The Role of Climate Change Research and Habitat Restoration Campaigns in Promoting Sustainable Environmental Conservation in Higher Education

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ABSTRACT

This study aimed to investigate the role of Higher Education Institutions (HEIs) in sustainable environmental conservation. Universities conduct extensive research on regional and global biodiversity, assessing the health, threats, and populations of various species. Universities worldwide are expected to provide practical learning opportunities, such as fieldwork, internships, and community projects, that emphasize sustainability and environmental conservation. The researchers tested two hypotheses on how scientific research and habitat restoration campaigns contribute to environmental conservation. The quantitative study collected data using a survey questionnaire. The participants were 92 higher education academic staff purposively selected from 5 universities in Mogadishu, Somalia. The correlation coefficients for studies on climate change and habitat restoration initiatives in relation to sustainable environmental conservation were 0.597 and 0.601, respectively. The study found that climate change research (CCR) and habitat restoration campaigns (HRC) had a significant effect on sustainable environmental conservation (SEC), as indicated by p-values of 0.02 and 0.01, respectively. The study also highlighted the need for further investigation into the factors contributing to climate change, including greenhouse gas emissions, deforestation, and industrial activities.

1. INTRODUCTION

With the increasing number of environmental issues facing the world, it is obvious that the current development path is unsustainable [1]. Millions of people may be displaced by climate change-related factors like rising sea levels and extreme weather, leading to the creation of climate refugees. Addressing issues pertaining to sustainable development requires a broad range of stakeholders [2]. In the twenty-first century, climate change poses a serious threat to the entire world due to its effect on ecosystems, human communities, and economic activity, and the environmental movement has progressed to a new level [3-5]. Reduced biodiversity, species extinction, and habitat loss can result from rising temperatures and changed precipitation patterns.

Higher education institutions (HEIs) regarding environmental sustainability initiatives are becoming more and more common as many of them are generally engaged on the national and international levels in sustainable development-related issues [1, 2]. Therefore, Higher education institutions play a critical role in addressing global challenges, including climate change. Environmental sustainability is of utmost importance in higher education due to the direct and indirect environmental impacts of university operations, including energy consumption, waste generation, material usage, human mobility, and campus transportation [6]. The environmental education programs offered by higher education institutions have a big influence on educating and preparing the next generation for a green society [7]. Higher education institutions can assist in putting pressure on the stakeholders and spreading the message at the grassroots level of society through coordinated work with NGOs [1]. Therefore, it is crucial to equip students with knowledge of climate change solutions such as adaptation and mitigation strategies [8]. The term "mitigation" refers to actions taken to lower greenhouse gas (GHG) concentrations by reducing GHG emissions or removing carbon from the atmosphere [9]. These actions can even include preserving forests or investing in renewable energy sources.

A study conducted by Stevenson et al. [10] argues that teachers must encourage students to think critically and creatively about strategies for coping with and adapting to climate change in order to enhance their capacity to respond with meaningful activities. When a student chooses to participate in any other mandatory extracurricular activity, he selects what aligns with his talents, enjoys the activity, and feels fulfilled [11].

One of the major problems facing the globe now is climate change. With the rapid advancement of technology, scientists can now more accurately and clearly track and predict the effects of human-induced climate changes through environmental sensing, satellite imaging, and computational modeling [12]. Mohamed et al. [13] also revealed that climate change is one of the biggest threats to the planet today, especially in developing nations where the rate of garbage production is expected to impede human existence and

livelihoods.

Somalia's federal government has outlined its vision to move the nation from enduring protracted humanitarian crises to one with a thriving and diverse economy as it works to overcome numerous concurrent crises brought on by decades of conflict, fragmentation, instability, and underdevelopment [14]. Climate change is characterized by notable variations in the average values of meteorological components, such as precipitation and temperature, which have been calculated over a long period [15]. Due to urbanization, cities expand, and a greater proportion of the population moves there, human race is currently dealing with serious environmental issues [1, 16]. As a result, the main goal of modern conservation efforts is to protect the most vulnerable species [17].

The study aims to figure out the role of higher education in sustainable environmental conservation by testing two hypotheses.

H1: Climate change researches have significant impact on Sustainable Environmental Conservation.

H2: Habitat restoration campaigns have significant impact on Sustainable Environmental Conservation.

This study is necessary because the current state of affairs indicates that the local population is not sufficiently involved in the numerous environmental protection projects and programs being carried out [8]. Theoretically, presenting people with accurate information about the degree of scientific consensus can help close the perception gap between the public's and scientists' viewpoints [18].

2. LITERATURE REVIEW

2.1 Climate change research

Around the world, research on higher education is regarded as one of the most effective tools for environmental development, particularly when it comes to promoting a healthy environment, ensuring the sustainability of renewable resources, and conserving non-renewable resources for the good of society and all living things [1]. Research on how natural disasters affect disaster-prone areas has gained a lot of attention as a result of growing awareness of the catastrophic effects of climate change events and the necessity of post-disaster restoration [19]. Numerous of these researches involved collaborations with several public and private stakeholders, including local governments, academic institutions, resource management organizations, and community organizations [12]. Therefore, policymakers must obtain scientific information from research data and analyses before deciding on appropriate mitigation strategies, regulations, and investments in sustainable environmental protection. Because the goal is to assist in the creation of plans that will help societies more effectively deal with the effects of climate change [20].

Studies conducted by Rahman [21] and ur Rehman and Khan [22] revealed that the declining state of the environment has made environmental sustainability a global and national priority; as a result, researchers and academics have studied environmental issues, with some of them focusing mainly on university students' environmental awareness.

Research by higher education faculty members is expected to accelerate appropriate environmental conservation and sustainability. The results of research projects on climate change are crucial for mobilizing public support, involving

stakeholders, and promoting international cooperation in mitigation efforts. This indicates that the study helps to reduce the adverse effects of climate change. So, evidence-based research in this area typically focuses on tracking changes in students' knowledge following the introduction of a specific educational program or module [9]. Surveys repeatedly reveal that the American public misjudges the scope of the scientific community's agreement on climate change, most likely as a result of the propagation of false information and the politicization of climate science [18]. A study conducted by Anderson [9] showed that the education industry presents a currently underutilized opportunity to address climate change. In order to enhance students' capacity to respond with meaningful activities, teachers must encourage them to think critically and creatively about strategies for coping with and adapting to climate change [10]. Although the importance of education in tackling climate change concerns is becoming more widely acknowledged, the education sector is still underutilized as a strategic resource for climate change adaptation and mitigation [23].

According to Warsame and Abdi [3], environmental degradation stems from tree degradation; environmental pollution is caused by burning fossil fuels, using fertilizers in agriculture, and burning trees for coal consumption. Therefore, precipitation in Somalia is more uncertain in the short term because of climate change. Still, it is likely to become more variable as droughts and flooding occur more frequently [14]. As rainwater overflows from preexisting waterways during the rainy season, flooding typically happens [24]. Hence, it is predicted that climate change will get worse in the near future. Malhi et al. [15] and Alimbaev et al. [25] revealed that the environmental situation is complicated by the absence of a requirement for an initial expert assessment of the environmental effects of the use of scientific and technological advancements, effective economic levers that encourage economic managers to use natural resources wisely, departmental divisions in environmental protection, ineffective legal sanctions, localism, and official negligence [25].

2.2 Habitat restoration campaigns

Campaigns have the power to influence people's decisions to live more sustainably, such as buying from local companies that uphold environmental protection. Diverse viewpoints exist regarding these campaigns' effectiveness in both the short- and long-term [26]. Higher education staff and students can involve local communities in habitat restoration projects, which could lead to the achievement of long-term environmental protection. Advocates for disaster risk reduction education contend that students ought to be involved in risk reduction procedures and knowledgeable about what to do in an emergency [10]. Thus, the creation and implementation of future campaigns that are more successful can be facilitated by gaining a clearer understanding of how and to what degree awareness campaigns contribute to concrete conservation activities [27].

Somalia is a long-term crisis country that has experienced political instability and civil unrest for more than thirty years [19]. Like other African nations, Somalia has experienced rapid population growth, with each generation surpassing the previous one despite the country's high death rate due to famine and civil conflict. This population growth has led to deforestation and urbanization, so one of the habitat

restoration initiatives that higher education institutions might support is planting native or compatible seedlings in degraded areas. There are obvious policy implications to the fact that most developing countries' urban areas are expanding primarily as a result of natural population growth [28]. As a result of urbanization harsh environmental conditions, primarily in the form of deforestation and the extraction of natural resources. For example, the proportion of Somalia's land area covered by forests fell from 13% in 1990 to 9.5% in 2020 [19]. Consequently, there must be campaigns to restore the lost habitat. This demonstrates that environmental protection activities must utilize new informal and hybrid spaces that provide alternative learning and action opportunities rather than being restricted to traditional frameworks and formal learning environments [10]. People with knowledge of biology know that plants release oxygen and use carbon dioxide. Reforestation on degraded land that once supported forest ecosystems may help reduce the effects of climate change by significantly increasing atmospheric carbon capture [29]. Despite the fact that universities have been recognized as crucial contributors to habitat restoration and environmental sustainability, little is known about the precise effects that these establishments have on local populations, especially in areas like Somalia that are impacted by conflict or other crises. Further studies are required to assess the potential for long-term, sustainable habitat restoration outcomes in disaster-prone, vulnerable areas through educational campaigns, student involvement, and faculty-led projects.

3. METHODOLOGY

The study's primary focus is to find out how climate change research and environmental restoration campaigns can contribute in sustainable environmental conservation.

The researchers developed two hypotheses to assess how climate change research and habitat restoration activities can improve sustainable environmental conservation.

To describe the current state of higher education positions relevant to environmental protection, the researchers used descriptive statistics. Testing hypotheses, establishing facts, demonstrating relationships between variables, and predicting outcomes are the objectives of this quantitative research [30].

A quantitative design was employed to gather primary information and ascertain the role of higher education institutions in long-term environmental preservation. Data that can be 'objectively' quantified with numbers is the foundation of quantitative approaches [31]. A questionnaire was used as a data collection instrument, and it was distributed to the academic staff of five universities in Mogadishu, Somalia. The query was split into two sections: the first contained demographic data, and the second contained items based on hypotheses to gauge the opinions of higher education personnel regarding the importance of research and habitat restoration activities to the environment. The following five-point Likert scale was used to evaluate the variables: 5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, and 1 = Strongly Disagree. Twelve items total in the questionnaire used in this study, which was divided into three main sections called contracts, each of which had four items.

The target population was Mogadishu's higher education academic staff. A purposive sampling technique was used to gather data for the studies [32, 33] to determine the sample size, with the goal of including participants who had direct experience with sustainability initiatives, climate change research, and environmental education. Ninety-two (92) academic staff members from five universities in Mogadishu City participated in the study. The need for participants with specific knowledge and the capacity to offer in-depth viewpoints is reflected in the smaller sample size rather than the larger, more generalizable sample.

The survey was anonymous, and the participants' answers were completely independent of the researchers.

4. RESUSTS

4.1 Demographic information of the respondents

Table 1 demonstrates the characteristics of the study participants in terms of gender, age and years of working experience in higher education. Few females were in the sample (7, 7.6%), while males made up the majority (85, 92.4%). 65.2% of the sample were between the ages of 26 and 35, and 27.2% were between the ages of 36 and 45. Fewer participants (7.6%) are 46 years of age and older. In terms of experience, 43 people had worked in higher education for 1-5 years, accounting for 46.7%. Thirty-five individuals had 6-10 years of experience, accounting for 38.0%. Only 5 participants (5.4%) had more than 16 years of experience.

Table 1. Demographic information of the participants' gender

Gender	Frequency	Percentage %
Male	85	92.4
Female	7	7.6
Total	**92**	**100**
Age		
26-35	60	65.2
36-45	25	27.2
46 and above	7	7.6
Total	**92**	**100**
Years of Working at Higher Education		
1-5 years	43	46.7
6-10 Years	35	38.0
11-15 Years	9	9.8
16 Years and above	5	5.4
Total	**92**	**100**

4.2 Reliability analysis

Cronbach's alpha, composite reliability, factor loadings of the constructs, and extracted average variance were used to analyse the data. The stability of the measurement instrument was examined using Cronbach's alpha [34]. Bonett and Wright [35] also revealed that Cronbach's alpha is the most popular reliability metric in the social and organizational sciences. Strong reliability and an acceptable index are associated with an Alpha Cronbach value of more than 0.6, while low reliability is related to a value of less than 0.6 [13]. Every item in the construct variables has a value greater than 0.6, as shown in Table 2, which suggests that all groups of observed variables have high overall reliability. This illustrates how well the specific scales and conceptions have proven to have good validity and reliability [36]. A low Cronbach's alpha value will affect the data's validity. This condition may arise due to an insufficient number of items, partially correlated items, or diverse instrument construction [34]. All of the variables in the current study have AVE values that are greater than the threshold (0.5), indicating satisfactory convergence [36].

Table 2. Constructs and items' validity analysis

Constructs	Items	Factor Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
CCR	CCR1	0.789699	0.836217	0.890671	0.670941
	CCR2	0.843538			
	CCR3	0.848445			
	CCR4	0.79292			
HRC	HRC1	0.691385	0.715827	0.820983	0.535396
	HRC2	0.669406			
	HRC3	0.758603			
	HRC4	0.799992			
SEC	SEC1	0.7492	0.703697	0.81655	0.527097
	SEC2	0.758838			
	SEC3	0.688262			
	SEC4	0.705372			

CCR = Climate Change Research, HRC= Habitat Restoration Campaign, SEC = Sustainable Environmental Conservation

Table 3. Correlation analysis

	CCR	HRC	SEC
CCR	1		
HRC	.680**	1	
SEC	.597**	.601**	1

Correlation is significant at the 0.01 level (2-tailed).
CCR = Climate Change Research, HRC= Habitat Restoration Campaign,
SEC = Sustainable Environmental Conservation

4.3 Correlation analysis

One of the most essential tools in a data analyst's toolbox for comprehending the data and drawing conclusions is correlation analysis [37]. The direction and strength of the relationship between two variables can be understood with the aid of correlation. If a correlation is found, it means that changes in one variable are typically linked to changes in the other variable. Senthilnathan [38] argues that almost all studies have the same goal when conducting a correlation analysis, which is to investigate the associative relationship between independent and dependent variables. Table 3 shows the correlation between the variables of the research. According to Alenezi [39], correlation is used to determine the relationship between the survey's constructs. The value 0.597 indicates that there is a strong relationship between climate change research (CCR) and sustainable environmental conservation (SEC). The high correlation ($r = 0.597$) indicates that research on climate change is crucial to advancing and accomplishing sustainable environmental preservation.

According to the findings, incorporating scientific research into conservation practices helps to create a more resilient and sustainable environment in addition to improving the efficacy of environmental policies and strategies. Habitat restoration campaigns and sustainable environmental conservation have a strong correlation ($r = 0.601$), which implies that HEI participation in restoration projects greatly improves conservation results. Projects involving habitat restoration benefit greatly from the academic and research expertise that Higher Education Institutions (HEIs) contribute.

This suggests that the study gives people the information, abilities, and mindset needed to participate positively in environmental conservation efforts and promote a healthy environment. The correlation coefficient between the habitat restoration campaign (HRC) and sustainable environmental conservation (SEC) is 0.601, which indicates a strong positive correlation between these two variables.

4.4 Hypothesis testing

The study examined how climate change research (CCR) and habitat restoration campaigns are essential to sustainable environmental conservation (SEC). The (P- 0.000) indicated that the null hypothesis was rejected as shown in Table 4. Hence, the predictors have a significant impact on the dependent variable.

Table 4. Regression analysis

	Sum of Squares	Df	Mean Square	F	Sig
Regression	32.191	2	16.096	33.166	.000b
Residual	43.191	89	.485		
Total	75.382	91			

Dependent Variable: SEC; Predictors: (Constant), HRC, CCR

Table 5. Significance

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
Constant	.978	.282		3.467	.001
CCR	.296	.092	.351	3.211	.002
HRC	.398	.120	.362	3.307	.001

CCR = Climate Change Research, HRC= Habitat Restoration Campaign

Table 5 shows the changes in the variables with respect to predictors, dependent variables (unstandardized coefficient), and standard deviations (standardized coefficient). The significance level and T values suggest that the null hypotheses were not accepted. Both H1 and H2 are accepted because the p-values for the Climate Change Research and Habitat Restoration Campaigns are less than 0.05. This would suggest that habitat restoration initiatives and research on climate change have a big influence on long-term environmental conservation.

Table 6. R squared

R	R Square	Adjusted R Square	Std. Error of the Estimate
.653a	.427	.414	.69663

Predictors: (Constant), HRC, CCR

In Table 6, R stands for correlation coefficient, which is commonly expressed as "r." It gauges how strongly and in which direction the dependent variable and the predictor

variables are correlated linearly. The correlation coefficient in this instance is 0.653, indicating a strong positive linear relationship between the dependent variable and the predictor variables.

The percentage of the dependent variable's variance that can be predicted from the independent variables is shown by R Square (R^2). In this instance, an R^2 of 0.427 means that the independent variables in the model account for roughly 42.7% of the variance in the dependent variable.

With an adjusted R^2 of 0.414, it can be inferred that the independent variables in the model account for roughly 41.4% of the variance in the dependent variable after adjusting for the number of predictors.

5. DISCUSSIONS

Higher education institutions (HEIs) are well known to be important in promoting social changes that are necessary to ease the transition to a sustainable future [40]. The result of regression analysis revealed that climate change research (CCR) and habitat restoration campaigns have a significant impact on sustainable environmental conservation ($p< 0.05$). Using this basic strategy, researchers are often reassured that the explanatory variables in the model are accurate predictors of the dependent variable [13]. The correlation analysis revealed that there is a strong positive relationship between CCR and SEC (r =0.597), similarly HRC and SEC (r=0.601). To combat climate change, there must be significant reductions in anthropogenic greenhouse gases [41]. The results highlight the critical role that Higher Education Institutions (HEIs) play in influencing public opinion and policy in addition to carrying out research and restoration initiatives. Higher education institutions can increase the impact of their research and advance a sustainable culture outside of academic circles by integrating students, staff, and local communities in environmental initiatives.

In Somalia, it is harder to predict short-term precipitation, so it is expected that rainfall will become more unpredictable, with a greater frequency of both droughts and floods [14]. So, the Paris Agreement, which went into effect on November 4, 2016, prioritized climate action and sustainable development [42]. The last sustainability report of the UN [43] in the area of climate and biodiversity revealed that, despite some reductions in greenhouse gas emissions in developed countries, greenhouse concentrations hit record highs in 2022, with real-time data in 2023 indicating a continued rise.

While not everyone will benefit equally from such risk reductions, both adaptation and mitigation together will lower the risks associated with climate change [14]. The study discovered that more research will be needed to pinpoint the causes of climate change, including industrial activity, deforestation, and greenhouse gas emissions. With a better understanding of these factors, scientists can forecast how climate change will affect biodiversity, weather patterns, sea levels, and human health. Sustainable development is hampered by disasters, many of which are made worse by climate change and are occurring more frequently and intensely [44]. This information helps policymakers develop laws and other measures that will effectively combat climate change. As human being We are unable to confidently map out

our future in achieving the Sustainable Development Goals without evidence of where we are currently at [45].

Since there are already some unavoidable effects of climate change, this study highlights how HEI-led climate change research can inform policy, develop adaptation strategies, and foster community resilience.

A study conducted by Warsame and Abdi [3] revealed that agriculture sector currently relies on fossil fuels, coal, and oil for its production. These non-renewable energy sources increase the sector's emissions. By raising public awareness of climate change, explaining the causes of environmental degradation, and offering evidence-based solutions to mitigate its effects, higher education institutions can effectively promote sustainability. Their efforts support global goals such as the Sustainable Development Goals (SDGs) of the United Nations, specifically SDG 15 (Life on Land) and SDG 13 (Climate Action), as well as local conservation efforts [44]. Public awareness of environmental issues and climate change is raised by research, which also promotes more sustainable practices and behaviors.

Campaigns for habitat restoration and environmental conservation are essential for preserving and reviving natural environments that have suffered degradation, harm, or destruction. These programs seek to restore ecosystems to a state of health while also boosting biodiversity, enhancing ecosystem services, and raising standards of living for all animals, including humans. A study conducted by Andres et al. [29] described habitat restoration as the procedure used to aid in the restoration of an ecosystem that has suffered harm, degradation, or destruction. Therefore, in order to analyze disaster risk, research was conducted to determine hazards, vulnerability, and coping capacity [46].

There are significant gaps in our understanding of baseline data related to plant conservation, including taxonomy, distribution, ecology, population biology and demography, values, threat, and conservation status [17]. Warsame and Abdi [3] also argued that educators must push them to think critically and creatively about coping mechanisms and climate change adaptations to improve students' ability to respond with worthwhile activities. Higher Education Institutions facilitate disaster risk reduction by educating communities on resilience strategies and implementing habitat restoration programs. Furthermore, these programs are designed to mitigate the effects of climate-related disasters. Additionally, universities actively support habitat restoration campaigns by collaborating with environmental organizations, promoting reforestation initiatives, and involving students in conservation projects. Concerning the development of capacity HEIs are essential in developing local capacity because they teach professionals, students, and the general public about sustainable environmental practices.

Their research helps to bridge gaps in baseline data, guides conservation efforts, and empowers communities to adopt sustainable and adaptive practices. According to this study, educational institutions should provide programs that combine environmental studies with other subjects in order to encourage creative ways of tackling environmental problems. The provision of sufficient funds to support scientific research in the application of climate-innovative practices is another expectation from this study. Lastly, starting initiatives to raise awareness of environmental issues and encourage sustainable practices among employees and students.

6. CONCLUSIONS

The study surveyed the role of climate change research and habitat restoration campaigns in promoting sustainable environmental conservation in higher education. Both H1 and H2 are supported by the results, which show that habitat restoration initiatives and research on climate change greatly improve sustainable environmental conservation efforts. This emphasizes how crucial it is that HEIs give community involvement and reforestation projects top priority as crucial tactics to lessen the effects of climate change.

According to this quantitative study, habitat restoration campaigns and research have a statistically significant favorable influence on long-term environmental conservation. The importance of combining scientific research with proper conservation measures was brought to light by the correlation found between focused restoration efforts and improved environmental indicators. Furthermore, by involving students, researchers, and the general public in the resolution of global environmental issues, higher education institutions foster a culture of collective accountability for environmental stewardship. These organizations conduct research that informs policy and community initiatives, helping to develop concrete, scalable solutions for sustainable development. This study had limitations, as do all academic studies. Purposive sampling is subjective, and the study focused on Mogadishu's higher education institutions. As a result, the findings may not be applicable to other areas of Somalia. Despite these limitations, the study emphasizes the importance of Higher Education Institutions (HEIs) in leading the transition to a sustainable future, as well as the need for ongoing research and restoration projects to combat climate change. The authors highlighted the following suggestions. Higher education institutions should allocate adequate resources to support scientific research in adopting climate-innovative practices and enhance students' capacity through training programs to provide the scientific foundation needed to create management plans and conservation policies. Programs that integrate environmental studies with other disciplines should be provided by higher education institutions to encourage creative solutions for environmental issues. Creating committees to implement campus sustainability initiatives is recommended. Recycling metal, glass, plastic, and paper materials to reduce the quantity of waste dumped in landfills. Universities should encourage staff and students to volunteer in groups that preserve wildlife and natural areas. Higher educational institutions should encourage and engage in organic farming to avoid the use of hazardous fertilizers and pesticides.

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