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Exploring the Role of Higher Education Institutions in Promoting Climate Control and Justice in Uganda

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Abstract

This exploratory qualitative study focused on exploring the role of Higher Education Institutions in advancing Climate Control and Justice in Uganda with a focus on; climate control efforts; research and advocacy; and climate-related educational programs. Findings indicated that the universities had introduced programs such as advocacy for climate control and justice, adoption and assessment of science-based programs to integrate climate and also involved student activists who often prioritized enforcing environmental curricular changes which stimulated knowledge growth through educational awareness to the staff, and students. However, the efforts were inadequate due to the economic status of our country which largely depends on donor funds. The study concluded that Higher Education Institutions were not adopting enough interdisciplinary approaches to address climate control and justice adequately, aligning educational goals with global climate challenges and thus they should continue to incorporate climate education into all academic programs and integrate climate-related topics across various academic disciplines.

Keywords: higher education, climate control, climate justice, climate education

1. Background of the Study

Education in Uganda is categorized into various periods namely, Before-colonial, During-Colonial, and After-colonial. Before the colonial period, education was informal or indigenous and based on practical skills for daily life like hunting, fishing, farming, and craftwork (Ssekamwa J.C, 1997). Universities were not there at the time. During the colonial period, missionaries established primary and secondary schools. Universities were still not there at that time. Those who wanted a university education would go either abroad or to neighbouring countries like Tanzania and Kenya. Makerere College was established in 1922, originally as a technical school, then later as a centre for higher learning. It became part of the University of East Africa in 1949. After independence, Makerere College became Uganda's fast fully- fully-fledged university, a symbol of academic excellence in East Africa (Semali, L. M., 1999). There was only one university in the country until liberalization policy reforms (in the 1990s) where private institutions of all levels including universities were allowed to operate. There are now very many universities both public and private in operation controlled by the National Council for Higher Education (NCHE) to regulate and monitor them. The climate control in Uganda is influenced by tropical climate diverse ecosystems like savannas, forests and wetlands. People used to practice

sustainable activities (Muweesi, C., 2021). With the increase of people, and social-economic activities proportionally the increase, National Environmental Management Authority (NEMA) was introduced to address environmental issues. The Government also ratified international commitments to climatic changes like the United Nations Framework Convention on Climate Control (UNFCCC) and the Tokyo Protocol for climate action. People believe that universities are crucial in addressing issues of climate control and justice (Ssekamwa J.C, 1997). They contend that those universities are key actors in promoting research to advance climate control and justice. Many universities have embraced seminars, talks, conferences, etc. which have been focal think as well as platforms for climate control debates these have heavily been attended by university scholars, professors, and students and a lot of debates have accumulated into policy recommendations that governments more so the government of Uganda has embraced with the help of various stakeholders who participate in these debates such as inter-ministerial representations, members of parliament, among others (Rwabuhinga, R., et al., 2024). The universities contribute by generating knowledge, shaping leaders, and driving innovations in climate-related fields (Leal Filho, 2010). Research from universities forms public policy and contributes to international climate agreements (Anderson, Teisl, Noblet, & Klein, 2015). Universities are hubs for developing sustainable solutions, including carbon capture technologies, which contribute to both mitigating climate change and promoting social equity (Leal Filho, 2010). However, incorporating climate justice into university curricula which is vital for preparing students to understand and address the complex ethical issues surrounding climate change has been lacking. Yet, climate justice promotes inclusivity by highlighting how vulnerable populations, such as Indigenous communities and women, are disproportionately affected by climate change (Stephens et al., 2008). According to Schlosberg & Collins, (2014), climate justice is the ethical dimension of climate change, emphasizing the fair treatment of all people in efforts to address and mitigate its effects. The concept stems from the recognition that climate change exacerbates existing social inequalities, disproportionately impacting low-income communities, indigenous peoples, and developing nations, even though these groups contribute the least to global emissions (Charles, M., Sarah, N., & Anthony, M. M. 2024). Climate justice advocates argue for a fair distribution of the benefits and burdens of climate action, ensuring that marginalized communities are protected and empowered in decision-making processes.

1.1 Purpose of the Study

The purpose of the study was to explore the role of Higher Education Institutions in advancing climate control and justice in Uganda.

1.2 Research Objectives

The study objectives were;

1) To establish how Higher Education Institutions contributed to climate control and justice efforts.
2) To examine how Higher Education Institutions engaged in research and advocacy to address climate control and promote climate justice.
3) To identify how Higher Education Institutions catered for marginalized communities in climate-related educational programs.

1.3 Research Questions

The study was guided by the following study questions;

1) How Higher Education Institutions were contributing to climate control efforts?

2) How Higher Education Institutions were engaging in research and advocacy to address climate control and promote climate justice?

3) How do Higher Education Institutions cater for marginalized communities in climate-related educational programs?

1.4 Theorization

This study was conducted within the context of environmental justice (Bullard, 1993) and sustainability education theory (Sterling, 2010). The environmental justice theory posits that marginalized communities bear the burden of climate change impact, a concept that was reflected in the inequitable distribution of climate-related educational resources across universities. Sustainability education theory suggests that educational institutions play a pivotal role in shaping societal responses to climate challenges. The research study supports these theoretical insights, showing that universities that integrated climate justice into their curricula were better positioned to promote equitable climate solutions. However, the marginalization of social justice perspectives in climate control education suggests a gap in current sustainability theories, which often prioritize the environment over the social aspect of climate change. Furthermore, the study proposes an expanded theoretical framework, incorporating critical pedagogy (Freire, 1970) to highlight the role of student

activism in reshaping university policies. Critical pedagogy underscores the importance of empowering students to challenge existing structures and advocate for systemic change, a theme that emerged strongly in the interviews with climate activists in the institution. This research suggests that future theoretical models must incorporate both environmental sustainability and social justice, recognizing the role of universities in promoting an integrated approach to climate action.

2. Literature Review

2.1 How Higher Education Institutions Contributed to Climate Control Efforts

Universities and research institutions generate scientific knowledge that informs climate policy and offers technological solutions to mitigate climate change. For instance, academic institutions have contributed to advancements in renewable energy, such as solar and wind power, as well as carbon capture technologies. Research has shown that interdisciplinary collaborations within universities have been instrumental in developing low-carbon technologies and sustainable solutions (Bauer, 2020). Universities also frequently partner with local governments, NGOs, and industries to implement community-level climate control projects. According to Evans et al. (2016), universities can act as catalysts for local sustainability initiatives, providing expertise and resources that help communities transition to more including energy efficiency, waste reduction, and the use of renewable energy (Lazarus, 2018). These initiatives demonstrate the feasibility of large-scale operational changes that can be replicated in other sectors.

2.2 Higher Education Institutions Advocate Addressing Climate Control and Promoting Climate Justice

Universities are not only advancing scientific and policy knowledge to address climate control but also ensuring that the pursuit of climate solutions is equitable and inclusive. For instance, researchers at Makerere University have explored the relationship between climate variability and food security in Uganda's rural areas, revealing how smallholder farmers face greater challenges in adapting to climate change (Mukwaya & Tumushabe, 2018). According to Tumushabe et al., (2019), Makerere University's College of Agricultural and Environmental Sciences (CAES) offers training on climate-smart agricultural practices, including agroforestry, rainwater harvesting, and drought-resistant crops. Uganda Martyrs University has been active in hosting climate justice forums that bring together academics, policymakers, community leaders, and the general public to discuss how marginalized groups, such as women and indigenous peoples, are disproportionately impacted by climate change (Kakande, 2020). The partnership between Gulu University and local communities in northern Uganda is commendable. Through this collaboration, the university has worked with local farmers to study the impacts of climate change on crop production and develop community-driven solutions, such as diversified cropping systems and soil conservation techniques.

2.3 Tracking Communities in Climate-Related Educational Programs

Programs offered by Gulu University have shown that climate-related education is effective in raising awareness about sustainable practices, such as energy conservation, carbon footprint reduction, and the adoption of renewable energy technologies. Extracurricular programs that involve hands-on learning experiences, such as campus sustainability initiatives, environmental clubs, and participation in climate conferences encourage students to actively engage in climate control measures, turning theoretical knowledge into practical applications. Studies have shown that such experiential learning programs (Charles, M., et al., 2024) can lead to long-term behavioural changes that contribute to reduced carbon emissions and the adoption of climate-friendly practices (Anderson et al., 2017).

According to Simpson (2019), Universities in Europe and North America have successfully implemented campus-wide sustainability initiatives that serve as models for local communities. The University of Edinburgh's "Zero Carbon by 2040" campaign not only reduces the institution's carbon footprint but also educates the local population on energy conservation and waste reduction techniques. According to Ochieng & Muthoni (2021), awareness programs also create a ripple effect by influencing public policy. Communities in Canada due to climate change. The course explores the intersection of environmental degradation, colonialism, and social inequality, encouraging students to engage in climate advocacy that prioritizes indigenous rights and knowledge systems (Collins et al., 2020). Universities in Uganda, such as Makerere University, have implemented community-based climate adaptation projects that focus on empowering smallholder farmers, women, and rural communities who are most affected by climate variability (Mukwaya & Tumushabe, 2018). According to González & Martinez (2020), Universities in regions such as Latin America and Sub-Saharan Africa also play a critical role in facilitating access to climate finance and resources for marginalized communities. Awareness programs in these institutions emphasize the importance of equitable access to climate funds, ensuring that vulnerable populations receive the financial and technical support needed to adapt to climate change. By advocating for fair distribution mechanisms, universities contribute to climate justice at both local and global levels. According to UNFCCC (2021), during the United Nations Climate Change Conference (COP26), several

universities, including those from Africa and Asia, played an active role in advocating for climate finance mechanisms that prioritize least-developed countries (LDCs) and vulnerable communities.

3. Methodology

3.1 Research Design

The study used a qualitative design to gather data from multiple cases at a specific point in time. This approach allows for efficient data collection by reaching all respondents at once, saving time and cost. The sample size was determined using the (Krejcie & Morgan, 1970) table for determining sample size as cited by Amin (2005). The sample size and selection for this study from Iganga Technical Institute is presented in Table 1 below.

Table 1. Sample size and selection strategies

Category	Gender	Target Population	Sample size	Percentage	Sampling technique
Academic staff	Male	12	4	33%	Purposive sampling
	Female	8	3	38%	
Graduate students	Male	30	6	20%	
	Female	24	5	21%	
Total		**74**	**18**	24%	

Source: Primary Data.

The study's purposive sampling approach focused on key stakeholders and experts, enabling a comprehensive understanding of the research issues while addressing potential bias through transparent documentation and data validation. The interviews generated from respondents were gained through open-ended questions designed to align with the study's topic and objectives. This approach allows for a comprehensive exploration of facts, beliefs, feelings, motives, and behaviours, providing rich and detailed data. The selected interviewees' knowledge and experiences made them valuable sources of information.

4. Presentation of Findings

The study analysed qualitative data following the purpose of the research of exploring the role of higher education in advancing climate control and justice in Uganda, and summarized in a narrative form as a representative of the major findings:

4.1 Climate Control and Justice Efforts in Higher Education Institutions

Respondents highlighted the importance of universities in playing a pivotal role in addressing climate change by fostering a culture of environmental stewardship, advancing climate science, and equipping future leaders with the knowledge and skills necessary to implement sustainable solutions. One lecturer said,

> "*As academic institutions, our mission transcends the boundaries of imparting knowledge; we are responsible for shaping the values and competencies of future professionals, policymakers, and researchers to respond effectively to global challenges like climate change. Through interdisciplinary research in areas such as renewable energy, sustainable agriculture, and climate modelling, universities can provide the scientific evidence and innovations needed to inform policy decisions and industrial practices.*"

This implied that universities are hubs of knowledge generation, where cutting-edge research can lead to the development of sustainable technologies and climate mitigation strategies. Equally important, is their role in education and capacity building, by integrating climate change and sustainability into curricula across disciplines, universities can prepare students not only in environmental sciences but in all fields to understand the implications of climate change in their respective professions. An administrator of the University said,

> "*Business students, for example, can learn about green finance and corporate sustainability, while engineering students can explore sustainable design and energy efficiency. Graduating students equipped with such knowledge will be better prepared to implement climate control measures in their professional careers. Universities can create networks and collaborations with institutions, researchers, and organizations around the world to share knowledge and best practices. Participating in global initiatives such as the United Nations Sustainable Development Goals (SDGs) allows Higher Education to contribute to a coordinated global effort to address climate control.*"

A senior lecturer said,

> "*Universities in Uganda are well-positioned to influence national and local climate policies by providing research-based evidence and engaging with policymakers to ensure that climate justice is at the forefront of policy formulation. Institutions like Makerere University have been involved in policy discussions at both the national and regional levels, advocating for climate action that considers the needs of marginalized communities. This included pushing for policies that support fair access to resources, such as land and water, which are often disproportionately affected by climate change in rural and impoverished areas.*"

Universities have a responsibility to foster a global mindset and collaboration. Climate control is a global issue that requires international cooperation.

4.2 Research and Advocacy to Address Climate Control and Promote Climate Justice by Universities

Academic staff responses indicated that universities in Uganda play a significant role in advancing climate justice, especially in marginalized communities. Another senior lecturer said,

> "*Climate justice focuses on addressing the disproportionate impacts of climate change on vulnerable populations, such as rural communities, women, and the poor, who contribute the least to global warming but suffer the most from its effects. Through a variety of initiatives, universities in Uganda are leveraging their expertise, research, and community engagement to promote climate justice in several meaningful ways.*"

Many Ugandan universities have developed partnerships with rural and underserved communities to assess the local impacts of climate change, such as droughts, floods, and food insecurity. A student leader stated,

> "*These collaborations often involve engaging community members in identifying challenges and co-creating solutions that are culturally and economically appropriate. For example, researchers from Makerere University and other institutions work with smallholder farmers in rural areas to introduce climate-smart agricultural practices, such as drought-resistant crops and sustainable water management. This not only improves the resilience of marginalized communities to climate change but also ensures that the solutions are tailored to their specific needs and contexts.*"

By integrating climate justice into academic curricula, universities are preparing students to understand the social and ethical dimensions of climate change. This was confirmed by another student leader who noted that,

> "*Many Universities offer courses and programs focused on sustainable development, environmental management, and climate control, ensuring that students from various disciplines are equipped to address the unique challenges faced by marginalized communities. Graduates, particularly those studying social work, law, agriculture, and environmental science, are empowered to advocate for policies and practices that promote both environmental sustainability and social equity.*"

A senior lecturer emphasized that,

> "*Universities in Uganda are well-positioned to influence national and local climate policies by providing research-based evidence and engaging with policymakers to ensure that climate justice is at the forefront of policy formulation. Institutions like Makerere University have been involved in policy discussions at both the national and regional levels, advocating for climate action that considers the needs of marginalized communities. This includes pushing for policies that support fair access to resources, such as land and water, which are often disproportionately affected by climate change in rural and impoverished areas.*"

4.3 Extensive Community Role in Climate-Related Educational Programs

A student mentioned that climate-related education and awareness programs implemented by universities have a profound impact on promoting both climate control and justice; and explained that,

> "*These programs contribute significantly to creating an informed society that is capable of addressing the challenges posed by climate change, while also ensuring that vulnerable populations are not left behind in the pursuit of sustainable solutions. Higher Education is uniquely positioned to influence how climate change is understood and tackled, particularly through their research, education, and community outreach initiatives.*"

Another student added,

> "*One of the most visible effects of these programs is the enhanced public understanding of climate change and its consequences, both at the local and global levels. By integrating change and sustainability into curricula across various disciplines, universities equip students with the scientific, social, and economic knowledge needed to understand the complexities of climate issues. This education often goes beyond environmental science departments to include students in fields such as*

> *business, law, agriculture, engineering, and social work. As a result, future professionals in all sectors are trained to incorporate climate-conscious thinking into their work, which contributes directly to climate control efforts. Graduates become advocates for sustainability, incorporating principles of resource efficiency, renewable energy, and environmental protection into industries, government policy, and local practices.*"

Climate-related education programs encourage students to take on leadership roles in sustainability efforts both on campus and in their wider communities. In confirmation of this finding, another student leader said,

> "*Many universities facilitate student-led environmental organizations, where students actively engage in tree-planting campaigns, waste reduction initiatives, and awareness-raising activities. This sense of responsibility and agency extends beyond the classroom, with many graduates entering careers focused on environmental advocacy, policy development, and organizing grassroots. These platforms for public dialogue increase awareness of climate issues and mobilize communities to take collective action. The awareness generated through these programs often leads to community-led initiatives, such as the adoption of climate-smart practices in agriculture, energy conservation efforts, and local campaigns for environmental justice.*"

Universities also play a critical role in influencing national and international climate policy. Through their research and academic expertise, they contribute to the body of knowledge that informs policy decisions on climate control and justice. Climate-related education programs often encourage interdisciplinary research that links environmental science with economics, social justice, and law, providing a comprehensive approach to climate solutions. This research not only supports the development of effective climate mitigation strategies but also emphasizes the importance of social equity, ensuring that the most vulnerable populations are considered in policy-making processes.

5. Discussions

According to findings, universities are at the forefront of research and innovation in climate science, renewable energy, and sustainable technologies. This is in agreement with a report by UNESCO (2017), that universities can contribute to climate change mitigation by developing new technologies, such as clean energy solutions, and by conducting research that informs sustainable practices in sectors such as agriculture, transportation, and energy production.

Researchers at universities in the Global North and South are investigating climate-resilient agricultural techniques that can help reduce greenhouse gas emissions while ensuring food security in the face of changing climate patterns. This research is particularly vital for developing countries, where climate change disproportionately affects livelihoods and economic stability (UNESCO, 2017). Through these efforts, universities play central roles in driving the technological innovation required to achieve global climate targets, such as those set by the Paris Agreement. One of the most significant contributions of universities to climate control is their role in educating future generations of leaders, professionals, and citizens about climate change. By integrating climate science and sustainability into curricula across disciplines, they prepare students to address climate-related challenges in their respective fields. UNESCO (2020) emphasizes the importance of education in empowering individuals to adopt sustainable practices and promote environmental stewardship. Graduates equipped with this knowledge are better positioned to influence climate control measures in sectors such as business, law, engineering, and public policy. For instance, universities in rural areas often work directly with local farmers to implement sustainable agricultural practices that reduce emissions while improving resilience to climate-related shocks. Gulu University is setting examples for climate control through the implementation of sustainability initiatives on its campus. These initiatives, often referred to as "living laboratories," allow the university to experiment and model sustainable practices, such as energy conservation, waste reduction, and the use of renewable energy sources (Filho, 2018). Through advocacy and knowledge dissemination, universities ensure that scientific evidence informs climate policy. According to Filho (2018), universities act as knowledge brokers, bridging the gap between climate science and policymaking. For instance, universities often collaborate with international organizations such as the United Nations to contribute to global initiatives like the Sustainable Development Goals (SDGs), which include targets related to climate action (SDG 13).

Gulu University, like other universities, has engaged in participatory research with rural communities, developing sustainable practices that mitigate climate impacts while improving livelihoods. According to Nakabugo et al. (2018), universities in Uganda have been instrumental in introducing climate-smart agricultural practices in partnership with smallholder farmers in rural areas. Those efforts include promoting drought-resistant crops, sustainable land management techniques, and innovative water conservation methods. Gulu University runs outreach programs that focus on educating rural populations about sustainable practices. For instance, extension services train farmers in climate-resilient agricultural techniques, helping them reduce

crop failure rates due to erratic weather patterns (Nakabugo et al., 2018). Through specialized programs, Gulu University provides training to women on sustainable farming, water management, and renewable energy solutions. Those programs not only help women improve their economic resilience but also empower them to take leadership roles in advocating for climate action within their communities, as also observed by Mfitumukiza et al. (2020). Gulu University has contributed to shaping national discourse on climate justice by providing policymakers with evidence-based research on the socio-economic impacts of climate change. This research is vital for creating policies that address the needs of marginalized communities, such as smallholder farmers and slum dwellers who are particularly vulnerable to extreme weather events about what is stated by Kyazze (2019). Universities work closely with civil society organizations to raise awareness about climate justice and advocate for policies that prioritize the needs of marginalized populations, ensuring that national climate action is both inclusive and fair (Mfitumukiza et al., 2020). Another significant contribution by Gulu University to climate justice is its involvement in developing and promoting green technologies that are accessible to marginalized communities. Several universities, in collaboration with non-governmental organizations (NGOs) and international partners, have introduced renewable energy solutions, such as solar energy, in rural areas that lack access to reliable electricity (UNESCO, 2021).

Furthermore, Gulu University has been instrumental in promoting the adoption of clean cooking technologies, such as improved cookstoves, which reduce indoor air pollution and decrease reliance on firewood, a major driver of deforestation. By making these technologies available to marginalized communities, Gulu University is addressing both environmental degradation and public health issues, while also promoting economic empowerment through energy independence (Kyazze, 2019). Gulu University is also involved in global networks that advocate for climate justice. By participating in international conferences, collaborations, and research projects, Gulu University ensures that the voices of marginalized communities are included in global climate discussions. For instance, academicians have been part of global initiatives such as the United Nations' Sustainable Development Goals (SDGs), which prioritize climate action and social equity (UNESCO, 2021). Through these networks, Universities not only contribute to the global understanding of climate justice but also bring back valuable insights and resources that can be applied to local contexts.

By integrating climate science, environmental sustainability, and climate policy into academic curricula, Gulu University ensures that students are well-equipped with the knowledge required to mitigate and adapt to the effects of climate change. This climate literacy is essential for preparing future leaders who can drive climate control measures in various sectors, including industry, policy, and community development as was noted by O'Brien et al. (2018). For instance, students at Gulu University offering courses on renewable energy, sustainable agriculture, and environmental economics graduate with the capacity to develop and implement strategies to reduce greenhouse gas emissions. These graduates often become advocates for clean energy technologies, conservation, and efficient resource use, contributing directly to climate control efforts as supported by Leal Filho et al. (2019). Climate justice recognizes the disproportionate impact of climate change on marginalized communities, including those in developing countries, low-income communities, and indigenous populations. Through education and awareness programs, Gulu University helps to raise awareness of the social and ethical dimensions of climate change, encouraging students and communities to view climate action through a justice lens as supported by Schlosberg & Collins (2014). Climate justice is increasingly incorporated into environmental science, law, and social science programs, where students learn about the unequal distribution of climate impacts and the need for fair and inclusive solutions. This is in line with Okereke & Coventry (2016). Gulu University is often involved in interdisciplinary research that combines climate science with economics, sociology, and political studies to understand the complex interactions between climate change and society. The knowledge generated through such research informs climate policies and ensures that they are both effective in reducing emissions and equitable in their implementation (Leal Filho et al., 2019). Research often emphasizes the need for targeted interventions in marginalized communities that are disproportionately affected by climate impacts, such as droughts, floods, and heat waves. Gulu University also engages in advocacy efforts, using its academic credibility to influence policy decisions and push for climate justice at the national and international levels. This is also supported by Schlosberg & Collins (2014). By raising awareness about the environmental and social consequences of unsustainable practices, Gulu University helps shift public attitudes toward more sustainable lifestyles. Gulu University engages in public outreach initiatives, such as workshops, seminars, and community projects, aimed at educating the broader public about climate change and encouraging them to adopt climate-friendly behaviours (Barth et al., 2016).

6. Conclusions

According to findings, universities play vital roles in promoting climate control measures through their multifaceted contributions to research, education, advocacy, and community engagement. By generating cutting-edge research and fostering innovation in sustainable technologies, universities provide essential knowledge and tools for effective climate mitigation and adaptation strategies (Leal Filho et al., 2019).

Moreover, universities are instrumental in cultivating climate literacy among students and the wider community, equipping future leaders with the skills necessary to tackle climate-related challenges (O'Brien et al., 2018). Furthermore, by engaging in policy advocacy and promoting sustainable practices on their campuses, universities set examples of climate leadership and accountability (Barth et al., 2016). Their involvement in global networks enhances collaboration and amplifies their impact, ensuring that climate action is informed by scientific evidence and social equity considerations (Schlosberg & Collins, 2014). As the urgency of climate change continues to grow, the contributions of universities will be increasingly essential in shaping a sustainable and resilient future for all.

Universities are pivotal in advancing climate justice initiatives, particularly for marginalized communities. Through community-based research, education, and direct engagement, these universities empower vulnerable populations to understand and address the impacts of climate change on their lives and livelihoods. By promoting sustainable practices, facilitating capacity-building programs, and advocating for equitable policies, universities ensure that the voices of marginalized groups are heard in the climate discourse (Mfitumukiza et al., 2020; Nakabugo et al., 2018). Furthermore, their involvement in global networks amplifies local concerns, highlighting the need for inclusive climate action on an international scale (Kyazze, 2019).

Climate-related education and awareness programs implemented by universities have a transformative effect on both climate control and justice. These programs foster a deeper understanding of the intersection between environmental and social justice, ensuring that climate action is both equitable and inclusive (Leal Filho et al., 2019). By raising awareness and promoting sustainable practices, universities help shape a generation of informed citizens and leaders who advocate for climate control while upholding justice (Schlosberg & Collins, 2024). The integration of climate science and policy, universities are thus essential for achieving sustainable development goals and addressing the global climate crisis fairly and effectively (O`Brien et al, 2018).

7. Recommendations

Universities should continue to incorporate climate education within all academic programs, not just environmental science. This interdisciplinary approach will ensure that all graduates, regardless of their field, are equipped with a fundamental understanding of climate issues and sustainability practices. Universities should prioritize research initiatives focused on the specific climate challenges faced by local communities. By collaborating with community stakeholders, Universities can develop targeted solutions that address local vulnerabilities and promote adaptive strategies.

Universities should create platforms for students to engage in climate activism and innovation, such as funding sustainability projects or providing resources for student-led initiatives. Encouraging student involvement fosters a culture of responsibility and leadership in addressing climate challenges.

Universities should facilitate the distribution of climate adaptation resources, such as sustainable agricultural practices, water management techniques, and renewable energy solutions, to marginalized communities. Collaborating with government agencies and NGOs can ensure that these resources reach those most in need, and vulnerable groups to ensure that their voices are heard in climate action planning. Universities should support student initiatives aimed at addressing climate justice in marginalized communities. By providing resources and guidance, universities can encourage students to lead climate action projects that empower local populations and drive meaningful change. Universities should focus on conducting localized research that explores the effects of climate change on specific communities, especially those vulnerable to climate impacts. By tailoring education and awareness programs to the local context, universities can develop targeted strategies that address both climate control and social equity. Universities should actively engage with local and national governments to ensure that their research and education programs inform policy decisions. Collaborative efforts will ensure that policies aimed at climate control are grounded in scientific evidence and prioritize justice for marginalized communities. Universities should encourage and support student-driven climate initiatives, including awareness campaigns, sustainability projects, and advocacy for policy change. Empowering students to lead will help instill a sense of responsibility and agency in tackling climate control and justice issues.

Finally, the government and all donor agencies should increase funding to universities to enable them to reasonably cater for climate control and justice. The government should strengthen and implement climate control and justice policies; and enforce existing environmental laws. The government and all stakeholders should embrace renewable energy promotion like solar and biogas as well as encourage sustainable agriculture such as climate-smart agriculture (CSA) practices. Government should also empower vulnerable groups like women, youths and communities in climate programs; address the land issues as well as embrace international collaboration to access technical and financial support. They should continuously monitor and evaluate the effectiveness of climate control and justice interventions. While communities should be guided on water resource management; and the meteorological department should guide people on early warning signals to avoid disasters. Universities can collaborate with the government, and all relevant stakeholders in pursuit of their

activities of climate control and justice.

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