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Perceptions of Climate Change among Natural Resources Management Students at Jimma University, Ethiopia

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Abstract

Climate change is any change from normal condition of the atmosphere. These changes include increase or decrease in temperature, rainfall fluctuations, wind patterns change, melting of snow and others. Increasing of temperature and rainfall fluctuations have been escalating the exposure of the country to drought and environmental problems. The study was conducted in Jimma University College of Agriculture and Veterinary Medicine, Department of Natural Resources Management, to examine the perception of students on climate change. Students' understanding on major environmental problems, main cause of climate change, students' perception on climate change and the way forward to overcome the problems of climate change were assessed using questionnaire survey which consisted 182 purposively sampled respondents. For data collection open and close ended questionnaire were employed and distributed to students. The collected data were analyzed using Microsoft office excel and Statistical Package for Social Science (SPSS) version 20. Descriptive statistics such as frequency and percentage were employed to compute the perception of students on climate change. The outcome of the study indicates that climate change is one of the top environmental problems and 92.9% of the respondents perceived that climate change affects the Ethiopian economy and 87.9% of the respondents agreed that climate change is a real problem of a country, 85.2% agreed that climate change affects human health and 74.7% of the respondents perceived that climate change disturb the ecosystem services.

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The study suggests that human beings should do something to combat climate change; industrial sectors are supposed to do more to tackle climate change and people awareness are required to bring the attention of the community at grass-roots level to overcome the problem of climate change in Ethiopia.

Keywords: climate change; environmental problems; rainfall; perceptions; temperature.

1. Introduction

The term climate change is widely spoken across the world in 21th century because of its impact on the life of people. Climate change can cause social and economic disruption and requires urgent attention [1]. Climate change is defined in different ways. The Intergovernmental Panel on Climate Change [2] defines climate change as any change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. According to the US Environmental Protection Agency [3] rising global temperatures have been accompanied by changes in weather and climate and human beings are largely responsible for the world climate change. According to the United Nations Framework Convention on Climate Change [4] the rising global average temperature, increasing ocean temperature, changes in rainfall pattern and gradual melting of glaciers are the most prominent effects of climate change.

The issue of climate change is the question of existence of living things. Many global issues are climate related, including basic needs specifically food, water and health. Based on the study conducted in Benin [5] climate change affects the biodiversity, food security, water availability and health, especially in Africa. Climate change affects productivity level of Africa [6]. Report by the [2] described that climate change is associated with the way in which we live our lives and it is induced by human beings.

Climate change is real and substantially caused by human beings [1]; however, the level of understanding varies among different people including skilled man power. Assessing the experiences, perceptions and responses of people is relatively recent changes in climate that can support the development of adaptive capacity and help to formulate policy in local realities [7]. Considering local perception on climate change can contribute to scientific understanding for designing an adaptive management and governance system [8, 9, 10]. Through better understanding of the attitudes of people, the decision makers can guarantee the interest of the people for climate change adaptation initiatives [11]. A person's views can be shaped by factors such as their life experiences to their shared opinions on how to manage resources [12]. Evaluating perceptions and response to climate change includes exploring what these perceptions are, how they are formed and how perceptions affect response.

Analyzing the perceptions of people is important for policy makers and implementations. Perception is defined in different ways: the oxford dictionaries defined perception as the ability to see, hear, or become aware of something through the senses. Perception is the process by which organisms interpret and organize to produce meaningful experiences of the world [13].

Global warming is one of the effects of climate change. Global warming is the increase of average temperature

of Earth's atmosphere and oceans [14] due to the effect of greenhouse gas (GHG) which trap heat that would otherwise escape from Earth. Most of the global warming over the last 50 years is likely to have been caused by increased concentration of GHG in the atmosphere. Human beings increased the amount of GHG in the atmosphere since the beginning of industrial revolution of 1750's.

''If global warming is mainly due to anthropogenic GHG emissions, GHG mitigations policy may be justified; however, if it is not the case, there is little reason to sacrifice about 0.12% economic growth'' to stabilize CO_2 concentration [15]. In spite of lack of common understanding on the main sources of global warming, people have common fear on the impacts of climate change (e.g. changes in rainfall patterns, reduction of yields from agricultural fields, melting of the ice caps, increasing of extreme events like flooding and hurricanes, rising sea level, melting of glaciers, loss of plankton from ocean, bleaching of coral reefs, and storm-related infection diseases). Global climate change threats the well-being of human beings and non-human species that affects air quality, stimulating more extreme weather events and enhancing heat stress conditions [16].

Global warming adversely affects the economy of a country. It is estimated that an increase in 3.0^0c in temperature can be as much as decrease by 3% of a country's GDP [17, 15]. The world temperature is increasing due to the anthropogenic and natural causes and predicted the global surface temperature is likely to rise by 1.1 to 2.9^0c for their lowest emissions scenario and 2.4 to 6.4^0c for their highest emissions [2].

Developing nations are more affected by climate change [18] because of their reliance on agriculture, lower financial, technical, and institutional capacity to adapt [19, 20]. Africa contributes the least to climate change globally but will be the most affected and vulnerable region to climate change [5, 6]. From Africa continent, Ethiopia is among the world countries which are predicted to be most affected by climate change and variability which includes: temperature rise, rainfall decrease, drought and floods [10]. Because of heavy dependence on rainfall agriculture, climate change adversely affects the Ethiopian economy [21, 22, 23, 24, 25, 26].

Ethiopia is the second most populous country in Sub-Saharan Africa with a population of 94.1 million and population growth rate of 2.6% [27]. Majority of the Ethiopian economy is dependent on agriculture and live in rural areas. Agriculture contributes about 44% to the country gross domestic product (GDP) and about 84% of the national population is rural, deriving livelihoods from agriculture and natural resources [22].

Drought and floods are the two most recorded climate change related disasters in Ethiopia. One event can be a disaster when a hazard impacts on vulnerable people. Disaster is both nature and human induced. The International Federation of Red Cross and Crescent Societies define the term disaster as ''A sudden, calamitous event that seriously disrupts the functioning of community or society and causes human, material, and economic or environmental losses that exceed the community's/society's ability to cope using its own resources.'' According to the EM-DAT: The OFDA/CRED International Disaster Database [28], disaster can entered and registered in the database at least one of the following criteria has to be fulfilled: 10 or more people reported killed, 100 people reported wounded, a call for international assistance and declaration of a state of emergency.

The various hazards, like drought, untimely rain, hail storm, crop pest and diseases, depletion of soil fertility,

human disease and strong winds are the direct products of climate change [26, 29]. Similar to other Sahel African countries, Ethiopia was affected by flood and drought and has suffered more deaths through drought over the last century than any African countries [21]. According to the EM-DAT report [28] that Ethiopia was seriously affected by flooding and drought in 1960'5, 1970's 1980's 1990's and also in 21th century. The EM-DAT documented that drought was registered in Ethiopia in 1965,1969, 1973,11983, 1987.1998, 1999, 2003, 2005, 2008, 2009, and 2011. The EM-DAT, also documented the occurrence of flooding in 1994, 1999, 2005, 2006, 2011, 2013 (www.em-dat.net).

So far, various researches were conducted on climate change related topics with less emphasis on perception of people towards climate change. Accordingly, little is known about the perceptions of climate change in Ethiopia. The objective of this study is to assess the climate change perceptions among Natural Resources Management students of Jimma University.

2. Materials and Methods

2.1 The study Area

The study was conducted at Jimma University College of Agriculture and Veterinary Medicine, Oromia National Regional State, Jimma Zone, in southwestern Ethiopia, located about 346 km south west of Addis Ababa (Fig 1). The university is situated in Jimma Zone, one of the main coffee growing regions in Ethiopia. As it described on its website (http://www.ju.edu.et/) the vision and mission of Jimma University is to be the leading public premier in the country, renown in Africa and recognized in the world. Jimma University accommodate 42, 672 students in various program in the academic year of 2014/2015.

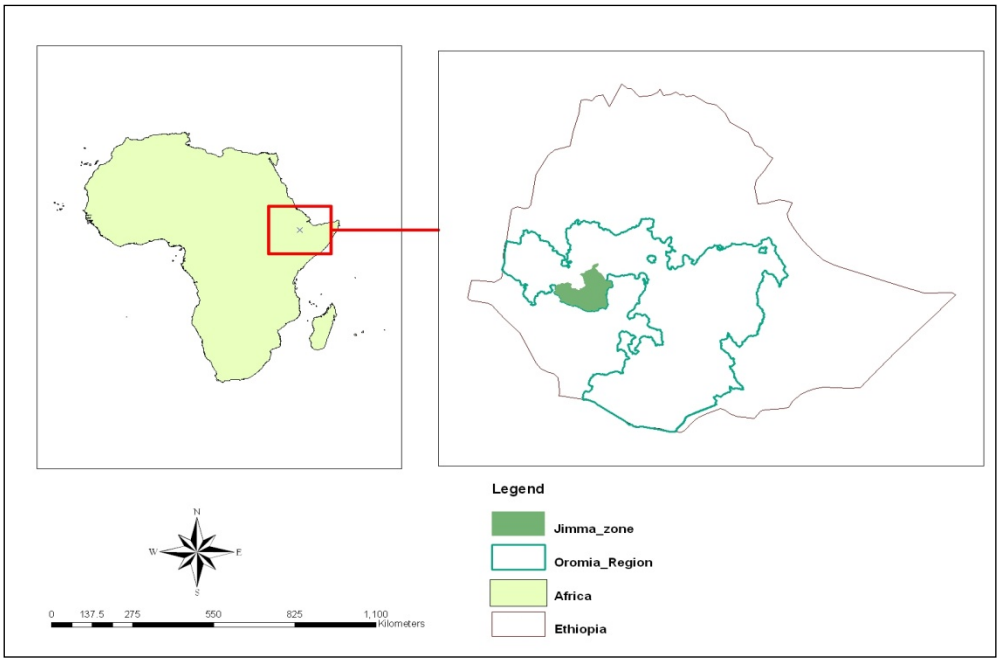

Figure 1: Map of the study area

2.2 Methods

The respondents were purposively sampled from Jimma University College of Agriculture and Veterinary Medicine, Department of Natural Resources Management. The Department of Natural Resources Management was selected because of two factors: 1), they are expected to know more and analyze the possible impacts of climate change on natural resources and 2) they should take future responsibility on the implementation of climate change adaptation and mitigation strategies after their BSc and MSc graduation. A total of 182 respondents were sampled from which 166 undergraduate and 16 postgraduate students (93 males and 89 females) took part in this research.

2.3 Data collection and Method of analysis

After conducting literature review on climate change perceptions, open ended and close ended questionnaire were developed and distributed to undergraduate and postgraduate students of Natural Resources Management. Next, the respondents answered the open and close ended questionnaire developed by the researchers.

The questionnaire are structured as follows: participants answered first the basic demographic information: gender, age, educational levels, religion, residential areas; urban or rural, and birth place and secondly, they list the major environmental problems of Ethiopia (Table 3) and main causes of climate change (Table 4), followed by ten questions on student perceptions towards climate change(Table 5) and six questions to assess students understanding on climate change with two alternative answers (Table 6) and lastly, based on their experiences they prioritized the possible way forward to overcome the problem of climate change based on their perceptions and experiences (Table 8 to 10).The listed ways forward used a five-point Likert scale [30] from 'Strongly Agree' to 'Strongly Disagree' to analyze the possible solution for climate change problems.

Information was recorded on SPSS. Data collected on each question was expressed as percent of respondents. The Quantitative data were analyzed by using SPSS and Microsoft Excel 2007 for data management and analysis. Descriptive statistics such as frequency and percentage were used to analyze the perception of students on climate change and the findings were presented using tables and figures.

3. Result and Discussion

In this research a total of 182 students were involved in the survey. The age of the respondents varies from 20 to 34 years of age with an average age of 21.79 (Table 1).

Table 1: Age of respondents (N=182)

Age of Students	20	21	22	23	24	25	26	27	28	29	30	31
Percent	61	46	29	19	8	4	2	3	3	2	2	3

All undergraduate (166) and 16 postgraduate students of Natural Resources Management were involved in the survey. Of the total 182 respondents, 63 students of third year, 56 of 2nd year and 47 students of 1st year undergraduate and 7 students of 1st year and 9 students of 2nd year Postgraduate students took part in the survey (Fig 2).

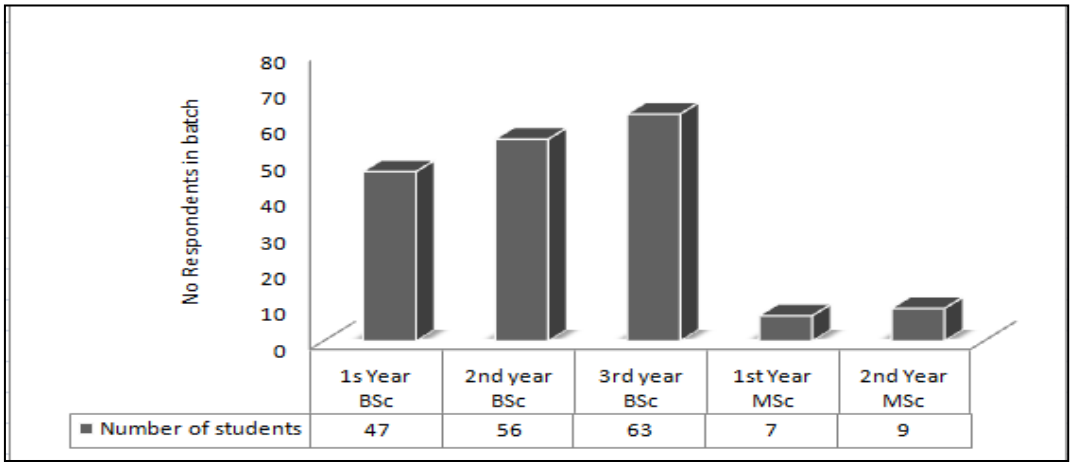

Figure 2: Distributions of respondents per year and batch

The respondents joined Jimma University to attend BSc and MSc program from five Regional States and one city administration and majority (60%) of the respondents were from rural areas where agriculture is a predominant economic activity. This situation brings an opportunity to analyze the perception of students on climate change in comparison with agricultural yield productions. The findings support the report of [19, 20, 18], that developing nations like Ethiopia are more affected by climate change because of rainfall dependence agriculture. As demonstrated in (Table 2) the respondents come from different regional states across Ethiopia. From the existing regional states Oromia accounts about 39.6%, Amhara 29.7%, Southern Nations, Nationalities and Peoples Regions (SNNPR) 18.7%, Somali 7.1%, Addis Ababa city administration 3.3%, Benshangul 1.1% and Afar 0.5%. The geographical distribution of the respondents enables as to judge the perceptions of students across different regional states in Ethiopia.

Table 2: Respondents across Ethiopian Regional States

Regional States	Frequency	Percent
Oromia	72	39.6
Amhara	54	29.7
SNNPR	34	18.7
Somali	13	7.1
Addis Ababa	6	3.3
Benshangul	2	1.1
Afar	1	0.5
Total	182	100

Based on the respondents, climate change is considered as the major environmental problems of Ethiopia. As demonstrated in (Table 3), the postgraduate students ranks climate change (1st rank) is the major environmental problems of Ethiopia followed by deforestation and overpopulation whereas the undergraduate students ranks overpopulation is the major problems followed by climate change and deforestation. All respondents (both undergraduate and postgraduate) students put climate change is one of the top ranking problems in Ethiopia. The total scores of climate change and overpopulation is equal 52 (28.57%) followed by deforestation 48 (26.37%).

The results of this study reveal that there are strong interconnection between overpopulation, deforestation and climate change. More specifically, deforestation is the direct impacts of climate change. There are cause and effect relationship between the three. Because of high population growth rate of Ethiopia (2.6%) and majority of the population depend on agricultural activities; the people are depleting natural resources to get family subsistence and the depletion of natural resources leads to deforestation and climate change. Similar findings were found by [22] in their study **"**extension agents' awareness of climate change in Ethiopia". They found that about 84% of Ethiopian livelihoods derived from natural resources.

With respect to causes of climate change, the respondents rank deforestation 83 (45.6%), rapid population growth 56 (30.7%) and agricultural expansions 21 (11.5%) are the top three main causes of climate change in Ethiopia followed by air pollution 12 (6.6%). The respondents give least concern for road construction and urbanization (Table 4). This is due to mainly; Ethiopia is an agricultural country in which majority of the population lives in rural areas [22].

Table 3: Major environmental problems of Ethiopia

Major environmental problems of Ethiopia	Undergraduate Students		Postgraduate students		Total scores and ranking	
	Scores	Ranking	Scores	Ranking	Total scores	Ranking
Overpopulation	49	1	3	3	52	1st
Climate change	45	2	7	1	52	1st
Deforestation	43	3	5	2	48	3rd
Air pollution	11	4	1	4	12	4th
Poor waste Management	11	4	-	-	11	5th
Flooding	7	6	-	-	7	6th

Evaluation of the students feelings on climate change, increasing of temperature, rainfall fluctuations, climate change evidences, impact of climate change, cause and impact of global warming shows that greater percentage of the respondents perceived the existence of climate change and its associated problems. 92.9% of the respondents declared that climate change affects the Ethiopian economy that depends on agriculture and 88.5% of the respondents declared that climate change reduce crop production and 90.7% of the respondents understand the causes of global warming and 92.3% sense that global warming affects our way of life but had

little confidence (45.1%) on their family knowledge on climate change issues (Table 5). Some 87.9% of the respondents agreed climate change is a real problem of Ethiopia and only 12.1% of the respondents perceived that climate change is not a real problem (Table 5).

Table 4: Main causes of climate change

Main cause of climate change	Undergraduate Students		Postgraduate students		Total scores and ranking	
	Scores	Ranking	Scores	Ranking	Total scores	Ranking
Deforestation	79	1	4	2	83	1st
Rapid population growth	47	2	9	1	56	2nd
Agricultural expansion	18	3	3	3	21	3rd
Industrialization	17	4	0	-	17	4th
Road construction	5	5	0	-	5	5th
Urbanization	0	-	0	-	0	

Table 5: Climate change perception questions

No	Question towards student perceptions on climate change	Yes		No	
		Frequency	Percent	Frequency	Percent
1	Do you feel temperature getting warmer in Ethiopia	156	85.7	26	14.3
2	Do you feel rainfall fluctuations is occurring in Ethiopia	134	73.6	48	26.4
3	Do you feel the pattern of weather is changing in your area?	158	86.8	24	13.2
4	Do you feel climate change is happening in Ethiopia?	156	85.7	26	14.3
5	Do you feel climate change is a real problem of Ethiopia	160	87.9	22	12.1
6	Do you feel climate change reduce crop production	161	88.5	21	11.5
7	Do you feel climate change affect Ethiopian Economy	169	92.9	13	7.1
8	Do you understanding the causes of global warming?	165	90.7	17	9.3
9	Do you feel global warming affect our way of life	168	92.3	14	7.7
10	Do you feel your family believe that climate change is a serious problem?	82	45.1	30	16.5

With respect to increasing of temperature and rain fall fluctuations, results shows that about 85.7% of the respondents agreed that temperature is getting warmer in Ethiopia and 73.6% of the respondents agreed that there is a problem of rainfall fluctuations in Ethiopia. Majority of the respondents (85.7%) said that climate change is happening in Ethiopia (Table 5). A similar finding was reported by [10] on the study of the perceptions of climate change among members of the house of peoples' representatives of Ethiopia.

Table 6 indicates the understanding of students on climate related information. The evaluation results of the respondents shows that there is clear understanding of the issue of climate change. First the respondents were asked if they understand the difference between weather and climate and then, their attitudes on causes and impacts of climate change on ecosystem services at large and specifically on human health. Accordingly, almost 99% of the students understand the difference between the term weather and climate. Majority 86.3% of the respondents agreed that climate change is human induced not from natural causes and 13.7% said that climate change is not human induced but it is due to natural causes.

Concerning the impacts of climate change on human health 85.2% of the respondents agreed that climate change affects human health and 14.8% said that climate have no impacts on human health. The respondents also give concern on ecosystem services; 74.7% of the respondents perceived that climate change might disturb the functioning of ecosystem services. 71.4% of the respondents said that flood after rainfall is common in their region and 64.8% of the respondents had observed drought in their birth place (Table 6).

Table 6: Students understanding on climate change

No	Knowledge and experience based question on climate change	Yes		No	
		Frequency	Percent	Frequency	Percent
1	Do you understand the difference between weather and climate	180	98.9	2	1.1
2	Climate change is human induced	157	86.3	25	13.7
3	Climate change affects health conditions?	155	85.2	27	14.8
4	Climate change can disturb ecosystem services	136	74.7	46	25.3
5	Floods after rains are common in your region?	130	71.4	52	28.6
6	Do you observe drought in your birth place?	118	64.8	64	35.2

4. The way forward for climate change

Climate change problem is accelerated due to natural and anthropogenic activities both in developed and third world countries including Ethiopia. Majority of them are related to industrial expansions and unwise use of natural resources. Climate change is the concern of all people since it affects health, economies, drinking water and conducive environment of people without disaggregation of rich and poor.

All sectors which are involved in GHG emission should do something to overcome the problem of climate change. Accordingly, 47.3% of the respondents strongly agreed that industrial sectors should do more activities to tackle climate change. This is due to the fact that industries releases pollutant gases to the atmosphere that adversely affects climate change (Table 7). Besides, industrial sectors, the government should play an important role to solve the problems of climate change.

The results of the survey shows 33.5% of the respondents strongly agreed that the government is conducting

some tasks to solve the problem of climate change and 20.9% of the respondents had a negative response on government performance and 22.5% of the respondents undecided to provide their suggestion on government practices to undertake the problem of climate change (Table 8).

Table 7: Role of industrial sectors

The industrial sectors should do more to tackle climate change	Frequency	Percent
Strongly Agree	86	47.3
Agree	47	25.8
Undecided	11	6.0
Disagree	16	8.8
Strongly disagree	22	12.1
Total	182	100.0

Table 8: Role of government

The government is performing well to solve climate change	Frequency	Percent
Strongly agree	61	33.5
Agree	42	23.1
Undecided	41	22.5
Disagree	24	13.2
Strongly disagree	14	7.7
Total	182	100.0

Human being is the main contributor to climate change and at the same time, the most responsible organs to address the problem of climate change. This research findings shows that almost 2/3rd (65.9%) of the respondents strongly agreed that human should do something to combat climate change and 14.8% of the respondents also agreed on the involvement of human on climate change adaptation and mitigations (Table 9). Any policy and proclamation cannot be successfully implemented if there is no awareness and support from the mass at grass root levels. Table 10 show that 46.7% of the respondents agreed that people awareness is required to tackle climate change and 22% of the respondents strongly agreed that people awareness can solve the problems of climate change.

Table 9: Role of people

Human should do something to compact climate change	Frequency	Percent
Strongly agree	120	65.9
Agree	27	14.8
Undecided	21	11.5
Disagree	9	4.9
Strongly disagree	5	2.7
Total	182	100.0

Table 10: people awareness

People awareness are needed to tackle climate change	Frequency	Percent
Strongly agree	40	22.0
Agree	85	46.7
Undecided	27	14.8
Disagree	14	7.7
Strongly disagree	16	8.8
Total	182	100.0

5. Conclusions

Climate change is the outcome of natural and human induced activities that adversely affects the life of an individual, communities and nations. Majority of the respondents (86.3%) perceived that climate change is human induced not nature based. The share of human being in climate change is very high; climate change is the output of various economic activities. The results of student perception on climate change demonstrates that Ethiopia has experienced in rising of temperature, rainfall fluctuations and changes of wind patterns that directly affects its economy. Deforestation, rapid population growth, agricultural expansions, industrialization and road construction are the main cause of climate change. The study reveals that climate change is real happening in Ethiopia. Since Ethiopia is dependent on rain fed agriculture, the increasing of extremely temperature and rainfall fluctuations from normal conditions makes Ethiopia more vulnerable to climate change.

6. Recommendations

- Various governmental and NGO's, the industrial sectors and the community at large should do their best to

work on the issues of climate change;

- Afforestation and re-forestation program will be promoted to minimize the impacts of climate change;
- The Ethiopian Ministry of Education should do more to incorporate the issue of climate change and its adaptation and mitigation strategies at all level of education from primary school to higher institutions.

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