



Insights Of Indigenous Knowledge Systems on Resilience and Risk Mitigation of Climate Change: Examining Climate Action Policies

Abstract: The paper purposed to explore the benefits of incorporating indigenous knowledge systems on climate governance structures and green policy initiatives. Climate change is the uttermost exigent matter forming a global agenda in the recent decades. The severe effects of climate change across the world necessitates inevitable deliberations on adaptation and mitigation. Consequently, climate regulation systems reflect the dedication of the state in promoting adaptation, resilience and reducing the effects of global warming across all spheres. Effective Climate action plans are gauged by the extent of competency in handling the multiple demands, aspirations, and contexts associated with climate change. Due to the limitation of adaptation and mitigation approaches grounded on technoscience, indigenous knowledge systems are considered a valuable remedy. Therefore, from the formulation stage of climate action policies to the reporting stage, it is vital to acknowledge and incorporate indigenous knowledge systems to guarantee its utilization. The study draws upon a systematic literature review of 135 peer-reviewed articles published over the last 16 years to examine the trend and correlation of the variables. Data was analysed and conclusions were drawn using discourse content analysis. The paper highlighted that indigenous mitigation and adaptation mechanisms in building tenacity in confronting climate change are generally recognized although countries have not utilized them significantly. Notably, acknowledgement and the use of indigenous knowledge systems fosters resilience building amidst climate change. Further, it suggests integration of indigenous knowledge systems in climate change legal instruments for enhanced mitigation and adaptation.

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1.Introduction:

States have crafted diverse strategies to combat climate-induced hazards due to the serious threats that climate change poses to human lives, livelihoods, the environment, food security and economy (Nyahunda, 2024) (Nyahunda et al., 2019); (Mistry et al., 2016) (Nkomwa et al., 2014). Nations have created and effectively implemented their climate action plans and policies in compliance with international climate change frameworks and conventions including the Paris Climate

Agreement, Kyoto Protocol, and United Nations Framework Convention on Climate Change (UNFCCC) (Ford et al., 2016) (Selaledi et al., 2021) (Nyahunda, 2024). Not only have institutions been established and policies formulated to address the perennial threat but also programs have been created. The current dominance of Market-Based Instruments (MBIs) in sustainable management and governance predominantly Payment for Ecosystem Services (PES) like REDD+ highlight the global awakening of the climate change effects getting steadily worse (Mistry et al., 2016). These initiatives demonstrate universal steadfast commitment to mitigating the effects of climate change, encouraging adaptation, cutting greenhouse gas emissions, reinforcing carbon sinks, lowering the risk of climate-related disasters, and fostering resilience.

Taking into account that climate change is increasingly a complex issue globally curtailing socio-economic development, compromising the environment and causing vulnerability in rain-fed agricultural zones necessitates devising of appropriate techniques and approaches to combat the menace (Derbile, 2013). Climate change conspicuous myriad negative effects are indeed detrimental to the ecosystem, economy and the communities at large. It is characterized



by a proliferation of reemitted heat emanating from the Green House Gas (GHG) emissions causing carbon pool in the atmosphere (Makondo & Thomas, 2018) (Nyong et al., 2007). In order to halt the continued increase of climatic risks and protect human lives and livelihoods, climate change adaptation and mitigation techniques are crucial. (Tirivangasi et al., 2023) (Nyahunda et al., 2019) contend that economically developing states initiated appropriate adaptation and mitigation techniques in response to its high disaster risk profile and susceptibility to severe climate occurrences. Developing world is more susceptible to climate change impact because of heavy reliance on rain-fed agriculture and other climate volatile sectors (Mbah et al., 2021).

Since climate change has been realised to have huge negative impacts that require urgent solution, technology-based and indigenous knowledge systems have both emerged as formidable complimentary strategies (Selaledi et al., 2021). Indigenous knowledge systems encompass tested and validated knowledge developed by tribal communities through their interactions with the environment and their observations of its changes. It is an important source of knowledge in climate change adaptation and mitigation measures. Indigenous knowledge systems entail complex knowledge, set of information, expertise, skills, practices, values and representations guiding human interactions with nature (Ford et al., 2020). Through imitation and demonstration, this information is verbally transmitted to subsequent generations. The behaviours, knowledge, abilities, decision-making procedures, and expertise that particular communities have created in response to risks and stresses are continuously stored in the indigenous knowledge realm (Altieri et al., 2012) (Ebhuoma & Simatele, 2019). Additionally, a community's cultural norms serve as the foundation for indigenous knowledge systems, which influence how that culture views the world. Conversely, western science employs technology-based methods, technological approaches, and techniques to foresee and develop solutions to owing to the impacts of global warming (Selaledi et al., 2021).

Based on World Development Report (2022) rubric the foundation of sustainable development is knowledge which implies that intellectual capital is critical before financial capital. It is against this backdrop that the local knowledge mostly utilized by the indigenous people majority of them domiciled in forested regions needs to be acknowledged. It is this kind of priceless knowledge (Maldonado et al., 2016) that has enabled such people to manoeuvre harsh climatic conditions besides other environmental setbacks over the years, a daunting situation that monetary capacity alone could not have salvaged (Nyong et al., 2007). Consequently, there are strong appeals to promote the identification and use of native wisdom to minimize global warming dangers hence adapt accordingly. In response to global warming ravaging effects including disasters such as tropical cyclones, societies consistently draw from IKS archive to issue early warning systems, forecast seasons, reduce risks, and adjust accordingly (Nkomwa et al., 2014) (Ford et al., 2020) (David-Chavez & Gavin, 2018). Ironically, numerous studies have expressed concerns that climate and disaster reduction policies and reports such as IPCC are framed from an external viewpoint, overlooking the capabilities, capacities, experiences, and knowledge of indigenous people, which are fundamental to native wisdom (Ford et al., 2016). Building on the previous ideas of Louis and Tirivangasi (2019) suggest that further follow up is needed in policy framing and coverage to ensure that IKS are included into climate action policies and other mainstream initiatives aimed at combatting and coping with global warming effects.

Numerous emerging research apparently points out the under-utilization of native wisdom in global warming. Ndlovu (2021) contends that climate change policies lack indigenous knowledge in their efforts to build resilient societies (Ndlovu & Mjimba, 2021). This backs up the claims made by Ford et al. (2020) that, notwithstanding indigenous people's essential contribution in minimizing occurrence of disasters indigenous knowledge systems have not received enough attention. Similarly, Eromose et al. (2017) contend that climate action frameworks depict strong inclination toward Western-led perspectives, which are



frequently inappropriate for developing countries in their attempts to prevent climate associated disasters (Ebhuoma & Simatele, 2019). There is a claim that these strategies are in contrast to the standards established by the Intergovernmental Panel on Climate Change (IPCC), an international authority on climate action leadership, procedures, advancements, and goals (Nyahunda, 2024); (Ford et al., 2016). IPCC recognizes the significant role that IKS play in both mitigating and adapting to global warming. Makondo et al. (2018) further emphasize the importance of recognizing valuable insights from IKS to facilitate its smooth integration into policy for the formulation and execution of climate change mitigation and adaptation approaches.

In their view, Makondo et al. (2018) has highlighted that the use of IKS has proved to play a crucial role on the climate and disaster management systems that have been useful when it comes to managing the lives and living of the communities in view of the current climatic conditions. Presumably, the UN recognizes IKS as a useful mechanism for attaining sustainable development in accordance with the Sendai Framework for Disaster Risk Reduction (SFDRR) (Nyahunda, 2024). As a way of answering the research questions considered for use in this study, the following were addressed. Consequently, the following questions have been developed: To what extent has indigenous knowledge systems been integrated into the goals and provisions of climate action policies? Consequently, what does using indigenous knowledge systems mean for policy changes on how the negative effects of climate change can be addressed? Thus, in line with the sentiments from previous research, this study sought to find out to what extent indigenous knowledge systems have been subjected to or have adopted for combating and adapting to climate change?

The analysis concentrated on major climate action policies and a review was done which pinpointed the gaps and progress related to indigenous knowledge systems. This article attempts to determine how native wisdom functions in addressing and adjusting to global warming. Regulatory institutions can use the study findings as a foundation to examine how much indigenous knowledge systems underpin

climate action policy. Additionally, the paper adds to the body of knowledge and the foundational theories of indigenous knowledge and its essential role in climate action policies. Further, it aims to promote culturally inclusive methods and community-centred practices for addressing and adjusting to effects of global warming. Besides, it endeavours to close the knowledge gap from the standpoint of ethnobotanical wisdom and rationally support the broader traditional knowledge in addressing disasters.

2.Literature Review

Climate Action Policies and Strategies

As previously mentioned, in response to the catastrophic impact of global warming, many states have discussed, crafted and implemented a series of climate action policies, approaches and actions to address ravaging ramifications associated with the unprecedented climate crisis (Maldonado et al., 2016). These approaches for responding to climate change form the foundation of both national and international climate action policies (Mugambiwa, 2018). Therefore, actions in the shape of policy guidelines demonstrate strong adherence to addressing global warming issues evident in the environment and all facets of society (Medeiros et al., 2017). Given the primary focus of this paper on climate action, it is noteworthy that certain countries have shown a steadfast commitment to tackling the impacts of climate change, decreasing socio-economic risk, fostering interdisciplinary adaptation, cutting emissions, as well as building protection for communities (Nyahunda, 2024). Nyong et al. (2007) state that the Sahel Region of Africa has recognized the effects that climate change poses to achieving the sustainable development goal no. 2 which is concerned with the sustainable agriculture and food security. In response to this, the Food and Agriculture Organization (FAO) of the United Nations in 2010 offered Climate-Smart Agriculture (CSA) (Altieri et al., 2012); (Nyahunda, 2024). The program was unveiled in an article drafted for the Hague Conference on Agriculture, Food Security and Climate Change. The main goal of the initiative was to address the challenges of climate change while ensuring food security and promoting sustainable



agricultural practices. Practices such as drought-resistant crops, improved irrigation techniques, and sustainable land management promote climate-smart agricultural approaches to foster food security and resilience (Ford et al., 2020). These strategies, policies, and programs reflect not only the Sahel region but other countries' commitment to addressing global warming and strengthening robustness in response to environmental issues.

As enjoined by the Paris Agreement, Kyoto Protocol as well as the UNFCCC guidelines, adverse impacts of climate change resulted into formation of National Adaptation Programmes of Action (NAPA) (Nyahunda, 2024). According to UNFCCC (2024), the necessity of nations implementing economic, social, and environmental measures, including coping is confined within NAPA (Averchenkova et al., 2021). NAPAs were established during the COP stipulated under Article 4.9 of the treaty in 2001 United Nations Treaty Series. The establishment was geared towards supporting Least Developed Countries (LDCs) to solve challenges since they are more susceptible to climate crises. COP further initiated a Least Developed Countries Fund (LDCF) to finance the groundwork and execution of NAPAs and establish LDC Expert Group (LEG) to offer specialized guidance and advisory services to the LDCs. NAPAs offer platform for the LDCs to classify essential actions to reinforce prompt response with regard to adaptation to climate change (Nyahunda, 2024). Priority activities focus on urgent requirements to avoid heightened vulnerability or harmful consequences from postponement. The basis for NAPA mandate is founded on the limited capability of the LDCs to adjust to the adverse consequences of climate change. For the proper execution of NAPA process, great eminence is given to IKS as the foundation for community-level input. Indigenous knowledge systems are considered an important source of information, values, attitudes and skills in recognizing that indigenous communities are the custodians (Nyahunda, 2024); (Fitchett & Ebhuoma, 2018). NAPAs leverage available information, are action-focused, country-specific, adaptable, and tailored to national situations. By December 2017, 51 countries had prepared, finalized and submitted their NAPAs to the secretariat. NAPA document primarily

consists of a list of adaptation activities and projects that have been rated in order of priority, along with brief summaries of each activity (IPCC, 2024). Agriculture, food security, and water resources are the primary sectors targeted by the NAPAs as enshrined in SDG No. 2 and 6 respectively. Coastal zones, early warning and disaster management areas also take precedence in the program. Upon submission to the UNFCCC secretariat, NAPAs allow the LDC Party to become eligible for funding from the Least Developed Countries Fund (LDCF), which is overseen by the Global Environment Facility (GEF), for their execution (UNFCCC, 2024).

Accordingly, in keeping with the worldwide initiative to reduce climate change by creating low-carbon economies, LDCs are in the midst of carrying out their NAPAs. They have made impressive strides in evaluating and revising its intended course. Moreover, Great Green Wall Initiative and Bamako Declaration on Climate Security adopted at the Sahel Climate, Peace, and Security Forum in 2023 reflect utmost commitment in reducing the global warming threat (Averchenkova et al., 2021). Great Green Wall Initiative and Bamako Declaration on Climate Security are Pan-African programs aimed to combat desertification and land degradation in the Sahel (Tirivangasi et al., 2023); (Ford et al., 2020). These initiatives strengthen the need for innovative climate action, sustainable land management, and collaborative regional initiatives to address the intertwined issues of global warming.

After the Paris Agreement was ratified in 2016, the G20 Alliance swiftly scaled up climate finance from billions to trillions of dollars to support climate action plans (IPCC, 2024). This comprises innovative mechanisms like progressive taxation and wealth taxes to mobilize resources for climate-vulnerable developing countries. The G20 has emphasized the importance of scaling up renewable energy and improving energy efficiency. This includes initiatives like India's "One Sun One World One Grid" and the Global Biofuels Alliance, which aim to promote sustainable energy solutions (Basu et al., 2023). In addition, the G20 supports the amalgamation of climate action with sustainable development goals which entails efforts to enhance resilience, reduce emissions, and



promote sustainable practices across all the sectors. Remarkably, it is dedicated to providing technical assistance and monetary support to developing countries to facilitate them in their climate action plan accomplishment and achieve their Nationally Determined Contributions (NDCs) under the purview of Paris Agreement (UNFCCC, 2024); (Nyahunda, 2024). These subtle approaches reflect the G20's obligation to tackle climate change and advance worldwide sustainable development.

Creation of a successful climate change action and a fair, sustainable shift to an ecofriendly, climate-secure world can only be made possible by the appropriate Climate action ratified legal instruments (Averchenkova et al., 2021). Approaches and mechanisms described have sought to mainstream IKS in climate action plans to a significant extent. Kanchebe et al. (2013) point out that emerging economies have already demonstrated a strong commitment to mitigating the effects of climate change. The programs described have been designed to offer guidelines for coordinating and integrating climate action considerations into individual nation transformative path, to be applied across regions (Derbile, 2013). These policies, through their various provisions aid in lessening susceptibility and boosting low carbon mitigation measures development path.

Additionally, these initiatives primarily aim to enhance community's adaptation to change by diminishing vulnerability (Mbah et al., 2021). Climate action policies and strategies acknowledge tribal and indigenous people vulnerability due to reliance on climate-sensitive livelihoods (Adaawen, 2021). Therefore, these approaches aim to improve empowerment, boost coping ability, diminish risk, and augment flexibility among affected people. This underscores the importance of examining how extensively traditional knowledge is the bedrock of tribal communities' social capital and have them interwoven into climate action policies aimed at alleviating vulnerability.

Climate Action from an Indigenous Perspective

Global warming solutions often hint at indigenous wisdom evidently tested (Nyong et

al., 2007). It's influence is immensely significant to combat the ongoing crisis (Mbah et al., 2021). Natives have unique views and ways of doing things that will guarantee resilience and adaptation amidst complex changes in climate (Ndlovu & Mjimba, 2021). Some of them include sustainable land management techniques, traditional seed selection and using indigenous plants for medicinal and agricultural purposes. Indigenous people draw their expertise from nature centred beliefs which aligns humankind to nature for reciprocal benefits. Acknowledging and integrating this knowledge creates robust and environmentally sound mechanisms for acclimating to the unprecedented changing weather. Naomi Klein and Dr. Robin Wall Kimmerer, are climate change activists from an indigenous perspective whose efforts have brought awareness on the importance of indigenous knowledge. Dr. Kimmerer a distinguished professor, author, and a member of the Citizen Potawatomi Nation focuses on the obligation to unify indigenous knowledge into the ecological sustainability approach. In her book "Braiding Sweetgrass" she reiterates the interface of traditional ecological knowledge being a valuable insight, specifically in relation to climate change adaptation and mitigation strategies (Kimmerer, 2020). Similarly, Naomi Klein eloquently articulates the importance of incorporating indigenous practises in combatting climate change. Throughout her book "This Changes Everything" she describes the fact that the only way to salvage environmental degradation majorly caused by capitalism is by reverting to the indigenous ways of living (Klein, 2021).

Despite the broad acknowledgment of indigenous knowledge systems across various fields, it faces a range of criticisms. Some disaster risk scholars and Western climatologists have expressed doubts whether there's much effectiveness and relevance in it (Mbah et al., 2021); (Makondo & Thomas, 2018); (Maldonado et al., 2016). Various literature sources refer to indigenous knowledge systems as ethnomedicinal wisdom. Due to the variety of nomenclature, researchers dismiss the importance of indigenous knowledge systems in climate action plans, labelling it as rudimentary and substandard. Some view indigenous knowledge systems as being specific to



particular communities, which hinders their transferability. Others consider indigenous knowledge to be outdated relics incompatible with Westernized generations. Moreover, there is a myth that traditional knowledge is linked to poverty (Nyahunda, 2024).

Indigenous knowledge extends beyond formal education in addressing climatic hazards, enhances local community adaptation, and promotes coping mechanisms. Indigenous knowledge systems are central to local-level decision-making in many communities affected by climate change. Therefore, preserving and sustaining indigenous knowledge, is crucial for both its users and researchers who aim to enhance the standard of living for the vulnerable people. These arguments support (File & Derbile, 2020) and (Ford et al., 2020) assertions that, notwithstanding criticisms in contradiction of indigenous knowledge, authorities ought not to disregard them, as they aid communities in preparing for, preventing, mitigating, responding to, and recovering from climate-induced calamities. Likewise, Maldonado and Bennett (2015) highlight increasing concerns about the drawbacks of standard scientific methods in tackling ecological predicaments. Therefore, this clearly positions indigenous knowledge systems as valuable and practical community-focused and resilience plan. While this paper does not primarily aim to examine the erroneous views on traditional knowledge, it is important to note the identification of a few actual constraints when comparing indigenous knowledge with mainstream science. Consequently, there is increasing support among scholars for integrating indigenous knowledge systems with scientific methods, as unknown variables and unreliability of global warming suggest that indigenous knowledge systems by itself can hardly confront the magnitude of these environmental hurdles. Integrating mainstream science and ancient knowledge helps to cover the drawbacks of each form of information. This combination enhances the effectiveness of climate action, mitigation and adaptation efforts (Fitchett & Ebhuoma, 2018).

3. Materials and Methods

This paper employed a systematic literature review of 119 articles that were retrieved from

Scopus database. 16 articles derived from Web of Science were compared with the 119 articles to avoid redundancy. Scopus was chosen because it has a wide spectrum of disciplines that can reinforce the comprehension of indigenous knowledge systems phenomenon. The focus was mainly peer-reviewed articles over the span of 16 years from 2007 to 2023. Data set criteria was basically filtered to the English language to avoid translation which could lead to distortion of pertinent indigenous perspectives. Of the 119 articles reviewed 91 were from Africa, Asia, and South America which justifies the increase in utilization of indigenous knowledge systems. Research in relation to indigenous knowledge and climate change between 2007 and 2015 was intermittent. From 2016 onwards there was an exponential rise in publication with over 80 articles being published in between. More than 20 articles were published within the year 2023 alone. The description does suggest that in the past, the indigenous knowledge systems were only grudgingly admitted as relevant to climate change issues. With publications recently mushrooming is adequate evidence that global challenges are exacerbated due to global warming hence the need to revert to indigenous ways to address the menace.

Presentation of Key findings

This section examines climate action policies and strategies, focusing on how they incorporate indigenous knowledge systems to address climate challenges. It highlights integrated contexts of indigenous knowledge systems, thus contributing to the academic discourse on the benefits of including native wisdom in climate change mitigation and adaptation efforts.

The nexus of Indigenous Knowledge Systems and Climate Change Adaptation and Mitigation

IKSs have continuously influenced profoundly in creating an understanding in adapting to environmental changes (Tirivangasi et al., 2023); (Adaawen, 2021); (David-Chavez & Gavin, 2018). Throughout history, indigenous people have developed subtle and intricate knowledge systems that have helped them adapt to changing weather patterns, ecosystems and natural disasters (Mugambiwa, 2018). They exhibit phenological cues which enable them



promptly to trigger a response when need be (Fitchett & Ebhuoma, 2018). These insights have been applied to guide agricultural practises, resource governance and community resilience. Environmental resilience often hint at indigenous knowledge that has been tested for centuries (Nyong et al., 2007). The influence of indigenous wisdom on coping mechanisms regarding climate change has never been as significant given the current crisis of induced global warming (Ford et al., 2020). Tribal people have shown their traditional practices to be effective in curbing ecological damage (David-Chavez & Gavin, 2018). They have unique views and ways of doing things that will provide an appropriate framework for strengthening climate change policies and strategies (Ndlovu & Mjimba, 2021). Some of them include sustainable land management techniques, traditional seed selection and using indigenous plants for medicinal and agricultural purposes.

In line with the objectives of this paper, it has been observed that a brief review of published papers reveals indigenous people draw their expertise from nature centred beliefs which aligns humankind to nature for reciprocal benefits which enables them build adaptive capacity and resilience from a natural perspective (Tirivangasi et al., 2023); (Wildcat, 2009). This suggests that a solution to global environmental degradation is pegged on embracing indigenous realism which discredits the fallacy that humans can be at odds with nature. In his book, Wildcat (2009) alongside several scholars acknowledge that merely long misconceptions emanating from civilizations led to economic development at the detriment of the environment. They profoundly describe the ravaging effect of global warming on people and their livelihoods across the world and explicitly emphasize on the need to allocate resources for knowledge and capacity enhancement for sustainable communities. However, this suggestion is imprecise as it does not blatantly pinpoint the genre of information and empowerment to be reinforced. Indigenous knowledge systems form the foundation of knowledge for tribal communities yet details of this knowledge are neither mentioned in climate action policies nor in disaster preparedness frameworks (Ford et al., 2020). Furthermore, regulatory institutions through their policy

document outlines abundant approaches to boost funding for optimal resilience to climate change crisis. However, scanty investigation into tribal community-based resilience grounded on indigenous knowledge is available.

Indigenous-based adaptation as Climate Change Response Strategy

Indigenous-based adaptation is regarded as approaches and practices that indigenous and rural communities utilize to make themselves less vulnerable to climate change impacts. This refers to tribal communities identifying their specific vulnerabilities, developing from local knowledge and resources, and taking measures to increase their resilience and adapt to changing climatic conditions, which ultimately makes them more resilient (File & Derbile, 2020). Therefore, community-based adaptation emphasizes the importance of local knowledge and social networks, in addition to community participation, in resolving climate change issues. Building climate resilience is actually a progression towards minimizing global warming negative effects while also capitalizing on the opportunities presented by atmospheric conditions (Mugambiwa, 2018).

Indigenous-based adaptation is paramount in avoiding vulnerability and enhancing resilience (File & Derbile, 2020); (Fitchett & Ebhuoma, 2018). This approach focuses on the dynamic nature of adaptive capacity as well as factors that have an impact on it. Overtime indigenous communities have been compelled to adjust in their farming practices to boost their adaptation capacity (Selaledi et al., 2021). Adjustments include crop diversification and shifting to more resilient crops; soil management practices such as organic mulching and zero tillage. Benefits that accrue from these soil conservation practices entail soil structure preservation, reinforces germination, retains carbon pool and reduces soil erosion (Derbile, 2013). Prior to the advent of artificial fertilizers, local farmers relied upon organic fertilizers which minimize emissions of greenhouse gases (David-Chavez & Gavin, 2018). They also depend on their knowledge of seasons and soil fertility to enhance sustainable crop production. Zero tilling practices are particularly useful in dryland areas, such as in northern India, where water is scarce and soil erosion is a significant problem.



Keeping the land fallow for a period ranging from one to four years is equally practiced to naturally reinforce the fertility of the land. These mechanisms are instrumental in sustaining indigenous practices and adapting to the effects of climate change (Adaawen, 2021).

4. Climate Action Legal Frameworks

Climate Change governing instruments majorly embody mitigation plans more than adaptation strategies. They focus on abating carbon footprint to minimize the causes of global warming. These plans are anchored on legal frameworks such as Kyotol Protocol, a binding treaty ratified in Japan to lessen emission of greenhouse gases (Kyoto Protocol, 2018). Another classical example of mitigation plans is the COP 21 Paris Agreement. The accord ratified on the 12th of December 2015 is a critical step towards recognizing the role of indigenous knowledge in climate change adaptation (UNFCCC, 2015). The international treaty outlines indigenous people's rights and participation in efforts to combat global warming effects. It provides a legal binding framework which compels the international community to support and uphold native people rights in the context of climate change. The current dominance of Market-Based Instruments (MBIs) in environmental management and governance, particularly payments for ecosystem services (PES) like REDD+ highlights the global awakening of the climate change effects getting steadily worse thus a need for a course of action (UN, 2020). Native people's responsibility to implement these policies considering their inherent ecological knowledge is phenomenal (Mistry et al., 2016). Although critics have mentioned the potential for MBIs to override existing inherent environmental motivations and ethics, the impact these MBIs have on global warming mitigation is immense.

Akin to mitigation plan is the Seasonal Climate Forecasts (SCF) which is based on scientific weather models. SCF can enable the improvement of farm practice and adaptation to severe climate fluctuations (Ebhuoma & Simatele, 2019). Rural communities across the world rely on indigenous knowledge system, such as moon appearances and animal behaviors, to predict weather events. Climate variability and change pose challenges to

farmers in developing economies that depend solely on traditional knowledge (Ford et al., 2020). If adopted and utilized effectively by farmers, SCF could aid the uptake of systematic and productive approaches, leading to more effective food production. However, factors such as lack of trust in scientific forecasts and inability to understand human activities that cause the current induced climate change prevent small-scale farmers from adopting and using the SCF. (Fitchett & Ebhuoma, 2018); (Ebhuoma & Simatele, 2019). Mitigation aims to institute mechanisms to prevent or slow down the rate of environmental changes by reducing the emission of atmospheric gases from various sectors including energy, transportation, and industry (Mugambiwa, 2018). Mitigation mechanism include measures like moving toward renewable energy solutions, optimizing energy use, and rolling out emission reduction regulations (Ndlovu & Mjimba, 2021); (Makondo & Thomas, 2018). While mitigation plans and mechanisms tackle fundamental drivers of climate change by cutting down on greenhouse gas emissions, indigenous-based coping focuses on building robustness and endurance amidst climate adversity (File & Derbile, 2020). Both approaches are important and complementary in addressing climate change, with mitigation aiming to prevent further climate change and adaptation strategies helping communities cope with the changes that are already occurring unprecedentedly.

Mitigation plans in isolation are not sufficient to avoid climate change, making adaptation instrumental (Nyahunda et al., 2019); (Vilakazi et al., 2019). Although mitigation plans can be implemented, they are inadequate to prevent changes in the global climate (Makondo & Thomas, 2018). indigenous-based adaptation can alleviate vulnerability and fortify endurance capacity of community to climate change effects (File & Derbile, 2020). The ability to adapt is governed by household and communities capacity for adaptation which is guided by a number of influences including knowledge, skills, information, natural assets, social systems, finance and leadership styles (Nkomwa et al., 2014); (Makondo & Thomas, 2018). Mitigation plans alongside indigenous adaptation measures can drastically neutralize global warming effects.



5. Evaluation of Climate Action Policy Priorities, Initiatives, and Institutions

Climate-related reports provide valuable insights into the breakthroughs and challenges in strengthening climate action and addressing environmental response to climate change. From the above perspectives, it is widely recognized that there is a need to maximize human capital and cultural assets under the purview of indigenous epistemologies in greenhouse gas reduction and climate change resilience building (Nyahunda, 2024). Reports like the IPCC reports, climate assessments from NASA, and UNEP's Emissions Gap Report give a detailed look into climate change. They cover global warming, emissions, and the actions needed at a policy level. 2024 Annual Progress Report by the Climate Change Authority established that Australia's emissions are contracting but not fast enough to get to the pace necessary to achieve the 43% below 2005 levels target by 2030. It contains ten recommendations on how to speed up emission cuts this decade (IPCC, 2024).

United Nations Framework Convention on Climate Change (UNFCCC) is considered the core of institutional frameworks governing climate action intervention efforts geared towards creating a climate-resilient and decarbonized universe. It is focused on strengthening adaptive capacity, increasing mitigation measures and calling upon individual countries to align to the global policies for compliance. New Analysis of National Climate Plans by UNFCCC highlights that national climate action plans do not suffice in order to constrain global temperature rise to 1.5 degrees Celsius. It emphasizes need for immediate action and stronger climate policies. Climate Action Progress Report 2022 by the European Commission report describes the milestones by the EU and its Member States in meeting greenhouse gas reduction targets and recent updates in EU climate action policy. While the Intergovernmental Panel on Climate Change (IPCC) has summarized five years of reports, encompassing present trajectory, future climate and development outlook, and immediate climate change actions. Indigenous viewpoints have been trivialized and insufficiently covered in past IPCC reports. From these reports it is clear that there is a lack of in-depth exploration of

diverse experiential knowledge and cultural contexts concerning the utilization of indigenous knowledge in tackling climate crisis (UNFCCC, 2024).

Although indigenous knowledge is highly valued numerous emerging research evidently point out the underutilization of tribal knowledge in addressing climate change issues. The inclusion and representation of tribal people knowledge and experiences in IPCC evaluation reports on climate change is limited leading to an incomplete grasp of the pertinent concerns and a lack of culturally appropriate adaptation responses (Ford et al., 2016); (Fitchett & Ebhuoma, 2018); (Maldonado et al., 2016). The structure and layout of IPCC chapters shapes the formulation of global climate action policies and decisions. Regarding integration of indigenous knowledge systems, climate action policies acknowledge the essential role ancient technical know-how play in climate change mitigation and adaptation although to a narrow extent.

6. Role of IKS in Climate Change Mitigation and Adaptation Strategies

The massive role of indigenous peoples in fighting climate change is glaringly evident in their environmental stewardship role through the ages, having possessed traditional knowledge and land management practices that are crucial in preserving pristine natural assets (Mbah et al., 2021). The UN Inter-governmental Panel on Climate Change (IPCC) asserts that natives are integral components in efforts regarding climate change coping mechanisms since they possess essential knowledge regarding sustainable land management, biodiversity, and the preservation of ecosystems (IPCC, 2014). Their traditional agriculture practices, water management techniques, forest management techniques, and knowledge of medicinal plants have shown to be efficient and durable; thus, they could be an asset to contemporary development programs on climate change (File & Derbile, 2020); (Fitchett & Ebhuoma, 2018).

While the South America has added much to carbon emission, especially in the Amazon region in Brazil, the aborigines in this region through their knowledge systems have relatively brought the situation to check by employing the traditional agricultural practices. They have



developed their tailored exotic sophisticated agriculture, which engages crop diversity and soil fertility reducing global warming effects (Mbah et al., 2021). Indigenous people control land so that it remains resilient and productive for many years. Moreover, the natives have also had an implicit knowledge of controlling forests. There are tree-cutting techniques to use wood without necessarily clearing the forest (UN, 2020). These environmental practices are vital to the survival and health of the Amazon rainforest, which remains fundamental for keeping biodiversity equilibrium and in maintaining the Earth's climate. Similarly, studies in Australia reveal that Indigenous people's habitats exhibit low numbers of forest fires since they employ subtle fire controlling techniques to extinguish wildfires (Altieri et al., 2012).

Within the same context of environmental conservation through utilization of local knowledge and indigenous practices, local herders in the nomadic society of the Qinghai-Tibetan Plateau in China have held a good strategy on grazing their livestock in due consideration of patterns of pasture growth within seasons as well as avoiding overgrazing (Wu et al., 2015). The constant variation of the complex climate requires proper land management practices. The pastoralists control numbers of livestock based on the need for a forage supply in the rangelands during different seasons to achieve sustainable grazing, as central and southern rural areas of Zambia herders do (Makondo & Thomas, 2018). They also opened up other routes for grazing based on the weather patterns, land geomorphological features, and accessibility of grass in various grazing pastures. Transhumance in grazing livestock is moved between the alpine meadows for hot seasons to low-altitude pasture. This approach has been effective in the process of maintaining the health of rangelands, grasslands during the cold season. Moreover, herders have cooperated with community organizations and adopted joint production initiatives to adapt to changes. They have recognized the importance of preventing rangeland degradation and have shown willingness to do so (Wu et al., 2015). Adaptive management practices employed by Chinese herders resonates with ecosystem management practices of the Maasai people of East Africa predominantly considered

indigenous nomadic community. Maasai forage pasture to avoid overgrazing which may lead to degradation of grasslands. Maintenance of grasslands is inherent as they understand its significance in water retention, soil fertility management, carbon storage and maintenance of biodiversity.

7. Implications for Assimilation of IKS in climate Action Policies

The preceding sections of the paper highlight key provisions in climate action policies, revealing notable differences in how these policy documents acknowledge tribal people knowledge in global warming alleviation and adjustment measures. The article indicates that in certain countries particularly the G20 climate action policies seem not explicitly firm regarding the essential responsibility of indigenous knowledge in promoting long-term mitigation and adaptation approaches. Although indigenous knowledge is acknowledged, it is not as clearly and thoroughly articulated in climate action policies. Additionally, climate action legal instruments heavily rely on scientific approaches as the foundation for climate action plans. From the authors' standpoint such kind of approach is degenerating, given the significant investments made in preserving, replicating, systematically applying, and utilizing traditional ecological knowledge in various development areas, including climate action efforts and interventions, particularly in reinforcing food security (Altieri et al., 2012).

Merging tribal people knowledge and climate action programs has been argued to enhance resilience and adaptation in many communities across the world. This integration helps tribal and indigenous communities, who rely on indigenous knowledge, to better understand climate change. Consequently, it cultivates feeling of affiliation and partnership between legal instruments and the tribal communities. These views align with (Nyahunda, 2024) assertions that a connection exists among legislative bodies, institutional frameworks and social order. Therefore, climate action plans ought to align policies with objectives of the people they are designed to serve. The paper also suggests that that embedding IKS into climate action policies can be instrumental in creating long term alleviation and adjustment plans.



(Ford et al., 2020) propounds that recognizing indigenous knowledge systems at the policy level enhances indigenous people participation, which can help achieve climate governance objectives. In tribal societies, indigenous knowledge is treated as the most important source of information owing to the fact that such knowledge has been proven in diverse contexts. Disregarding traditional ecological knowledge in global warming legal instruments creates limitations in mitigation and adaptation efforts. Recognizing indigenous knowledge has led to its integration into current interventions imposed by technocrats which previously remained theoretical models rather than practical tools for implementation. This study encourages regulatory institutions and nations across the world to frame climate action plans using indigenous community perspective, by adopting tribal people capacities, experiences, and knowledge.

Incorporating indigenous knowledge in climate action policies reinforces effective robustness in the current climate change era. Tirivangasi (2019) notes that policies that encourage tribal people participation by integrating their knowledge base become effective in resolving the impending climate change problems. This paper emphasizes that indigenous communities exercise crucial functions in climate action plans and global warming mitigation, adaptation, and handling a wide spectrum of climate change hazards. Since indigenous knowledge is a vital insight in developing mitigation and adaptation strategies, climate action policies that embrace ancient technical know-how achieve desired outcomes because it embodies natural systems of mitigating climate change while adjusting to the effects caused by global warming.

8. Conclusion

This study aims to drive the evolution of knowledge and transformation in the concept of reality that seek to optimize indigenous knowledge systems and shield the earth from disastrous impact caused by global warming. It argues that indigenous knowledge should be central to climate action policy discourse to enable the accomplishment of the 17 Sustainable Development Goals (SDGs) at earliest before situations gets out of hand. Assimilation of indigenous knowledge into

climate action policy frameworks will give an assurance of unwavering community resilience, adaptive capacity, and mitigation strategies. The study criticizes the fact that most of the climate action policies emphasize science-oriented climate change mitigation and adaptation strategies while selectively recognizing traditional knowledge. Furthermore, the paper concludes that indigenous knowledge remains a valuable insight in all stages of climate action policy cycle. The analysis suggests that integrating indigenous knowledge systems in climate action policies initiates a progressive step towards effective climate change mitigation and adaptation measures. Climate action policies should aim to provide legal instruments that are rationale, practical, sustainable, knowledge- and evidence-based while incorporating indigenous knowledge.

9. Conflict of Interest Statement: The authors declare no conflict of interest concerning this manuscript.

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