Knowing Climate Change: Knowledge, Perceptions and Awareness (KPA) among Higher Education Students in Eritrea

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Abstract

This research is an attempt to examine the knowledge, perception andawareness of climate change among the higher education students in Eritrea. The study employed a qualitative method of analysis based on questionnaires and interviews with the concerned Government authorities. A total of 300 questionnaires were administered to all the six colleges of Eritrea from 12 November 2018 till 20 March 2019, out of which 291 valid responses were reported. From each college, 50 students were selected randomly. The sampled population stratified in tiers based on gender, age-range andyears in college. The survey questionnaire in this study consisted of four-point Likert scale questions.

Based on the results of such surveys, relevant policy reviews and adjustments are supposed to be formulated to ensure that sufficient levels of climate change knowledge are achieved that can enhance the effective implementation of the National Adaptation Programme of Action (NAPA). The result recommends that Eritrea's endeavours to execute climate-change-related information in the higher education system have not been effective at present, hence, the level of efforts ought to be expanded to reach the common masses as a whole.

Keywords: Awareness, Climate Change, Eritrea, Higher Education, Knowledge and Perceptions.

Introduction

The impacts of climate change have just begun to undermine all biotic communities andhuman social orders and these will worsen over time. To resist, the incites related to mitigation and adaptation will require an informed and motivated population. From the perspective of green education, imparting knowledge about climate change and encouraging pro-environmental practices are vital.

Climate change presents the most serious environmental problems that humanity has not yet come across. It is much more than merely hot air and melting ice. Its far-reaching consequences extend beyond where people can inhabit or produce their food. The United Nations Framework Convention on Climate change has been prefigured that an overwhelming majority especially from developing countries will face the risks of food and water and innumerable threats to health and life due to climate change.[23]

Currently, climate change has been accepted beyond any doubt as an emerging emergency that requires fundamental and immediate action. The progressions required range from the local to worldwide, from the day-to-day activities of individuals to economic and social development programmes and new types of international agreements. Although at the initial stage, the development towards laying down international conventions or agreements and structures into place has been slow, currently public awareness and pressure are on the rise and thus, there are expanded political responsibilities to deal with climate change and make use of education to address this concern. It is undisputed that developing countries are the most vulnerable against climate change because they have a lack of resources to adjust socially, technologically andfinancially.

As Besada et al[3] state, "Climate change is already a reality in Africa. There are prolonged and intensified droughts in eastern Africa; unprecedented floods in western Africa; depletion of rain forests in equatorial Africa and an increase in Ocean acidity around Africa's southern coast". The impacts of climate change are already pushing the African continent under pressure andmany areas in Africa are now recognized as having climates that are among the most variable in the world on seasonal and decadal time scales. Strangely enough, floods and droughts can occur in the same area within months of each other[3].

Famine and widespread disruption of socio-economic well-being are becoming the norms rather than the exception. According to an estimate, about one-third of African people already live in drought-prone areas and220 million are exposed to drought each year[8]. The effects of global climate change are now believed to be unavoidable even if strict global emission reductions and mitigation efforts are put in place.

Therefore, "adaptation" has emerged as a crucial policy response to manage the impacts of climate change. Numerous African Governments including Eritrea, have given "adaptation" action a high and urgent priority. Though adaptation to climate change is a complex issue that is affected by many social, economic, political and gender-based factors, it can be greatly improved by climate change awareness of the general public. It is vital first to understand the adverse effects of human actions and secondly to take

appropriate action under the national adaptation policies and programmes on climate change.

Nevertheless, particularly in developing nations, very few people are conscious of the causes and adverse effects of climate change. Therefore, assessing the levels of understanding of climate change and educating the citizens from all walks of life should be of great interest and utmost priority to intellectuals and policymakers. It should be underlined that awareness plays a significant role in responding to climate change. It can help politicians understand the priority and importance of making the right policies and mechanisms to combat it. Communities, vulnerable communities, in particular, can learn about how climate change will affect them, what they can do to protect themselves from negative consequences andhow they can reduce their negative contributions to this change.[23]

In the world of environmental changes, it becomes imperative to have an adequate understanding of climate change. Ignorance or unawareness now can have negative repercussions for future generations. Eritrea had ratified the UNFCCC on 24 April 1995 to join hands with the international community in the mitigation and adaptation of climate change[2] and in accordance with this, the country has prepared its Intended Nationally Determined Contribution (INDC) for the period 2020-–-2030.

Mitigation is not the main concern for Eritrea, as it is true with all third world countries. However, adaptation measures to climate change are of paramount relevance for sustainable development. Therefore, the "adaptive capacity" of a nation is directly related to an adequate degree of knowledge, perceptions and levels of awareness that its citizens have on climate change.

Ascertaining level of climate change knowledge in different sectors of society is, therefore, a crucial aspect of dealing with future climate change. We strongly believe that there is a gap that must be filled on the issue of climate change awareness in Eritrea by increasing knowledge and perception levels. Through this, people will be in a better position to perceive the adaptation policies of the Eritrean Government and take all plausible measures to improve climate change adaptive capacity. Eritrea, under its obligation to the UNFCCC, has forwarded the intended adaptation goals to its citizens. However, higher levels of climate change awareness should come first in order to ensure the success of the adaptation goals.

Review of Literature

There is substantial proof of linking higher education to supportive ecological conduct. Numerous empirical investigations have shown that individuals with more years of formal education have better access and exposure to a variety of information that helps them in reducing emissions or adapting adequately to change their actions vis-à-vis climate change.[4] In the United States of America, people with higher education are bound to adopt energy-efficient behaviours.[20]

Environmental knowledge and other factors influencing pro-environmental behaviour include formal and casual training sources, gender, inspirations, mentalities andperceived effectiveness of pro-environmental behaviour. Contrasts are found between students from developing and developed countries owing to the difference in external factors such as culture, environmental structures andservices in each country. These external factors might play a paramount role in university students' behaviour towards the environment.[25]

Perceptions of climate change differ among gender, men and women. Past research suggests that women report more substantial pro-environmental qualities, convictions andperspectives than men[6]. The socialization theory postulates that individual standards of conduct are moulded by gender-orientation desires inside the setting of cultural norms.

According to the available literature on climate change, women tend to have different insights towards climate change than their male counterparts.[19] Climate scepticism showed up especially common among older adults from the middle-class section of the society who are politically moderate and hold conventional values. Conversely, the youth from higher socio-economic backgrounds are well aware and have better ecological qualities.[18] Students' changing attitudes towards human-incited climate change can frequently present extraordinary challenges such as conceptual difficulties and misinterpretations regarding the distinction between the weather and climate.[17,21,22]

The subject of the role of humans in climate change can be thoughtfully difficult andsome students see it as both disputable and complex. This introduces distinctive challenges for engaging students productively with the content.[21] Subsequently, notwithstanding the association between education level and attitudes andconcerns for nature, as a whole education on climate change is still in its evolving stage in various countries, including the United States.

Given the impact that climate change will have on their industry, there is by all accounts an overall absence of comprehension of the degree of information and impression of climate change held by people examining the travel industry as a scholastic major. While one could argue that understanding climate change issues is vital at the general college level[21], a study by Leiserowitz, Smith and Marlon[16] reports that only 25 per cent teens and 30 per cent adults demonstrated a somewhat comprehensive knowledge concerning climate change. The literature on climate change knowledge and attitudes is chiefly centred around primary and secondary school children with just restricted and dated information on college students.[26] The relevance of climate change for society appears to be undeniable: scientific

evidence focuses on a huge human commitment in causing climate change, the effects of which will progressively influence Government assistance. To meet national and international greenhouse gas (GHG) emissions reduction targets, there is an urgent need to comprehend and enable societal engagement in mitigation.

However, recent research specifies that this involvement is currently limited, even though consciousness of climate change is inescapable; understanding and conduct commitment are far lower. Recommendations for mitigative "individual carbon budget" infer a requirement for open comprehension of the causes and consequences of carbon discharges in order to decrease the outflows, be that as it may, little has been done to think about the arranged implications of carbon and vitality in regular day-to-day life and decisions.[27] Socio-demographic factors assume a vital role in risk perceptions of climate change. Beyond the influence of a student's academic discipline, numerous preceding researches have stated that the gender orientation should be considered while breaking down conduct since it can impact attitudes, beliefs, opinions and so on.[28]

Huang and Shih[7] contend that ecological information is identified with an understanding and ensuing concern regarding regular habitats and advances a person's obligation towards natural insurance. Furthermore, there is a noteworthy connection between education level and the types of attitudes and perceived concerns that people have towards the conditions of nature.

Population and economic growth will represent a large portion of the foreseen development in GHG emissions in the following century. Education is linked with development andthe world population in the future seems to be probably better educated than today. Past investigations of family vitality requests and related emissions have not straightforwardly thought about the results of a more educated population.

Past studies assessed the vitality power of utilization dollars and the all-out effect of family units as per their demographic characteristics with specific regard for contrasts in ways of managing money by instruction and ecological outcomes.[20]

Defeating students' misconceptions might be a challenge when teaching about phenomena, for example, climate change. Understudies will, in general, refer to transient climate impacts as proof to help or disprove long-term climate change which shows a principal misconception about climate and weather differentiations. Disarray about climate and atmosphere may likewise reflect understudy misconception about deep time, a concept that spans several scientific content areas.

This study inspects the connections between understudies' comprehension of deep time and their understandings of the differentiation between climate and weather just as how these understandings impact students' perceptions about the believability of human-instigated global climate change.[17]

Material and Methods

The objective of this study is to determine the levels of climate change knowledge, perception and awareness among the students of higher education in Eritrea. College students were purposefully selected for the study because of their unquestionable importance and contribution to society. They are the best agents for change andsociety will be influenced and advanced by the upcoming younger generations. As future citizens, very soon they will be in a position of responsibility where the implementation of the climate change adaptation policies will be carried out. Potentially they will be the policymakers of tomorrow andit is essential to determine college students' conceptions or misconceptions regarding climate change.

Furthermore, the choice of college students for the unit of observation was guided by the vital role they will play not only in imparting knowledge on climate change but also in shaping attitudes and behaviours of the communities they will interact with. As the present study focuses on the knowledge, perceptions and awareness of climate change among the students of higher education, it includes all six higher educational institutes in Eritrea: College of Arts and Social Sciences (CASS), Eritrean Institute of Technology (EIT), College of Marine Science and Technology (COMSAT), Hamelmalo Agricultural College (HAC), College of Business and Economics Halhale (CBEH) and Asmara College of Health Sciences (ACHS).

Methods of Data Collection: The study employed a qualitative method of research using a structured form of a questionnaire to obtain information and responses of the sampled population to examine their climate change knowledge, perceptions andawareness level. It included 30 closed-ended questions with "true", "false" and "I do not know" as response options. The questionnaire covered various aspects of the current climate change issues at global and local levels. It is believed that closed-ended questions probably limit the responses to the topics. Therefore, six open-ended questions were also incorporated. Additionally, the survey questionnaire in this study consisted of four-point Likert scale questions ("strongly agree", "agree", "disagree" and "strongly disagree" response section). The questionnaire for this study was customized from and prepared based on a wide range of previously utilized and validated awareness surveys.

Primary Data: As a primary data source, a total of 300 questionnaires were prepared and distributed out of which 291 questionnaires were acceptably completed. Furthermore, extensive semi-structured interviews were conducted with concerned Governmental authorities such as the Ministry of Land, Water and Environment and the Ministry of Education, especially curriculum head, on the geography panel of the State of Eritrea. Besides, non-

governmental bodies such as the United Nations Development Programme (UNDP), the representative body for the United Nations Environmental Programme (UNEP) and the UNFCCC were also interviewed to enrich secondary sources of data for the study.

The questionnaire was divided into two parts: Part I contained the demographics and part II enclosed the six parameters under knowledge, perception and awareness (KPA) (Figure 1).

Secondary Data: The study also reviewed several relevant literatures and previous research works from both published and unpublished sources such as journals, reports and books to enrich the introductory and literature review parts of the research work.

Analytical Techniques: Simple descriptive statistical techniques were used to analyze the data obtained for the study. The values obtained were first designed on a computer software called epi info, later inputted in a different software-Statistical Package for Social Sciences (SPSS version 21.0) to analyze the collected data. Tables, frequency counts, percentages and cross-tabulation were determined. The findings were presented in graphical forms using pie and bar charts to ensure adequate illustrations which were further supported with explanations and discussions.

Study Area

Eritrea is one of the countries in the horn of Africa which covers an area of about 124,000 sq. km, lying at the north of the equator. It sprawls between 12º to 18º north and 36º to 44º east. Eritrea is shaped like a hatchet; the handle of the hatchet is in the Red Sea in the east. Her neighbours include Sudan in the north and northwest, Ethiopia in the south, the Red Sea in the northeast and east and Djibouti in the southeast (Figure 2). Eritrea ratified the Vienna Convention and the Montreal Protocol on 2 March 2005 and all four amendments on 27 June 2005.

However, Eritrea had already realized the problems associated with Ozone Depleting Substances (ODSs) on human health and other life forms well before it ratified the convention. As a first step to address the concern, Eritrea, through the Department of Environment of the Ministry of Land, Water and Environment, has undertaken a nationwide inventory of ODSs and ODS-based equipment in 2002.

Levels of climate change awareness in Eritrea: The literature on public awareness and perception of climate change in Eritrea is understudied due to lack of research. According to the Ministry of Land, Water and Environment, no formal survey was carried out to assess the levels of climate change awareness of the Eritrean public (Interview 1).

The survey in this research study on the subject of climate change awareness among Eritrean college students is believed to be the pilot study in the country. Although the issue of climate change as a concept might not be widely and deeply understood among the Eritreans, their ample knowledge of changing weather patterns and high levels of enthusiastic participation on the adaptation programmes could be indicative of sufficient informal awareness.

Courses offered on climate change in Eritrean colleges: The courses were offered at the six Eritrean colleges: College of Arts and Social Sciences, Eritrean Institute of Technology, College of Marine Science and Technology, Hamelmalo Agricultural College, College of Business and Economics Halhale and Asmara College of Health Sciences that were a part of the survey (Table 1).

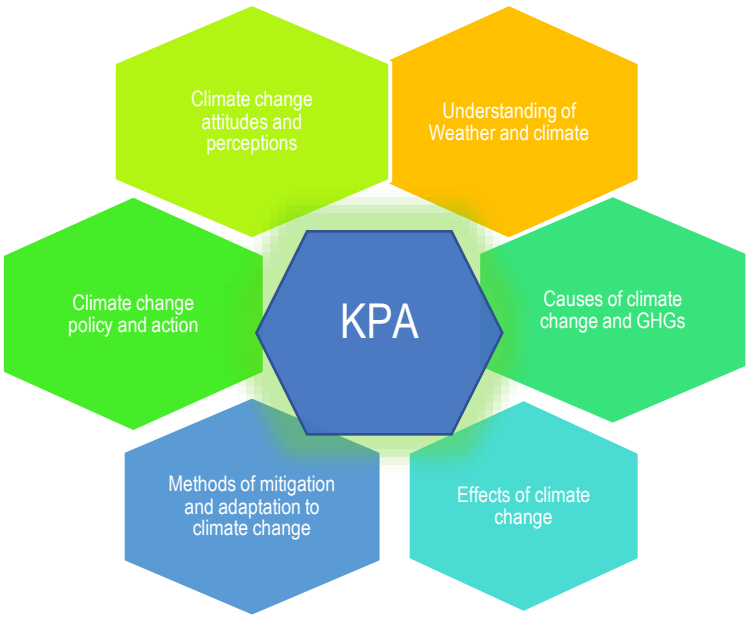

Figure 1: Schematic diagram of the questionnaire base (KPA)

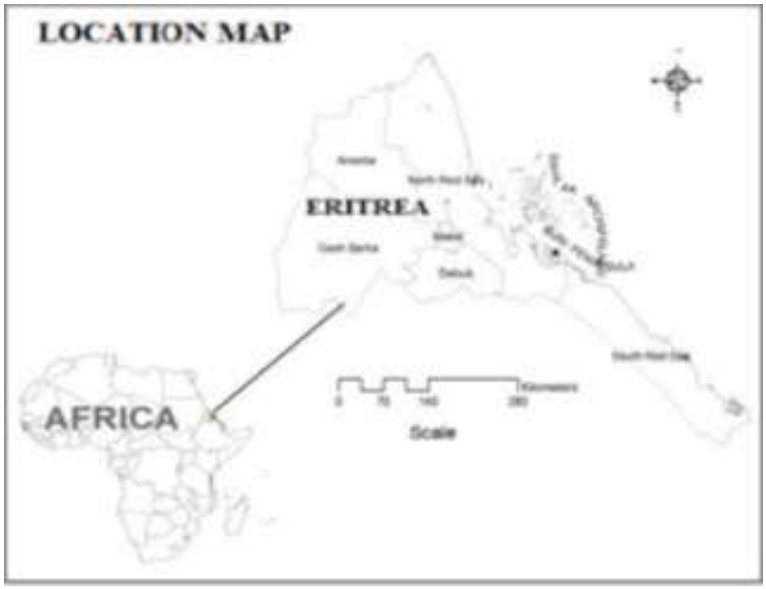

Figure 2: Location Map of Eritrea

Table 1
Number of Courses Offered in Eritrean Colleges

S.N.	Name of the college	Total no. of courses offered	No. of courses on climate in general	No. of courses on climate change
1	College of Arts and Social Sciences (CASS)	295	2	Nil
2	Eritrean Institute Technology (ETI)	743	1	Nil
3	College of Marine Science and Technology (COMSAT)	299	Nil	Nil
4	Hamelmalo Agricultural College (HAC)	403	1	Nil
5	College of Business and Economics, Halhale (CBEH)	222	Nil	Nil
6	Asmara College of Health Sciences (ACHS)	334	Nil	Nil
	Total Number of courses in all Eritrean colleges	**2,296**	**4**	**Nil**

At the College of Arts and Social Sciences, Adi-Keih, only two courses on climate. Introduction to Climate, course code (221) and Applied Climatology, course code (222), were offered at the third-year in their first and second semesters respectively (Interview 2).

The Eritrean Institute of Technology, Mai Nefhi, offers the largest number of courses—743 in total, but there is only one course on climate, in general. Department of Geography in the College of Education has a mandatory course on Introduction to Climate, course code (231) in the first semester of the second year (Interview 3).

Out of 299 courses in total, no single course on climate is offered at the College of Marine Science and Technology (Interview 4). Energy and climate change could be considered to be the best course on climate change that is offered at the Hamelmalo Agricultural College, Department of Land Resources and Environment (Interview 5).

There are 222 various courses provided at the College of Business and Economics, Halhale, but no single climate-related course has been opted by students (Interview 6). The same is also the case with Asmara College of Health Sciences, Asmara with no climate course out of a total of 334 courses (Interview 7). It is imperative to highlight that several different courses are covering environmental topics in general. However, there is no single dedicated course on climate change in any Eritrean colleges surveyed.

Results and Discussion

This research has analyzed several parameters through questionnaires to derive possible outcomes.

Demographics: A total of 291 respondents from the six Eritrean colleges have participated in this survey. The majority of college students are between the ages of 18 (3.4 per cent) and 24 (21.6 per cent) and about 18.1 per cent are above the age of 25 (Table 2) with a distribution of 54.6 and

41. 6 per cent of males and females respectively. About 3.8 per cent missed mentioning their gender (Table 3). Age and gender were not found to be determinant factors for the students' knowledge, perceptions andlevel of climate change awareness in Eritrea.

The distribution of the sample based on "year of study", that is, between year 1 and year 5, saw a considerable difference. The majority of the students were in the second year (41.6 per cent), which accounted for 121 students followed by fourth-year students (24.7 per cent), or 72 in all, followed by third-year students (21.3 per cent), or 62 students and finally first-year students (9.6 per cent) who were 28 in number.

Consistent with the overall number of students in the Eritrean colleges, the least number of students in the sample was from the fifth year, 8 in all, who constituted 2.7 per cent (Table 4). The difference in the levels of understanding of the climate change issues between the different colleges and the year of study was also found to be negligible.

Knowledge of Weather and Climate: The first part of the survey dealt with basic knowledge about the weather and climate. It was found that there exists a lack of clear understanding among the students between the issues of weather and climate. The basic concepts seem to be indistinguishable. While 49.3 per cent of the respondents have correct scientific knowledge about the subject, about 41.2 per cent did not clearly comprehend the relationship between weather and climate.

The remaining 8.8 per cent of the respondents indicated that they have no definitive idea or could not be sure. Most of the respondents 81.5 per cent assumed climate change and global warming to be the same and agreed that climate change is the cause of global warming.

Causes and Effects of Climate change and GHGs: Awareness about the causes of climate change among college students was tested with the questions from 8 to 15. The first four questions of this part of the questionnaire produced the highest number of correct answers. A total of 93.5 per cent of the students correctly identified that "burning fossil fuel causes climate change" (Figure 3, question 8).

A much higher level of correct answers was chosen which identifies that students have a good knowledge of the effects of cutting down trees (question 9). Damage to the ozone layer and its relationship to climate change were also correctly answered by 90.1 per cent of the students (question 11).

Table 2
Student's Age Range (n=291)

Age	Frequency (n)	Per cent (%)
18	10	3.4
19	46	15.8
20	63	21.6
21	51	17.5
22	33	11.3
23	24	8.2
24	12	4.1
25>	26	18.1

Table 3
Student Gender Breakdown (n=291)

Gender	Frequency (n)	Per cent (%)
Male	159	54.6
Female	121	41.6
Missing	11	3.8

Table 4
Year of Study and Number of Students in the Sample (n=291)

Year of study	Frequency (n)	Per cent (%)
1st year	28	9.6
2nd year	121	41.6
3rd year	62	21.3
4th year	72	24.7
5th year	08	2.7

However, a considerable percentage of the students, that is, 65.2 per cent, believes that ozone layer depletion is the leading cause of climate change (Figure 4 question 12). A total of 28.1 per cent did give incorrect answers to the causes of the GHG effect (question 13) and 34.0 per cent did not believe that without GHG, the earth could be as cold as the outer atmosphere (question 14). Eritrea ratified the Vienna Convention and Montreal Protocol on 2 March 2005 under the responsibility of the Ministry of Land, Water and Environment for phasing out the Ozone-depleting substances (ODSs) that deplete the ozone layer. For this purpose, Eritrea established separate departments that care about ozone affairs. Even before, Eritrea had been playing a considerable role in such issues.[1]

Students generally had a better understanding of respect to knowledge which relates to the causes of climate change, but exceptions are common. On average, 69 per cent of students answered these eight questions correctly, 20 per cent incorrectly and11 per cent "did not know" the answer.

On questions regarding the effects of climate change (questions 16 to 23), the level of understanding is also reasonably good. A total of 85.6 per cent of the respondents correctly answered to the question of whether climate change can cause sea levels to rise (question 18) and 90.2 per cent knew that more flooding and droughts could be caused as a result of climate change (Figure 5, question 20).

11.3 per cent wrongly believed that climate change could help in stopping diseases (question 21), another 21 per cent answered "I do not know" to this question. On all the eight questions related to the effects of climate change, an average of 72.9 per cent got the correct answers.

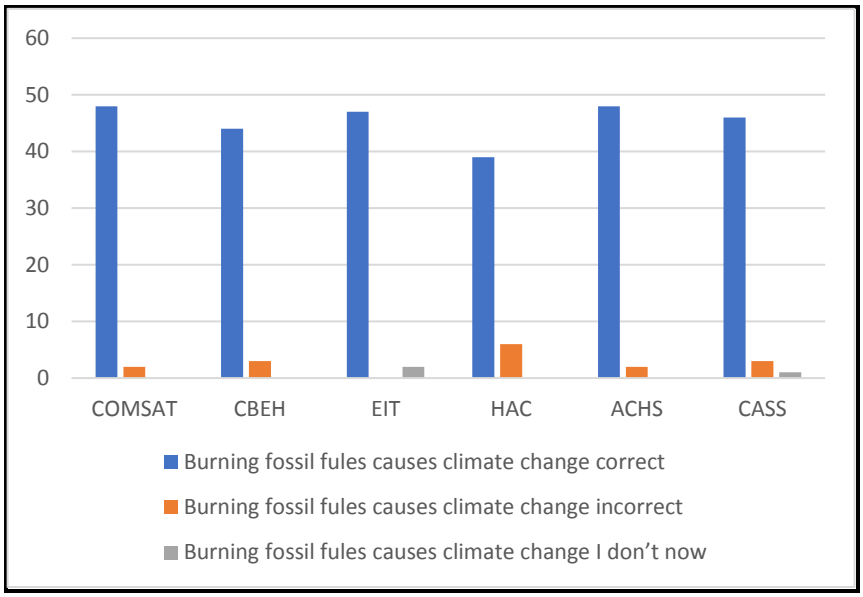

Figure 3: Burning fossil fuel causes climate change

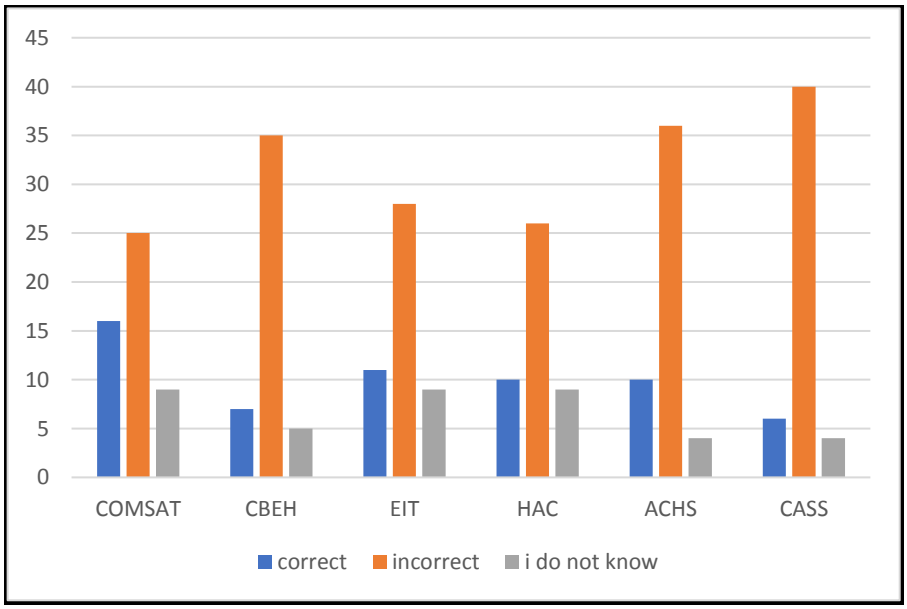

Figure 4: Ozone layer depletion is the main cause of GHG effect

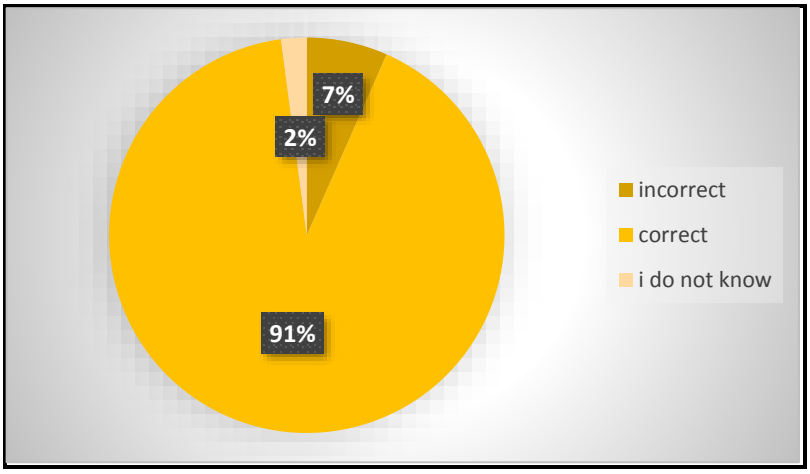

Figure 5: Climate change can cause more flooding and droughts

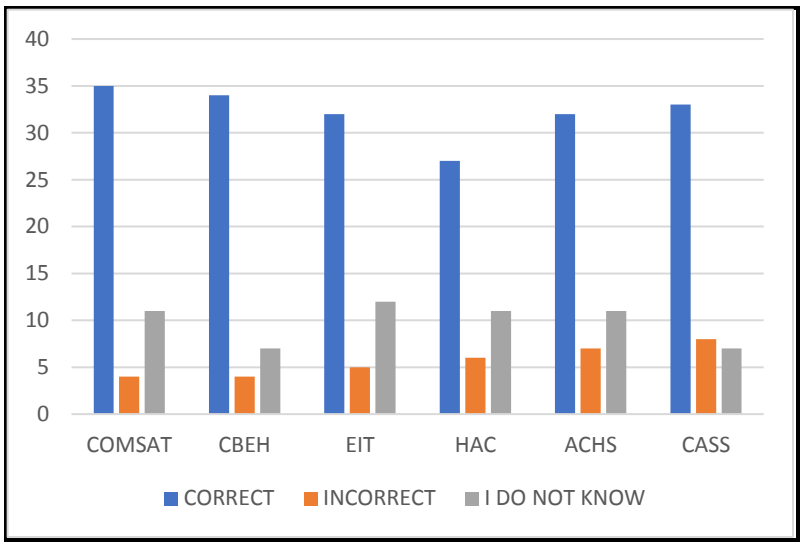

Figure 6: Climate change can help stop diseases

Methods of Mitigation/Adaptation to Climate change: The next seven questions of the questionnaire (questions 24 to 30) attempted to test students' knowledge of climate change mitigation and adaptation. More than half of the students, that is 52.6 per cent, incorrectly answered the question that climate change could be mitigated by using more land to grow food (question 24). High percentages of students correctly recognized public transport (question 25) and planting trees (question 29) as climate change mitigation measures (85.0 per cent and 93.2 per cent respectively).

Similarly, the use of renewable energy and reducing electricity use were identified correctly by 50.2 per cent of students as ways to adapt to climate change.

A total of 21.3 per cent of the students did not know when asked about the ability to adapt to climate change by consuming more organic produce (question 27). In comparison, 36.8 per cent incorrectly believed that using more electricity can help "stop" climate change. On average, 60.0 per cent answered the questions correctly, 25.0 per cent answered incorrectly and15 per cent "didn't know" the answer (Figure 6).

Climate change Policies and Action: Here, the students were presented with six open-ended questions that dealt with the major international conventions and institutions covering the issue of climate change. The knowledge of UNFCCC, IPCC, national adaptation programmes and the country's efforts also addressed climate change. Although all the students (100 per cent) have heard about the issue of climate change, a majority (about 85 per cent) of the respondents had no information on the international framework agreements in dealing with this issue. Furthermore, the levels of understanding by the remaining minority were observed to be insufficient. Majority of all students said that the mass media is their primary source of information on climate change.

Climate change Attitudes and Perceptions: There was a general understanding of the various issues raised. A total of 71.0 per cent strongly agreed that human activities have a significant impact on climate change and the majority of students (88.8 per cent) either agreeing or strongly emphasized that all countries should educate to increase awareness about climate change. Similarly, up to 54 per cent of the students strongly disagreed to the fact that there are

already enough teachings on climate change while 80.7 per cent were interested to learn more about climate change. The reflections states, that awareness should be created in order to curb the human activities on climate change.

Conclusion

As stated earlier, an overwhelming majority of Eritrean students at the higher education level have good knowledge, better perceptions andenough awareness about climate change. A high percentage of students correctly recognized climate change mitigation measures. Relating to the effects of climate change, the level of understanding is also reasonably good. In terms of behaviour, students with lower levels of knowledge were significantly more likely to find uncertainties related to climate change to be a greater obstacle for engaging in pro-environmental behaviours.

Higher levels of knowledge allow individuals to assess better the threats posed by climate change and reduce the perceived level of uncertainty related to it, which impacts their pro-environmental behaviours. Even though the Eritrean students generally believe in and are concerned about climate change, the least effort is being made at a personal level to reduce greenhouse gas emissions.

However, no in-depth course on climate change is taught anywhere in any of the Eritrean colleges. This study revealed that Eritrea's efforts to implement climate change-related information in the higher education system have not been effective; hence, the level of efforts should be broadened to reach the public as a whole. Thus, the present research recommends for relevant policy reviews and adjustments at the Governmental level on the one hand and create awareness both at the individual and social level on the other hand to ensure sufficient levels of climate change knowledge among the higher education students that in turn will help to enhance the effective implementation of the National Adaptation Programme of Action.

Indeed, a special effort is needed by the Government to promote personal and civic potency. According to the Ministry of Land, Water and Environment of the State of Eritrea, this study on climate change awareness is necessary. Therefore, it may prove to be a milestone to open the doorway for further research on similar issues.

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