration efforts particularly daunting due to the dynamic structures of IKS, its history of colonial subjugation, and its informal/oral transmission methods [3]. Often, integration efforts in EG treat IKS as an add-on, with researchers or writers on IKS frequently situated outside the Indigenous communities they study, using research paradigms external to the IK community. Consequently, IK ends up as ideas and information to be mined into modern environmental governance structures to the degree that it is compatible with a set agenda. This extractive approach reflects the classical pragmatic concept of truth, popularised by William James, which reduces truth to ideas that are useful in our experiences [4]. However, by turning IK into a mere idea, its value is reduced to its utility, judged through the lens of the dominant Western epistemic paradigm, often neglecting important aspects such as spirituality and values [5]. This raises the question of how the utility-driven extractive paradigm impacts the integration of IK, particularly in EG.

Using the postcolonial Indigenous theory (PIT), this study examines this utility-driven approach in IKS research to highlight its implications for the potential contributions of IKS in EG and sustainability [6,7]. Drawing on relevant scholarly materials and official reports, the study argues that the challenges in integrating IKS into EG stem partly from misconceptions about IKS. It critiques the subtle epistemic neo-colonialism embedded in IKS research and calls for greater sensitivity to this issue to promote a more holistic understanding of IKS for effective and ethical integration in EG. Given the context-specific nature of IK, achieving EG and sustainability through IKS requires more than superficial consultation with Indigenous people. Instead, an appreciation of Indigenous values and spirituality, which may not align easily with Western worldviews is necessary [8,9]. This calls for creating a parallel system within EG that supports Indigenous self-determination. Consequently, IKS researchers must be cautious about packaging IK only on perceived utility grounds, as doing so risks losing the original effectiveness and purpose of such knowledge.

As a necessary point of departure, the next section explores the potential misunderstandings in

conceptualising IKS and how they might contribute to the pitfalls of the extractive paradigm vis-à-vis EG. The subsequent sections highlight the theoretical framework and the methodology for this study. Findings and discussions of insights regarding the challenges of integration within the broader discussion of whether IKS will follow afterwards, emphasising how IKS should be integrated into sustainability issues in South Africa.

1.1. Indigenous Knowledge: An Overview

Despite the burgeoning research on IKS, a consensus on its definition remains elusive. Terms such as traditional knowledge, local knowledge, Indigenous knowledge, traditional ecological knowledge (TEK), Indigenous knowledge systems, Aboriginal tradition, Indigenous technical knowledge, ethnobotany, and place-based knowledge are often used interchangeably to refer to IKS. Indeed, defining social phenomena accurately is generally challenging, as each of these conceptions of IK emphasises different aspects. This diversity of conceptions reflects the struggles and power dynamics associated with the concept of IK [10].

The political dimension of knowledge contributes to this challenge, as definitions are often formulated by scholars or professionals who are not necessarily community members, leading to the privileging of their agendas for environmental and natural resource stewardship and management. When definitions fail to acknowledge IK as a coherent system, they tend to produce misconceptions and misunderstandings. For example, defining IK as the knowledge possessed by Indigenous people of a place fails to address the challenges around the criteria for determining Indigenous people, considering human migratory characteristics, [11] as well as the changing landscape of many societies. It also raises questions about the length of time required for someone to be considered Indigenous and have their knowledge regarded as 'indigenous.' In South Africa, for instance, there is a debate about who qualifies as Indigenous: only the Khoi and San people or other African communities as well? [10].

Although the Khoi and San people are the first Indigenous groups identified in IKS discourse in Southern Africa, the term "indigenous" in Africa, according to the African Commission on Human and People's Rights (ACHPR), does not exclusively refer to the first inhabitants of a place. Rather, the term Indigenous include elements such as self-identification, a special attachment to and use of traditional lands, and experiences of marginalisation, exclusion, or discrimination due to cultural differences in lifeways and modes of production [12]. Thus, every ethnic group has a knowledge system that promotes sustainable livelihoods. A commonality across various knowledge systems in the region is their focus on axiology rather than epistemology. They place a value on principles such as respect, honesty, gratitude, caring, collective responsibility, and harmony between the living and "living dead" [11].

Indigenous societies celebrate peaceful and collective coexistence and recognise their dependence on nature for sustenance

In the South African context, one prominent Indigenous worldview that resonates with the above is Ubuntu, which places a significant emphasis on a robust ethic of interconnectedness. Within Ubuntu, there exists a profound understanding that an individual's well-being and survival are intrinsically linked to the well-being and survival of the broader community. This fundamental principle is succinctly captured in the adage, "I am because we are." This phrase encapsulates both metaphysical and ethical perspectives on the interconnectedness of all existence, both of which shape Ubuntu's epistemology. Within the Ubuntu worldview, this sense of interconnectedness and interdependence extends beyond the human realm. It encompasses the entirety of the ecosystem, recognising the profound interrelationships between humans, the natural world, and even spiritual entities [13]. This interconnectedness is not merely a philosophical concept but a guiding principle that shapes ethical behaviour and relationships in South African society, which is still alive in some form today, despite the historical influence of colonialism and apartheid.

The portrayal of "Indigenous people" however, shapes the value placed on their knowledge systems. The common invalidation of IK as unscientific stems from the perception of Indigenous people as primitive, backward, and uncivilised. Its culture is considered not only outdated but also static, especially under the modernisation efforts of colonialism. However, acknowledging the ongoing existence of Indigenous people entails attributing more value to their knowledge as an unfolding process rather than a fixed content at a specific time. This distinction leads to different responses or dispositions toward indigenous knowledge as a system. It is essential to recognise that IK is not entirely compatible with the dictionary definition of knowledge prefixed by "Indigenous".

Moreover, the historical marginalisation of Indigenous Knowledge (IK), extensively documented in scholarly literature, is inextricably linked to the widespread inferiorisation of IK holders and their communities globally.

Given the deep and valuable wisdom embedded in IK, scholars acknowledge the scarcity of a noun designation for knowledge in many African indigenous languages, where the closest translation often refers to a process rather than a content in itself [11]. Such process is often roughly translated as "knowing," "way of knowing," "coming to know," and "act of knowing," among others, involving the knower, the known, and the context in which they coexist. Indigenous societies consider knowledge thus as a way of life or being, often using "knowledge" and "wisdom" interchangeably, an indication of its value-laden attitude toward knowing. To the Indigenous societies, knowledge is actively created and transmitted in relationships rather than

being a body of ideas that exist independently of the knowers and the known. Knowledge is seen as a "way of living and behaving properly" or as "wisdom in action". This understanding highlights why IK is better understood within its broader political, legal, economic, and cultural systems, as it implicates how IKS is treated in Environmental Governance (EG).

Environmental Governance, which involves the decision-making process for controlling and managing the environment and natural resources [14], takes place within the systemic context of "Integrated World Capitalism" especially in the modern era [15]. In this context, there is an increasing recognition of the centrality of IK to environmental management, with emphasis on the importance of involving of Indigenous people in decision-making. Indigenous knowledge and communities are considered valuable resources in conservation, restoration, and sustainable use of nature to benefit humanity, including addressing climate change, pollution, and biodiversity loss [16]. The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) report, for instance, highlights the importance of Indigenous groups in providing information on local biodiversity and environmental change, positioning them as significant contributors to biodiversity governance at local and global levels [17]. Indigenous groups' wisdom, as evident in their creation stories about the land and water, emphasises the importance of respect in relationships. These recognitions have made indigenous participation in relevant EG forums a prominent issue.

Discernible in this global recognition, however, is an attitude towards the advocacy for IK in EG that merely focuses on the information, ideas, and facts that can be derived from Indigenous communities for sustainability applications. The underlying extractive tendencies prioritise the factual aspect of IK, such as data and information, to integrate them into Western resource management mechanism. Even the derived IK-based information is hardly controlled by the Indigenous people, undermining the importance of Indigenous governance in the context of data sovereignty, which advocates for Indigenous people's control over data related to their communities as outlined by Kukutai and Taylor [18].

Consequently, the integration of IK in EG remains deficient in several ways, as engagements with Indigenous communities and its knowledge are often without a sufficient appreciation of its context and system. For example, in the context of education in South Africa, the integration of IK into the curriculum often comes down to an isolation of a few examples of IK into the existing school sciences, which can have negative effects when such selective compatibility is prioritised [10,11]. These downsides are not sufficiently addressed in scholarship seeking to integrate IKS into the curriculum. The strict adherence to the Western epistemic approach to data collection, analysis and dissemination of research in higher

education institutions across the country sometimes in IKS research is a case in point. This approach does some disservice to the IK holders, for instance, in cases where the use of pseudonym is research presentation with a tendency to underrepresent the ownership of knowledge, deferring it from the IK to the holders to researcher. So far advocacy for indigenous research methods has yet to take full hold among researchers for various reasons, ranging from oversupply of scholars trained in western epistemic paradigm relative to the existing expertise in IK among supervisors to resource constraints faced by researchers who must graduate within a specific time. Similarly, Hays [3] points out that while involving elders and bearers of IK in the formal education system is crucial, the preference for compartmentalised and written information and formal qualifications poses significant challenges for the integration of IKS in formal education. These, among other issues, reinforce the need for a proper conceptualisation of IKS for meaningful integration in the context of EG.

2. Materials and Methods

This study employs a Critical Qualitative Research Method (CQRM), a methodological approach that integrates critical theory with qualitative research strategies to thoroughly explore power dynamics, social constructs, and the ideologies that shape human experience within the social sciences and humanities [19]. The CQRM framework is particularly effective in examining social realities by analysing how certain groups are represented within cultural, institutional, and policy discourses, and by critically engaging with the structures and values that influence these portrayals. As Cannella and Lincoln [19] note, CQRM is designed to question whose voices are prioritised within societal frameworks while other narratives are marginalised or suppressed. This approach encourages researchers to seek out and validate knowledge systems and community narratives that are often excluded from dominant knowledge structures, and it emphasises the importance of identifying when inclusivity or equity in discourse may, in fact, serve to reinforce underlying forms of oppression. Furthermore, CQRM examines how elite or influential groups across various social sectors influence and institutionalise values, ideologies, and language that maintain existing power hierarchies. With a focus on social justice and transformative societal impact, CQRM aligns well with the study's aim to deconstruct entrenched paradigms and foster equity in knowledge production [19].

This study's primary data collection comprises a theoretical analysis, synthesising a wide array of scholarly perspectives to build a critical and comprehensive understanding of the topic. By engaging with diverse academic sources, this research constructs a robust theoretical foundation that enables a contextually rich and nuanced analysis regarding the need to go beyond the extractive paradigm in the quest to integrate indigenous

knowledge in environmental governance in South Africa.

3. Theoretical Framework

Consistent with methodological framework, the **Postcolonial Indigenous Theory (PIT)** is employed in making sense of the dynamics of the extractive paradigm in the integration of Indigenous Knowledge Systems (IKS) in environmental governance. PIT is a critical approach that challenges the enduring influence of colonial power structures in shaping knowledge systems and the need for decolonising efforts that recognise the unique contributions of Indigenous perspectives [7,15,20]. By centering Indigenous values, ethics, and knowledge systems, PIT offers a framework to examine not only these challenges but also the opportunities for more efficient and ethical incorporation of IK into environmental policies in a manner that respects and empowers Indigenous communities. To do this, the following three key conceptual frameworks are useful in articulating the potential of PIT to present a useful critique of environmental governance vis-à-vis IKS, with reference to South Africa.

1. Extractive Paradigm

The extractive paradigm refers to a Western-centric approach in which Indigenous knowledge is selectively incorporated into governance structures to serve utilitarian or economic objectives, often without consideration for its broader cultural and spiritual significance. This paradigm reduces IKS to a resource that can be "mined" for data or practical insights, overlooking the deep-rooted, holistic nature of IKS. McGregor [21] and Whyte [27] observed that this extractive mindset not only disregards the full depth of Indigenous knowledge but also perpetuates a form of epistemic neo-colonialism, where Western frameworks dominate environmental policy, sidelining Indigenous perspectives as mere supplementary information. In the South African context, the government's efforts to formalise IKS within national frameworks sometimes result in a fragmented view of knowledge, detached from the cultural practices and spiritual beliefs that sustain it. For instance, the extractive paradigm manifests in policies that focus on cataloguing and commercialising Indigenous knowledge, such as through the National Indigenous Knowledge Systems Office (NIKSO). Despite its noble goal of valuing indigenous knowledge, NIKSO unwittingly promotes the instrumentalisation of IKS, where its value is assessed primarily based on its applicability within existing governance structures rather than as a fully realised system of knowledge that integrates ethical, spiritual, and ecological principles [5,22].

2. Decolonisation of Knowledge Systems

In response to the historical marginalisation of colonised societies around the world, leading to the undervaluing of its knowledge systems, PIT advocates for the

decolonisation of knowledge, which involves recognising and validating Indigenous knowledge systems on their own terms. Rather than simply implying a rejection of Western science, decolonisation in this context calls for a balanced approach that values the distinctiveness of IKS as an equally legitimate knowledge system [6]. For example, in South Africa environmental sustainability practices guided by IKS should revolve around communal, ethical, and sustainable approaches to resource management that is often overlooked in mainstream governance frameworks. In this regard, the reference to PIT indicates the need to go beyond traditional postcolonial theories, which primarily focus on historical exploitation, by acknowledging the wisdom and aspirations of the colonists. Accordingly, "postcolonial" is herein construed not as a fixed temporal condition (after-colonialism), but as an ongoing aspiration that is yet to be fully realised.

The process of decolonisation in this regard also addresses the need to reframe Indigenous communities as leaders in EG rather than passive stakeholders [15]. By centering Indigenous voices in decision-making, decolonisation, it promotes cognitive justice—an equitable representation of diverse knowledge systems within environmental policy. In South Africa, this means adopting governance models that do not merely integrate IKS superficially but instead respect and incorporate Indigenous knowledge as a guiding framework for sustainability [8,23].

3. Ubuntu as an Indigenous Framework

Particular to the IKS framework of EG is the potential of the Ubuntu worldview in Southern Africa, which aligns closely with PIT's call for a relational, community-centered approach to governance. Ubuntu is rooted in the principle of interconnectedness and collective responsibility, encapsulated by the phrase, "I am because we are." This philosophy promotes an ethic of care and respect for all beings—human and non-human—and serves as a framework that complements sustainable EG [24,25].

In South Africa, Ubuntu provides an Indigenous ethical framework that EG by emphasising relationships rather than transactional or extractive practices. As Okoliko and David have argued, incorporating Ubuntu within governance models encourages a view of environmental stewardship as a communal responsibility that prioritises harmony with nature over exploitation. This approach challenges dominant governance models pivoted on economic growth, offering culturally grounded perspective that recognises the spiritual and ethical dimensions of environmental care.

Ultimately, the postcolonial indigenous theory brings attention to the need for a significant shift away from the prevailing Eurocentric research paradigm, which objectifies Indigenous people and interprets their experiences, histories, beliefs, and ways of life based on European perspectives [26]. By treating IK as mere content to be learned and utilised, rather than recognising it as a

lived process, there is a reluctance to place both knowledge systems on an equal footing for meaningful dialogue and synthesis. If the inclination towards assimilation or integration in IK research is not properly addressed, it risks perpetuating the predetermined standard of Western epistemology, which goes against what IKS research aims to challenge. Consequently, it not only reproduces the extractive motives that underpin colonialism and the slave trade but also undermines the decolonisation agenda of IKS research, with particular implications for EG.

4. Finding and Discussion

There is enormous interest in IKS and its integration in various pursuits of sustainability. However, the various approaches to such integration reveal that Indigenous communities are persistently regarded as external entities and mere stakeholders within the broader framework of global, regional, and local environmental decision-making processes [7, 35]. Evidence from the context of Canada is helpful in this regard.

4.1. Approaches to IKS and Environmental Governance

According to a recent study by in the context of Canada, the extractive paradigm in IKS scholarship has led to three main approaches that minimise the efficacy of IKS in EG. The first approach, known as the "data and information" approach, treats IKS as data that can be mined to solve global problems. It reduces IK to a source of information and focuses on extracting useful data from Indigenous communities.

The second approach builds upon the first but includes theoretical acknowledgement of the holistic nature of IKS. However, it still treats IK as something that can be extracted from Indigenous people in manageable bits or categories. The Indigenous knowledge policy framework and guidance of the Canadian government exemplify this approach. While it recognises that the indigenous worldview encompasses various aspects such as culture, environment, and social, health, and economic conditions, the purpose of extracting IK is still primarily for external usages, such as in Impact Assessment Acts. This approach relies on a simplistic definition of IK as merely "the knowledge of Indigenous people of Canada," without sufficient reference to the existing legal, political, and governance systems that Indigenous communities have developed. These aspects are often seen as challenging to state authority.

The third approach represents a further improvement on the second, as it emphasises the inclusion of IK in decision-making processes. However, it still falls short in recognising Indigenous legal orders and governance in relevant IK policies and guidance. There is a varying degree of disregard for full collaboration with Indigenous

people in the pursuit of incorporating IK into EG. McGregor notes that governments and other external actors explicitly exclude the broader systems of knowledge, as they may directly challenge the purpose and intent of the legislation in which attempts at compartmentalising Indigenous knowledge currently find expression.

These three approaches in IKS scholarship within the extractive paradigm undermine the necessity of full collaboration with Indigenous communities and disregard the broader systems of knowledge that Indigenous people possess. This limits the effective incorporation of IK into EG, as it fails to recognise the importance of indigenous legal orders, governance, and the holistic nature of IKS.

Hence, various scholars have highlighted how IKS has been historically undervalued and sidelined in favour of Western knowledge paradigms [37,38]. This historical context significantly shapes the contemporary challenges faced by indigenous communities in participating meaningfully in sustainability and environmental decision-making processes. McGregor [28], for instance, highlights the struggles of indigenous communities in asserting their knowledge systems in EG and the need to recognise their contributions in shaping sustainable practices and systems. In line with other recent scholarship, the United Nations Declaration on the Rights of Indigenous People (UNDRIP), adopted in 2007, equally draws attention to the importance of Indigenous knowledge and calls for the protection and promotion of this knowledge [39].

The Assembly of First Nations identifies four interlinked components of IKS or traditional ecological knowledge (TEK): 1) Creation stories and cosmologies, 2) Codes of ritual and behaviour governing people's relationships with the earth, 3) Practices and seasonal patterns of resource utilisation and management expressing these relationships, and 4) A body of factual knowledge accumulated in connection with these practices [5]. It appears that non-indigenous scholars and external actors tend to be primarily interested in the body of factual knowledge, overlooking its interlinkages with the other components. As Whyte [27] argues, this approach of "knowledge mobilisation" assumes that TEK can be extracted from communities through historical research or direct engagement and then incorporated into the EG of non-indigenous institutions, such as the United Nations or the U.S. Department of Agriculture. Thus, IK is reduced to archival information that can be interpreted for use in different contexts, particularly in science policy contexts, where scientific information plays a role in EG. This utility-driven focus of IKS scholarship within the Western epistemic paradigm neglects certain features of IKS, especially its spiritual and normative aspects [28].

As a result, the significance of IK in environmental governance and policy discussions is minimised, despite its acknowledged importance. These approaches fail to establish the necessary dialogue with Indigenous people, whose knowledge is extracted and integrated into policies. The importance of Indigenous governance is also

undermined in the context of data sovereignty, as outlined by Kukutai and Taylor [18], which advocates for Indigenous control over data related to their communities. The Advocacy for the integration or incorporation of IKS in various sustainability issues highlights the necessity of rectifying the historical injustices inflicted upon Indigenous people and their culture by the colonial government, particularly in terms of epistemology [29-31]. Such have been generally construed as means of achieving cognitive justice, aiming to overturn the historical hierarchy of knowledge that places IKS in a disadvantaged position. For example, in the context of education, the integration of IKS into the basic curriculum is seen as a remedy to the existing toxic formula, with the hope that it will facilitate the functionalisation of cognitive justice in epistemology within South Africa [10]. Alternative models attempt to incorporate IK alongside other knowledge forms without entirely adopting an integrationist or assimilationist approach. These models generally aim to foster interaction and collaboration between different knowledge systems, metaphors, and models to generate knowledge collectively. While this study does not extensively delve into these models, it is important to note that they encounter significant challenges in dismantling the hegemony of the Western system, as discardable, for instance, in approaches to EG. The subsequent section examines this dynamic in South Africa's efforts toward IKS integration in EG.

4.2. To Integrate or Not to Integrate: Potentials and Pitfalls for South Africa

South Africa is not immune to the pervasiveness of global science in EG pivoted within the extractive climate that essentially undermines the integrity of IKS as it excludes Indigenous laws and governance. This extractive posture toward Indigenous people continues today, as corporations and governments put traditional Indigenous land and resources under immense pressure in the name of investments, economic growth, and research.

In South Africa, the recognition of the relevance of IK is primarily acknowledged through the extractive paradigm, particularly in the commercial exploitation of indigenous biological resources. Compared to other countries on the continent, South Africa has robust scholarship and notable official recognition of the IKS, which is closely tied to its rich biodiversity. Ranking third in terms of biodiversity worldwide, after Brazil and Indonesia, South Africa encompasses approximately 2% of the world's landmass, 10% of its plants, and 7% of its reptiles, birds, and animals. It also boasts 15% of known coastal and marine species and an entire floral kingdom [32].

Consequently, the South African government has established a robust protocol for the protection of its indigenous biological, genetic, and knowledge resources. In 2013, it became the 12th country to ratify the Nagoya Protocol. The creation of the National Indigenous

Knowledge Systems Office (NIKSO), the National Recordal System (NRS), and the Indigenous Knowledge Protection Bill all exemplify South Africa's leadership in Indigenous knowledge management and promotion. These initiatives aim to ensure that the utilisation of these resources ultimately facilitates the development of indigenous and local communities, aligning with the goals outlined in South Africa's 2004 IKS policy, which seeks to recognise, develop, affirm, and protect IK.

NIKSO, established by South Africa's Department of Science and Innovation, represents a pioneering effort to institutionalise Indigenous Knowledge Systems (IKS) within the country's governance framework. NIKSO's primary objective is to safeguard and promote Indigenous knowledge, ensuring it is acknowledged not only as cultural heritage but also as a valuable contributor to South Africa's developmental and environmental strategies. Its mandate is the creation of the **NRS**, a comprehensive repository designed to document, protect, and manage Indigenous knowledge. This system provides a structured means of cataloguing knowledge that is traditionally transmitted orally, thus addressing the challenge of preserving Indigenous knowledge in a rapidly globalising world. By formalising these records, the NRS enables communities to retain intellectual property rights over their knowledge, with potential economic benefits derived from the sustainable use of biological resources and traditional knowledge.

While NIKSO has made significant strides in recognising the value of Indigenous knowledge, its approach reveals inherent tensions between formal institutional structures and the fluid, relational nature of IKS. The very act of documentation—while well-intentioned—risks isolating knowledge from its cultural and spiritual contexts. Critics have argued that Indigenous knowledge, as understood and practiced within communities, is not merely a collection of facts but a living system embedded within daily practices, spiritual beliefs, and the socio-environmental relationships of Indigenous people. By focusing on cataloguing and formalising IKS, the approach can inadvertently reduce Indigenous knowledge to data, detached from its cultural and spiritual contexts Chalmers [39]. This may only serve governmental or commercial interests without fully honouring the cultural depth and ethical commitments inherent in IKS.

Moreover, NIKSO's emphasis on intellectual property rights and commercial applications introduces further complexities. While intellectual property protections are essential to prevent exploitation, they are often framed within Western legal norms that may not align with Indigenous values of collective ownership and stewardship. For many Indigenous communities, knowledge is not owned in a proprietary sense but is considered a shared legacy that transcends individual or even generational claims. This discord reflects a broader challenge within NIKSO's approach: reconciling Western legal and economic frameworks with Indigenous philosophies that

prioritise collective well-being, ecological stewardship, and intergenerational responsibility. Thus, using PIT to examine South African EG reveals the limitations of initiatives like NIKSO and the Indigenous Knowledge Protection Bill. Although these policies represent progress in recognising IKS, they often operate within an extractive framework that does not fully align with Indigenous perspectives [33]. Western governance systems, which tend to compartmentalise knowledge and prioritise its instrumental use, undermine the holistic, lived experience of IKS, where knowledge is inherently tied to community identity, land, and intergenerational continuity.

Despite these challenges, NIKSO has played a critical role in empowering Indigenous communities by fostering awareness and training programs that enable community members to actively engage in documenting and managing their knowledge. Through capacity-building initiatives, NIKSO has facilitated workshops and partnerships that aim to bridge the gap between Indigenous and governmental perspectives, empowering communities to exercise greater control over how their knowledge is recorded and utilised. These initiatives highlight NIKSO's potential as a platform for a meaningful dialogue between Indigenous communities and the state, advancing the goal of cognitive justice, where diverse knowledge systems are equally valued and safeguarded within the national development framework.

Several other challenges persist in promoting indigenous self-determination. Despite the existence of protocols, the focus of these protocols remains primarily on the utility of indigenous biological resources, while neglecting the values and spirituality that are not easily commercialised. One example that highlights the disempowerment of Indigenous people in decision-making is the hoodia debacle, which involved the mishandling of an indigenous plant resource by the Council for Scientific and Industrial Research (CSIR). The CSIR patented, licensed, and marketed the plant without engaging with the San people, whom they erroneously believed to be extinct at the time [33]. This incident sparked debates and contributed to the development of legislation and protocols in the field of access and benefit-sharing (ABS) with indigenous knowledge holders, specifically the Khoi and San communities.

The CSIR's approach to promoting best practices in facilitating the commercialisation and benefit sharing of indigenous knowledge underwent some reassessment after the hoodia debacle, which encompasses the controversy surrounding the marketing, authenticity, and ethical considerations related to Hoodia as a weight loss supplement, as well as the broader ethical issues regarding the commercialisation of traditional knowledge and the exploitation of Indigenous cultures. The CSIR has incrementally developed best practices, such as engaging with Indigenous knowledge holders and identifying relevant communities and leaders to facilitate equitable ABS in collaboration with the Department of

Environmental Affairs [33]. In so doing, the CSIR has played a beneficial role in capacity building and creating a level playing field for marketing indigenous knowledge among small businesses and knowledge holders. This includes activities such as identifying and acquiring commercial intellectual property, providing licensing support, and assisting partners. A noteworthy success story in this regard is the collaboration between the CSIR and the Traditional Healers Council (THC) in optimising the economic benefits of the *Lippia javanica* plant by harnessing traditional knowledge exploitation processes [33]. While such collaborations are crucial for the meaningful incorporation of IK in the sustainability agenda, the full prioritisation of indigenous rights and leadership in relevant environmental decision-making is yet to be realised, reflecting a common challenge faced by indigenous communities worldwide [15]. In addition to their current emphasis on the practical aspects of indigenous knowledge, these protocols often overlook the profound cultural and spiritual significance it holds.

The challenges of IKS integration in EG in South Africa can also be seen in context of Marine Spatial Planning (MSP) and governance. According to a recent policy brief by the South African Institute of International Affairs (SAIIA), a lack of recognition of Indigenous and Local Knowledge ILK as valid and dynamic knowledge systems has led to inadequate representation, marginalisation and exclusion in MSP and governance frameworks. The SAIIA report for instance illustrates disservices to ILK within MSP, whereby decision-support tools primarily rely on quantitative ecological data, rendering the socio-cultural aspects of ocean use invisible [34]. These limitations of current governance tools that lack provisions for integrating qualitative, cultural knowledge central to IKS, reduce Indigenous knowledge to “supplemental” rather than foundational within governance frameworks. Corroborating the issues of legislation earlier mentioned, existing legislation limits access to coastal and marine areas for ILK communities, further entrenching inequities. The absence of transparent communication and meaningful engagement mechanisms exacerbates distrust between ILK holders and authorities, hindering collaborative efforts [34]. The policy brief thus indicated that context-specific knowledge integration is often overlooked, resulting in generalised approaches that fail to address the unique cultural and environmental connections of ILK communities to their marine resources.

A recent systematic study examining the participation of Indigenous people in global environmental governance (GEG) forums highlights significant challenges in their involvement, which resonate in the South African context. While the importance of Indigenous voices is recognised at the GEG level, their actual inclusion in EG remains limited [35]. Various challenges, ranging from structural limitations to outright denial, contribute to the exclusion of Indigenous people from EG processes. For instance the SAIIA report underscores how apartheid-era laws, such as

the Group Areas Act, forcibly removed Indigenous communities from coastal areas, severing them from their ancestral lands and disrupting their cultural and ecological practices [36].

In addition, bureaucratic complexities, inadequate resources, and insufficient capacity within both government and local communities hinder effective collaboration and the co-development of policies that incorporate ILK, perpetuating exclusion and inequity in marine spatial planning and management [34]. For example in the MSP spaces, Indigenous stakeholders often encounter language and accessibility barriers that prevent them from fully engaging in governance processes according to the SAIIA’ [34] report. This emphasises the need for translating governance documents into Indigenous languages and presenting information in user-friendly formats, such as visuals and infographics, to make them accessible to Indigenous communities for meaningful participation [34].

Another structural challenge is the undervaluation of indigenous contributions compared to those of so-called scientific experts, such as biologists, government employees, and resource managers who are trained in the Western scientific paradigm. In South Africa, for example, without proper accreditation IK, the Council for Scientific and Industrial Research (CSIR) and the government tend to make binding decisions on technical issues like commercialisation and intellectual property acquisition with only superficial consultation with the indigenous community. The extractive paradigm prevalent in IK protection often prioritises the utility of indigenous biological resources, leaving little room for the promotion of intangible aspects such as values and spirituality. Notably, the Indigenous Knowledge Protection Bill of South Africa does not even mention the word “spirituality.”

Furthermore, the tendency to validate the usefulness of IK through Western scientific methods reinforces the disregard for its non-commercialisable aspects. In EG, this disposition sometimes leads to research focusing on proving or disproving traditional people’s environmental management attitude, according to Western experts. However, valuable insights can be gained from Freeman’s 1985 study in Canada, which demonstrated the validity and usefulness of Inuit Traditional Ecological Knowledge (TEK) regarding the social structure and behaviour of musk-oxen, even though it contradicted conventional wisdom held by scientists [cited in 5]. Similarly Chalmers and Fabricius [37] observe that “Scientists must, however, acknowledge that positivist studies that compare local knowledge to science are fraught with ethical and methodological challenges.” This insight is particularly instructive for efforts to integrate IK into EG in South Africa, which often grapple with the limitations of a Western positivist approach.

As Casimirri [5] has observed, certain aspects of local knowledge, are sacred and do not have the same origins as Western science. Local knowledge and science can

complement one another, but we advise against integrating them in a way that co-opts local knowledge for scientific purposes.

The extractive paradigm presents significant challenges for the collaboration between Indigenous Knowledge (IK) and scientific knowledge, particularly due to cross-cultural and cross-situational divides. From the perspective of the PIT, this paradigm perpetuates colonial power dynamics, placing emphasis on capitalist-driven development at the expense of holistic, spiritual, and relational understandings of the environment inherent in IK. Indigenous worldviews, deeply rooted in the interconnectedness of land, nature, and community, encompass not only ecological practices but also embody spiritual and cultural significance. The extractive paradigm overlooks these non-material aspects, thereby constraining a more comprehensive and sustainable approach to EG.

Moreover, the PIT underscores how historical exploitation, racism, and unequal power relations have shaped cross-cultural divides that hinder the integration of IK with scientific knowledge. By positioning science as objective and universal while relegating 'Indigenous knowing' to a secondary or incompatible status, a theoretical and situational divide arises, affecting the perception, validation, and implementation of IK in EG contexts. Nonetheless, effective collaboration demands the decolonisation of these paradigms and the redressal of historical injustices perpetuating these challenges.

Cross-cultural divides refer to differences in worldview, language, lifestyle, and other factors between indigenous and non-indigenous populations. For example, Indigenous people may view the restoration of a native fish species as an opportunity to reestablish the relationship between that species and the humans residing in the region. In contrast, non-indigenous populations may perceive the restoration of the same species solely in terms of achieving certain population numbers to benefit recreational outcomes, such as increasing tourism. This disparity in perspectives creates a barrier to effective collaboration.

Similarly, cross-situational divides encompass differences in capacities for EG. Indigenous communities may have limited financial resources compared to neighbouring states or provinces, less political control over their entire region, and limited representation in national decision-making processes. These disparities undermine the necessary synergy required for collaborative EG.

4.3. Wither South Africa?

Although the government of South Africa professes support for IK through the establishment of protocols, the above only suggests that this support does not translate into informed environmental decision-making by the government. This reality as Healy [38] rightly observes says a lot about the extent to which South African political and economic elites benefit from, and are therefore willing to perpetuate, the harmful extractivist paradigm of

development that originated from colonial times and was exacerbated during the Apartheid era. Herein lies disjunct between avowal to entrench IK in decision-making, and the actual implementation of such in relevant matters. The lack of or insufficient public participation in South Africa's governance contravenes the Batho Pele principle of putting people first, as it overlooks the unique needs, values, and ecological insights of those most affected. Although the South African Constitution emphasises public participation and community rights, these principles are inadequately reflected in environmental policies. Economic goals often overshadow the inclusion of Indigenous knowledge, missing the opportunity to harness Batho Pele values for more sustainable and inclusive EG. Often South Africa's focus on economic development, including resource extraction and industrial projects, frequently comes at the expense of environmental health and community welfare.

Addressing these divides and fostering genuine collaboration between IK and science in EG requires recognising and respecting the unique perspectives and capacities of indigenous communities. It entails creating inclusive platforms where indigenous voices are valued and given equal weight, allowing for meaningful dialogue and the integration of diverse knowledge systems. By acknowledging and addressing these challenges, EG can move towards a more equitable and effective approach that respects indigenous worldviews and promotes sustainable outcomes for all.

Similarly, the practical and moral aspects of IKS are undervalued within the extractive paradigm. At times, the term "indigenous wisdom" is preferred over "indigenous knowledge" to emphasise the lived experiences and cultural expressions that encompass IK. The study adopts the definition of IKS provided by the South African Indigenous Knowledge Protection Bill, which includes knowledge developed within Indigenous communities, assimilated into their cultural and social identity, and covers functional knowledge, natural resource knowledge, and Indigenous cultural expressions. This understanding of IKS emphasises a relationship that extends to all living things, the spirit world, ancestors, and future generations. The oral transmission of knowledge in Indigenous societies underscores the relational nature of knowledge, rather than the predominant focus on ideas in Western epistemic paradigm. This relationship imbues all beings with responsibilities and respect, fostering a harmonious connection that sustains the environment. Its marginalisation due to colonialism has however impacted its contribution to EG. Hence, by integrating PIT, this study advances an inclusive, decolonised approach to sustainability that respects Indigenous contributions and promotes a more equitable knowledge framework in EG [6]. This perspective aims to address the persistent impact of colonisation and imperialism on the colonists, who are often objectified in Indigenous scholarship portraying indigenous communities as perpetual victims of history, while simultaneously undermining their significant

contributions to the shaping of human history [6].

In response to this "pathologising view," PIT proposes a more balanced approach that seeks a present enriched by both the past and the future through dialogical engagement with Indigenous people, their worldview, and their system, creating a level playing field [20]. Consequently, IK is not merely to be uncritically extracted from its relevant system or context based solely on its compatibility with Western science. PIT thus challenges the notion that Western knowledge is inherently superior to IK. Without endorsing an essentialist perspective, advocates of PIT emphasise a distinctive way of engaging with reality across cultural differences, characterised by open-mindedness and a commitment to the well-being of humanity based on a revised understanding of what it means to be human [39]. Such balance is necessary in IKS's integration in EG in Indigenous societies, including South Africa.

Ubuntu is a widely embraced indigenous worldview that provides a foundation for establishing meaningful relationships, particularly in the realm of EG. Ubuntu promotes values such as harmony, ethics of care, and responsibility toward the environment, which can greatly influence effective EG, especially in terms of the need for cooperative agencies [25,40]. However, the marginalisation of indigenous communities in environmental discussions undermines much of the potential eco-responsive contributions that this worldview can offer. For instance, a recent scholarship on EG in the context of South Africa suggests a prevailing paradigm centred around extractive developments shaping EG realities. This paradigm seems to prioritise profit and politics at the expense of ethical and responsive approaches to environmental issues [38]. For example, the government's decision in March 2020 to increase industrial capacity for pollution, effectively doubling national limits for Sulphur dioxide emissions contradicts the principles of Ubuntu. Such decisions, which often exclude the voices of indigenous communities and are inconsistent with the spirit of Ubuntu.

Initiatives such as Shell's exploration projects have sparked public concern over potential harm to ecosystems and local communities. Its focus on short-term economic gains often leads to decisions that neglect long-term environmental and social consequences. By neglecting these impacts, governance fails to embody the Batho Pele (people first) ethos, often leaving Indigenous communities—those most vulnerable to environmental degradation and climate change—bearing the brunt of unsustainable policies.

In another instance, it illustrates how provincial officials made minimal efforts to address or involve themselves in addressing the community's worries regarding the Saiccor mill in Umkomaas, KwaZulu Natal (KZN) Province, after withdrawing their support from the Permitting Advisory Panel (PAP) in the early 2000s. The PAP, which was established in April 1997, was envisioned as a panel consisting of representatives from various sectors,

including company officials, ministry representatives, and local environmental/community organisations and individuals. Its primary objective was to serve as a "transparent mechanism for decision-making and permit management." Ideally, it was intended to function as a "platform for the development of a more comprehensive environmental management system in the region" [38]. Consequently, it required strong backing from the provincial government to effectively handle conscientious developments in the vicinity of the Saiccor Mill. But as observed, politicians have wholeheartedly supported the mill's growth, essentially approving permits without thorough scrutiny and disregarding instances of permit violations.

Furthermore, there is a need to recognise Indigenous people as leaders in EG, instead of treating them merely as interest groups. McGregor [28] emphasises that Indigenous knowledge resides within the people, the community, and the land, and cannot be quantified like Western science.

Incorporating indigenous knowledge, exemplified by concepts like Ubuntu, would be beneficial in recognising the moral principles embedded in these worldviews. This, in turn, could guide more holistic and sustainable contributions to EG through lifestyle choices. This necessity is further underscored by the growing recognition of the limits of the United Nations Sustainable Development Goals (UN SDGs) in contemporary times [41], resulting in Conversi's advocacy for learning from Exemplary Ethical Communities (EEC) in sustainability efforts [42]. Achieving objectives like SDG number 10 in this regard thus necessitates full understanding and active promotion of the distinct complementary values that IKS brings to the EG discussion. This can be cultivated by genuine and full participation of Indigenous Knowledge (IK) holders in pertinent governance forums, both at local and global levels [43]. In so doing, IKS, through its emphasis on decoloniality, has the potential of enriching the SDG agenda with culturally grounded and inclusive solutions for global challenges. Integrating these contributions can transform development into a participatory and holistic process rooted in self-determination [44].

4.4. Indigenising the Context

The influence of postcolonial theories extends to indigenous scholarship where there is an increasing focus on valuing indigenous knowledge only to the extent that it can be integrated into the dominant Western epistemic system. This disposition mirrors, if not replicates, the extractive mindset of (the former) colonial masters towards natural resources in colonial territories, disregarding the well-being of the people [20]. Despite, the values being placed on IK, indigenous communities are still treated as mere stakeholders and largely underrepresented in environmental matters that matter to their livelihood, indigenous communities continue to be grossly

underrepresented in critical sustainability discourse. PIT highlights the need for a paradigm shift in South African environmental policy—a move from extractive, top-downward decolonised governance frameworks that respect the intrinsic values of IKS. By integrating Ubuntu as a guiding philosophy and enabling Indigenous leadership in decision-making, South Africa could move closer to an inclusive, culturally responsive governance model that upholds cognitive justice and environmental sustainability. This theoretical framework, therefore, provides a critical foundation for understanding both the opportunities and the challenges in integrating Indigenous knowledge into formal governance and underscores the importance of moving beyond symbolic inclusion toward meaningful, transformative change. Concerning the PIT employed in this study, decolonisation can be understood as an intellectual, economic, political, and legal process aimed at restoring indigenous culture and bringing an end to a historical colonial era. Using the concepts of rediscovery and recovery, Chilisa [22] argues that this restoration involves "a process of interrogating the captive mind so that the colonised others and the historically oppressed... can come to define in their terms what is real to them". Such freedom creates the necessary platform for positioning IKS in dialogue with the dominant epistemic paradigm, where the application of IKS in social and environmental issues is grounded in a proper appreciation of the knowledge's producing context.

However, while the integration of a knowledge system is beneficial, such as in bridging relationships with research institutions for ABS of Indigenous biological resources, without an equal playing field, it results in IK being assimilated into the often-dominant Western knowledge system and the institutions that fund and inform the research. In these contexts, the application of IK sometimes serves external agendas, such as state authorities or research bodies, and promotes an extractive paradigm that obscures the meaningful contribution of Indigenous people to humanity. In such instances, IK is often subsumed under the dominant knowledge system, undermining the freedom of Indigenous people for self-determination. McGregor argues that IK is "embedded in systems supported by and in support of Indigenous societies." She rightly observes that "it is often hollow and potentially damaging to consider any knowledge without understanding the societal systems that produced, maintained, applied, and transmitted it." Therefore, the notion of acquiring or learning IK without undergoing similar experiences to those originally involved in acquiring/generating, holding, and transmitting such knowledge is considered impossible at a fundamental level, according to McGregor.

The near consensus among scholars that IKS is a way of life and not just knowledge as a noun strongly suggests that IKS "ought to be lived if it is to be known, understood, and practised". Hence, scholars and policymakers must ensure that their efforts at integrating IKS are free from the extractivist tendencies that characterise the colonial

relationship with Indigenous people. PIT criticises the commodification of Indigenous knowledge, where Indigenous practices and resources are often appropriated for economic gain under Western legal and economic frameworks. This is evident in South Africa's emphasis on developing a "sustainable blue economy" through MSP initiatives like the Operation Phakisa project. The project seeks to unlock the economic potential of South Africa's oceans, an approach that often leads to prioritising economic growth over preserving the cultural and ecological values inherent in Indigenous knowledge [34]. It is necessary to ensure that the historical colonial dislocation is not repeated in the current knowledge economy, recognising that IK and IKS are inseparable from the people who hold and live this knowledge [9].

4.5. Resolving Structural Barriers to Integration

The structured formal means of knowledge construction in the Western post-humanist system ignore the avenues in which elders or IK holders can fully participate. Parts of the achievement in South Africa's efforts to address some of the challenges of integration identified earlier include the validation of IK holders outside the Western epistemic canon. South Africa's IK policy has proposed accreditation and certification for IK holders and practitioners to enhance the recognition of their knowledge gained through experiences rather than formal education. Indeed, any integration model that neglects the sources of IK, including the physical/biological and socio-economic environment, as well as the human spirit, may not reliably produce the required or desired synergy in knowledge construction [10].

As the case of Canada demonstrates, while the government seeks to integrate IK into its legislations, such as the Fisheries Act, not understanding the difference between IK as an idea and IK as a system (IKS) makes integration problematic for EG. Furthermore, McGregor argues that the government may be refusing to engage the system fully but prefers merely extracting the knowledge to avoid the extensive implications of fully recognising the legal, political, and governance systems that constitute IKS. This avoidance is not a comfortable zone for the government in its EG approach. In this regard, IK "incorporation" serves the federal government and other external agency agendas, but not Indigenous self-determination [9,23].

This reality has prompted the call to move from "Indigenous participation" to "Indigenous leadership" in EG, and Indigenous-led governance needs to be supported across sub-national/regional, national, and global scales [43]. The lack of a clear definition of participation in virtually all the protocols that advocate IK leaves the actual participation of IK holders in EG superficial and vague. Hence, progress in this direction for South Africa inevitably entails breaking down structural barriers to the involvement of IK holders in the development and implementation of relevant EG guidelines and protocols

[43]. It is not enough for Indigenous voices to be deemed useful in environmental decision-making merely as victims to be helped concerning ABS. Environmental sustainability issues are not merely about today's utility; they are also about the survival of future generations. Prioritising indigenous customs, values, and spirituality in environmental decision-making are vital to meaningful integration of IK in EG.

5 Conclusions

It is essential to recognise that IKS encompasses more than just IK. While IK holds significant value in EG's theory and practice, its efficacy relies on the holistic involvement of the relevant system. Merely extracting knowledge labelled as "Indigenous" without considering the associated values and spirituality is likely less effective in yielding desirable outcomes, especially in practical applications towards attaining environmental justice and governance. This insight is highly relevant to South[ern] Africa, as it grapples with growing ecological challenges amidst the relegation of Indigenous people to stakeholders' role in EG. To address these issues, it is essential to prioritise full dialogue with indigenous governance and the integration of the IK system, rather than pursuing an assimilation/integration approach. This is crucial to prevent the erosion and potential extinction of IKS, ensuring that indigenous perspectives and knowledge are valued, respected, and actively involved in shaping environmental decision-making processes.

REFERENCES

- [1] McLean K., Johnston S., and Castillo A., "The role of Indigenous Peoples in global environmental governance: Looking through the lens of climate change," *Green Economy and Good Governance for Sustainable Development: Opportunities, Promises and Concerns*, pp. 245-266, 2012. [Online]. Available: https://www.researchgate.net/publication/259609272_The_role_of_Indigenous_Peoples_in_global_environmental_governance_Looking_through_the_lens_of_climate_change.
- [2] Gupta A. D., "Does Indigenous Knowledge Have Anything to Deal with Sustainable Development?," in *Antrocom: Journal of Anthropology*, 2019, pp. 59-64.
- [3] Hays J., "Learning indigenous knowledge systems," in *Learning/Work Turning work and lifelong learning inside out*, Cooper L. and Walters S. Eds. Cape Town: HSRC Press., 2009.
- [4] James W., "Pragmatic Theory of Truth," *Pragmatism: A New Name for some Old Ways of Thinking*, pp. 1-15, 1910.
- [5] Casimirri G., "Problems with integrating traditional ecological knowledge into contemporary resource management," presented at the XII World Forestry Congress, Québec City, Canada., 2003. [Online]. Available: <https://www.fao.org/3/xii/0887-a3.htm>.
- [6] Battiste M., "Animating Sites of Postcolonial Education: Indigenous Knowledge and the Humanities," *Plenary Address*, pp. 1-17, 2004. [Online]. Available: https://www.academia.edu/download/31175344/csse_battiste.pdf.
- [7] Chilisa B., "Postcolonial indigenous research paradigms," *Indigenous research methodologies*, pp. 98-127, 2012. [Online]. Available: <https://hsrc.ac.za/uploads/pageContent/148/MicrosoftPowerPoint-CapeTownAPostcolonialIndigenousResearchParadigm.pdf>.
- [8] McGregor D., "Indigenous Environmental Justice, Knowledge, and Law," *Kalfou*, vol. 5, no. 2, pp. 15367-15367, 2018. DOI: 10.15367/kf.v5i2.213.
- [9] McGregor D., "Indigenous Knowledge Systems in Environmental Governance in Canada," *KULA: Knowledge Creation, Dissemination, and Preservation Studies*, vol. 5, no. 1, pp. 1-10, 2021. DOI: 10.18357/kula.148.
- [10] Moichela K. Z., "Integration of indigenous knowledge systems in the curriculum for basic education: Possible experiences of Canada," *Pretoria*, 2018. [Online]. Available: <https://uir.unisa.ac.za/handle/10500/25096>
- [11] Khupe C., "Indigenous knowledge and school science: possibilities for integration," *Johannesburg*, 2014. [Online]. Available: http://mobile.wiredspace.wits.ac.za/bitstream/handle/10539/15109/C_Khupe_Thesis.pdf
- [12] Maruyama J., "From 'Displaced Peoples' to 'Indigenous Peoples': Experiences of The! Xun and Khwe San in South Africa," *African study monographs*, vol. 54, pp. 137-154, 2018. DOI: 10.14989/230157.
- [13] Okoliko D. A., "The Gridlock Anthropogenic Global Warming Debate in Light of 'Uncertainty': How African Epistemic Contribution can Bypass the impasse," in *Africa at a crossroads: Future prospects for Africa after, Mutanga S., Simelane T., Gumbo T., and Mujuru M. Eds. Pretoria: Africa Institute of South Africa*, 2018, pp. 77-96.
- [14] Mngoma W., Pillay P., and Reddy P. S., "Environmental Governance at the Local Government Sphere in South Africa," *African Journal of Public Affairs*, vol. 4, no. 2, pp. 105-118, 2011.
- [15] Bignall S., Hemming S., and Rigney D., "Three Ecosophies for the Anthropocene: Environmental Governance, Continental Posthumanism and Indigenous Expressivism," *Deleuze and Guattari Studies*, vol. 10, no. 4, pp. 455-478, 2016. DOI: 10.3366/dls.2016.0239.
- [16] McGregor D., Whitaker S., and Sritharan M., "Indigenous environmental justice and sustainability," *Current Opinion in Environmental Sustainability*, vol. 43, pp. 35-40, 2020. DOI: 10.1016/j.cosust.2020.01.007.
- [17] IPBES, "Global Assessment Report on Biodiversity and Ecosystem Service," 2019.
- [18] Kukutai T. and Taylor J., "Data sovereignty for indigenous peoples: current practice and future needs," in *Indigenous data sovereignty: Toward an agenda*, Kukutai T. and Taylor J. Eds. Canberra: ANU Press, 2016.
- [19] Cannella G. S. and Lincoln Y. S., "Deploying Qualitative Methods for Critical Social Purposes," in *Qualitative*

- Inquiry and Social Justice: Toward a Politics of Hope, Norman K. Denzin and Lincoln Y. S. Eds. New York: Taylor and Francis, 2017, pp. 53-72.
- [20] Chilisa B. and Phatshwane K., "Qualitative Research within a Postcolonial Indigenous Paradigm," in *The SAGE Handbook of Qualitative Research Design*, Flick U. Ed., 2022, ch. 16, pp. 225-240.
- [21] McGregor D., "Coming full circle: Indigenous knowledge, environment, and our future," *American Indian Quarterly*, vol. 28, no. 3/4, pp. 385-410, 2004.
- [22] Chilisa B., *Indigenous Research Methodologies*, 2 ed. SAGE Publications, 2019.
- [23] Reed G. *et al.*, "Toward Indigenous visions of nature-based solutions: an exploration into Canadian federal climate policy," *Climate Policy*, vol. 22, no. 4, pp. 514-533, 2022. DOI: 10.1080/14693062.2022.2047585.
- [24] Le Grange L., "Ubuntu, ukama, environment and moral education," *Journal of Moral Education*, vol. 41, no. 3, pp. 329-340, 2012. DOI: 10.1080/03057240.2012.691631.
- [25] Metz T., "Climate change in Africa and the Middle East in light of health, ubuntu and Islam," *South African Journal of Bioethics and Law*, vol. 9, no. 2, pp. 88-88, 2016. DOI: 10.7196/sajbl.2016.v9i2.489.
- [26] Wolf A. C. E., "Matsiyip áfapiiysini: K áñai Peacekeeping And Peacemaking," *Masters of Arts, School of Graduate Studies, University of Lethbridge, Lethbridge, Alberta*, 2007.
- [27] Whyte K. P., "On the role of traditional ecological knowledge as a collaborative concept: A philosophical study," *Ecological Processes*, vol. 2, no. 1, pp. 1-12, 2013. DOI: 10.1186/2192-1709-2-7.
- [28] McGregor D., "Linking traditional ecological knowledge and western science: aboriginal perspectives from the 2000 state of the lakes ecosystem Te of the lakes ecosystem conference," *The Canadian Journal of Native Studies*, vol. 28, no. 1, pp. 139-158, 2008.
- [29] Heleta S., "Decolonisation of higher education: Dismantling epistemic violence and Eurocentrism in South Africa," *Transformation in Higher Education*, vol. 1, no. 1, pp. 1-8, 2016. DOI: 10.4102/the.v1i1.9.
- [30] Kaya H. O. and Chinsamy M., "Community-based Environmental Resource Management Systems for Sustainable Livelihood and Climate Change Adaptation: A Review of Best Practices in Africa," *Journal of Social Sciences*, vol. 46, no. 2, pp. 123-129, 2016. DOI: 10.1080/09718923.2016.11893519.
- [31] Seehawer M., "South African science teachers' strategies for integrating indigenous and western knowledges in their classes: Practical lessons in decolonisation," *Educational Research for Social Change*, vol. 7, no. SpecialEdition, pp. 91-110, 2018. DOI: 10.17159/2221-4070/2018/v7i0a7.
- [32] Modise A., "Republic of South Africa: Strengthening indigenous governance, benefit sharing and capacity building for traditional phytomedicines," [Online]. Available: https://www.dffe.gov.za/sites/default/files/docs/publications/biodiversity/babs_geneticresources_sustainabl_edevelopment.pdf
- [33] Bagley M. A. "Toward an Effective Indigenous Knowledge Protection Regime Case Study of South Africa." <https://www.cigionline.org/static/documents/documents/Paper%20no.207web.pdf> (accessed August 2022).
- [34] SAIIA, "Integrating Indigenous and Local Knowledge in Marine Spatial Planning," in *SAIIA Policy Briefing No 268*, Rivers N., Strand M., Snow B., Metuge D., Lemahieu A., and Benkenstein A. Eds. Johannesburg: SAIIA, 2023.
- [35] Belfer E., Ford J. D., Maillet M., Araos M., and Flynn M., "Pursuing an indigenous platform: Exploring opportunities and constraints for indigenous participation in the UNFCCC," *Global Environmental Politics*, vol. 19, no. 1, pp. 12-33, 2019. DOI: 10.1162/glep_a_00489.
- [36] SAIIA. *Integrating Indigenous and Local Knowledge in Marine Spatial Planning*, April 2023.
- [37] Chalmers N. and Fabricius C., "Expert and generalist local knowledge about land-cover change on South Africa's Wild Coast: Can local ecological knowledge add value to science?," (in English), *Ecology and Society*, vol. 12, no. 1, p. 10, 2007. DOI: 10.5751/es-01977-120110.
- [38] Healy H., "Pulp and participation: Assessing the legitimacy of participatory environmental governance in Umkomaas, South Africa," *Ecological Economics*, vol. 208, p. 107794, 2023. DOI: 10.1016/j.ecolecon.2023.107794.
- [39] Brydon D., "Canada and postcolonialism: Questions, inventories, and futures," in *Is Canada Postcolonial?: Unsettling Canadian Literature*, Moss L. a. Ed. Waterloo: Wilfred Laurier University Press., 2003, pp. 49-77.
- [40] David J. O. and Okoliko D. A., "Acting in solidarity: A phenomenological study of the global response to COVID-19 and common good concept," *African Journal of Governance and Development*, vol. 9, no. 1.1, pp. 244-269, 2020. [Online]. Available: <https://journals.ukzn.ac.za/index.php/jgd/article/view/1740>.
- [41] Zeng Y., Maxwell S., Runting R. K., Venter O., Watson J. E., and Carrasco L. R., "Environmental destruction not avoided with the Sustainable Development Goals," *Nature Sustainability*, vol. 3, no. 10, pp. 795-798, 2020.
- [42] Conversi D., "Exemplary Ethical Communities. A New Concept for a Livable Anthropocene," *Sustainability*, vol. 13, no. 10, pp. 5582-5582, 2021. DOI: 10.3390/su13105582.
- [43] Zurba M. and Papadopoulos A., "Indigenous Participation and the Incorporation of Indigenous Knowledge and Perspectives in Global Environmental Governance Forums: a Systematic Review," *Environmental Management*, vol. 72, no. 1, pp. 84-99, Jul 2021. DOI: 10.1007/s00267-021-01566-8.
- [44] David J. O., "Decolonizing climate change response: African indigenous knowledge and sustainable development," *Frontiers in Sociology*, vol. 9, p. 1456871, 2024. DOI: 10.3389/fsoc.2024.1456871.