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Strategies to combat desertification in Northern Region of Ghana: The role of Environmental Protection Agency

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ABSTRACT

Desertification has long been recognized as a major environmental hazard with adverse impacts on the livelihoods of people in the affected regions. Desertification, according to article 1(a) of the United Nations Convention to Combat Desertification (UNCCD) refers to land degradation in arid, semi arid and sub-humid areas resulting from various factors including climatic variation and human activities. Although all continents have areas where desertification is occurring, the effects depend on the specific natural, socio-economic features of the area concerned. In many parts of Africa, especially sub-Saharan Africa, it has contributed to the increasing poverty of the people and the gradual but irreversible degradation of the ecosystem. It is estimated that sub-Saharan Africa will lose two-thirds of its arable lands by the year 2025 if strategies are not put in place to combat desertification. Therefore, this study was conducted to examine the roles of Environmental Protection Agency in combating desertification in Northern Region of Ghana as envisaged in the EPA Act 490 and the LI 1652. The study made use of methodological triangulation in sourcing data for the research. By this method, secondary data and satellite imagery of the study area were sourced from the Environmental Protection Agency and the Department of and other institutions in the study area were triangulated with data collected from research participants. The aim was to analyse how remote sensing and GIS satellite images have been used by the Environmental Protection Agency to monitor desertification in northern region of Ghana and the challenges they faced thereon. The results revealed that communities most affected with the threat of desertification in the metropolis are those that shares boundary with the Upper East Region. It also indicated that the major causes of desertification in the metropolis are poverty, land degradation, migration and drought representing 33.3, 30.7, 22.7 and 13.3%, respectively. The results also showed that despite the numerous challenges facing the EPA, they still manage to formulate various interventions and organize programmes with the aim of combating desertification in the metropolis. It is therefore recommended that, EPA should improve on their public education programmes in both the official and local languages to enable the people understand their programmes. This will ensure the maximum participation of the people in helping the course of desertification.

Keywords: Environmental Protection Agency, agency, desertification, land degradation, economics, drought, northern region.

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INTRODUCTION

Desertification is a serious environmental problem that continues to threaten biodiversity and human inhabitants of third world countries with semi-arid or arid climates in particular (Albalawi and Kumar, 2013). The fight against desertification, in Africa, remains one of the most important and enduring challenges in recent times of climate change (UNCCD, 1994). Efforts to combat desertification are difficult due to increasing anthropogenic activities, with inadequate attention and commitment from the international community to halt the process. While deserts occur naturally, desertification is accelerated by a combination of human and natural causes (Moseley and Jermé, 2010). As per the research finding of Albalawi and Kumar (2013), many countries

lack adequate financial resources to prevent the causes of desertification, or monitor the processes involved. Understanding the causes and implications of desertification must be a priority before any monitoring of desertification can take place. The United Nations Convention to Combat Desertification (1994) defined desertification broadly as land degradation in arid, semi-arid, and sub-humid regions. More than 250 million people are directly affected by desertification and about a billion people are at risk of desertification. Since the early 1920s desertification has been identified as an environmental problem globally, however, major adverse social and economic impacts over the last two decades have emphasized the serious environmental issues (Xue and Shukla, 1993). The cumulative effects of desertification lead to serious threats worldwide, especially populations of affected developing countries.

It has generally been observed that natural forces such as relief, uneven spatial and distribution of rainfall and drought coupled with human activities such as population pressure, annual bushfires, over-harvesting of wood coupled with unsustainable cultivation practices and soil nutrient depletion without replenishment are responsible for the accelerated land degradation in the Northern Region (CSIR, 1974; Abu, 1983; Senayah, 1994). Consequently, fallow periods which were crucial to soil fertility regeneration have reduced drastically. Other studies by Gyampo (1985) and Nsiah-Gyabaa (1994) have revealed that inhabitants of rangelands in northern Ghana are mainly farmers who grow food crops and rear ruminant livestock. These areas are, therefore, intensively farmed and grazed leading to over-cultivation and over-grazing. According to EPA (2002), the livestock (cattle, sheep and goats) population density per km^2 in 1996 was 130, 33 and 16 for the Upper East, Upper West and Northern Regions respectively. This implies an increasing pressure on the natural resource base, particularly natural vegetation and soil. According to the United Nations Environmental Programme (UNEP, 1992) and FAO (1984), increased pressure on arable lands invariably tends to be reflected in encroachment of cultivation on forest and rangelands. In a study by Soil Research Institute (SRI, 1971), the estimates for areas in northern Ghana as a whole considered affected by sheet erosion are about 35,172 km^2 and 27,306 km^2 by gully erosion. About 31,442 km^2 of the area suffer from 'severe' sheet and gully erosion. Considering the national figure (54,712 km^2) of areas affected by 'severe' sheet and gully erosion, it is realized that more areas in northern Ghana (57.5%) are affected by 'severe' sheet and gully erosion than other parts of the country. Although, no studies have been done in recent times on the national situation, these figures in no doubt have increased tremendously. Soils of the Northern Region are mainly Lixisols, Luvisols, Acrisols, Plinthosols, Leptosols and Fluvisols (Adu, 1969). Most of these soils have low inherent fertility due to less accumulation of organic matter – majority is less than 2% in the surface horizons (Boateng and Ayamga, 1992). This stems from the high temperatures (annual average is 28.4°C) resulting in a rapid rate of decomposition. The annual burning of vegetative cover throughout the area also reduces the amount of organic matter available. A study by CSIR (1974) indicated that soil erosion is one of the most potent degradation processes affecting soil productivity in Northern Ghana. Another study by Abu (1983) revealed that soil chemical degradation ranks second to soil degradation. The research was conducted to ascertain major causes of desertification in the Northern Region, to determine which human activities contribute to desertification in the form of vegetative cover loss and their extent, to identify the socio-economic effects of desertification in the Region, to find out what adaptive mechanisms are used by the Environmental Protection Agency in the Northern Region to combat desertification and to identify the challenges facing the EPA in implementing the policies adopted to combat desertification. The Environmental Protection Agency in Ghana is traced back to the Environmental Protection Council (EPC) established in 1974 immediately after the United Nations Conference on the Human Environment held in Stockholm, Sweden in 1972. When the Environmental Protection Agency Act 490 was passed in 1994, the Environmental Protection Agency replaced the Environmental Protection Council. The EPA as it was formed was mandated under the National Action Plan among others, to establish year round vegetative cover in desert prone areas which is a fundamental requirement for combating desertification and to create awareness of the causes and impacts of desertification to prompt people to find solution to the problem.

Study area

Northern Region of Ghana (Figure 1) with Tamale as its administrative capital lies between latitude 9.16° and 9.34° North and longitudes 00.36° and 00.57°. It is located approximately 180 m above sea level. Tamale, the Regional capital shares boundaries with Savelugu/Nanton District to the north, Tolon/Kumbungu District to the west, Central Gonja District to the south-west, East Gonja District to the south and Yendi Municipal to the east. The Tamale Metropolis occupies approximately 750 square kilometres which is 13% of the total area of the Northern Region.

The Region experiences a single rainy season from May to October and is characterised by a long dry season starting from November to April. Rainfall is erratic and its average amount ranges from 800 to 1000 mm per annum. Potential evaporation ranges between 1652 and 1720 mm per annum and the annual aridity index is 0.60. This area falls within the Guinea and Sudan Savannah Agro-ecological zones of Ghana which consist of grass

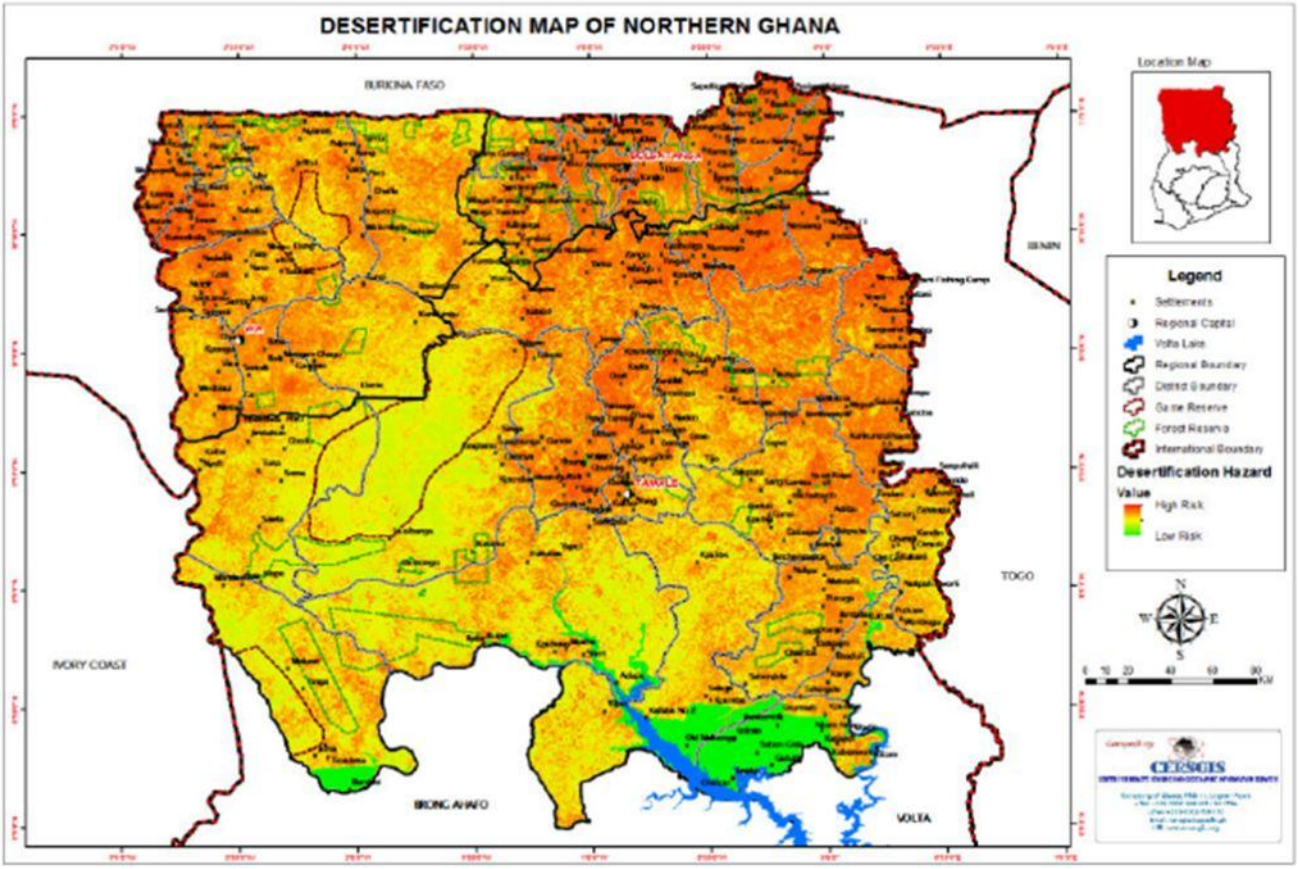

Figure 1. Desertification Map of Northern Region. Source: CERGIS, University of Ghana, Legon.

with isolated short trees such as dawadawa, and shea (Meteorological Service, 2012). It is estimated that 60% of the people are engaged in agriculture with 40% engaged in petty trading and other public sector jobs in the study area. The major crops cultivated in the Region include maize, rice, sorghum, millet, cowpea, groundnuts, soya bean, yam and cassava. The animals reared range from goats, pigs, and cattle to birds. The most common system adopted in livestock production is the semi-intensive and extensive system of husbandry (GSS, 2000).

METHODOLOGY

Basically, primary and secondary data were used for the study. Classified satellite 2010 imagery of the study area was sourced from the Centre of Remote Sensing and Geographical Information System of the University of Ghana and from scholarly research article of Adamu et al. (2013). Secondary data on combating desertification in Ghana was obtained from the National and Regional Environmental Protection Agency Office in Accra and Tamale respectively. It included documented work by the Agency in combating desertification in Ghana and the three northern regions of Ghana. Primary data were sourced from the people of northern region. 150 respondents, randomly selected, were probed into their knowledge of the existence of the Agency in the Region and their role in combating desertification in the region. Some key informants were also interviewed based on the knowledge in desertification and the role of the Environmental Protection Agency in combating desertification in the Region. Focus group discussion was also tailored for identified concerned youth group in Tamale and women's focus group al in Tamale. Their views on desertification and the Agency role in combating desertification in the region were triangulated with the views obtained from the key informants and those interviewed on the street.

RESULTS AND DISCUSSION

Socio-economic and natural causes of desertification in the region

Numerous studies, notably, Nsiah-Gyabaah (1994) and Tonah (2000) have associated intense pressures on the savanna environment with human activities such as

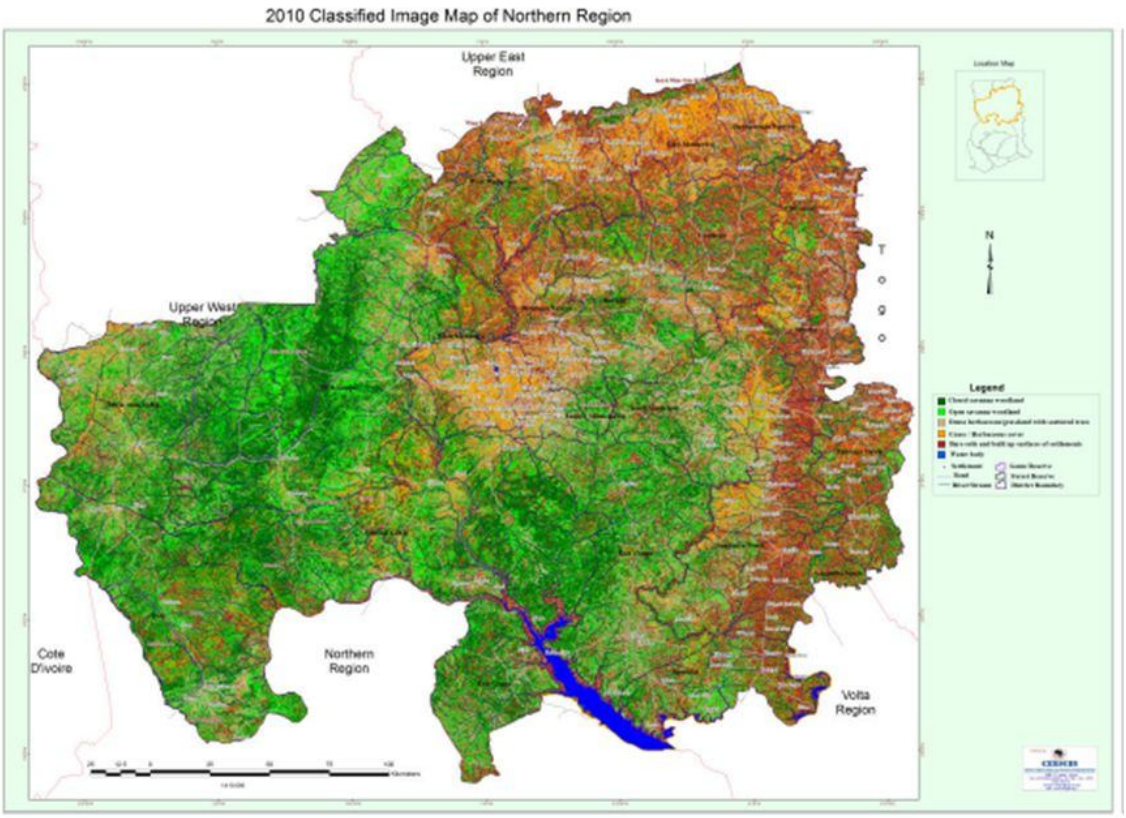

Figure 2. Nature and extent of desertification in the study area. Source: CERGIS, (Legon, 2013).

mining, grazing, and bush burning. To relate their studies and findings to what is happening in the study area, research participants were asked to identify activities in the study area they perceived to have contributed to desertification.

Most of the research participants, mostly key informants, interviewed were of the view that the major socio-economic causes of desertification in the study area are as a result of human activities including bush burning, charcoal production, overgrazing and indiscriminate cultural practices. The ability of research participants to identify such human activities with serious environmental consequences confirms earlier observations made by Albalawi and Kumar (2013), Laurian (2004), Zaferatos (2004) and William and Dunn (2003) who attributed the causes of environmental degradation leading to desertification to unsustainable land use practices of local communities. Songsore (2011), also made similar observations, that activities such as charcoal production and bush burning cause desertification in m any areas of the savannah region as seen in Figure 2. The study area, as participants observed, is noted for massive destruction of sheanut trees in the White Volta river basin which is 30 km from the Tamale Metropolis of the study area as also noted in the research findings of Bakari (2007). Participants also perceived the prevailing harsh climatic conditions in northern Ghana as a major determinant of the nature and extent of desertification in the study area.

Data obtained from CERGIS, Legon (2013) as depicted in Figure 2 and summarized in Table 1 for land use and cover analysis for the study area show distribution of land cover types such as close savanna woodland vegetation, open savanna woodland, dense herbaceous/grassland with scattered trees, Grass/herbaceous cover, bares areas/built up areas and water bodies (Adamu et al., 2013).

Figure 2 and Table 1 demonstrate extensive conversion of savanna vegetative woodland to bare and built environment. Statistical results of the classified image of Figure 2 show distinctive characteristics in terms of degraded environment. By year 2010 as portrayed in Table 1, the dominant cover type of the study area was bare lands and built areas that represented by 24.2% of the total land area of the Region, followed by close savannah woodland representing 22.3% of the land area. Grass and herbs recorded the least of 11.4% of the land cover. The statistical results as demonstrated in Table 1 shows potential degradation of the environment through the dramatic conversion of the savannah vegetation woodland types to built and barren environment. The pace of the observed ecological transformation in the study area as a potential threat to desertification is also noted by the Environmental Protection Agency (2003).

Table 1. Land use and cover analysis of Northern Ghana, 2010.

Land use and cover analysis	Hectares	Percentage (%)
Close savanna woodland	1557221.7	22.3
Open savanna woodland	1339258.3	19.1
Dense herbaceous/grassland with scattered trees	1516856.4	21.7
Grass/herbaceous	802172.6	11.4
Bare land/built areas	1692252.4	24.2

Source: CERGIS Legon, 2013.

Socio-economic effects of desertification

From the study, it was gathered that poverty, migration, land degradation and drought are the major effects of desertification in the metropolis as illustrated in the Table 2.

From the Table 2, it is deduced that 50 of the respondents, randomly selected, identified poverty, 34 identified migrations, 46 identified land degradation and 20 identified drought as the major effects of desertification in the metropolis representing 33.3, 22.7, 30.7 and 13.3%, respectively. This therefore goes to affirm Bonsu and Quansah (1992) that poverty, migration and land degradation are some of the effects of desertification in the Northern Region of Ghana. Below are the social and economic impacts of desertification in the study area.

Table 2. Socio-economic effects of desertification.

Effects of desertification	Frequency	Percentage
Poverty	50	33.3
Migration	34	22.7
Land degradation	46	30.7
Drought	20	13.3
Total	150	100.0

Economic effects of desertification

The study revealed that on the economic front, a reduction in agricultural production and income caused by land degradation can have "knock-on" effects throughout the economy of the Region by affecting the circulation of income and international trade flows since exports of agricultural commodities would decline leading to poverty, low revenue to the assembly, low standard of living, food insecurity, malnutrition and high mortality among others. This has been affirm by Diao and Sarpong (2007), in a non-peer reviewed study, and predicted that a mean loss of 5% in AGDP caused by soil erosion between 2006 and 2015 in Ghana would increase the national rural poverty rate by 5.4% by 2015. Hence, evaluating the economic benefits and costs of major global environmental problems can show governments how these problems relate to the economic development of their countries.

Social effects of desertification

The social implications of desertification in the Region was well responded by the research participants, both the key informants and focus groups. Most of them were of the view that if nothing is done to halt the advancement of desert in the Region the next line of action would be migration to other regions of the country. This is in line with Bilsbarrow (2002) who found out that most people when faced with severe environmental problems in their places of origin tend to migrate to other areas. Some of the key informants noted that majority of the rural folks depends largely on farming for livelihood and the threat of desertification would forced most of them to southern in search of jobs. A situation, according to most of the participants had already started. In contrast to Preston (1998) who proposed that as people migrate their places of origin, the pressures exerted on the environment tend to minimise, bringing about a reduction in the degradation of the environment, research participant where of the opinion that already degraded land takes a long time to replenish which is a potential threat to desertification.

Food security and health

Desertification, as research participants noted, threatens food security, which is of great concern in the Region where majority of the rural folks depends upon subsistence farming as their livelihood. Participants saw desertification as secondary social impacts in the form of malnutrition and diseases that arise through poor farm yields, poverty, and constraints on water quality and availability as also observed in the study of Agyemang, (2007) in northern Ghana.

The Environmental Protection Agency in combating desertification

The Environmental Protection Agency being the institution

mandated to combat the spread of desertification in Ghana has initiated a number of programmes to combat desertification in the Region. These include the Global Environmental Facility, the Savannah Accelerated Development Authority (SADA), the Regional and District Environmental Management Committee among others. The Agency enhances and facilitates environmental protection and maintenance in a particular community through the global environmental facility with the aim of making it a model for the rest of the communities to emulate. As part of the programme, the Agency has a regulatory mechanism which:

1. Seek funds to educate and create awareness on the threat of desertification in the metropolis, with regards to the global environmental management facility sensitization and validation workshops form part of the strategies used to combat desertification.
2. Provide alternative livelihood support to the inhabitants which do not directly affect the environment. An example is the guinea fowl and mango plantations project by SADA to enhance the protection of the environment.

The Metropolitan Environmental Management Committee has been harmonized with the subcommittee on the environment to provide horizontal link with the direct departments and NGOs in the environment sector and vertical link between the metropolitan area and the communities at the community level, the community environmental management committees has been formed in the pilot communities which consist of the Chiefs, Tindanas, Youth Leaders and the representatives of cluster of people in the community.

The Agency also conducts effective environmental impact assessment on companies which tend to embark on environmentally related projects which may also lead to or cause desertification in the Region.

Furthermore, the EPA has equal formed fire volunteer groups in the various communities in partnership with the metropolitan authorities in the Region, the Ghana National Fire Service and the Community Environmental Management Committees. The members of these groups are charged with the responsibility of educating members of their respective communities about bush burning and it's the consequences of bush burning to the environment.

The Agency has also enacted rules and regulations with their corresponding penalties in conjunction with the stake holders such as the traditional authorities, the metropolitan assembly, NGOs, youth leaders and leaders of the various groups in the catchment's area to serve as a deterrent to offenders.

The Agency ensures that exploited areas and resources are rejuvenated by encouraging the replanting of felled trees, the levelling of grounds which have been excavated due to sand winning activities to reclaim the land as well as the promotion of intercommunity collaboration in environmental protection and management in the Region.

In addition, the Agency makes use of the opinion leaders and other prominent personalities in the communities to reinforce and ensure effective and efficient education and awareness creation of the public in order to advise them on the causes and effects of desertification in the metropolis as well as mitigation and adaptation measures to avert the situation to ensure their active participation.

The Agency also encourage the town and country planning department to mark areas for high rising building and create green belts in their designs and the promotion of regenerative sites in communities that are prone to bush fires with a density of trees to serve as demonstration sites as well as the protection of secret groove.

The Agency in collaboration with the Ghana Education Service has established environmental clubs in some selected schools to equip them with the skills of identifying problems related to the environment and how they can be mitigated to complement the work of the commission for civic education on the project called "Project Citizen Ghana". The participating schools are also engaged in tree planting exercises and charged with the responsibility of educating their peers about environmental issues and how the environment can be protected.

Environmental awareness program adopted by the EPA in combating desertification in the study area

A visit to five Communities namely Lamashiegu, Dungu, Gushiegu, Kakasunanka and Vitin in the Region in regards to the level of people's awareness of the Agency activities in combating desertification in their communities revealed the following results as shown in the Table 3.

From Table 3, it can be deduced that out of a total of 150 respondents 89 were aware while sixty-one were not aware of the Agency activities and strategies in combating desertification in the metropolis representing 59.3 and 40.7, respectively. This therefore testifies that the Agency is gradually achieving their aim through advocacy on environmental issues as indicated by Nkegbe (2009).

Constraints faced by the EPA in combating desertification in the study area

The study revealed that the EPA like any other public sector organization in Ghana is faced with challenges that hinder their operations with bid of fulfilling their obligations as far as desertification is concerned. Below are some of the challenges gathered from the study research participants mostly the key informants:

Table 3. The level of environmental awareness in the study area.

Level of awareness	Response	%
Aware	89	59.3
Unaware	61	40.7
Total	150	100

i) Financial constraint
ii) Lack of community commitment
iii) Inadequate personnel of the Agency
iv) Lack of alternative livelihood support
v) Ignorance of some people on the activities of EPA in the Region
vi) Non-compliance of rules and regulation
vii) Insufficient supply of logistics
viii) Poor transport facilities

Notwithstanding the challenges facing the Agency, they are working hard to combat desertification in the Region.

FINDINGS

During the study to ascertain the role of the Environmental Protection Agency in combating desertification in the Region, most of the research participants were of the view that desertification is an environmental threat in the Region. The Agency has however initiated some strategies such as advocacy programmes, environmental management committees, enactment of rules and regulations as ways of combating desertification in the Region.

Almost half of the research participants interviewed, were aware of the activities of Agency in combating desertification in the Region while the remaining were not aware of Agency activities on desertification. However, Agency still continues to carry out its role of combat desertification in order to minimize its effects on the environmental, physical, social and economic development of the people.

The study also revealed the challenges facing the Agency in combating desertification in the Region despite the numerous challenges they face.

CONCLUSION

For environmentally and socially sustainable development, there is an urgent need to promote awareness and understanding of the interdependence of environmental, socio-economical, and political systems at local, regional and national levels. The Environmental Protection Agency has taken steps to combat desertification that is threatening northern Ghana. The Agency is continuously promoting continuous and detailed environmental education programmes with emphasis on drought and desertification at all levels in the region. They are also strengthening the Information Services Department and the media houses to promote public awareness and education on desertification training. They have also embarked on training of personnel in line agencies, NGOs and CBOs in all issues related to desertification and drought with the aim of combating desertification in the region. Environmental Management Committees have been set up to effectively enforce legislation and bye-laws on bushfire control, wildlife and water resources management.

RECOMMENDATION

1. The EPA together with other state and non-governmental organizations that have similar task of ensuring compliance and enforcement of environmental legislation such as the forestry commission, the security services, wildlife conservation among others to achieve the aim of combating desertification. In addition, the regional branch of EPA must establish programmes to bring together all the stake holders in a workshop to enable them keep themselves abreast with and appreciate environmental issues, management practices and principles as well as environmental offences.
2. The EPA should be well resourced and equipped with qualified well trained human resource personnel to embark on its struggle of combating desertification in the Tamale Metropolis. This will enable the EPA to provide alternative livelihood support for the people who are engaged in activities that degrade the land causing desertification such as charcoal producers, hunters and farmers.
3. The development of the requisite infrastructure for community-based agro-industry would contribute significantly to the attainment of food security and enhancement of the incomes and livelihoods of rural households.
4. Provision of support for rural communities in the affected areas to engage in non-agricultural and off-farm enterprises could reduce the pressure on the fragile land resources with a consequent reduction in land degradation whilst enhancing the income of rural households.
5. Combating desertification cannot be achieved without due regard to the general socio-economic environment of the people. Desertification-prone areas in Ghana are difficult economic environments with the least infrastructural development. For the survival of communities in these affected areas, there is the need to provide certain basic infrastructure for water and sanitation, health, education, markets, storage, agro-processing and accessibility (roads). Improvement in rural access roads leads to reduced transport costs, enhanced access to health and market facilities and

consequent reduction in post-harvest losses especially for perishable agricultural produce. Water and sanitation and health infrastructure result in improved health which in turn enables the communities to engage in productive activities, such as farming. Provision of education facilities will equip communities to be better informed and make informed choices. Post-harvest facilities (e.g. storage) afford the producer and the consumer time utility and to even-out supply as against demand. The link between good infrastructure and general economic development is very strong and cannot be over-emphasized as far as the desertification-prone areas are concerned.

6. Provision of water through small irrigation schemes, dugouts, water harvesting, soil and water conservation, promotion of integrated dry land farming systems, development of drought tolerant crops and use of improved crop and livestock husbandry practices will, among other factors, contribute to increased food production and food security.

7. Environmental education should be promoted with emphasis on drought and desertification through all available media and both formal and informal education. Institutional capacity building should target training of personnel, provision of equipment and logistics and administrative restructuring.

8. Efforts towards drought management and mitigation should therefore be directed, among others, at the development of early warning systems, contingency plans for drought relief schemes, contingency crop planning and dry season farming.

9. Effective policies and strategies are needed for land, forest, water and other natural resources management, developed as part of an overall national policy framework to improve land management and promote sustainable development. These policies must be based on the best available knowledge and science relevant to the local, national and regional conditions and circumstances.

9. More investment in scientific research on desertification is needed in order to formulate more effective policies. This would strengthen the EPA to facilitate community awareness programmes by improving the science-policy interface, and the structures and processes through which scientific knowledge in desertification can be disseminated.

10. At the national and local levels, decision makers should also have responsibility to ensure participation and provide full ownership to local and primary affected communities.

11. Inter-linkages should be developed between land degradation, climate change and biodiversity, the development of synergistic approaches together with the creation of an enabling policy and institutional environment is important for the strengthening the EPA in their bid to combat desertification. Areas for building synergies include capacity-building, technology transfer, research and monitoring, information exchange and outreach, reporting and financial resources.

12. Adequate financial resources are required to develop and implement effective policies for addressing desertification in the metropolis, and thus more financial resources should be provided by the financial mechanisms of the UNCCD to assist the EPA in developing countries.

13. Economic impacts, social impacts and environmental impacts need to be tackled collectively in an integrated manner, rather than separately, if policies for addressing desertification are to be effective. This could support integrated land-use planning and monitoring of the sustainability of national development.

14. Governments should check their policies for unintended consequences; societal institutions need to be audited to check for constraints that lead to poor people degrading land instead of managing it sustainable; and an integrated approach should be adapted to national land-use planning and government policies.

15. The government should sponsor workshops organized by the Economics of Land Degradation initiative that would enable a group of leading economists to catalyse the development of a new family of economic models of desertification with policy applications must be encouraged in the metropolis. This will benefit the districts as well as the government and could have a snowball effect on economic research in this neglected area.

16. The approach to implement national policies and strategies to combat desertification by the EPA should include a legal system that provides for the effective management of land, taking an ecosystem-based approach.

17. The levels of technical and financial support for eligible Region must be raised for the implementation of the programmes and strategies adopted by the EPA for addressing desertification in the metropolis, including the estimation of social and economic impacts of desertification where appropriate.

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