**Adamawa State University Journal of Scientific Research**
Volume 9 Issue 2, 2021; Article no. ADSUJSR 0902021
ISSN: 2705-1900 (Online); ISSN: 2251-0702 (Print)
*http://www.adsujsr.com*

# Residents Perception on Climate Change Mitigation using Trees in Jimeta Metropolitan Area Adamawa State, Nigeria

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*(Received in November 2021; Accepted in December2021)*

**Abstracts**
This study examined the residents' perception on the possibility of reducing the global warming using trees in Jimeta Metropolitan Area Adamawa state, Nigeria. The marginal error of 5% adopted from Saunder et al (1997) was used to select 383 household respondents based on the population of 266,422. Proportional factor was used to select the respondents for each ward. Simple random sampling was used to distribute the questionnaire to the selected respondents. Questionnaire was used in obtaining information from the residents on the possibility of reducing global warming using trees. Chi-Square ($X^2$) was also used to test the association between respondent's socio-economic activities and their perceptions on reducing the global warming using trees. Descriptive statistics such as tables, frequencies and percentages were used in analyzing the questionnaire. The results show that, 82% of the respondents agreed that trees help in reducing the global warming. The $X^2$ results showed that, there is association between the respondent's educational level and their perceptions on reducing the global warming using trees. The $X^2$ results also showed that there is no association between respondent's age and their level of perception on the possibility of reducing the global warming using trees. Government, Non- Governmental Organizations and individual should therefore be encouraged to embark on tree planting to mitigate climate change and restore degraded areas. Efforts should also be geared towards enlightenment of the peoples on the benefits of trees in offsetting $CO_2$ from the atmosphere. A strong long-term political commitment by the government to prevent deforestation, to manage and protect the remaining trees is required as a high priority.

**Keywords**: Residents, Perception, Climate Change, Trees, Jimeta

## Introduction

Global warming is a complex and long-term problem that continues to threaten ecosystems and livelihood worldwide (USAID, 2010). Impacts of global warming is severe in developing countries, where large numbers of rural people with low adaptive capacity depend on climatic resources and are highly vulnerable to climate variability and change (USAID, 2010). Global warming is on the increase in the average temperature of the earth's surface resulting from the rise in the concentration of greenhouse gases (GHGs) like carbon dioxide $CO_2$, methane (CH4), nitrous oxide (N20), and chlorofluorocarbons. The increased concentration of GHGs in the atmosphere attributes to the change in the world's climate. GHGs destroy the ozone layer allowing the ultra violet rays to pass towards the earth's surface. The intense heat emitted from the earth's surface through radiation has hazardous effect on plants, animals, humans, and its total environment (Tapupa et al, 2010). In addition, the warming has indirectly increased mortality and morbidity through climate related cardiovascular diseases; respiratory diseases due to heat waves; lack of access to safe drinking water which has also led to outbreak of diarrhoea; and malnutrition associated with crop failures. The World Health Organization (WHO) has projected that global warming may increase the number of individuals prone to vector-borne diseases (such as malaria, schistosomiasis, onchocerciasis, leishmaniasis) by16-28% in future (2009; Shakirudeen, 2014). Hence, there is a global interest on how to reduce the impacts of global warming.

In spite of the opportunities associated with the solar radiation management (SRM) and ocean-based $CO_2$ removal techniques, several risks are also associated and these are yet to be properly understood (Abiodun et al., 2012). However, the land-based $CO_2$ removal techniques such as forestation, afforestation and reforestation, remain the most promising option. It is cost-effective, efficient and offers realistic ways of sequestering carbon thereby mitigating the impact of climate change). This has been recognized by the Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2000; Arora and Montenegro, 2011). These land-based $CO_2$ removal techniques have potentials to slow down the atmospheric and marine accumulation of greenhouse gases, which are released from burning fossil fuels and alter the energy and moisture balances (IPCC, 2001).

Furthermore, there are co-benefits associated with forestation activities. The expansion of land such as agro-forestry also provides unique opportunities for mitigating greenhouse gases (GHGs) emissions while addressing other pertinent concern of the rural dwellers (Syampungani, 2010). It is estimated that about 60 Pg C is exchanged between terrestrial ecosystems and the atmosphere every year, with a net terrestrial uptake of 0.7 ±1.0 Pg C (Schimell et al., 1996 cited by Lasco and Pulhin 2000; Shakirudeen, 2014). Thus, forest as a major component of the terrestrial ecosystems plays an important role in the global carbon cycle acting as both sources and sinks of carbon depending on the specific management regime and activities (IPCC, 2000). In recognition of this, several efforts are currently being undertaken to harness the potentials of the forest in curtailing the present warming and mitigating futures impacts. Thus, concepts such as Carbon Sequestration, SarbonCredit andTrading, Clean Development Mechanism (CDM) are being discussed globally (2008; Gillenwater and Seres, 2011). Carbon sequestration describes long-term storage of carbon dioxide or other forms of carbon to either mitigate or defer global warming (Sedjo and Sohngen, 2012). Numerous sectors were proposed by the United Nations Framework Convention on Climate Change (UNFCCC) for CDM investments in the various sectors. These include rural electrification and wind projects (energy sector) in India and Maldives; United Nations Industrial Development Organization (UNIDO) industrial projects in Nigeria (built sector); as well as other initiatives in the forestry sector among numerous others (IPCC, 2007).

Actions to stem emissions of the gases that cause global warming are unlikely to approach what is needed until the public perceives that human-made climate change is underway and will have unacceptable consequences if effective actions are not taken to slow the climate change (Hansen et al 2012). Similarly, Bord et al (1999) opined that improved understanding of public perceptions about global warming can contribute to inform scientific and policy discussions of climate change. Scientists need to know how the public is likely to respond to climate impacts or initiatives, because those responses can attenuate or amplify the impacts. They stated further that policy makers need to know what the public wants, in order to design policies that will be supported or at least tolerated. Both groups need to understand the extent to which people's responses will defer across regions. In the same vein Rukefwe (2008) observed that much emphasis has been devoted to the science of climate change, but the education of the people and how they perceive the causes and impacts are lacking.

Therefore, people's perception on the possibility of reducing the global warming using trees may be the most important factor determining their willingness to accept the scientific conclusion that trees serves as carbon sink (Odjugo 2011). This acceptance could be the key to positive behavioural changes, which would assist in the development and implementation of strategies in tackling the causes and impacts of climate change. Hence, this study is aimed at the determination of the public perception of the awareness and mitigation strategies of climate change using trees in Jimeta Metropolitan Area.

## Materials and Methods

### *Study Area*

Jimeta (Yola North) is located in Adamawa State of the North- Eastern part of Nigeria. Jimeta's geometrical location is between latitude $9^0$ 13' and $9^0$ 17'N and longitude $12^0$ 24' and $12^0$ 28'E. Zemba (2013) reported that Jimeta has an approximate land area of 111.85km$^2$ in 2002. The city is located in a flood plain of the Benue valley and is relatively asymmetrical, having possibilities of expansion in

only North-West through South as North to South-East are bordered by River Benue and its adjoining marshy lands. It is bordered by Yola South Local Government in the South and West and Girei Local Government Area in the North and East.

Jimeta area has a typical tropical climate. The average daily hours of bright sunshine are about 7-8 hours and the wind speed averaging about 76.1Km/hr. It has monthly mean sunshine hours of about 220 from January to April. This decrease to a mean value of 207 hours between May and September was due to increases in cloud. The mean sunshine hours increase again to about 255 for the period between October and December. The average sunshine hours for the year as a whole stand at about 2750 approximately (Adebayo and Umar 1999; Zemba 2010).

Air temperature characteristics in Adamawa state as a whole is typical of West African Savannah Climate. Temperature in this region is generally high throughout the year. In Jimeta, there is a seasonal change, indicating a gradual increase from January to April. This is because at this period the sky becomes clearer leading to more receipt of solar radiation. The seasonal maximum usually occurs in April reaching as high as $43^0$C. There is a distinct drop in temperature at the onset of rains due to the effects of cloudiness. A slight increase after the cessation of rain (October-November) is common before the onset of harmattan in December when temperature drops further. The minimum temperature value for the area can be as low as $18^0$C between December and January.

Between January and March, relative humidity is extremely low (20-30%) in Jimeta. It starts increasing as from April and reaches its peak (about 80%) in August and September. This is due to the influence of the humid maritime air mass, which covers the whole area during this time. This could also be attributed to the effect of River Benue and the basin-like terrain of the city. Relative humidity starts to decline again from October following the cessation of rains.

Jimeta has two distinct seasons- the rainy and dry season. The rainy season runs from the months of May through October, while the dry season commences in November and ends in April/May. The average annual rainfall is put at about 960mm with the highest occurrence in August and September, when intensity assumes over 20% of the annual value. In fact, in the past few years, the highest occurrence of the rainfall has shifted to September, as opposed to August previously, with an intensity of about 15% of the annual value.

The wind direction in the area is characterized by northeast and westerly winds. The northeast trade winds bring harmattan from the north during November to March through the influence of tropical continental air mass while the influence of tropical maritime air mass from the south brings about rains during the period of May to October.

Evaporation is generally high in the area due to high insolation. The monthly distribution pattern is similar to that of sunshine and temperature, which shows significant decline during the rainy season. A record of evaporation in Jimeta shows that, the minimum value of about 2.5ml occurs in August while the highest value is in March (about15ml) (Adebayo and Umar 1999; Zemba, 2010).

The natural vegetation over a geographical area is essentially a response to the climate and some other parameters such as edaphic and topographic (Adefioye 2013; Olutoyin et al, 2017). Nigeria's vegetation belts reflect this very close link between vegetation and climate, and hence the similarity in the west-to-east zonation of both climate and vegetation. With the south-to-north progressive decline in total rainfall and length of wet season, vegetation belts are demarcated in a west-to-east pattern characterized by transitional zones between one belt and another (Aweda and Adeyewa 2009; Olutoyin et al, 2017). The prevalence of drought and desertification in the northern part of the country and the incessant pastoral clashes resulted in to the depletion of vegetation in the area (FAO 2005; Olutoyin et al, 2017).

The climate of the north is drier than that of the south and is marked by a greater range of temperature. The hottest month averages about 32°C (90°F); the coolest, 21°C (70°F). Most of central Nigeria receives 635 mm to 1,270 mm of rain each year. The natural vegetation of Nigeria varies with the climatic conditions, and particularly the amount of precipitation. The savanna vegetation predominate the sub humid central zone and the drier north. About one-eighth of Nigeria is

covered with forests. Rainfall distribution over Nigeria for the study period revealed that the northern part of Nigeria experiences rainfall as low as 500mm, especially at the north-eastern part of Nigeria, with a corresponding low vegetation cover. Therefore, variability in rainfall is a key variable in explaining the spatial variation in vegetation cover (Arome and Ejaro 2012; Olutoyin et al, 2017).

***Types and Sources of Data***

The study used both primary and secondary data. The primary data that was used for this study include; data on the perception of urban dwellers on reduction of global warming using trees. The secondary data include; the relevant literatures, maps and some important geographical information regarding the study area which were sourced from publications such as journals, books, bulletins, institution of learning , internets etc.

***Sampling Techniques and Procedures***

Considering that it was nearly impossible to cover the entire study area, ie the population of the study area; the survey collected sample that was used to represent the population so as to obtain relevant primary data needed for the study. The study area (Jimeta) consist of 11 ward namely, Yelwa, Limawa, Ajiya, Demsawo, Alkalawa, Gwadabawa, Luggere, Jambutu, Nasarawa, Doubeli, Karewa. The marginal error of 5% adopted from Saunder et al (1997) was used to select 383 household respondents based on the population of 266,422. Proportional factor was used to select the respondents for each ward. Simple random sampling was used to distribute the questionnaire to the selected respondents.

The Proportionality Factor is expressed as:

$Qi = (Fi/P) * N$

Where:

Qi = The Number of respondents needed from each ward.

Fi = The Total population from each ward.

P = The Total population of the entire study area (11 wards).

N = The Adopted household respondents.

**Table 1:** Administrative Wards and Population for Jimeta

| Name of Ward | Base Population NPC (2006) | Projected Population (2016) | Sampled population (Qi) |
|---|---|---|---|
| Ajiya | 14,359 | 19,297 | 28 |
| Alkalawa | 23,043 | 30,967 | 44 |
| Doubeli | 31,077 | 41,764 | 60 |
| Gwadabawa | 21,209 | 28,503 | 41 |
| Jambutu | 17,981 | 24,164 | 35 |
| Karewa | 22,227 | 29,871 | 43 |
| Limawa | 14,426 | 19,387 | 28 |
| Luggere | 15,854 | 21,306 | 30 |
| Nassarawo | 15,891 | 21,356 | 31 |
| Rumde | 11,493 | 15,445 | 22 |
| Yelwa | 10,687 | 14,362 | 21 |
| **Total** | **198,314** | **266,422** | **383** |

**Source:** National Population Commission (NPC, 2006)

***Method of Data Collection***

Data on the perception of people on reduction of global warming using trees was collected by the used of structured questionnaire and interview through Focus Group Discussion (FGD). The questionnaire has been divided into four sections, Section A deals with the personal information of the respondents such as sex, age, educational background and socio-economic activities among others. Section B, deals with the information on the perception of people on reduction of global warming using trees in the study area.

***Statistical Analysis***

Descriptive statistics such as average mean, table, percentages and frequencies will be employed to analyze socio-economic characteristics of the respondents and their perceptions on the reduction of global warming using trees. The inferential statistics

($X^2$) was used to determine the association of the respondent's socio-economic characteristics and their level of perception on possibility of reducing global warming using trees.

**Results and Discussion**

This section contains the results which are presented using appropriate statistical techniques and discussion relating to the results. The discussion highlights the perception of the respondents on the possibilities of reducing the global warming using trees.

***Socio-Economic Characteristics of the Respondents***

The socio-economic characteristics of the respondents for this study such as; sex, age, educational background and economic activities are presented on Table 2.

***Sex of the Respondents***

The household heads are the respondents for this study. The household head is defined as the senior member of the household who makes key decisions in the household and whose authority is acknowledged by other members. The results from table 2 indicate a predominance of households headed by males. 78.8% of the households interviewed were male headed households while 21.2% were female headed households. This implies that most decisions made regarding land use such as planting trees are made by the males.

***Age of the Respondents***

The table reveals that 68.8% were 26-45 years of age while, 31.2% of the respondents are aged above 45 years. This implies that, there are relatively young and physically active peoples to assess climate changes. This has direct bearing on the ease of climate change mitigation strategies. Also, age influences the ability to seek and obtain off-farm jobs and income, which could increase income and could help cope with adverse change in climate. Aging populations are less able to engage in modern agricultural practices, trading, fishing, as well as working in civil service or private organizations. They are also less able to source and synthesize information. Since youth has the highest percentage, there is high level of climate change awareness and more will be able to adapt, improved ideas and innovations than the aging peoples.

***Educational Level***

This is an important factor that determines the ability of an individual to understand policies and programs relating to climate change mitigation measures. The educational distribution of the respondents as measured by years of formal education is presented in Table 2. The table reveals that about 13% of the respondents had no formal education, about 26% attained primary education, while about 35% attained secondary education. Only about 23% attained tertiary education. Thus, about 87% of the respondents have some form of formal education. This indicates the roles that education plays in creating awareness to peoples, because educated people are better equipped to source information that could result in climate change mitigation action to adjust quickly to disequilibria than the uneducated peoples. This study revealed that literacy level is high among the respondents and this could have implication for socio-economic activities and also for possible measures to reduce global warming. This study indicates a positive relationship between level of education and climate change awareness and mitigation among respondents in the study area.

***Economic Activities***

Formal employment was the main economic activity (21.5%) undertaken by the households followed by self-employment (20.8%) and, both crop production and formal employment (10.8%). Both crop production and self-employment (10.4%) is also another economic activity of the households. Livestock production and sale of fuel wood is not a major economic activity. Some households preferred to combine some these economic activities together so as to earn a living. The results further indicate that 63.5% of the households engaged in formal and self-employment, crop production, for food and income purposes.

**Table 2:** Socio-Economic Characteristics of the Respondents

| **Sex** | **Frequency** | **Percentage** |
|---|---|---|
| Male | 78.9 | 302 |
| Female | 81 | 21.1 |
| **Total** | **383** | **100** |
| **Age Group** | **Frequency** | **Percentage** |
| 10-25 | 00 | 00.0 |
| 26-35 | 109 | 28.5 |
| 36-45 | 128 | 33.4 |
| 46-55 | 91 | 23.8 |
| >55 | 55 | 14.3 |
| **Total** | **383** | **100.0** |
| **Educational level** | **Frequency** | **Percentage** |
| No formal education | 53 | 13.8 |
| Primary education | 103 | 26.9 |
| Secondary education | 137 | 35.8 |
| Tertiary education | 90 | 23.5 |
| **Total** | **383** | **100.0** |
| **Economic Activities** | **Frequency** | **Percentage** |
| Formal Employment | 82 | 21.5 |
| Self-Employment | 80 | 20.8 |
| Casual Employment | 37 | 9.6 |
| Crop Production | 34 | 8.8 |
| Livestock Production | 22 | 5.8 |
| Sales of Fuel Wood | 16 | 4.2 |
| Both Crop Production and Formal Employment | 41 | 10.8 |
| Both Crop Production and Self-Employment | 40 | 10.4 |
| Both Crop Production and Livestock Production | 34 | 8.1 |
| **Total** | **383** | **100** |

**Source:** Field Survey, 2017

***Trees and Climate Change Issues***

***Peoples Participation in Tree Planting***

The participation of the respondents in the tree planting in their respective areas is presented in Table 3. The survey shows that 71% of the respondents are said to have planted trees in their areas, while 29% did not planted any tree. This indicates that, majority of the people in the study area knows the roles that trees can play which make them participated in tree planting. This is also noted by Jerry (2016) that, community tree growing plays an important role in securing livelihood and providing environmental benefits to the local communities. This can be considered as part of the carbon emission reduction efforts of the local community.

**Table 3:** Participation of Peoples in Tree Planting

| **Variable** | **Frequency** | **Percentage** |
|---|---|---|
| Yes | 272 | 71 |
| No | 111 | 29 |
| **Total** | **383** | **100** |

**Source:** Field Survey, 2017

***Reasons why Peoples Plant Trees***

The reasons why peoples plant trees in their respective areas are presented in Table 4. The survey reveals that almost 22% of the respondents do plants trees for providing of shade only, 25.6% plants trees for both shade and wind breaker, while 22.7% goes for both shade and fruits. The percentage of the respondents that plant trees for fruit alone is 13.1%, decoration alone (6%), both timber and firewood (3.4%), wind breaks alone (5.5%), carbon sink (0.5%) and others (1%). This implies that, majority (89.1%) of the respondents in the study area plants trees for shade, fruits and wind breaks, while only 0.5% plant trees for the purpose of carbon sink. This indicates that peoples in the study area does not plant trees with the view of reducing the global warning or as mitigation strategies for climate change which is the major global concerns today.

There are growing concerns on the roles of trees in the community for managing atmospheric carbon sequestration. Many researchers were able to come up with activities that lead to reduction $CO_2$ from various sources. Therefore management activities or practices at community forest helped sink more carbon (Jerry, 2016).

**Table 4:** Reasons of the Respondents for Planting Trees

| Variable | Frequency | Percentage |
|---|---|---|
| Both shade and windbreak | 70 | 25.6 |
| Both shade and fruit | 62 | 22.7 |
| Both timber and firewood | 9 | 3.4 |
| Shade alone | 60 | 22.2 |
| Fruit alone | 36 | 13.1 |
| Wind break alone | 15 | 5.5 |
| Decoration | 16 | 6 |
| Carbon sinks | 1 | 0.5 |
| Others | 3 | 1 |
| **Total** | **272** | **100** |

**Source:** Field Survey, 2017

*Climate Change Awareness by the Respondents*

Table 5 shows the level of climate change awareness by the respondents. From the survey, 96.2% of those interviewed were aware of issues to do with climate change, 2.7% were unaware and 1.1 percent was uncertain. This is a good indication that efforts to intensify the tree planting for mitigation climate change may be successful.

**Table 5:** Climate Change Awareness Issues by the Respondents

| Variable | Frequency | Percentage |
|---|---|---|
| Aware | 369 | 96.2 |
| Un Aware | 10 | 2.7 |
| Uncertain | 4 | 1.1 |
| **Total** | **383** | **100** |

**Source:** Field Survey, 2017

***Perception of the Respondents on Reducing Global Warming Using Trees***

Table 6 summarizes perception of the respondents on whether trees can help in reducing global warming. From the results, 39.7% strongly agreed that trees can help in reducing global warming, 42.3% agreed, 15.4% were neutral and another 2.6% strongly disagreed. This implies 82% of the people are aware that trees can be used to reduce global warming. This indicates the possibility of people's participation in planting of trees for reducing the global warming.

**Table 6:** Perception of the Respondents on reducing Global Warming using Trees

| Variable | Frequency | Percentage |
|---|---|---|
| Strongly Agree | 152 | 39.7 |
| Agree | 162 | 42.3 |
| Neutral | 59 | 15.4 |
| Strongly Agree | 10 | 2.6 |
| **Total** | **383** | **100** |

**Source:** Field Survey, 2017

***Association between Respondent's Socio-Economic Characteristics and their perception on the possibility of reducing the global warming using trees***

In order to test for association to determine if respondent's environmental perceptions depends significantly on their socio-economic characteristic (educational level and age group), the data were subjected to chi-square test. The chi–square ($X^2$) test represents the difference between the given frequencies and the expected frequencies obtained.

***Association between age of the respondents and their perception on the possibility of reducing the global warming using trees***

Table 7 displays the Chi-Square distribution of the respondents' age and their perception on the possibility of reducing the global warming using trees in the study area. The P-Value of 0.366 means that, the null hypothesis is accepted meaning there is no association between respondent's age and their level of perception on the possibility of reducing the global warming using trees. This means that respondent's age does not determine the level of their perception on the possibility of reducing the global warming using trees. This also implies both aged and young percepts that climate change can be reduce through tree planting and therefore it can be easier for both the aged and young to key into the climate change mitigation through planting of trees.

**Table 7:** Association between Age of the Respondents and their Perception on the Possibility of Reducing the Global Warming Using Trees

| Awareness of climate change | Age of respondents | | | | Total |
|---|---|---|---|---|---|
| | 26-35 | 36-45 | 46-55 | > 55 | |
| Strongly Agree | 44 | 46 | 47 | 15 | 152 |
| Agree | 41 | 50 | 43 | 28 | 162 |
| Neutral | 20 | 19 | 09 | 11 | 59 |
| Strongly Disagree | 04 | 03 | 02 | 01 | 10 |
| Total | 109 | 128 | 91 | 55 | 383 |

Chi-Square Test

| | $X^2$ Value | Df | P-Value |
|---|---|---|---|
| Pearson Chi-Square | 9.814 | 9 | 0.366 |

**Source:** Field Survey, 2017

***Association between educational level of the respondents and their perception on the possibility of reducing the global warming using trees***

Table 8 displays the Chi-Square distribution of the respondents' education level and their perception on the possibility of reducing the global warming using

trees in the study area. The $X^2$ P-Value of 0.000 implies that there is association between the respondent's level of education and their perception on the possibility of reducing the global warming using trees. The results revealed that, the level of education of the respondents determine their level of perception on the possibility of reducing the global warming using trees. This implies that, the level of education of the respondent increases their level of perception on the possibility of reducing the global warming using trees. Therefore the mitigation measures of climate change will be easier and faster among the educated than the uneducated in the study area.

**Table 8:** Association between Educational Level of the Respondents and their Perception on the Possibility of Reducing the Global Warming Using Trees

| Awareness of climate change | Educational level of the respondent | | | | Total |
|---|---|---|---|---|---|
| | No formal education | Primary education | Secondary education | Tertiary education | |
| Strongly Agree | 05 | 28 | 66 | 53 | 152 |
| Agree | 18 | 52 | 60 | 32 | 162 |
| Neutral | 25 | 20 | 10 | 04 | 59 |
| Strongly Disagree | 05 | 03 | 01 | 01 | 10 |
| Total | 53 | 103 | 137 | 90 | 383 |

Chi-Square Test

| | $X^2$ Value | Df | P-Value |
|---|---|---|---|
| Pearson Chi-Square | 91.442 | 9 | 0.000 |

**Source: Field Survey, 2017**

**Conclusion**

Majority (89.1%) of the respondents in the study area plant trees for shade, fruits and wind breaks. While only 0.5% plant trees with the view of reducing global warming. About 82% of the people in the study area are aware that trees can be used to reduce global warming. The $X^2$ results showed that, there is association between the respondent's educational level and their perceptions on reducing the global warming using trees. This implies that, the level of education of the respondent increases their level of perception on the possibility of reducing the global warming using trees. Despite the fact that, peoples of the study area are aware of the issue of climate change and also agreed that trees could help in reducing the global warming, they don't plant trees with the view of reducing global warming.

**Recommendations**

The following recommendations were proposed based on the findings:

1. Efforts should also be geared towards enlightenment of the communities on the benefits of trees in offsetting $CO_2$ from the atmosphere. This can be done by ensuring strict compliance with rules and regulations guiding conservation in the country.

2. Tree planting (afforestation) project should also be encouraged in order to restore the already degraded area.

3. A strong long-term political commitment by the government to prevent logging, deforestation, to manage and protect the remaining natural forests (natural production forests and protected areas) is required as a high priority. The local community should be discouraged from destroying the natural indigenous tropical forests.

4. Furthermore, the issues of climate change and sustainable environmental management should be incorporated into the General Studies (GST) courses at the undergraduate level in geography and social studies subjects at both the secondary and primary school levels, respectively. If the people are well informed on these issues it would be easier for the

people to key into government plans in mitigating climate change. In addition, it will make the people imbibe positive behavioral changes that would help to save planet earth and achieve sustainable socioeconomic and environmental management.

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