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SOCIO-CULTURAL PRACTICES PROMOTING THE INCIDENCE OF BUSHFIRES: A STUDY OF THE SISSALA EAST DISTRICT IN THE UPPER WEST REGION

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MARCH 2018

DECLARATION

Student

I hereby declare that this thesis is the result of my own work and no part of it has

presented for another degree in the University or elsewhere:

Signature: …………………………………… Date …………………………….

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Supervisor

I hereby certify that the preparation and final presentation of the thesis were

supervised in accordance with the laid down guidelines on supervision of thesis as

set out by University for Development Studies.

Signature:……………………………………….

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Name: DR. TOGBIGA DZIVENU

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ABSTRACT

Bushfire serves as a natural instrument for generating re-growth and new life enabling fire dependent species to survive, maintain biodiversity and habitat structure. This study examined the nature of the prevalent socio-cultural practices inducing the incidence of bushfires and the effectiveness of the preventive measures put in place to curb it in the Sissala East District. Multiple methods were employed in the study including interview schedules, personal and focus group interviews and participants mapping. To understand the prevailing socio-cultural practices and key causal factors of the incidence of bushfires in the district, the analysis focused on the nature of the socio-cultural practices, how they influenced the incidence of the bushfires, how it affected the inhabitants of the district and the outcomes of the interventions put in place. The findings of the study indicated that appropriate techniques, policies and strategies for dealing with bushfires at the grass root were either missing or if known, have not for some reasons been disseminated and applied by local people. The slow response of local institutions is reflected generally in the inability to reduce the rate at which bushfires are started during the harmattan season and at the start of the farming season. Bushfires occur mostly through the destructive activities of group-hunters, herdsmen and the negligence on the part of cigarette smokers, honey harvesters, and bush-burnings by farmers. Food and cash-crops worth millions of cedis have been destroyed by bushfires. It is recommended that education should be a priority of all Ghanaians to sensitize themselves well and other community members on the need to avoid setting bushfires, especially during the harmattan season. The incidence of bushfires in this country and its destructive effects on the environment cannot be overrated.

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DEDICATION

I dedicate this work to my mother, my supervisor and my pastor, and all friends

who contributed in diverse ways to the success of my studies.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Bushfire is an integral component of ecosystems and some plants, animals and ecosystems have accordingly evolved to depend on fire as part of their environment. However, as the bush is not a homogenous landscape, various vegetation types have different needs for it in terms of fire frequency and intensity. Among the many incidental benefits it bestows on the ecosystem, bushfire serves as a natural instrument for generating re-growth and new life enabling fire dependent species to survive, maintain biodiversity and habitat structure (Keddy, 2007). Like the prairies and pine forest ecosystems, the eucalypt species are fire dependent as they cannot reproduce on their own without the help of fire (Vaibhav, 2015). These plant species naturally require fire to split open their seed pods to release their seeds in order to germinate or propagate rendering fire a critical element of their life cycle (Fitzpatrick, 2012; Pyne, 2002). Bushfire also encourages growth of grassland plants. Burning of dried grasses allows new growth to sprout up quickly providing palatable and nutritious forage for use as food-source for both humans and herbivorous species (Archibald, et al., 2005). Growth of these fresh leaves and shoots attract game for easy hunting (Graham et al., 2004).

In most grassland ecosystems, bushfire is the primary mode of decomposition. As ground fires burn through the soil, they directly affect the soil and its associated plant community leaving behind it a rich organic matter or soil nutrient which becomes food for the grass. It is this process of recycling the nutrient that critically contributes to retaining soil fertility and helps grasslands to maintain high productivity (DeBano et al., 1998). In other words, bushfire has vital effects on both the soil and the other abiotic components of the ecosystem.

Bushfire is, therefore, crucial in biodiversity maintenance, soil nutrient recycling, and in structuring the habitat. It also effectively eliminates competition between the grass and the other species that would otherwise compete for the rich aftermath nutrient-filled layer of ash (Fitzpatrick, 2012; DeBano et al., 1998).

Studies have also shown that the Australian Aborigines have for centuries used bushfire as a traditional resource management tool for managing their ecosystem. According to Karki (2002), these Indigenous people have used bushfire in clearing the undergrowth, hunting, regenerating growth of plant food, regulating their immediate environment and in managing the bush land (NAF, 1999). Burning of the under growths cyclically reduces the danger of out-of-control fires that would otherwise have destroyed their homesteads and facilitates their much easier access through the thick and prickly vegetation areas. It also increases their ease for trapping animals for food. As well, it encourages development of other useful food plants[1] for cooking, warmth, signalling and spiritual purposes (Pausas and Keeley, 2009; Jones, 1969).

The periodic surface burning of the vegetation also promotes plant structure and health and ensures high diversity of species and limits fuel accumulation and resultantly reduces the risk of crown fires (Graham et al., 2004; Fire, 1999).

In many significant ways, the Indigenous people of America also used bushfire ranging from protecting an area from fire to altering the landscape and clearing the prairies. Bushfire was as a rule used to control invasive species without resorting to herbicides or pesticides in agricultural

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[1] This process is known as *fire-stick farming* describing the process of using fire to facilitate hunting and changing the composition of plant and animal species in an area (Jones, 1969).

practices (Mann, 2005). This was often applied to ecosystems to create habitats for species negatively impacted by fire suppression to maintain a diverse natural ecosystem (Williams, 2003).

Early European explorers and settlers commented on Indigenous people's knowledge and use of fire in keeping large areas of forest and mountains free of undergrowth (Williams, 2000; Denevan, 1992). In this case, intentional burning was used in modifying the vegetation by converting pristine forests to open woodlands and ensure grassland openings (Lafon, 2010; Vale, 2000). As Denevan (1992) observed, though natural fires also did occur, they varied in their frequency and intensity.

Deduced from the incidences of bushfires is that bushfire ignitions often result from both human and natural causes. Human-caused ignitions originate in three forms and are classified deliberate/ intentional, accidental/ unintentional and unknown reasons (Plucinski, 2014). Deliberate/ intentional bushfires are those fires lit to achieve specific objectives as in livelihood and land-use activities as in farmland preparation, hunting and land resource management or outright arson (Rolley, 2003). For example, in most developing economies, the use of fire to clear farmlands or prepare sites for agricultural production is a regular social practice among rural communities.

Deliberate bushfire ignitions can also be utterly spiteful actions carried out of ill will. This wilful and malicious bushfire ignition is arson. Such arsenic actions are performed out of malice, especially when there is conflict over a piece of land or problems with access rights (Applegate et al, 2001). Thus, a critical factor in arson is the element of intention or will to cause harm. Arsenic bushfire ignitions often occur on fire weather days[2] and so put people and property at serious risk. Also observed is that arson bushfire ignitions are the most difficult to eradicate given their clandestine nature (RFS, 2005). Unintentional/ accidental bushfire ignitions are bushfires that escape from campfires, social practices in livelihood activities as in farmland preparations and

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[2] Fire weather days are extreme hot days that create low humidity and make the grass highly flammable.

hunting, children playing with fires in surrounding areas, vehicle fires and careless disposal of lit cigarette stubs (RFS, 2005). In other words, escaped fires are those that burn and spread out to unintended nearby bushes or forests with fuel loads and therefore, accidental. Causes of some human-caused ignitions are indeterminate although they contribute notably to bushfires.

A natural cause of bushfire ignition is lightning and has been the single causal factor for many millennia. According to the Australian Year Book (2006), lightning bushfire ignitions rank the highest and the commonest followed by deliberately lit fires and escaped fires from agricultural burning and campfires. For example, during the month of February 2015, a total of 120 lightning bushfire ignitions were recorded in Western Australia (Steffen et al., 2015). Similarly, between 2007 and 2011, lightning bushfire incidents reported to local fire departments in Massachusetts, Quincy, totalled 22,600 per year on the average (NFPA, 2013).

Other studies have also indicated that though lightning bushfire ignitions do frequently occur, they happen in remote areas unlike human-caused bushfire ignitions (Dowdy and Mills, 2012; Wotton and Martell, 2005). Lightning bushfire ignitions generally occur during fair weather days when plants become more flammable as they quickly release their moisture content creating conditions of low humidity. Differently put, dry air or low humidity promotes greater intensity of bushfires than the moist one (Arhens, 2013).

Impacts of bushfires incidents on communities are many and varied and often disastrous. They may, however, be broadly grouped as social and economic. Social impacts range from burning down of houses, loss of lives, splitting of families and/or communities, distress over lost loved ones to environmental pollution. In most cases, many families hardly recover from these effects resultantly inducing drastic changes in the victims' lifestyles (BFF, 2015). In New South Wales, for instance, the New South Wales Rural Fires Service (RFS) recorded 1.46 million ha of burnt area in just 151 consecutive days (September 2002 to 24 February, 2003) (Brinkworth, 2003).
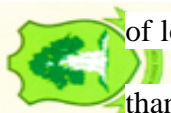
Economic impacts include loss of farmland and farm crops with its attendant issues of food insecurity and high cost of food prices. Others include loss of livestock, damage to forest and economic trees, destruction of wildlife, adverse impacts on surface water supplies and damage to critical community infrastructure (CEDRE, 2015).

1.2 Statement of the Problem

Incidence of bushfires is common phenomena in the Upper West Region and for that matter in the Sissala East district. Located in the Guinean forest-savanna ecological zone, the District experiences a period of 5-6 months long dry spell in the year. This period in effect establishes a fire regime that peaks up between November and March. This long dry spell together with conditions of rainfall variability makes the District bushfire disaster-prone. It is these prevailing conditions that render the Sissala East District vulnerable and prone to natural hazards like bushfire, flash floods and windstorms.

The Upper West Region ranked third in the incidences of bushfire in the country (Nsiah-Gyabaah, 1996) and the district also ranking first in the region (NADMO, 2008). Though these hazards are natural phenomena, certain socio-cultural practices also induce their onset. One other factor escalating the vulnerability of the district is its location within the Guinean Savannah-vegetation zone which makes the grass flammable during the hotter months. Consequently, bushfires are frequent events during the hotter months of the year making the effort at poverty reduction increasingly difficult. These causal factors jointly make bushfires annual incidents in the district recording the highest bushfire-events in the Upper West Region. The resultant environmental degradation also poses threat to sustainable development, safety, food sufficiency and productive base of the people of Sissala East.

The frequency together with their increasing severity not only endangers safe community living but it is also ominous to the communities' coping capacity, food security and resilience.

The general effects of these bushfires include loss of farm crops, loss of homes and property, loss of wildlife and farmland and environment degradation. Observed is that bushfires render the top soil impervious to water engendering alternate flash floods and soil infertility and droughts. As subsistence farming is the primary occupation of the people, bushfires produce striking impacts on food production vital to community survival.

With the loss of farm and attendant loss of farm crops, farmers are the most hit. For instance, the during the 2008-2009 bushfire regime, bushfire disaster-events indicated that subsistence farmers affected in the Sissala East District totalled 322 from 211 households. The total monetary value of crop loss for that year amounted to GH¢24, 657. Impact of flash floods included the collapse of 179 households rendering 528 people homeless. Valuated cedi equivalent of the collapsed buildings was GH¢62, 650. Similar reports gathered from the National Disaster Management Organisation (NADMO) and Ghana Fire Service (GFS) during the 2009/2010 bushfire regime indicated increased loss to the farmers. Again, during the 2011/2012 bushfire regime, a number of people displaced from their homes totalled 389 from 250 households. The computed cedi value totalled GH¢39,200. All these recurrences not only deepen rural poverty but also entrench it.

Over the years a number of prevention and mitigation measures have been put in place to ensure community safety. Notwithstanding these implemented prevention and mitigation measures, bushfire incidences are on the increase and so is the attendant emotional trauma. The recurrent nature of these bushfire disaster-events in the Sissala East District, their extent and intensity of their impact fundamentally requires rethinking of bushfire management practices in the District. It further places a priority focus on exploring most effective ways of protecting the people and their property by way of re-examining the interventions implemented, social practices and social

patterns of behaviour that have implications for bushfire management in the District. The aim is to identify the social practice-types and behaviour patterns contributing to the frequent incidence of the bushfires and to explore strategies for behavioural change in the District.

1.3 Research questions

To appreciate the community social practices engendering the recurrent incidences of bushfire in the Sissala East District, the study addresses the following questions:

i. What is the nature of the socio-cultural practices inducing the frequent incidence of bushfires in the Sissala East District?

ii. What are the community interventions put in place to prevent and/or mitigate bushfires?

iii. What are the impacts of these community interventionist efforts?

iv. What are the constraints limiting community efforts in bushfire prevention?

1.4 Research objectives

The main objective of this study is to analyse the nature of the social practices inducing recurrent incidences of bushfires in the affected communities in the Sissala East District. Specifically, the study:

i. Examines the nature of the socio-cultural practices inducing the frequent incidence of bushfires in the Sissala East District;

ii. Identifies and reviews the process and types of community interventions put in place to prevent and/or mitigate bushfires

iii. Assesses the impacts of these community interventionist efforts

iv. Examines the constraints limiting community efforts in bushfire prevention

1.5 Significance of Study

The study of the socio-cultural practices and the incidence of bushfires seeks to contribute to three bodies of knowledge. First, it adds to the body of literature on the study of bushfires in the Sahel region of Ghana. Noteworthy is that the three regions in the North are also considered the food baskets of the country. So, when bushfires burn down people's farms, the immediate general economic effects felt across the country is instant rises in food prices often at a high political cost. Thus, the study of socio-cultural practices inducing the incidences of bushfires in any of these regions provides proactive measures to forestall the related economic and political consequences.

Second, this study seeks to advance the study of interventions to bushfire disaster management and development of community-led disaster management plans. The implication is that building resilient communities requires knowledge-based approach to reduction of known underlying risk drivers contributing to the risk generation and subsequent disaster-event occurrence. This is in line with the Hyogo Framework for Action (HFA)—2005-2015, Priority for Action Four—: reduce the underlying risk factors. The assumption here is that if human actions are the triggers, then the same human actions can be directed to address identified inducing factors. This study, therefore, attempts to investigate the nature of the underlying risk drivers and the attendant implemented interventions to identify the causal factors and the gaps in the implementation process. Understanding the main factors that determine the recurrent incidence of human-caused bushfires can better inform communities in planning and developing bushfire prevention and mitigation strategies.

Third, the study also seeks to extend the literature on preventive and preparedness measures necessary for safe community living. The emphasis is that the nature of communities' land-use activities increases their vulnerabilities to the identified disaster events. The essence is to provide further inquiry into the existing preventive and preparedness measures and offer analytically informed perspectives on the effectiveness of these measures in relation to community land-use activities, vulnerabilities and inherent community capacities.

1.6 Organisation of the Study

The study is organised into five chapters as follows:

Chapter One: 'Introduction' provides a general background and purpose of the study. It also outlines the research questions, research objectives, relevance of the study and organization of the study within which the socio-cultural practices and the incidence of bushfires in Sissala East District is discussed

Chapter Two: **'Review of the Literature conceptual framework**' reviews the relevant available literature on the topic area and the concept adapted for the purposes of the study of socio-cultural practices within the study area.

Chapter Three: '**Methodology'** discusses the profile of the study area, research methodology employed in the study as well as the study design, sources of data, the target population, the sampling techniques used, methods of data collection and analysis.

Chapter Four: '**Socio-Cultural Practices and the Incidence of Bushfires in Sissala East District'** examines the socio-cultural practices influencing the incidence of bushfires in the Sissala East District. The purpose is to identify the negative socio-cultural practices threatening community safety and increasing their vulnerabilities to bushfire disasters and how all these

negatively impact on community safety, livelihood and food security. The chapter also explores types of interventions implemented, their outcomes and inherent community capacity, limitations and how these can be enhanced for the good of the communities in the District and be possibly replicated elsewhere.

Chapter Five: '**Conclusions'** summarises the findings of the study and examines the implications for further research.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Introduction

The review of literature on the socio-cultural practices and the incidence of bushfires in Sissala East district are categorised into four subgroups. These are general studies on socio-cultural practices and the incidence of bushfires, socio-economic effects of bushfires, studies on use of fire as tool for resource management and studies on the incidence of bushfires in Africa at large and Ghana specifically.

Wealth of research that exists on bushfires and socio cultural practices testifies both to the presence and significance of the problem. All of the local practices, socio cultural practices are certainly critical problems whose damages and long-term consequences are not limited to individual inhabitants in the district but extend to impinge upon the progress of entire communities and stand as a threat to national economic growth. Consequently, not only is the identification of the causal factors essential but the design of strategies for the correction and eventual exclusion of the problem of indiscriminate burning are equally important.

The current chapter reviews a number of the literature on causes of bushfires, socio-cultural practices that trigger bushfires from a variety of perspectives and the effects of bushfires on the inhabitants. The aim of the review is the articulation of a comprehensive listing of the variables affecting bushfires.

In Europe, forest fires mostly affect the Mediterranean regions where, on average, 85% of the annual burned area is recorded (San Miguel and Camia, 2010). The main drivers of fire ignition are interconnected and evolve along parallel overarching trends to those of the human society and

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its use of forest resources. Socioeconomic developments in recent decades have led to changes in life patterns, with increasing mobility of people, spread of tourism and recreational activities and the resulting increase in the number of visitors to the forest. Additionally, in many rural areas of Mediterranean Europe, fire is a traditional and long established management tool. Its ancient and current use in agriculture, silviculture and livestock breeding is well documented (Bonora et al., 2002; Carmona-Moreno et al., 2005; Moreira et al., 2009). All the above-mentioned societal patterns have resulted in changes in fire ignition causes in the last decades.

The existence of a wide range of fire causes significantly complicates the assessment of fire risk since the factors that drive fire ignition have to be modelled, including human and environmental variables, as shown in several works (Bar Massada et al., 2009; Martínez et al., 2009; Thompson et al., 2011).

A fire requires three basic components: fuel, oxygen and heat. To control the fire, at least one of the elements must be removed. Bushfires as a natural phenomenon are beneficial to both the biotic and abiotic components of ecosystems (Afolayan, 1978). Regrettably, bushfire setters do not often take into consideration the direct (killing through burning) and indirect (clearing vegetation and exposing vulnerable animals to predation) destructive effects on wildlife (Collins, 1960). They rather consider anthropogenic bushfires as beneficial in several ways: (i) driving away dangerous animals like snakes, which shelter in dense vegetation, (ii) enhanced hunting efficiency in shortened grasses and attracting game animals after burning, (iii) destruction of unpalatable grass (e.g. *H. contortus, Bothriochloa*sp) and stimulating the budding of new and more palatable grass for grazing mammals at the beginning of the wet season (Korem, 1985; Happold, 1995).

The World Bank (1999) reported that widespread rural poverty, illiteracy, and hunger have constrained rural populations to exploit natural resources unsustainably for survival.

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Such populations simply could ill-afford to preserve wildlife for purely visual, cultural or educational reasons. This appears to be the case with the inhabitants of the study area that could only be expected to appreciate wildlife through education and awareness programmes which stress the importance of biodiversity conservation and its role in ultimately increasing food supply (Asibey, 1965).

2.2 Nature of the Socio-Cultural Practices and the Incidence of Wildfires/Bushfires

Fire has been a common observable fact throughout the history of the world. Fire has been a regular companion of humans throughout history. Humans have made use of it and at other times been threatened by it (Long 2006). Humans are believed to have altered the intensity and timing of fire over time, particularly in relation to increasing human demographics and changing power regimes, and anthropogenic activity is one of the main causes of fires in African Savanna today (Eriksen, 2007*)*.

Early attempts to model human-caused fire occurrence were based on indirect assessments of human activity using demographic indicators or data on generic accessibility to forested areas (Cunningham and Martell, 1976; Altobellis, 1983; Donoghue and Main, 1985). Later on several spatial analyses of fire occurrence explored the role of spatially explicit factors such as distance to roads and location of recreational areas or distance to urban settlements (Chuvieco and Congalton 1989; Vega-García et al.,1995; Alexandrian,1995; Russell-Smith et al.,1997; Follin,1999; Cardille et al., 2001; Pew and Larsen, 2001; Vasconcelos et al.,2001; Decarnin,2002; Prestemon and Butry2005; Mollicone et al., 2006; Maingi and Henry, 2007; Vasilakos et al., 2007; Yang et al., 2007).

Indeed, the analysis of human-caused fire occurrence requires a comprehensive assessment, integrating in one framework spatially explicit variables related to human activities (e.g. location and distance to infrastructures such as roads, railways, power lines, populated areas or recreational sites, the configuration of wildland/urban interface areas) as well as socio-economic variables and indicators affecting human ignition (e.g.unemployment rates, age of rural populations, population density, housing density, etc.).The literature on fire and savanna environments tends to focus on biophysical aspects of fire management and impact, and tends to take a top-down approach to land management (Eriksen,2007). Bushfires are becoming one of the environmental challenges confronting Ghana and increasingly it has become complicated for the Government to control it because this activity is deeply rooted in the socio-cultural and economic systems of the people.

The effects of bushfire on rural livelihoods and on the ecosystem in Ghana are extensive and damaging. Bushfires have accelerated environmental degradation especially in the fragile savannah ecosystem, yet there is very little in the form of public education, published data and information concerning the frequency, intensity, duration and effects of bushfire on the environment and human welfare in Ghana (Kusimi and   Appati, 2012).

This human ability to manipulate fire is a contested issue in discussions on sustainable land management because indigenous fire manipulation skills in tropical drylands remain in conflict with Western style land management, which tends to attempt to keep constant abiotic factors like fire. Dating back to colonial land management models, tropical drylands have, in general, been interpreted using a single-state equilibrium model of succession.

However, recent studies by Laris and Wardell (2006), Parr and Andersen (2006), Laris (2002), Mistry (2000), Stott (1997), Van Wilgen and Scholes (1997), and Sullivan (1996) have established that fire, along with other disturbance factors, such as drought and grazing, makes possible the co-existence and co-dominance of herbaceous and woody savanna vegetation. Savanna are, therefore, increasingly perceived as heterogeneous ecosystems at different spatial and temporal scales,

influenced by abiotic and biotic factors, and with fluctuating boundaries over the short as well as the long term (Stott, 1991; 1994; 2000; Baker, 2000; Higgins *et al*., 2000; Mistry, 2000).

Clearing of the bush late in the dry season, and the creation of firebreaks earlier in the dry season, are linked to the extensive growth of tall grass species in areas where woodland has been cleared for agriculture and settlements. Tall grass is valuable to local villagers, as it is used for roof thatching and mats. The height and density of the grass, however, creates problems as it dries, as it harbours pests and becomes unpalatable for livestock. It is also problematic, because this dry, tall and dense grass produces vast amounts of combustion material, which contributes to the late dry-season bushfires becoming so hot and intensive that they can become uncontrollable and 'burn with the wind for weeks at a time (Eriksen, 2007).

The timing of burning is clearly linked to particular livelihood activities. In the district, fire is exclusively ignited during the early dry season to encourage tree growth, for hunting, to drive away snakes and species biodiversity. It is self-evident that bushfires occur during periods of hot weather. 'Bushfire weather' is generally of a short term nature within the climatic variation typical for some areas. Whilst bushfires can be expected any time in the summer season, the worst bushfires tend to occur during the following meteorological conditions (Webster, 2000). There are many factors that trigger bushfires – some result from natural events, some are intentionally lit and others are unintended and avoidable man made causes

More recent statistics indicate an escalation of the problem. According to statistics from the district office of National Disaster Management organization it is established that it is becoming a common phenomenon across the communities in the district. Statistics for 2012 show an additional increase in the number of reported cases (NADMO, 2012). Bushfires are generally defined as any uncontrolled, non-structural fire burning in a grass, scrub, bush or forested area. Fires can be divided into two main categories, depending on topography of the area.

• Hilly/mountainous fires - Burn in hilly, mountainous areas which are usually densely forested. The land is less accessible and not conducive to agriculture, thus many of these densely forested areas have been saved from deforestation and are protected by national, state and other parks. The steep terrain increases the speed and intensity of a firestorm. Where settlements are located in hilly or mountainous areas, bushfires can pose a threat to both life and property.

• Flat/grassland fires - Burn along flat plains or areas of small undulation, predominantly covered in grasses or scrubland. These fires can move quickly, fanned by high winds in flat topography, they quickly consume the small amounts of fuel/vegetation available. These fires pose less of a threat to settlements as they rarely reach the same intensity seen in major firestorms as the land is flat, the fires are easier to map and predict and the terrain is more accessible for firefighting personnel.

According to Korem (1985), fuel wood provides the main energy source for both rural and urban households throughout the entire West African sub-region, with estimates of about 50% of total energy consumption. Fuel wood plays an important role in human activities like fish smoking and charcoal production in the essentially coastal wetland community. It was apparent from his study that over-exploitation of fuelwood has resulted in a reduction in size of fuelwood harvested and the use of less preferred materials like tree stumps. Some of the reasons given generally for fuel wood over-exploitation in deprived localities such as Sissala East District include: (i) high costs of alternative energy sources(LPG, electricity), (ii) alternative uses of fuel wood for non-domestic purposes like fish smoking, and preparation of "street food", and (iii) widespread cutting of small- and medium-sized branches from wild-growing trees instead of collecting dead fallen wood as pertains in parts of East Africa and West Africa (Korem, 1985), and (iv) production of commercial

quantities of charcoal, which is in very high demand in urban areas, because of its lighter weight and slow and hot burning qualities.

There has been amazingly little study of the impact of broader cultural influences on community understandings of fire and other disasters. Quarantelli (1980) led the way with an assessment of disaster movies and the influence these had upon community perceptions.

Pyne (2002) has recently pointed to a disconnection between America's vernacular fire reality and its high culture. He argues that wildfire in America cries out for philosophy, history, ethics' literature, economics and political theory. Instead, the language of fire has become the jargon of the technical manager and astounding journalism: "a subject that goes to the heart of our identity as a species ends up as government reports, bowdlerised war stories, or a genre of juvenile sports literature".

Bushfire is becoming a normal part of people's natural environment, particularly in forested areas, and bushfires are a common occurrence during drier periods of the year in most places. This is as a result of failure to properly control the incidence of bushfires. The frequency and intensity of bushfires varies throughout the landscape under natural regimes. Various land uses and land management practices have modified, and continue to modify, natural fire regimes.

People living and working in or visiting bushfire-prone areas need to adapt to the risk posed by their environment, including changing fire regimes.

The annual incidence of major bush fire confirms to the community that bushfire is part of the communities and that there is the need to prepare for major fires. It is not just a recent phenomenon due to climate change or global warming but a frequent occurrence.

They burnt forest and woodlands on a regular basis to encourage new growth that would become a food source for native animals. When there is a plentiful and stable food source then animal numbers would increase giving indigenous communities a reliable food source. It was this practice

that helped shape landscape, and it can be, if there is an acceptance of the importance of burning, the greatest tool available to protect and enhance our unique biodiversity assets.

Burning of bush and grass in most places occurs either unconsciously by natural forces such as lightning or often by man for agricultural purposes to facilitate the growth of new grass for livestock. Bushfires are more extensive in drier environments where a number of factors are responsible for the incidence and range of the fires. The grasslands, by their geographic locations, have a long-lasting dry period which extends from October-April which results in a more painstaking drying up of vegetation and soils. The intensity of the sun is generally felt with bare vegetation. Wind speed is usually high. The importance of grazing is particularly significant in this district. Therefore the need for fresh green grass leads to the tendency of herdsmen to burn off dry and undesirable grasses and to advance the growth of new pasture.

Hunting is also an important activity in Sissala East District, and some hunters set fires to drive out game in hunting. In the forest ecosystem, haphazard bush burning has been one of the major factors in the change of forest to woodland, woodland into savanna and savanna to shrubland.

The Sudan and Guinea grasslands are anthropogenic climax communities maintained by grazing, bush burning and crop cultivation, and they will relapse to scrub and then woodland and forest if these controlling factors are isolated. Weather extremes and rainfall unpredictability make the natural vegetation susceptible to wildfires. Where the wet season is short, lasting only three to five months, and where potential evaporation exceeds rainfall for most of the year, the natural vegetation becomes vulnerable and gets destroyed by bushfires which occur yearly. Thus, the Sudan and Guinea savanna areas in the country experience more extensive and frequent bush fires than the moist, humid rain forest zone.

In the semi-arid zone, drought often triggers them off, although four human activities -slash-and-burn agriculture and shifting cultivation, livestock production and hunting - are the most immediate causes. In Ghana, bushfires are more widespread in the semi-arid savanna regions where the rainy season is short and rainfall variability is high.

This literature review has revealed that, while bushfires are an increasingly popular area of interest for research, given the growing severity and frequency of this natural phenomenon and their impact on the lives of the local people and other surrounding communities, there is scope to conduct additional research to compliment and extend previous studies.

In particular, as captured in this literature, most literature has concentrated on impacts of these events on individuals and the environment, but not both, and has tended to be based on quantitative data with an emphasis on the macro rather than the microenvironment.

Both negative and positive impacts of bushfires have been canvassed in this section, as well as proposed management responses to bushfires, including the importance of planning, provision of information, use of the media and marketing/promotion as techniques or tools to minimise the impact of bushfires on an organisation, region or community.

Bushfire cannot be eliminated from the environment due to the relationship between the incidence of fire and socio-cultural practices. Furthermore, climate change may bring longer bushfire seasons to parts of the communities, an increasing number of extreme fire weather days, and increasing fire intensity.

Unfortunately, many people fail to prepare adequately for bushfires, leave it too late to make critical decisions, and as a result have few safe options. Hence, engaging with communities, sharing responsibility with them and building their capacity to prepare for, respond to and recover from bushfires will be a critical component in reducing loss of life and reducing broader social, economic and environmental impacts of bushfires across the district.

The numbers of fires shoot up around major urban centres, facilitated not only by higher incidences of accidental fires, but primarily driven by increased proportions of deliberate lightings. The impact of these numerous smaller fires on the community and the environment, particularly within remnant vegetation near the urban fringe, is significant. Many bushfires that burn each year are preventable, but to do this we must know more about the nature of bushfire arson; when, where and why people light fires in bush land settings.

Fire setting commonly reflects an attempt by the fire setter to effect 'positive' changes in their life with regard to an underlying desire or dissatisfaction.

Although some fires are possibly lit without reason, including some of those by children and people who have a psychological disturbance at the time of fire setting, many fires are lit in the effort to create excitement or relieve boredom, to gain attention or recognition, lit for a specific purpose or gain, including expressions of frustration or anger, or more than one of these motives. Reduction in bushfire fire-raising must necessarily involve the investigation and prosecution of offenders, but also efforts to address the underlying societal and psychological issues that lead arsonists to choose fire setting as a preferred means of expressing their emotional frustration. Increased community awareness plays a significant role not only in the detection of fire setters, but also in the prevention of deliberate fire setting in bush land settings.

2.3 Studies on the use of Fires as a Tool for Resource Management

People have used fire to manipulate the landscape since prehistoric times. The science of using prescribed fire to manage unwanted vegetation is a fairly new phenomenon, and it recently took an important stride front. Fire is perceived as an ecological resource management activity by many and there is an exclusive emphasis on controlled early dry-season burning within the park boundaries (Eriksen, 2007). It is therefore impossible in practice to protect an area the size Sissala

East from all late dry season fires, and it is obvious that this is a clear source of conflict between local land users (Eriksen, 2007).

The critical role of fire has acquired an international dimension after being contemplated within the overarching framework of the strategy to enhance international cooperation in fire management (FAO 2007).

Though fire has been used since prehistoric times to manage vegetation, the modern use of fire to control plants is an emerging science. Until recently, most studies on the use of fire as a management tool have been driven by requests for information from the agriculture sector and have been conducted on cropland and rangeland systems (DiTomaso et al., 2006). The key principle in controlling invasive plants with is to interrupt the reproduction cycle either killing the target plant before it produces viable seeds or by destroying the seeds before they can germinate or disperse (DiTomaso et al., 2006).

The most important step towards the wise use of fire to identify exactly where we are in the evolution of the fire problem and adapt responses locally by taking into account the lessons learned from other regions that have had a previous similar experience (Cristina et al., 2010).

Fire is widely accepted throughout the country as being a valuable tool in the management of natural vegetation, agriculture including livestock production and in other land use systems (Gyabaah, 1996). In the past and even in some instances today hunters, herders, farmers and cigarette smokers are the primary recipients of blame for uncontrolled and indiscriminate bush burning. Many bushfires in the forest zone are deliberately started during the dry season. In many areas, farmers and hunters do so to facilitate access by men and animals. Many farmers use fire to reduce the fuel load or combustible litter in order to reduce the potential frequency and intensity of late dry season fires (Gyabaah, 1996).

Some farmers also burn in order to control dangerous animals, insects and pests. For example, it is used to destroy or control some pests and diseases (e.g. grasshoppers, ticks, locusts, anthrax) and livestock parasites which live and thrive on the vegetation. Fire is sometimes used to create conditions suitable for particular land use systems or to create a habitat for particular species, for recreational purposes or to promote tourism. Although there are good reasons for using fire as a tool if it is uncontrolled or set indiscriminately, its effects can be damaging. Burning in certain seasons of the year can be very destructive not only of vegetation but soil structure and composition, and it increases soil erosion (Gyabaah, 1996).

The use of fire is an integrated part of land use and is also governed by socio-cultural traditions. The impact of fire on the dynamics of dry forests and grass savanna is studied considering the specifics of different fire regimes. It is proposed that a deliberate and controlled use of fire respecting the vegetation stage and the defined objectives could be an appropriate management tool. The strategy of a fire management is elaborated considering both the conservation of biodiversity and improvement of the livelihood of the local population depending upon the Reserve's resources. Obviously, a sustainable management of the natural resources requires a substantial participation of the community (Bloesch, 1999).

Mankind learned to handle fire as part of land use, but also used fire for socio-cultural reasons. In view of introducing and developing modern fire management it is important to understand the development of the use of fire and the underlying perception by the population (Bloesch 1999).

The frequency, season, and intensity at which fires occur in a given region make up the 'fire regime' (van Wilgen et al., 1990).

Lightning strikes are the cause of virtually all naturally occurring bushfires. Approximately some bushfires are started by lightning strikes. Thunderstorms build up when dense cold air overlies

dense, warm, moist air, converting the warm air's heat energy into electrical discharges and wind.

Lightning strikes that reach the ground set in motion with concentrated negative electrical charges, perhaps created by the collisions of rising ice crystals and falling hailstones that collect in the lower part of storm clouds. Eventually the electrical force between the charge of the cloud and the ground beneath it becomes too great and sparks known as 'stepped leaders' overcome the insulating ability of the air and shoot earthwards. Because the air around a lightning strike is suddenly superheated, it expands explosively. This creates shock waves that travel through the air - we call these shock waves thunder.

All other bushfires on lands are started as a result of human activity. Most of the bushfires in the area are caused by people. These are both purposeful and unplanned ignitions. Some examples of fires caused by people are discussed below. Farmers may burn vegetation on their properties for a diversity of reasons including weed control, burning of crop debris and the elimination of rubbish.

Agricultural burns can accidentally ignite fires on farm lands. Unattended burns are most likely to 'escape' and become bushfires. Some equipment or machinery that generates heat or sparks is a potential cause of bushfires. Examples of some of these machineries include chainsaws, welders and from the exhausts of vehicles.

Another dimension includes all fires which are intentionally lit and develop into bushfires on farm lands. Examples include children playing with matches or experimenting with fire, farmers deliberately lighting fires without necessary permits or authority or maliciously lit fires.

Many authors have shown that a large number of fire ignitions can be explained by a collection of factors (Langhart et al., 1998; Mangiavillano, 2004; Lampin et al., 2005 and 2006; Martínez et al., 2009;).

These authors found clear evidence for a positive relationship between the intensive use of the territory and the ignitions in forest areas, with a significantly higher occurrence of fires in the vicinity of urban areas and transport networks (at a distance of between 50 and 250 m from urban areas and less than 50 m from tracks). This trend was also underlined in the work of Padilla and Vega-García (2011). However, the spatial distribution of fires in relation to these factors may reveal different tendencies.

According to Alexandrian and Gouiran (1990), in France, some fires occurred close to roads, around highly populated towns or in forest fragmented areas, whereas other fires were ignited near isolated dwellings in large forest stands. Other authors, such as Archibald et al., (2009), confirmed the positive relationship between population density and occurrence of fires; however they showed that, simultaneously, there was also a decrease in the total area burned with increasing human densities because of the decrease in mean and maximum fire size.

Regarding intentional fires, high fire occurrence is linked to different motivations, which in turn depend on the socio-economic or political context of the region or country concerned.

In southern Italy, for instance, Lovreglio et al., (2010) identified as major motivations of voluntary fires those linked to policies concerning seasonal forest workers; in this case fires were used as an instrument to force or maintain seasonal employment.

In Galicia (NW Spain) and in northern Portugal, arson is also a major problem and has its roots in social conflicts. In some cases, the conflicts arose because government plantations were established on lands that were previously used as rangelands by the local community (Moreira et al., 2001, Tabara et al., 2003). In Greece, Lekakis (1995) concluded that political decisions and economic developments leading to increased demand for land were largely responsible for the reduction in the forested area in Greece due to fires.

At the global scale, human factors are proven to be related to fire persistency and seasonality, while fire density patterns are associated to human variables for specific climates and vegetation

covers (Chuvieco and Justice 2010).The great influence of anthropogenic activities on global patterns of fire seasonality was also underlined by Le Page et al., (2010).

2.4 Socio-Economic Effects of Wildfires/Bushfires

The impact of fire on the environment shows that when there is fire on erodible soils and slopes it can lead to accelerated erosion. Wildfires that are very hot can destroy the commercial value of wood in forests, either natural or plantations (Ladrach, 2009). The yields of the crops in the burned site were triple those harvested in the area that had been bulldozed. According to Seubert (1974), the results of his study notably favoured the traditional slash and burn agricultural system to that of mechanical clearing.

Some of the consequences of the bushfire include the burning of food stuffs, houses as well as domestic animals. The environmental impacts of these bushfires have been very devastating and these involve the loss of biodiversity (plants and animals) and the depletion of organic matter of the soil thus impoverishing the soils. The research found out that, the continuous prevalence of this activity was due to the laxity in the implementation of bye-laws regulating bushfire burning due to the lack of personnel and logistics to state agencies in the District to combat the problem (Kusimi and Appati 2012).

According to Kusimi and Appati (2012), fire is widely accepted throughout the country as being a valuable tool in the management of natural vegetation. Field survey indicated that about 60% of bushfires are caused by peasant farmers, 30% attributed to pastoralists, 6% to ward-off snakes and 4% due to the traditional festivals of the people (fire festival etc.).

Fires are used to clear lands for farming especially during the dry season. This is because it is a cheaper, faster and easier method of clearing lands. Though some farmers do it intentionally, others create fire belts, but in the dry season, the harmattan winds could be too strong and cause spill over

to unintended lands. The study also revealed that, the need to get fresh regrowth of grass for cattle grazing by Fulani herders promotes bush burning.

During the dry season, local cattle herders and immigrants from neighbouring countries, Mali and Burkina Faso called Fulani set ablaze the vegetation to promote early regrowth of fresh pasture for the animals. Sometimes village folks are paid some token fees by these nomadic herdsmen to set the dry vegetation ablaze during the dry months of November to March while they move southwards to find fresh vegetation for the cattle. The herdsmen return with their cattle around April and May by which time the vegetation might have sprouted by the early rains of April and May. Most herders believe that bush burning improves the palatability and nutritional value of grasses and trees for grazing (Gyabaah, 1996). The vegetation is also set ablaze when the headsmen notice that their heads of cattle are going to fall into the hands of harmful pests and insects such as ticks and tsetse flies.

Snake bites are a serious health problem confronting most communities and they resort to early burning of the vegetation to control the number of snakes in the ecosystem. This is due to the fact that, though snake bite patients entitle to free medical care at the health centres, however these health centres in most cases are inaccessible due to either the poor nature of the road, shortage of anti-snake serums and the distance to health post is sometimes far.

Hunting is also another important livelihood activity in the savannah ecosystems especially in the dry season; most people go on hunting expeditions and set fires to drive out game to kill because meat forms one of the primary sources of protein amongst the people. Accidental causes of wildfires involved cooking in the farms, palm wine tapping, charcoal burning, honey extraction and cigarette smoking. Bushfires of low or moderate intensity often pose little threat to life and rarely cause significant damage to property.

However, bushfires that burn in steep terrain or on hot, dry and windy days spread rapidly, crown in forested areas, produce powerful convective columns and create extensive forward spotting, often making their control impossible until weather conditions moderate. Such fires are dangerous events that cause significant damage to property and occasional loss of life.

The effects are loss of life, loss of homes and property, degradation of land and environment, and wildlife. Once an area has been burned out and denuded of vegetation, there is little left to hold the soil together, and any important wind or hopefully, rain, will wear down or wash away whatever is left.

The risk of serious injury or death to people in the path of uncontrolled bushfires increases significantly, and many properties can become complicated or impossible to defend. While fire is important to maintain many natural ecosystems, fire of unsuitable frequency and/or intensity can cause damage to these ecosystems. Inappropriate fire regimes are a threat to biodiversity, water catchments, and air quality and landscape values. Both too much and too little fire can damage ecosystems. The full extent of the impacts of the bushfires may not be known for many years. What is clear is that these large, intense fires have potentially devastated some of the most endangered animals and plants, raising major concerns for their survival in the future.

The psychosocial effects of the fires vary within each region depending on the locations and proximity to the fires. The lengthy time some communities in a vicinity of fires will have to stay alert, to prepare for possible fires, and be ready to protect their properties from the fires is a marked draw off on the physical, social and psychological health of people in these communities.

Residents' health are debilitated by, or certainly at risk from, the smoke and haze produced by the fires. Certainly, respiratory conditions are exacerbated by these conditions. Moreover, individuals involved in firefighting activities have to cope with the prospect of their homes being threatened, and in some cases, burned by the fires during their absence.

Road access closures, loss of schooling, and other community services, and broken communication/telephone lines exacerbated the feelings of isolation within local communities in the region, especially in areas directly impacted by the fires, but to varying degrees by communities threatened by or involved in fighting the fires.

Families also suffer financially because of their involvement in fighting fires. Many people lost income, not just for the duration of the fires, but also in the weeks following.

While the threat of the fires in many ways had the effect of marshalling the resources of communities, the fires also had the effect of creating divisions within communities where it was perceived that some families/properties were given priority service by fire crews. The economic effects of the bushfires are examined both in the short term and the medium term. The short term is defined as the period when the threat of the bushfires first appears until after the threat has passed. Given that most communities reported fighting bushfires continuously for a period from November to April to be the short-term period when economic activity is affected. Bushfires burn several hectares of public and private land. The fires have had a significant impact on forests and resorts.

The consequences of such extensive fire damage included reduction in water quality and supply, destruction of habitat for significant plant and wild life, burned commercial timber stands, destroyed recreation, tourism and cultural sites, and affected farms next to public land. Much of the land burned by the bushfires is part of the water supply catchments for towns. As a consequence of these fires, in the short to medium term, river water quality is expected to be affected following significant rain, due to the potential for increased overland runoff.

The bushfires, in terms of smoke and flames, threats to public safety and mass withdrawal of visitors haves severely affected economic activity. Tourism revenues have been greatly reduced

as the number of visitors has fallen off dramatically. In turn, the flow-on effects to other businesses that are indirectly related to tourism have been significant and have clearly demonstrated the critical contribution that the tourism industry makes to the regional economy. Fires have had a major impact on some species and habitats. Savannah vegetation types are affected, with some being totally burned out. In terms of cultural impacts, the fires have affected non indigenous archaeological sites. These sites are associated with early European exploration, mining, settlement, pastoral, survey and recreational activities and are significant tourism and recreational attractions.

Fire could negatively have an effect on the natural splendour of a landscape or the scenery (Lichtman, 1998), which may impact on visitation (Centre for Risk & Community Safety & OESC, 2003). Smoke 'can reduce scenic or aesthetic quality' (Kneeshaw et al., 2004: 479; Shelby and Speaker, 1990).

Forest can take time to recover to 'its pre-fire condition' (Kneeshaw et al. 2004: 480) and blackened, charred trees and groundcover can look unpleasing (Cioccio & Michael 2007). This might affect recreation, such as decreasing photo opportunities (Lichtman, 1998).

The destruction or damage to nature through these fires may consequently diminish the importance of our protected areas to the general population, although further research is required to explore whether this suggested phenomenon is in fact a real one. Lichtman (1998) suggests that fire may be seen as a 'policy failure' by government/protected area agencies and thus 'one's trust in the land management agencies was betrayed' (Lichtman, 1998: 7).

Fire is natural part of most landscapes and many of the native plants, animals and ecosystems have evolved to depend on fire as part of the environment. But because the bush is not a homogenous landscape, various vegetation types have different needs in terms of fire frequency and intensity.

This also means that there is no 'one size fits all' approach to fire management. We can never control fire but we can learn to manage it in ways that protect people, property and nature. Due to their increasing frequency, scale and intensity, fire can now be considered one of the most serious threats to nature in Ghana. This severe increase in the frequency and intensity of fires threatens to cause a reduction in the resilience of ecological communities, pushing endangered wildlife towards extinction, place once abundance wildlife on the threatened lists for the first time, and put our precious and deteriorating water storages at risk.

The effects of bushfires in Ghana led to the loss of large tracts of forest and wildlife, in localities where these bushfires occurred. This incidence would have the propensity of destroying the indigenous sources of livelihoods in the affected local communities.

The literature also indicates that society naturally have indigenous ways of protecting some national resources, through totems, taboos, best practices and punitive active, which must be strengthened.

Some tracts of land have also been uncovered to soil erosion by the incidence of bushfires. Bushfires pose a threat to food security, hence the need to draw the attention of policymakers to the fact that the environment constitutes a large constituent in any poverty reduction strategy.

Bush-burnings do not only pervade the entire farming lives of most Ghanaians and destroy several hectares of food and cash-crops to the detriment of farmers and their dependants but also to the nation as a whole.

Again, bushfires do pose a threat to eco-tourism development since most tourist centres are situated in fire-prone areas. Bushfires occur predominantly through the destructive activities of group-hunters, herdsmen and the negligence on the part of cigarette smokers, palm-wine tappers, honey

harvesters, and bush-burnings by farmers. Knowledgeable Ghanaians must make an effort to sensitise the public on the dangers of bushfires.

Now, because of bushfire situations in the country, many economic problems are rising as agricultural bases are being violently disturbed. Plant populations are being radically reduced by bushfires. Apart from destroying soil nutrients, making it infertile and causing soil erosion and desertification, bushfires have also destroyed large quantities of foodstuffs -- not sparing lives and dwellings. Repeated bushfires have also baked the lands and rendered agricultural activities impossible.

Bushfires have destroyed the creation of God and disturbed the harmony and balance in the environment, threatening the survival of persons and animals. The survival and development of our nation depends on the preservation of the vegetation, which provides our needs such as food, medicine, timber, rainfall, prevention of erosion, checking of floods, and protecting us from the direct rays of the sun. Every tree is life, so we should not burn them (Garry et al., 1999)

The importance of education and the duty of the communities cannot be over-emphasised. In spite of these efforts, very little has been accomplished in preventing and controlling bushfires because the beneficial uses of fire in agriculture to the individual far overshadow the harm it does to some resources.

2.5 Studies on the Incidence of Bushfires in Africa

Fire is undoubtedly one of the unifying characteristics of Savanna and it is more frequent than in any other biome (e.g. Huntley & Walker, 1982).

Fires are either natural or man-made. Natural fires are mostly caused by lightning and must have occurred since the earliest appearance of vegetation in Africa (Bloesch 1999). There are few

records on bushfires, especially fires ignited by lightning in Ghana. Data on anthropogenically caused fires dating back to the pre-independence era are also lacking (Gyabaah, 1996). However, records of bushfires in Ghana can be traced to the frequency of drought periods because most drought years are accompanied with widespread bushfires. Droughts have obviously been occurring since the beginning of the 19th century (Gyabaah, 1996). However, it was only after 1970 that the problem of drought and associated bushfires came into the forefront of natural concern for the environment (Gyabaah, 1996).

Available records show that during the 1982-83 harmattan season, about 35 per cent of crops were destroyed by bushfire. In 1984-85, about 145 bushfires were reported in the northern savanna zone alone (Gyabaah 1996). The crops most affected were rice and maize. The average size of farms affected was ca. 50 ha, with the largest covering about 10 ha (Gyabaah, 1996).

Ghana experienced serious bushfires during the catastrophic Sahelian drought (1973-74) and again in the period 1984-1985(Gyabaah, 1996). Available data on the 1984-85 bushfires in all the country's ecological zones show clearly that the Guinea and Sudan savanna areas suffered the most impact with loss of vegetation, standing crops, farms, wildlife, habitat, human lives and property (Gyabaah, 1996). A recurring debate throughout both the scientific and general community is the effectiveness, required amount and location of hazard reduction burns to reduce the intensity of bushfires.

The aim of these prescribed burns is not to prevent fires from occurring, but to reduce the intensity, rate of spread and crowning of those that do occur. Land managers such as government agencies, local government and private landowners have the legislative responsibility for undertaking hazard reduction activities. Criticisms have arisen that the environmental requirements of the *Rural Fires Act* have made hazard reduction burning more difficult, and hence there has been less of it.

One thing is certain – the rules we all understood about fire management have now changed and a new approach is necessary. The Wilderness Society encourages scientists, local communities, and our members to contribute to relevant processes. What we need now is a response that takes into consideration both a local and landscape approach where science guides us to take precautionary measures to protect people, property and the environment.

In Africa, local communities had well-developed traditional indigenous knowledge systems for environmental management and coping strategies, making them more resilient to environmental change (Boyce, 2000). This knowledge had, and still has, a high degree of acceptability amongst the majority of populations in which it has been preserved. These communities can easily identify with this knowledge and it facilitates their understanding of certain modern scientific concepts for disaster prevention, preparedness, response and mitigation (Kemp, 2007). Globally, there is increasing acknowledgement of the relevance of traditional knowledge as an invaluable and underused knowledge reservoir, which presents developing countries, particularly Africa, with a powerful asset in disaster management (Kemp, 2007). Specifically, from time immemorial, natural disaster management in Africa has been deeply rooted in local communities which apply and use traditional knowledge to master and monitor climate and other natural systems and establish early warning indicators for their own benefit and future generations (Lerner-Lam, 2007). In the traditional African worldview, environmental resources (land, water, animals and plants) are not just production factors with economic significance but also have their place within the sanctity of nature (Millar, 2006). These examples underscore the importance of harnessing local knowledge not only as a precious national resource but also as a vital element in environmental conservation and natural disaster prevention, preparedness and response. However, despite the prevalent application and use of traditional knowledge by local communities, it has not been harnessed to fit into the current scientific framework for environmental conservation and natural disaster

management in Africa. As a result, there is a general lack of information and understanding of the need to integrate or mainstream local mechanisms in disaster management.

There are many factors and causes of uncontrolled bush fires in Africa. Among the natural and human causes of bushfires, it appears that human activities, especially in agriculture (including hunting and livestock production), are the primary causes of indiscriminate and uncontrolled bush fires in Ghana. Although it is a fact that the Guinea and Sudan savanna areas are most threatened by widespread bush fires, the forest zone is also vulnerable during prolonged droughts. Therefore, policies, strategies and measures to avert and control bushfires in Ghana should pay care to both the savanna and forest zones with active support and commitment from local people (Millar 2006).

In the past development planners too often tended to ignore local people in decisions affecting their environment and wellbeing. The 'top-down' approach must give way to the 'bottom-up' approach which insists that local people must be fully involved in deciding how to tackle the problem of bushfires.

In developing bushfire policy, the aim should be to burn for conservation purposes or to meet clearly defined objectives such as reclaiming unmanaged grassland or to prevent the invasion of grassland by trees and shrubs. However, the development of good fire policy and plans and their successful implementation will depend on a thorough knowledge of the area (i.e., biophysical, socio-economic etc) through research and also the support of local people.

The process and techniques of burning have seen some changes over the years in response to the current fire regime. According to a literature reviewed, a significant number of the population indicated that there was a significant change in the period of year when farmers burn their slash and an appreciable number would not burn their slash when the relative humidity is perceived to be low.

Throughout Ghana, bushfires have exacted a heavy toll of death and unquantifiable suffering on people and animals and have adversely affected the environment. There are several factors which cause bushfires and villagers have good reasons for using fire. However, some of these fires if not properly controlled end up in causing serious damage. Although bushfires occur in the forest areas, they are not as frequent and extensive as in the Savanna Zone (Gyaabah, 1996).

Fire is widely accepted throughout the country as being a valuable tool in the management of natural vegetation, agriculture including livestock production and in other land use systems (Gyaabah, 1996)**.**

In the past and even in some instances today hunters, herders, farmers and cigarette smokers are the primary recipients of blame for uncontrolled and indiscriminate bush burning. Many bushfires in the forest zone are deliberately started during the dry season (Gyaabah, 1996). In many areas, farmers and hunters do so to facilitate access by men and animals. Many farmers use fire to reduce the fuel load or combustible litter in order to reduce the potential frequency and intensity of late dry season fires (Svotwa et al., 2007)

Foresters cause bushfires to maintain or achieve a plant composition which is optimal for a specific management objective (Gyaaba 1996). For example, in the Guinea and Sudan Savanna regions foresters and range managers cause bushfires to promote the growth of forage for livestock. Sometimes fire becomes a good management tool for facilitating and promoting the introduction of exotic species such as improved forage species into the vegetation (Acheampong, 2013). Most herders believe that bush burning improves the acceptability and nutritional value of trees and other species (e.g., grasses) for grazing and browsing (Gyaaaba, 1996).

In Ghana, using fire in hunting is mainly for meat. Therefore, problems arise from the lack of alternative sources of protein/meat and wildlife by-products. They also result from ignorance of better techniques of hunting (Gyaabah, 1996). Since meeting protein needs of household's leads

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to misuse and abuse of fire, incentives should be given to individuals who engage in activities which promote livestock productive to produce more meat so as to reduce the pressure on wildlife.

2.6 Conceptual Framework

This study of social practices inducing the incidence of fire in the Sissala East District is based on the social practice framework. Social practice theory originates in psychology and seeks to explain the link between practice and social context and so examines how context and cultural factors relate to common social practices of individuals in social group (Hedegaard, 1998; Herndl, 2000). Noteworthy is that social practices are socially shared routine interconnected everyday practices and behaviour patterns as exhibited by individuals in a social group typifying the group's collective social behaviour (Holtz, 2014; Reckwitz, 2002; Holland & Lave, 2009). Performing such practices basically requires acquisition of the know-how or local knowledge, skills, and attitude specific to the beliefs and values of the social group (Kuijer, 2014; Brown and Dugid, 2000). The argument is that social practices develop within a social context (Moloney et al., 2010). Social practice theorists accordingly argue that the factors driving these social practices and behaviour patterns are the beliefs, norms and values of the social group (Reckwitz, 2002). As it were, it is these social practices that give meanings to the group's beliefs, norms and attitudes as well as the exhibited group behaviour patterns suggesting a group behavioural lock-in (Holtz, 2014; Esfeld, 2003). Not only do the group's social practices represent the group's aggregate social behaviour but it also establishes the group's way of life and plays a key role in social governance (Castellani and Hafferty, 2009).

In other words, such collective organisation of social practices mutually forms the broad cultural entities that shape individual's perceptions, interpretations, actions and behavior patterns in the

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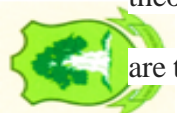
social group (Hargreaves, 2011). In this context, social behavior pattern is explained in terms of individual intentions and purposes for carrying out certain social practices (Holland and Lane, 2009). As these practices become typically and habitually performed acts of commission or omission, they in effect retain the social context and identity of the particular group (Holtz, 2014; Esfeld, 2003; Reckwitz, 2002). Consequent upon this, social practices tend to hold together social groups and for that matter the community and resultantly represents the aggregate social behaviour of the group. Not only does it effectively establish a way of life in the social group but it is also plays a key role in the social governance (Castellani and Hafferty, 2009).

In seeking logical connections between community events and practices, therefore, demands knowledge and understanding of the links between the social practices that give meanings to the patterns of the social behaviour and the event. In this way, social practice theory provides a holistic and grounded perspective on social behavioural change processes as they occur (Castellani and Hafferty, 2009). Central to the theory, therefore, is commitment to social behavioural change and is applied within the context of human development (Smolka, 2001). Social practice theory, therefore, helps identify the social causal factors and outcomes of such social practices and possibly seek behavioural and attitudinal change (Herndl, 2000). The inference is that barring a particular social practice would, therefore, require a form of behaviour or attitudinal change prompting knowledge and understanding of the causal factors of the identified practice. It is in this context that the study of socio-cultural practices and the incidence of bushfires in Sissala East District is analysed within the theoretical framework of social practice.

The study seeks to explore the link between community practices and recurrent incidence of bushfires, types and effects of community interventions put in place and the constraints limiting their effectiveness. The intent is to promote more sustainable ways of livelihood activities in affected communities to induce behavioural change and community safety and resilience.

2.7 Operational Definitions

The terms *bushfires* and *socio-cultural practices* are explained as used in the context of this study.

2.7.1 Definition of Bushfire

The ACT Emergency Services Agency (2011) defines bushfires as 'fire that burns in grass, bush, or woodland and can threaten life, property and environment'. This type of fire often burns in the bush and once lit becomes difficult to control. According to the Agency, bushfires have the tendency to spread fast if the following conditions are present: fuel for the fire (undergrowth; dry leaves littered on the ground), hot and dry weather, strong wind and low humidity (reduced moisture due to strong wind drying out the air).

The Cambridge Advanced Learners Dictionary & Thesaurus (2015) defines bushfire as a fire occurring in the bush (wild area of land) that is difficult to control and sometimes spreads out quickly. This implies that bushfires can be uncontrolled once lit. For purposes of this study, the operational definition of the term *bushfire* would mean a fire that is lit intentionally or otherwise in uncultivated bush/grass or woodland and quickly spreading out when factors affecting it are present threatening life, community property and environment.

2.7.2 Socio-Cultural Practices

Holtz (2014) defines social practices as everyday practices and how these practices are typically and habitually performed in (much of) a society. Inherent in Holtz's definition is that such practices must not only be meaningful to the people who perform them but must also necessarily

be parts of their daily routinely performed life activities impacting on resource-use (Holtz, 2014; Reckwitz, 2002).

In which case, calling such practices social means that they are similar for different individuals sharing common attributes of a physical environment and such practices are largely carried out at different points of time and locations (Reckwitz, 2002). The inference here is that the notion of social practices suggests a situation of behavioural lock-ins in a particular cultural setting. Thus, the term *social practices* is defined in this study to mean a widely shared socially routine or rule-following behaviour patterns generally displayed within a particular social group demonstrating their way of life; or, customary way of doing something or carrying out certain acts of commission or omission of some common activities.

2.8 Conclusion

In summary, people are responsible for bushfires; the greater the number of people, the higher the risk of accidental fires and the greater the likelihood of conditions conducive to fire setting becoming a preferred behavioral expression.

CHAPTER THREE

STUDY AREA AND METHODOLOGY

3.1 Introduction

To examine critically and understand the socio-cultural practices influencing frequent incidences of bushfires in the three regions of northern Ghana, the Upper West Region is selected for the study. Representing these regions are the Northern, Upper West and the Upper East. The Upper West Region typifies the socio-cultural practices and climatic conditions in the three northern regions. Community seasonal calendars designated the months of November, December, January through March and sometimes April as the driest period in every year. Though it is a long dry spell, it does not necessarily depict the extreme dry weather conditions implied in drought situations. Nonetheless, the long dry period coupled with the rainfall variability existent in these three regions increases the risk for drought situations and resultantly creates conditions conducive to bushfires. As the dry period peaks up from November, so do the bushfires also intensify. These render the three regions prone to the bushfire disasters indicating presence of shared ecological conditions and common livelihood activities in these regions. As well, these regions are considered food baskets of the country. So when bushfires burnt down people's farms resulting in loss of farm crops, the effects are generally felt. Not only does it affect food requirements of the affected communities but it also often induces rise in food prices causing a general social distress in the country (CEDRE, 2015). Thus, the study of socio-cultural practices and incidences of bushfires in any of these regions basically represent a microcosmic perspective of such issues in others.

3.2 Profile of the Study Area

The Sissala East District is located in the North- Eastern part of the Upper West region of Ghana. It falls between Longitudes. 1.30^0 W and Latitude. 10.00^0 N and 11.00^0 N (Figure 3.1). The district has a total land size of 4,744 sq. km – representing 26% of the total landmass of the region. It shares boundary on the North with Burkina Faso, on the East with Kassena Nankana and Builsa Districts, to the South East with West Mamprusi District, South West with Wa East and Nadowli Districts and to the West by Sissala West District (see Map below—Sissala East Strategic Plan).
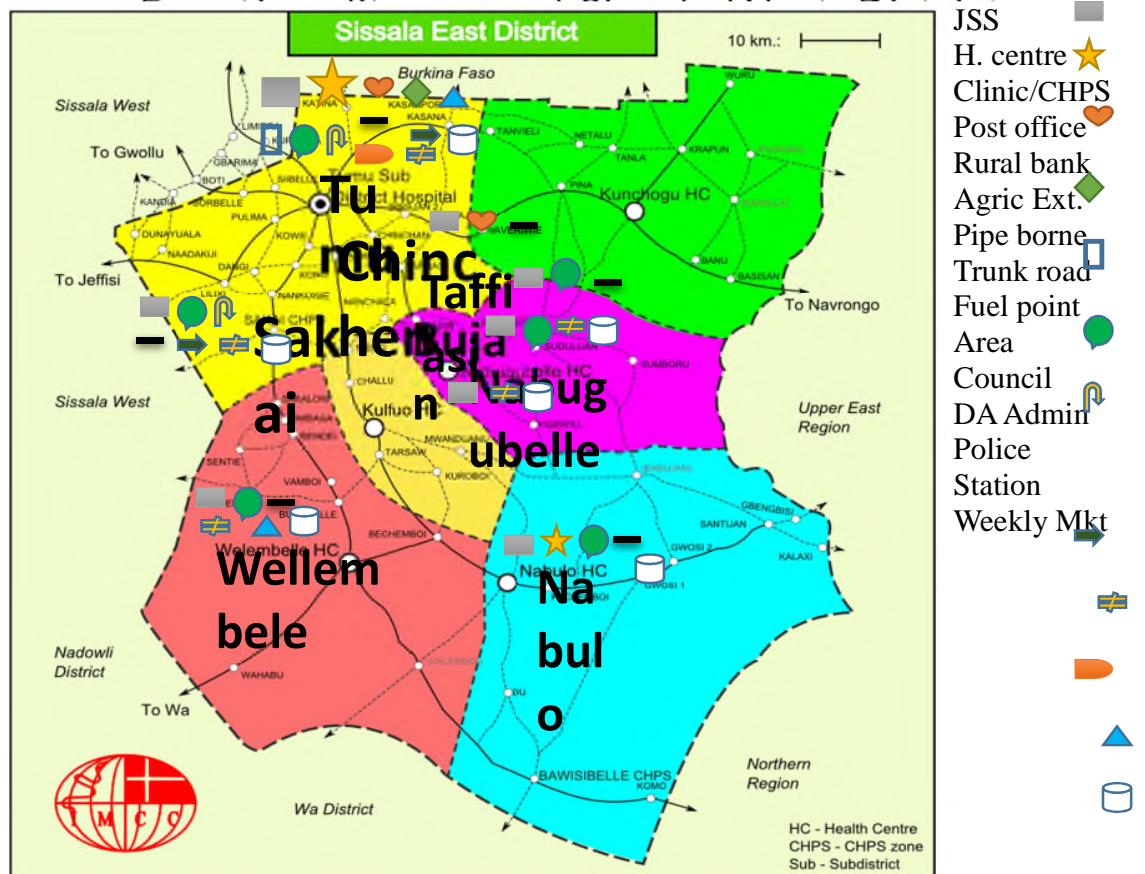
Figure 3.1: Functionality map of Sissala East District
Source: Sissala East District Assembly, 2013

In pursuant of the government's decentralization policy, the Sissala East District Assembly was established in the year 2004 by LI. 1766 with Tumu as its District Capital. The primary aim was

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to enhance the effectiveness and efficiency of local government administration and ensure fair distribution of the available resources at the grassroots. Other objectives include promoting peoples' participation in governance; assuring the District Assembly authority's quick response to the needs and aspirations of people of the district and encouraging public monitoring of the local government's operations to ensure transparency (Sissala East District Assembly, 2013)

3.2.1 Relief and Drainage

The topography of the Sissala East District could be described as gently undulating. It is generally characterised by gentle latitudes of between 330 and 365m in the northern part descending to 220m and 290m in the Valley of the Sissili River. The district is mainly drained by the Sissili River and its tributaries flowing in the south-eastern direction to join the White Volta. This is coupled with several tributaries and other unnamed streams. Though they have potential for supporting agricultural activities in the dry season, they equally serve as constraints in road construction rendering access to communities difficult during the rainy season. A significant characteristic feature of most of these rivers and streams is the perennial nature of their flows. The flow of the Sissili River itself reduces to intermittent pools in the dry season. Many of these streams could be developed to support dry season farming. The constant drying of the rivers necessitate the drilling of boreholes to supplement the seasonal shortage of water in the district which in one way might have accounted for the out-migration of the population during the dry season.

The rich valleys of the Sissili River maintain a vegetative cover that provides an abode for wildlife and further protect the land from erosion. (Sissala East district Strategic Plan, 2013)

3.2.2 Geology and Soils

With a gently undulating topography, the district is bound with fresh granitic. The granitic and bromine rocks weather fast as a result of low rainfall, high evaporation and sparse vegetative cover to form soils of lesser depths rich in minerals for potential farming (Sissala East district Strategic Plan, 2013). The bromine and granitic geological formations in the district are characterised by meta-sediments and meta-volcanic rock formation. The bromine formation has a 65% of yielding underground water, while the granite has 55% chances of yielding water. The geology of the district thus provides potential for underground water development (Sissala East district Strategic Plan, 2013)

3.2.3 Vegetation and Climate

Sissala East District falls within the Guinea Savannah vegetation belt. The vegetation consists of grasses with scattered fire resistant trees such as the shea nut, the baobab and dawadawa trees. Acacia is also a common tree of this vegetation belt. The heterogeneous collections of these trees meet domestic requirements for firewood and charcoal, construction of houses, cattle kraals and fencing of gardens. The shorter shrubs and grasses provide fodder for livestock. This has resulted in high influx of Fulani into the district. Their activities have to be appropriately controlled and managed if the environment is to be sustained and food security assured.

The shea nut tree is one of the great economic assets of the District and head portage has been the most common means of transporting the fruits from the farm to the house. This industry can be developed to serve as major source of livelihood in the district. The forest reserves cover a total area of about 267sqkm and encourage a rich stock of mammalian wildlife (Sissala East District Strategic Plan, 2013).

The climate of the Sissala East District is tropical continental as experienced in the northern regions of Ghana. Throughout the year, temperatures are high with a minimum of 23ºC at night and a maximum of 42ºC during the day and this favours plant growth (Sissala east district Strategic Plan, 2013).

The mean monthly temperature ranges between 21ºC and 32ºC. The highest monthly maximum temperature rises up to 40ºC before the rainy season in May with lowest minimum temperature falling to about 12ºC in December when the Harmattan winds from the Sahara dries up the vegetation (Sissala East district Strategic Plan, 2013)

The district experiences a single rainy season (May to September/October) conventional rainfall. In 2009, the first quarter of the year recorded 6.9mm of rainfall. However, for the second quarter, the erratic nature resulted in 447.2mm of rainfall which was an improvement over the previous year leading to early farming of crops particularly maize. At the beginning of the 3rd quarter another drought period almost threaten food production. As the season advanced, rains set in many parts of the district and the quarter registered 937.4 mm of rain. The rains intensified and resulted in floods which affected food crops yields (by 40%) especially maize and groundnuts.

Some fields were totally submerged under water and others washed away. This affected the entire district but the eastern block was worse affected (Sissala East district Strategic Plan, 2013)

As a result of the single maximum rainfall prevailing in the district all year round, crop production is mostly done during the rainy season (May to September/October). However, since farming is the major occupation of the people, it means that their major sources of livelihood and income are limited during the dry season apparently resulting in the migration of the youth to the south in search of greener pastures.

There is thus, the need to have adequate irrigation facilities to promote and enhance agricultural activities in the dry season. In addition, it is imperative to identify and provide alternative sources of livelihood to the people to complement their occupations and improve their income generating capacity. The total number of days of rain ranging between 70 to 80 days in 1999 as compared to 51 days of rain in 2009. The mean annual rainfall in 1999 was 121mm as compared to 104 in 2009. There is an indication that the number of days of rain as well as the mean annual rainfall are decreasing in the district. This has implications for food security in the district. (Sissala East district Strategic Plan, 2013)

3.2.4: *Natural Environment*

Sissala East District is mainly covered by guinea savannah vegetation with few savannah supported trees such as the Shea nut, Baobab and Dawadawa trees. However, human activities such as farming and bush fires, shifting cultivation, felling of trees for firewood and charcoal production and overgrazing by animals contribute greatly to deforestation and soil erosion in this natural environment. Government institutions and NGOs have instituted measures such as agro-forestry, tree planting and extensive education against bush fires to curtail these problems. However, environmentally degrading activities still persist in the district and poses a threat to food security in the district. (Sissala east district Strategic Plan, 2013)

The new National Wildfire Policy advocates for the management of wildfires in lieu of absolute prevention and likewise the District Assembly needs to have in place an appropriate wildfire management programme to contain the impact of wildfires on the natural environment.

There is the protection of wildlife mammals and other wildlife species through forest conservation and community management of the reserve. The management of forest and forestry resources is

handled at the district level, by forestry services division, NADMO, the Ghana National Fire Service, NGOs and Community- Based volunteers. These institutions are however confronted with challenges that need to be addressed. (Sissala East district Strategic Plan, 2013)

3.2.5 *The Built Environment*

The built environment is growing fast in the district. However, there is an inverse relationship between the built environment and the natural environment. The natural environment is depleted to allow for and use for the built environment. The primary problems of the built environment are those of poor housing quality, unplanned building construction and poor waste disposal system. Waste management in the District is highly inefficient. Open dumping is the mode of refuse disposal and these sites are not properly managed.

Refuse heaps therefore abound and poses health hazards to the people particularly in the relatively urban settlements. Institutions responsible for the built environment are confronted with human resource, logistical and financial challenges (Sissala East district Strategic Plan, 2013).

3.3 Research Methodology

This discusses the study design, sources of data, the target population, sampling techniques, methods of data collection and techniques of data analysis. The study covers the period between 2008 and 2012. The period was chosen for two reasons. First, since the establishment of the Sissala East District Assembly in 2004, a number of adaptive preventive measures have been put in place to avert and mitigate the incidence of bushfires in the district. This period provides a time frame to appreciate the nature of the prevalent socio-cultural practices inducing the incidence of bushfires and the effectiveness of the preventive measures put in place. Second, the increasing frequency in

the incidence of bushfires raises a number concerns and calls for the re-examination of the nature of interventions implemented and their associated constraints hindering these efforts.

Understanding the inherent issues and how they invariably conflict with the socio-cultural practices during the period under study is germane.

In other words, the study assesses the socio-cultural practices existent in the District and how these continue to influence the repeated incidence of bushfires in the Sudan savanna region.

3.3.1 Research Design

Burns and Grove (2003:195) define a research design as a blue print for conducting a study with maximum control over factors that may interfere with the validity of the findings. This study focused on the socio-cultural practices of the people of Sissala East district. The research approach was therefore non-experimental, quantitative, qualitative and contextual.

Non-experimental was used in the study for purposes of description and also to avoid manipulation of independent variables. Due to ethical considerations, manipulation of the human variables would have been unacceptable. In this study in the Sissala East district, the quantitative method was a questionnaire survey whilst the qualitative method was in-depth interviews. One inherent challenge in the quantitative and qualitative methods is the reason for the adaption of mixed methods in anticipation that the strength of one method compensates for the weaknesses of the other.

3.3.2 Sources of Data

Both primary and secondary sources of data were consulted for this study. Primary data included field data and specific policy documents on adaptive bushfire preventive measures and other relevant unpublished government directives covering the period under study, 2008-2012.

These included legislative instruments, annual budget statements presented to Parliament and the President's Sessional Address. Other documents were sourced from the Sissala East District Assembly, District /Regional National Disaster Management Organisation (NADMO), District /Regional Fire Service, Ministry of Interior and Ministry of Finance and Economic Planning (MFEP) at the national level. Secondary sources involved use of relevant published documents and library research. The study reviewed and analysed specific policy documents on bushfire disaster management and prevention. The study further ascertained specific disaster management policy objectives to determine why the implemented interventions did not achieve desired objectives and how actions or inactions of political actors influence policy outcomes.

3.3.3 Target Population

A study population of 56528 mainly subsistence food-crop farmers was the target group. The study focus was on rural communities in the study District.

3.3.4 Sample Size

The study considered a total sample size of 200 food crop farmers in the household data collection. Also included were a total of 10 community disaster volunteer group members comprising two each selected from the five study communities. To obtain official perspectives on the bushfire issues, 10 district government officials were also interviewed. These included five district

assembly members purposively selected from bushfire affected areas; District Planning Officer; four staff (two each) from both district National Disaster Management Organisation (NADMO) and Ghana Fire Service (GFS); and 10 opinion leaders—comprising one man and one woman selected from each designated study community (see Table 3.1).

The selected opinion leaders were mainly informal and formal community leaders of various age categories engaged in community bushfire management teams identified through community participant mapping. These personal interviews were conducted to establish in-depth understanding of the issues, confirm and cross-check findings and conclusions drawn from the field data analysis.

Table 3.1: Sample Size

Groups Interviewed	Sample Size
Subsistence (smallholder) Farmers	200
District Assembly Members	5
District Planner (Local Government Official)	1
NADMO (Officials)	2
Ghana Fire Services (Officials)	2
Community Volunteer Group Members	10
TOTAL	**230**

Source: Field Data June, 2013

The study used both open- and close-ended structured schedules in gathering data from subsistence smallholder farmers in 200 households in the study communities. The purpose was to establish the local knowledge and understanding of the hazard and consequent patterns of community behaviour and attitudes towards the bushfire incidences and attendant socio-cultural practices. In all, there were six traditional areas in the district. The three (3) rural communities were

purposefully chosen from identified bushfire affected areas in the six traditional areas were selected.

Selection of the three rural communities from the bushfire affected areas was based on frequency of the bushfire hazard; intensity of the events; impact extent and severity. These criteria were drawn from annual reports and other secondary data sources obtained from officials of the Sissala East District Assembly, NADMO and the GFS. Both the drawn-up criteria and the selection of the communities were carried through in consultation with these said officials. The study communities resultantly selected were Kowie, Tumu- Zongo and Kong. From each of these randomly selected three (3) study communities, 50 respondents were randomly selected. These 50 respondents were also selected from 50 households equally selected randomly from each study community using existing household numbers.

Where these numbers were non-existent, missing or inadequate, it was improvised for convenience. In all, 100 males and 100 females were interviewed achieving 100 percent responses (see Table 3.2). As part of the process, five focus group interviews were held in the selected study communities. These groups were composed of key community opinion leaders; victims of bushfire events and farm land holders from bushfire affected communities, community fire-fighting volunteer groups, officials from Forestry Commission, NADMO, and GFS. The purpose of the focus group interviews was to evaluate emergent issues in the analysis and triangulate findings from the field.

Table 3.2: Sex Distribution

Label	Frequency	Percent	Valid Percent
Male	115	50	50
Female	115	50	50
TOTAL	230	100	100

Source: Field Data, June 2013

3.3.5 Methods of Data Collection

Multiple methods were employed in investigating the socio-cultural practices influencing the incidence of bushfires in the Sissala East District. These included interview schedules, personal and focus group interviews and participant mapping. The interview was conducted largely at district/community and national levels. Relevant policy documents obtained from the district and national levels were reviewed. Policy instruments and various mechanisms designed towards prevention and mitigation of bushfire disasters together with their set objectives were considered in terms of their influence on policy or strategy outcomes. Structured questionnaire involving both open- and close-ended questions were used to collect data from farmers or households at district/community level, district assembly members and government officials at both district and regional/national levels.

Personal interview format and focus group interviews were used to firm up the findings from the literature and information gathered at both regional/national and district level. The problem of identifying key opinion leaders was overcome by participant mapping.

3.3.6 Techniques of Data Analysis

Critical to this study is appreciating the socio-cultural practices inducing incidences of bushfires in the Sissala East District. Also relevant for the purpose of our analysis were patterns of implicit and explicit behaviour patterns of community members in the district: their assumptions and instances of negligence.

These indicators necessarily represent units of the analysis. The analysis focused on the nature of the socio-cultural practices; how they influenced the incidence of the bushfires; how it affected the inhabitants of the district; and the outcomes of the interventions put in place. Understanding these units would essentially help identify with the prevailing socio-cultural practices and key causal factors of the incidence of bushfires in the District. The SPSS software was used to analyse the

data to determine how the identified indicators collectively and individually affect the incidence of bushfires and the outcomes of the interventions implemented in the district. The SPSS was used to generate the themes on the demographic characteristics of respondents. The SPSS was chosen because of its clarity in expressing quantitative relationships between the demographic variables.

Data collected from the various interviews was transcribed from Sissali into English. Data that was already recorded in English were organized and thereafter transcribed to show the responses to the questions in an order. In the process, attention was given to emerging themes.

CHAPTER FOUR

SOCIO-CULTURAL PRACTICES AND THE INCIDENCE OF

BUSHFIRES IN THE SISSALA EAST DISTRICT

4.1 Introduction

This chapter examines the socio-cultural practices influencing the repeated incidence of bushfires in the Sissala District. The chapter also explores types of community bushfire prevention and mitigation interventions implemented in the past, their outcomes and inherent community capacity and how these can be enhanced for the good of the communities in the District and possibly be replicated elsewhere. Furthermore, the chapter aims at identifying the socio-cultural practices undermining community intervention efforts; increasing community vulnerabilities to bushfire disasters and how all these impact on community livelihood activities, and consequent food security. Accordingly the chapter evaluates the nature of the socio-cultural practices inducing the incidence of bushfires; effectiveness of community prevention and mitigation interventions put in place; impacts of these interventionist efforts; and the constraints hindering community efforts.

4.2 Nature of the Socio-Cultural Practices Inducing Frequent Incidence of Bushfires

Farming is the major occupation of the people, it means that their major sources of livelihood and income are limited during the dry season apparently resulting in the migration of the youth to the south in search of greener pastures and those who decide to decide engage in other activities that could trigger the incidence of bushfires. The presence of varieties of soils including savannah ochrosols, tropical brown earths and terrace or alluvial soils renders the Sissala East District predominantly agrarian. Agriculture provides livelihoods for the vast majority of the poor populations of the District.

As indicated in the table 4.1; 85.5% of the respondents were engaged in farming as their primary occupation, 5.5% of the respondents are into small scale trading as their primary occupation, whiles 4% of the respondents were found to be engaged in charcoal production as their main economic activity and 5% were found to be engaged in hunting.

There is single maximum rainfall that prevails in the district all year round, and thus crop production is mostly done during the rainy season (May to September/October). As a result of the predominantly agrarian nature of the local economy, the farmers cultivate once a year and as a result of the nature of the economy, the incomes of the households will be low and therefore some engage in multiple activities after the raining season. Therefore, 85.5% of the total respondents thus confirmed that their engagement in agriculture was their main form of economic activities as the major source of income. Some minor occupations include: petty trading, dawadawa processing, fishing, hunting and sand winning.

As important influencing factor in the management of bushfires which is directly related to incomes, is the type of economic venture one engages in. The level of one's income has a direct consequence on the ones' vulnerability to bushfires. Employment opportunities in the study areas are limited to subsistence agricultural (crop farming and to a lesser extent, animal rearing).

Table 4.1 Primary occupation

Activity	Frequency	Percentage
Farming	171	85.5
Trading	11	5.5
Charcoal production	8	4
Hunting	9	4.5
Others	1	0.5
Total	**200**	**100**

Source: Field data, June 2013

Some other activities include, petty trading, dawadawa processing, charcoal burning, fishing, small scale mining, sand winning among others. Since farming is mainly carried out for five (5) months (May/June to September), 85.5% of the household heads remain unemployed for most parts of the year.

Some of the social cultural practices are routine activities that structure the lives of various communities and social groups and that are shared and important to many of the community members. These practices are crucial because they endorse the identity of those who practice them as a group or a society whether performed in public or private, are closely connected to important happenings. Social-cultural practices outline everyday life and members are accustomed to them.

The difficulties of eliminating bushfire does suggest that there is a need for a deep understanding of its causes particularly socio cultural practices and come out with policies that will address the adverse effects with particular attention to some areas such as forestry, arable agriculture and soil.

These practices have an adverse effect on the incidence of bushfires in the district as found commonly in all the three communities studied. Some of these adverse effects are reduction in soil fertility, destruction of crops and reduction in crop yield.

The local economy is predominantly agrarian, as 85.5 percent of the respondents confirmed. The type of soils in the district includes savannah ochrosols, tropical brown earths and terrace or alluvial soils. These soils are suited for the cultivation of cereals and root tuber crops including millet, maize, sorghum, yam and cash crop like cotton. They respond well to the application of organic manure and commercial fertilizers to give high yield. This encourages massive agricultural activities within the district. With adequate rains and good farming practices, these soils have the potentials of improving agriculture production (Sissala East District Strategic Plan, 2013)

Subsistence food crop production is the major primary occupation of the people in the Sissala East District. The local economy is predominantly agrarian and it is rain fed as found out from the field survey. Therefore, the farmers cultivate once a year and as a result of the nature of the economy, the incomes of the households are low.

As a primary occupation, and the main source of most household income, these farmers are heavily dependent on rudimentary knowledge of clearing the lands for cultivation is done by burning as found from the study.

Some depend on charcoal production for their economic survival and the neglect to control the fires sometimes leads to widespread fires in the district. It was found out that these farmers combine their farming activities with hunting for wild animals as a source domestic protein. These activities have become intrinsically part of their daily activities in the district.

Fire singularly seldom accomplishes long-term goals of suppressing persistent weeds and is effective as part of strategies combining other control methods including, mechanical, cultural, and biologic tools.

It was gathered from the field survey that the major causes of bushfires are socio- culturally. Illustrated below is a diagram which shows the summary of the socio-cultural practices that readily trigger bushfires in study area.

4.3 General Causes of Bushfires in the Sissala East District

Fire is an essential component of the district. Bushfires accordingly reflect more of human caused activities than the natural. The frequency and the area burnt vary from year to the other. The existence of a wide range of fire causes significantly complicates the assessment of bushfire situations since the factors that drive bushfires are structured to include human and environmental variables.

Despite its importance, the influence of human factors on the spatial and temporal patterns of wildfire occurrence needs to be better understood (Sturtevand and Cleland 2007; Shlisky et al. 2007). These causes are generally categorized into deliberate fires, accidental, arson, natural and unknown as captured in table 4.2

Table 4.2: Causes of Bushfires

Factors	Percentage
Deliberate fires	60%
Accidental fires	15%
Arson	10%
Unknown	10%
Natural	5%
TOTAL	100%

Source: Field Data June 2013.

Responses were diverse with regards to the causes of bushfires in the district. The revelation from this study is that these factors are well known to the community but there is little done to curb the problem. These causes have become a recurrent incidence tied to their practices.   These

deliberate fires are as a result of hunting, charcoal burning and land preparation. Livestock keepers also set fires in grassland to improve pastures quality and eradicate pests. This practice goes to confirm the works of Fitzgerald (1971). In his work, he accented to the point that the local farmers adjacent to some forests practice traditional subsistence farming and use fire as a management tool. Furthermore, fire is used for hunting, taboo reinforcement, honey collection, charcoal burning, pyromaniacs and arson. Some of these fires cause significant ecological and socioeconomic impacts and if fire enters dense high forest then it can cause considerable damage.

Regarding intentional fires, high fire occurrence is linked to different motivations, which in turn depend on the socio-economic or political context of the region or country concerned. In some countries, for instance, Lovreglio et al. (2010) identified as major motivations of voluntary bushfires those linked to policies concerning seasonal forest workers; in this case fires were used as an instrument to force or maintain seasonal employment. In some areas, arson is also a major problem and has its roots in social conflicts. In some cases, the conflicts arose because government plantations were established on lands that were previously used as rangelands by the local community (Moreira et al., 2001; Tabara et al, 2003).

As discovered from the field analysis according to the accounts of some community members, some of these causes go to confirm the works of Korem (1985) and Happold (1995). As stated in the work of Korem (1985) and Happold(1995), these inhabitants rather consider anthropogenic bushfires as beneficial in several ways:

(i) Driving away dangerous animals like snakes, which shelter in dense vegetation

(ii) Enhanced hunting efficiency in shortened grasses and attracting game animals after burning, (iii) destruction of unpalatable grass and stimulating the budding of new and more palatable grass for grazing mammals at the beginning of the wet season. The use of hoe and cutlass for the clearing of farm lands before cultivation is synonymous to rural agricultural practices the world over. Spraying has however emerged as a new technology introduced to some few fortunate rural farmers who in some cases produce on commercial and larger scales.

According to the responses gathered from the study, about 35.5% of the farmers weed their farms before cultivation including other local pre-planting practices, about 56.7% also practice slash and burn before planting while the rest either plant on the weeds or uses a combination of several practices before planting as indicated in the table below. The method of preparation of farms by the farmers largely contributes to the high rate of bushfires in the district as captured in table 4.3

Table 4.3: Methods of Preparation of Lands by Farmers

Practice	Frequency	Percentage
Weeding	60	35.1
Slash and burn	97	56.7
Planting on weeds	11	6.4
N/A	3	1.8
Total	171	100

Source: Field data, June 2013

The results of his study notably favoured the traditional slash and burn agricultural system to that of mechanical clearing. But from the study in Sissala East district, it was clear that the method of slash and burn constitutes 56.7% of methods of preparation of lands and this is not the most often used method of land preparation in the district.

This method is when a farmer or an individual practices a form of shifting agriculture where the natural vegetation is cut down and burned as a method of clearing the land for cultivation, and then, when the plot becomes infertile, the farmer moves to a new fresh plot and does the same again. This process is usually repeated over and over. But it does stand as the highest as captured in the table above. It is a significant contributing factor to the cause of bushfires.

Focus group responses discussed the methods of preparation of their lands before cultivation and how these can also trigger bushfires in the community:

"When I go to my farm, before I plant, I burn the bush because I have a big farm and I cannot weed. There are times that some other famers spraying their farms before cultivation. It all depends on your strength at a time". Salia Nuhu, Focus Group participant, 24th August, 2013.

It was observed that the major discourses centred on the notion of inability to finance the clearing of these lands by large groups, instead they would resolve to burn the bushfires. The participants own position in the life course, their gender, age, and so on affects the methods employed in clearing lands.

4.4 Burning to keep away Reptiles as a Cause of Bushfires

The environmental negligence of rural immediate surroundings makes them vulnerable to so many reptiles and dangerous insects. The sanitary conditions within the households have made the community an inhabiting ground for all kinds of reptiles. A resident confirmed that within a period of two months not less than 5 people suffered snake bites. In some cases the snakes were seen and killed whiles others could not find them due to the bushy nature of the surroundings.

For this, majority of the residents have resorted to burning the bushes around their homes to get rid of such reptiles while some also weed or spray around the house as a preventive measure. Table 4.4 indicates the responses gathered from the community during the data collection on the practices they use to prevent reptiles from their homes.

About 16% of the respondents said they spray their surroundings, 49% burn all bushes around their homes, and 34% in all practice weeding and any of the above mentioned to clear their homes of reptiles.

Table 4.4: Methods of protecting households

Methods of protecting their houses	Frequency	Percentage
Spraying	31	15.5
Burning	98	49
Weeding	68	34
N/A	3	1.5
Total	**200**	**100.0**

Source: Field data, June 2013

Most people are well conscious of the threats of bushfires and potential causes of bushfire, the effects are often experienced throughout the community, and many of the inhabitants do understand that they live in a fire-prone district. It appears that there is a great majority of people who do not expect a bushfire to occur close to where they live, or at least whilst they are living there.

One person stated one way he protected his house from reptiles:

If the grass around my house dries, I burn it so that snakes do not enter my compound". One other person had a contrary view: "Rather I weed around the surroundings and constantly close my doors and windows.

4.5 Provision of Domestic fuel as a cause of bushfires

The continues and increasing demand for domestic fuel in rural communities and the country at large is a main factor to the eventual loss of natural forest and its attending effects. Charcoal burning seems to be more associated to the people of Tumu in the Upper West Region. Research

has it that, there are two or more charcoal burners in each household in the Sissala land as the town is fondly referred to. Both men and women engage in charcoal burning on commercial basis as a means of livelihood. According to the Plan Ghana Report (2010) on livelihood diversification in the area, charcoal burning contributes almost 47% of per capita income of the community with 78% of the community engaged either part-time or full-time in charcoal burning.

From table 4.5, 41% of respondents said they use firewood as their domestic fuel, 51.5% of respondents use charcoal whiles5.5% of respondents use foreign fuel such as gas and kerosene stove. By implication, 92.5% of respondents depend on the environment for domestic fuel as identified.

Table 4.5 Types of domestic fuel

Fuel Type	Frequency	Percent
Firewood	82	41
Charcoal	103	51.5
Foreign	11	5.5
Missing	4	2
Total	200	100.0

Source: Field survey, June 2013

According to most respondents who use firewood and charcoal, they either buy it from the market or they fell trees on their farm lands, dry it and then use it as firewood. Charcoal burners use the wet felt trees.

According to Korem (1985), fuel wood provides the main energy source for both rural and urban households throughout the entire West African sub-region, with estimates of about 50% of total energy consumption.

In Sissala East, this plays an important role in human activities like charcoal production in the community. It was apparent also from this study, and as stated by Korem (1985), that over-exploitation of fuelwood has resulted in a reduction in size of fuelwood harvested, and the use of less-preferred materials like tree stumps.

The respondents during the interaction admitted that these factors are the main causes of bushfires in the locality. According to them, charcoal burners are sometimes careless with the way they handle fire, the charcoal is mostly burned overnight at which time no one monitors the extent to which the fire spreads.

Again, some community members who use foreign fuel such as LPG do not have enough education on the use and how to regulate them to avoid fire outbreak. The situation therefore remains the singular most dangerous cause of domestic fire in the neighbourhoods.

Other causes of wild/bush fires include hunting, negligence by farmers and cigarette smokers who throw away the left over carelessly. Some farmers also contended that, some of the bushfires are caused by their enemies who would just want to punish them for reasons best known to them. Interestingly, the respondents revealed that farmers who take loans for their farm businesses deliberately burn their farms when the yield fails to attract the sympathy of their creditors and well -wishers.

Women also burn around the Shea trees to increase yield. Some farmers also in the attempt to burn garbage on their farms end up burning their crops or the entire farm due to the natural environmental conditions such as wind direction and hot climate. This variable was requested to find out if marital status of a person could affect a person's occupation and involvement in bushfires.

The relevance of this variable was to ascertain the dependency level of households. This also brings out the labour force of various households. The data from the administered questionnaires was gathered from 105 married respondents, 73 singles, 10 divorcees and 12 widowed individuals.

Table 4.6: Marital status

Status	Frequency	Percent
Married	105	52.5
Divorced	10	5
Single	73	36.5
Widowed	12	6
Total	**200**	**100**

Source: Field data, June 2013

Majority of the respondents corresponding to 52.5% married the rest 47.5% were either widowed, divorced or single (Table 4.6). This is an indication of an African belief that four hands can produce better than two hands and married couples are likely to be more productive than single persons due to labour supply, hence household well-being (Muywanga, 2004). However, both married and unmarried respondents represent the mature people as far as the households are concerned.

One other factor worth considering is age distribution dynamics of the district. As is seen from the table below, there are active people than the aged and this does account for a high reliance on some sources of income such as farming and hunting for survival.

Table 4.7 Age Distribution of Respondents

Age Categories	Frequency	Percent
15-25	75	37.5
26-35	60	30
36-45	40	20
45+	25	12.5
Total	200	100

Source: Field data, June 2013

The respondents were requested to state their age. This is because age could add up to the understanding the trend of the incidence of bushfires. As a significant factor in determining the trend of the incidence, the rate of the incidence as it is connected to the socio cultural practices of the people, it is relevant to have their ages stated to help in the analysis.

From Table 4.7, data gathered from the household interactions on the age categories of the respondents were as follows; 15-25 represented 37.5% of the total sample size, those within the ages of 26-35 represented 30%, 36-45 also representing 20% while respondents within the ages of 46 and above represented 12.5% of the total population for the study.

The relevance of this is that majority of the respondents of age 15-25 represents 37.5% and 26-35 represents 30%. This clearly testifies to the rate of the incidence of bushfires as the age group of 15 to35 is an active group. The higher the active group with less employable opportunities, more of these people will be engaged in farming activities.

The domination of the respondent's 15-45 years age category indicates that the community comprised of higher percentage of energetic people who can contribute to household income. Age affects experience, wealth and decision which ultimately contribute to income generation activities. Respondents aged over 60 years rarely participate in income generation activities probably because they are considered as economically not active (Ishengoma, 1998). In pursuing economic activities such as farming and hunting incidences of forest fire could also increase.

The community members complained about the fact that, the Fulani herdsmen in their communities deliberately set fire on the dry grasses on the purpose to make it easier for fresh grass to grow a fodder for their cattle to feed on during the dry season. The need to get fresh regrowth of grass for cattle grazing by the Fulanis promotes bush burning. During the dry season, local cattle herders and immigrants from neighbouring countries, Mali and Burkina Faso called the Fulani set ablaze the vegetation to promote early regrowth of fresh pasture for the animals. Sometimes village folks are paid some token fees by these nomadic herdsmen to set the dry vegetation ablaze during the dry months of November to March while they move southwards to find fresh vegetation for the cattle. The herdsmen return with their cattle around April and May by which time the vegetation might have resprouted by the early rains of April and May. Most herders believe that bush burning improves the palatability and nutritional value of grasses and trees for grazing (Gyabaah, 1996). The vegetation is also set ablaze when the headsmen notice that their heads of cattle are going to fall into the hands of harmful pests and insects such as ticks and tsetse flies.

On the anthropogenic causes, these were some of the responses from the focus group discussions:

"We think that we are not the main cause of these fires in our communities; personally I think these Fulani people are those destroying our forests."(FGD, 24th August, 2013).

"I feel that sometimes people who smoke and maybe they forget and throw the cigarette sticks in the bush, these can start fires too." And also, some of us those who do charcoal burning too contribute to this thing.
Kowie farmers focus group discussion participant, 24th August, 2013.

4.6 Natural Causes of Bush/Wildfires

The study also sought to unearth the possible natural causes of bush fires in the locality. The respondents revealed that, extensive sunshine and thunder/lightening are possible causes of bushfires as they recall several instances the community witness in the past. In situations of thunder and lightning, those who own the thunder and lightning god are consulted before interfering.

According to the field survey, from the various focus group discussions, and as stated in the fore gone discussions, it is clear that there is a strong correlation between the incidence of bushfires and their activities such as land preparation, protection of their houses from reptiles and fuel sources. At one of the discussions at Kowie in the Sissala East District, participants arguably came to a consensus that the other causes that have become a recent hindrance are; the activities of Fulani, charcoal burners and smoking.

From the focus group discussions, there was an accurate assimilation of ideas from various people in spite of gender, or ability to read or not read as the groups composed of a fair representation of community members. These further enhanced participants to freely be interviewed who individually would have felt they had nothing to say. As one participant raises a point, one other participant remembers a different point which individual he or she would not have remembered.

The causes of bushfires were understood as both human induced and minimally naturally triggered. This is to say a lot of the causes are triggered by human activities and therefore this will require human commitment to deal with the problem.

Discussions were dominated by dynamism, complexity and the prevalence of the bushfires in the area. Though there are different human causes and the difficult nature in dealing with this canker, the incidence keeps rising.

Discussions at the Focus group also revealed that they are much aware of natural causes of bushfires and had this to say:

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In our community, we have not experienced such things but I know lightening, thunder and falling rocks can also start bushfires. I have heard it happens in some communities elsewhere but not in Kowie. Focus Group Discussion participant, 24th August, 2013, Kowie.

4.7 Impact of Bushfires

In line with the objective of the research, the effects of these bushfires were investigated. The study indicated a variety of responses with regard to the effects of bushfires. To facilitate the process of analysis, the findings from the field on the impact of bushfires were put into two categories: general effects of bushfires and effects on the individual and the household.

4.7.1 General Effects of Bushfires

Bush fires usually occur during the prolonged dry season experienced by the entire savannah belt of the country. The situation is usually aided by the movement of the monsoon dry hazy winds at which time all grasses dry up. Tumu is obviously a town with rampant occurrences of bush fires. The study sought to investigate the frequency of bush fires in the community. However most respondents could not even ascertain the last time they experienced bush fires since bushfire occurs very often and seems a normal practice in the community. Bushfire does not only render farmlands infertile, but also destroys the habitats of reptiles who then find accommodation under the same roof with the inhabitants in their homes. Bushfires also destroy environmental resources including medicinal plants, folder thatch and rafters which are relevant for the survival of the community members.

The effects of bushfire on rural livelihoods and on the ecosystem in Ghana are extensive and damaging. Bushfires have speeded up environmental degradation especially in the fragile savannah ecosystem, yet there is very little in the form of public education, published data and information concerning the frequency, intensity, duration and effects of bushfire on the environment and human welfare in Ghana.

The research revealed the undoubtedly importance of fire to rural livelihoods, but there is a mismatch in the process of preferred burning systems exists between some local stakeholders. Some of the costs of bushfires include the burning of food stuffs, houses as well as animals. The research found out that, the incessant frequency of this activity was due to the negligence in the implementation of community bye-laws regulating bushfire burning due to the lack of workforces and logistics to state agencies and departments in the Sissala East district to combat the problem.

4.7.2 Effects of Bushfires on the Individual Household

Social survey through the administration of the questionnaires it indicated that bushfires have brought untold hardships to individuals or sometimes a whole community/household either in the form of loss of lives or property. From the field survey, loss of crops was the hardest hit with a percentage of 71.5 as captured in table 4.8, burned houses as a result of bushfires at 14.5%.the other effects are loss of lives at 1.5% and loss of livestock too at 6.5%. There are numerous cases of part or whole communities being raised down by fires.

These fires sometimes burn crops such as maize, cassava and rice farms, cashew, mango and other tree plantations. Harvested farm produce in silos on the farms or at home are sometimes affected by spill over wildfires thereby affecting the livelihood sources of some residents out of which some do not even recover at all. Some businesses had since changed to other fields due to the unrecoverable losses incurred. These persons who were into agriculture prefer to set up stalls.

Property and lives are lost during fire outbreak; some respondents lamented their ordeals in the last domestic fire disaster in the area. Farm produce, livestock and habitats of people were destroyed and compensations not paid to the victims upon following all the due processes.

Bushfires have accelerated environmental degradation especially in the fragile savannah ecosystem, yet there is very little in the form of public education, published data and information

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concerning the frequency, intensity, duration and effects of bushfire on the environment and human welfare in Ghana (Kusimi and Appati, 2012).

Table 4.8 Effects of Bushfires

Effects of bushfires	Frequency	Percent
Loss of crops	143	71.5
Household got burned	29	14.5
Loss of lives	3	1.5
Loss of livestock	13	6.5
N/A	12	6
Total	200	100.0

Source: Field data, June 2013

The study highlighted a majority of respondents representing 143 persons at a percentage of 71.5 stated they lost their crops during the last fire disaster, 14.5% of respondents had their homes burned, and 1.5% respondents each lost their livestock and lives. By implication, 188 respondents were victims of two or more conditions as a result of the fire outbreak in the community.

Participants at the focus group discussions characterized wildfire as an overwhelming, out of control force and annual where destruction is inevitable. The communities however, had experienced wildfire either directly or indirectly, and many saw striking examples of fire behavior. Participants who had directly gone through the seasonal fire held stronger beliefs that destruction was expected.

These fires happen every dry season and when this happens, our crops are burned, some animals die, there is hunger and starvation. Focus Group Discussion participant, 24th August, 2013, Kowie.

For me, I have been affected before when my farm got burnt at that time I took a loan from the bank and this made want to leave the community because I was afraid I will be arrested. Focus Group Discussion participant, 24th August, 2013, Kowie

4.8 Process and Types of Community Interventions Put in Place to Prevent and/or Mitigate Bushfires

From the field survey, it was revealed that improvements in bushfire mitigation will be much significant only if the communities are better educated and engaged. And this the district does with support from NADMO and formerly from UNDP. Measures of success about these programs were largely confined to outputs such as the number of meetings held during a period of time.

The district through various community leaders have held bushfire campaigns to enhance and deepen the understanding of their daily activities that could spark off bushfires. The understanding is that people and their actions whether intentional or unintentional contribute largely to majority of bushfires. With such an increasing rate of bushfires incidence as a result of the actions of some of these people, community education is particularly significant. These campaigns in the form of education takes on a number of procedures and is particularly designed to provide people with a better understanding of the risks they face from bushfires and the mitigating measures the communities can take to minimise these risks.

A wide range of information leaflets were occasionally made available to the organized groups in the community which address issues as what measures people largely those living in bushfire prevalent areas can take to minimise the spread of bushfires and the protection of their property and lives before and during a bushfire.

Generally, farming is on subsistence level and crops grown include cereals like maize, sorghum and root crops such as yam and cassava. The environmental problem of the farming activity is bush fallowing which employs the slash and burn approach in preparing land for cultivation. Lands are often set ablaze by farmers to minimize the cost of preparing lands. It would therefore take intensive community sensitization to impact in community members the adverse effects of some of their practices which have a telling effect even on their productivity levels.

The study therefore tried to investigate some of the best practices and policies farmers could adopt to reduce the incidence of bush fires in the area. 27.5% of respondents were of the view that, the creation of fire belts around the farms and even the households would be a prudent measure to controlling wildfires. 50.5% of respondents were also of the view that ignorance is the greatest enemy that brings about wildfires, they therefore believe that public or mass education on both fire handling in the home and on the farm would be a good solution to the menace the community is faced with.

According to 17% of respondents as seen in **table 4.9**, the institutions put in place and the traditional authorities are weak and hence policy formulation and enforcement is what the community lacks. 5% of respondents however believe that, if farmers employ an early burning strategy on their farms instead of burning their farms under the dry hazy climatic conditions would do a lot good and protection to the forest and the vegetation cover.

Table 4.9 Types of Community Interventions

Mechanisms	Frequency	Percent
Creating fire belts around farms and houses	55	27.5
Educating community members	101	50.5
Introducing by-laws	34	17
Do early burning	10	5
Total	200	100.0

Source: Field data, July 2013

4.8.1 Proposed mitigation mechanisms

In as much as policy enforcement has become a major constrain to bushfires, respondents suggested a list of punishment which in their view would help curb the situation. From Table 4.10, 47% of the respondents suggested culprits should be fined an amount which could help in community development efforts. 40.5% of the respondents as seen from table 4.10, disagreed with the first suggestion with the reason that, not every culprit may have the capacity to pay the fine and hence they should be charged with labour work in the community to pay for their deeds while 12.5% of respondents also want them thrown into prison to serve as deterrent to others.

Table 4.10 Proposed Mitigation Mechanisms

Suggested measures	Frequency	Percent
Fines	94	47
Community labour	81	40.5
Imprisonment	25	12.5
Total	200	100.0

Source: Field data, June 2013

4.8.1 Proposed Community Level Measures

The women engage in shea nuts picking, pito brewing, and sale of firewood and charcoal burning, shea butter and dawadawa processing to supplement their husbands' incomes. Petty trading is a key component of rural survival strategy. It exists even in the old batter system; exchanging goods for goods and engaging in black marketing once their needs are met.

Sadly just 5% of the community engage in dry season gardening; the youth especially engage in small scale mining in other nearby communities and travelling down south in search for better paid jobs. The critical question in all these circumstances remains; whose responsibility is it to protect our natural forest and vegetation? In the case of Sissala East district, there have been several educational efforts to sensitize the communities on the impact of bushfires but these efforts seem to have had little impact on their attitude.

Other factors include weak legislative instruments as well as the lack of political will on the part of the government to prosecute the policy of anti-bushfires. These acts are not only negatively affecting the economic activities of the local people in the form of the destruction of their food, houses as well as domestic animals, but it is also destroying the physical environment.

Plants and animals are destroyed by the wildfires resulting in a reduction in biomass cover. From a group interview, with the chief and his elders, the queen mother, assembly members and community men and women revealed that they are unhappy with this state of affairs and suggested the promotion and intensification of anti-bushfire education through the chief, opinion leaders and even school children, equipping agencies and the rearing of animals such as grass cutter and other small ruminants to serve as a source of protein to the people will help curb the menace..

4.9 Responses on Dealing with Bushfires

The interviewer wanted to find out from the focus group with regards to institutions that immediately responds to their plight in times of bushfires. In a response, one of the participants, stated:

We send someone to go to fire service to come and help us. But before they even come to our aid, some of us use leaves, sand and available water to try and put off the fire.

If I remember very well, the last time we reported a case like that to NADMO, and later they came to help us. Plan Ghana has also helped some in the community who were affected by bushfires.

From the various discussions, it became clear that most often than not the community receives external assistance from government agencies and Plan Ghana International. These assistance from either the government or Plan Ghana does not get to victims early enough for quick recovery. Victims who are subsistence farmers are further entrenched in financial poverty because they would have to sell their animals to make a living.

The community in its local capacity has laid down structure for assisting fire victims. Seriously affected victims, who live on their farmlands, are helped to put their small farm structures (houses). They are further given foodstuffs and some undisclosed amount of money to start up.

4.10 Responses to Wild/Bushfires by Disaster and Fire Official or Government Support

Data gathered from the respondents indicated that whenever there is a fire disaster in the community, the community members and the Disaster volunteers are always the first to respond to the grounds then followed by the Ghana National Fire Service. The NADMO only come in when there are some compensation to be paid the victims of the fire. Unfortunately majority of the community is not aware of any emergency response plan whenever there is a fire outbreak.

Recovery support correspondences are considered by the government and other well- meaning organizations to help fire victims come out of their trauma any time it occurs. However, information gathered from the field indicated that, most victims are not aware of any recovery assistance from any quarters that they are entitled to.

The fortunate ones who are aware and are usually taken through the laid down procedures also complained to enjoy the recovery package always have to wait for 4 months to one year before they get any help from them. They also complained about the quantum and type of the support offered them which are usually unnecessary or just too little to really assist them in their situation.

….imagine your farm got burned and NADMO brings you mats, buckets and bed spreads as assistance in your situation. Or in an event where your store worth thousands of Ghana cedis destroys and you are given just a token as compensation, it's highly inadequate to actually help one put him/her back to business. They are indeed trying their best but their trail is never enough. Sadly, one will have to wait for 4 months or even a year before the support is given.

Once the family after the event is able to fend for their basic needs such as food, clothes and shelter they are considered to have recovered from the disaster. Women especially take longer time to recover compared to their male counterparts in disaster situations; a community member reiterated.

Table 4.11 below shows clearly how fire victims are assisted by the various groups in the community;

Table 4.11 Assistance from institutions

Groups that assist	Frequency	Percent
Government	69	34.5
NGOs	58	29
Community Leaders	19	9.5
Individuals	12	6
Social Groups	42	21
Total	200	100.0

Source: Field data, June 2013

The first source of relief support in times of bushfires has always been from other members of the communities and institutions in which the disaster occurred and then those of neighbouring communities before external help are sought (Enders, 2001). However, it is also known that because of the fact that people in these communities are generally very poor and their own systems of survival are week, their ability to support each other in times of disasters is limited in terms of the number of people they can reach and how long it can be sustained. From the table above, there are supporting institutions in the study communities for the poor and marginalised. It is clear from the data that, in times of disasters friends and relations has often been the first point of support before external sources are sought. The nature of support provided by the institutions varies in nature. Prominently, responses across the study districts show that, the first support offered is food from relations, friends, chiefs and clansmen.

It emerged from the study that 34.5% of the respondents confirm that fire victims usually get some support from the government, 29% of respondents admitted that some NGOs in the area also assist in times like that, 9.5% of respondents confirmed that the community leaders also help, 6% of

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respondents disagreed saying that the individual is mostly left to suffer it alone whiles 21% of the respondents opined that the various social networks in the community usually take such situations as their responsibility to reinstate the victims in a normal condition.

4.11 Community's Response to Bushfires

At the community level, the traditional leadership is usually the first to call on the victims to sympathize with them. However, some community members bemoaned that it is not everyone in the community that get that honour from the traditional leadership; some have fallen in worst situations but nobody heard their cry.

In some cases through community solidarity, some victims are supported with food stuffs and a cash amount to help them get back on their feet. From the table below, 88% of respondents confirmed the traditional authorities are doing their best in giving some form of compensations and sympathizing with affected families whiles 12% of respondents were of the view that they are yet to witness a compensation given by the chief to a community member after a disaster. This is a form of support mechanism introduced to help victims of bushfires cope with the aftermath of the effects.

Survival in this era of multitude physical and contiguous susceptibilities involves moving beyond self-reliance to broader alternative networks of relationships through which people can have access to other forms of capital to rescue their disintegrating businesses and household livelihood.

The interdependence of households and dependence on other members of the community especially in organised units is therefore an essential aspect of the livelihood and development of the people of Sissla East. With no or minimal modern technology and increasing vulnerability in all spheres of life especially food insecurity, individual farmers and households depend on other individuals and households for support in various ways in conducting their agricultural activities cannot be underscored.

Table 4.12 Community's assistance

	Assistance from Chief/Opinion leaders		Assistance from community members	
	Freq.	%	Freq.	%
Yes	176	88	139	69.5
No	24	12	61	30.5
Total	**200**	**100**	**200**	**100**

The most important aspects of social capital regards agriculture include the "nayipogba nuoriyeni lambo" songtaa nongtaa (organised labour/support) and household labour soliciting to facilitate the recovery processes of the distressed. These community members believe in canvassing support from other household in order to fasten the recovery process.

It is therefore binding on every community member for purposes of social capital well-being and support to belong to a social group who can be of immense assistance in times of trouble and grief. The analysis (Table 4.12) revealed that over 69.5% of the community rely on social capital (explained as those physical assets that count for most in the daily lives of people particularly fellowship, sympathy, and social intercourse among the individuals and families who make up a social unit) through social networks whiles about 30.5% of the community who have refused to belong to these social groups suffer in pain alone even in times of need as indicated in table 4.12.

4.12 The Community and Disaster Management

The study sought to solicit the views of the community members as to whom they think should be responsible for protecting our lands and proper from these wildfires. The community does not have a laid down mechanism for either preparing for or dealing with incidence of bushfires in the area. However, occasionally they organize community forums to sensitize farmers, charcoal producers and the community as a whole on the threats of bushfires to the environment and their livelihoods. As was stated by a participant:

Sometimes, an organization will come around to talk to us about the causes of bushfires and the destruction it brings to our community. They often advise us not to carry fire from our homes to our farms because these spark of fire can drop on your way. They also talk to us always weed around our farms and homes.

From the field survey, it became clear that education goes on but this not regular and sustainable. The community depends on external support from interested NGOs to hold regular educations. There is however no structured bye law in the community to deal effectively with culprits of this problem. There was a call for proper imposition of fines for people found culpable of the act. It was suggested that culprits could be asked to bring animals and food crops for the affected victims. Interestingly from Table 4.13, 26% of respondents agreed that the entire community should be responsible since it is the individual that creates the menace.

Whereas 42.5% of respondents believe the chiefs and opinion leaders are those given the mandate to protect and enforce laws and hence should be responsible for checking bushfires and punishing the culprits. About 10.5% of responses went against the forestry commission for being paid for work they don't do and therefore suggested that the forest became more responsible.

They therefore argued that, the forestry commission should be solely responsible for ensuring that our forest is adequately protected and effectively managed for the good of the entire community.

For 17% of the respondents, the district assembly is responsible for the development issues of the district and hence should consider the forest as part of their development agenda.

From Table 4.13, it is obvious that some respondents heeded to the combination of forces to fight the situation as the most important and realistic instrument.

Table 4.13 Proposed Institutions Responsible

Institutions	Frequency	Percent
Chief/Opinion Leaders	85	42.5
Forestry Commission	21	10.5
District Assembly	34	17
The whole community	52	26
Missing	8	4
Total	**200**	**100.0**

Source: Field data June, 2013

A National Fire Policy aimed at conservation and sustainable development of the nation's forest and wildlife resources for maintenance of environmental quality and perpetual flow of optimum benefits to all segments of society. Deriving from the policy objectives outlined various strategies intended to guide policy actions and execution of specific activities will be pursued: High incidence of bushfire in the country as a whole would be controlled through the adoption of the following strategies:

➤ Development and promotion of integrated wildfire prevention and control practices based on appropriate technologies.

➤ Inclusion of wildfire prevention and control issues in resource management planning at all levels by relevant institutions.

➢ Promotion of effective communication strategies, training and environmental education to sustain public awareness.

➢ Inter-agency coordination, cooperation and networking at national, district, and community levels shall be vigorously pursued.

➢ Development of adequate infrastructure and manpower to support wildfire prevention and control.

4.13 Impacts of Community Intervention Efforts

In some communities around the Sissala East District people continue to use fire in a safe and effective manner to improve livelihoods and protect resources. These communities are fairly acquainted with fire and its uses for livelihood activities such as clearing vegetation for agriculture, improving pastures for grazing, hunting and managing non-timber forest products. Where some of these communities may not rely straight on local natural resources to sustain a living or use fire to manage those resources, it remains in their greatest interests to have a stake in how bushfire is being managed across the communities with which they are associated.

The people of Sissala East District live in a bushfire prone environment as a result of the dry harmattan that occurs annually. Bushfires will happen but these can be reduced by the communities being bushfire ready. It is everyone's duty to be effectively prepared for, and know what to do, in the occurrence of a bushfire. The call for the removal of native vegetation around homes and buildings, has minimally reduced fuel across the landscape, and the urgent need for the inhabitants to construct fuel breaks or otherwise known as fire belts are part of the overall preparedness of the most of the communities. These were put in place with staff of NADMO and GNFS.

Local authorities have not been able to effectively enforce local legislation to ensure that people adhere to community regulations. Bushfire is a real risk for the district but there has not also been much commitment to ensure that these efforts by the communities are realized.

However in communities that have less impact of bushfires, have conducted prescribed burning procedures in their area. In these areas, the prescribed burning of the vegetation is intended to improve ecological processes.

The success story:

1. Bushfire prevention plans are developed and reviewed regularly.

2. They will focus on identifying bushfire risks, strategies to mitigate those risks and the implementation of those strategies

3. Reduction in the occurrence of bushfires that result from arson and carelessness.

4.14 Constraints Limiting Community Efforts in Bushfire Prevention

Societies have a long record of managing the impacts of weather- and climate-related events. Nevertheless, additional adaptation measures will be required to reduce the adverse impacts of projected climate change and variability, regardless of the scale of mitigation undertaken over the next two to three decades. Moreover, vulnerability to climate change can be exacerbated by other stresses.

The inability of the district to ensure the effective implementation of the mitigation methods arise from the unpredictable nature of weather conditions and therefore the dry season/harmattan sets in faster than they have expected.

Poverty and limited access to resources pushes the inhabitants to rely on various forms of activities that tend to defeat the fight to combat bushfires. More people resort to easy accessible sources of income such as charcoal production and hunting in order to make ends meet.

The rising case of food insecurity has a toll on the food supply chain of the communities and therefore some of the inhabitants resort to hunting to supplement their domestic food supply.

Knowledge limitations of most respondents on disaster risk reduction, has over the time affected the effectiveness of some of these efforts to curb bushfires. It suffices to state that the limited knowledge on the cause and effect of bushfires has been a great set back. These communities visited have not received training in any form regarding disaster risk reduction.

The educational status of a community can influence the community's economic, political, cultural and social life. It therefore enables to draw concrete conclusions and recommendation. An individual's level of education affects the person's understanding and appreciation of the impact of bushfires on people and the environment. It also draws attention to the nature of their occupation and involvement in activities related to the environment. From table 4.14 below, 22.5% of respondents had primary education, 7.5% of respondents had JHS education, 13% of them had SHS education, 18% of respondents had Middle school education, 11.5% had Tertiary education whiles 27% of respondents had no education at all.

The data indicated that on the average, one can describe the communities as highly illiterates and this can be seen in their involvement in some type of livelihood activities in the district. Education is a good factor that unlocks several opportunities, thus, the lack or limits number of educated persons in a community can be detrimental to the environment and income of household.

Table 4.14 Level of Education

Level	Frequency	Percent
Primary	45	22.5
JHS	15	7.5
SHS	26	13
Middle School	36	18
Tertiary	23	11.5
N/A	55	27.5
Total	**200**	**100.0**

Source: Field data, June 2013

Education plays a significant role in reducing the negative impacts of bushfires occurrences in direct and indirect ways. It is an accepted fact formal education is considered as a main way individuals acquire knowledge, skills, and capabilities that can affect their adaptive capacity. There is a large body of literature on the effects of education on health which is summarized in Lutz and Skirbekk (2013) who conclude that there is enough evidence to assume direct functional causality.

First, there is evidence that the learning experiences associated with formal education have a lasting impact on the synoptic brain structure (Kandel 2007) and enhances cognitive skills (Neisser et al. 1996, Nisbett 2009, Reynolds et al. 2010). Literacy and numerical skills as well as general skills e.g., abstract thinking obtained through formal education imply better understanding and ability to process such risk information as weather forecast or warning messages (Mileti and Sorensen 1990, Spandorfer et al. 1995). Second, education is associated with problem-solving skills (Moll 1994, Ishikawa and Ryan 2002, Schnell-Anzola et al. 2005).

Thus, in such an emergency situation like when a disaster strikes, educated individuals might be more capable to respond and act upon the event. Third, education enhances the acquisition of knowledge, values and priorities as well as the capacity to plan for the future and improve allocation of resources (Thomas et al. 1991, Glewwe 1999).

It is, for example, well documented that educated individuals have better basic practical knowledge on nutrition and health practices (Nayga 2000, Burchi 2010). Similarly, education may also enhance knowledge on disaster risks and how to respond to such risks. Fourth, education can influence risk perception. If people perceive their risks to natural disasters to be real, they are more likely to react to cope with these risks. It is found that highly educated individuals are better aware of the earthquake risk (Ainuddin et al. 2013) and are more likely to undertake disaster preparedness (Paul and Bhuiyan 2010). High risk awareness associated with education thus could contribute to vulnerability reduction behaviors.

Apart from the above mentioned direct impacts, education may indirectly reduce vulnerability through many other means. It suffices to say education improves socio-economic status as evident that education generally increases earnings (Psacharopoulos, 1994; Psacharopoulos and Patrinos 2002). This allows individuals to have command over resources such as purchasing costly disaster insurance, living in low risk areas and quality housing, implementing disaster preparedness measures and evacuating in time of emergencies. Secondly, highly educated individuals usually have diversified communication linkages and have better access to useful information (Cotten and Gupta, 2004; Wen et al., 2011; Neuenschwander et al., 2012). The level of education is highly correlated with access to weather forecasts and warnings as well as the types of technologies used to access weather information (Rodriguez et al., 2007). Access to forecast and early warnings allow individuals to respond and prepare for the hazards appropriately.

Thirdly, education is associated with greater social capital and social support and wider social networks (Department for Business Innovation & Skills, 2013). Social networks are particularly useful in time of emergency.

For instance, individuals who are embedded in large and well-established social networks and friendship groups have higher chance to receive informal warnings and consequently more likely to confirm warnings and engage in response (Mileti and Sorensen, 1990).

Furthermore, social capital and social networks increase the propensity to evacuate and facilitate relocation and recovery (Airriess et al., 2008). Through increasing socio-economic resources, facilitating access to information and enhancing social capital, education can promote vulnerability reduction and adaptive. At the societal level, it is found that better educated society enjoys greater economic growth (Lutz et al. 2008, Crespo Cuaresma et al. 2013), higher life expectancy and higher degree of democracy (Lutz et al., 2010).

This implies that better educated societies have greater social, economic, and institutional capabilities necessary for successful adaptation to climatic change (KC and Lutz 2014). Consequently, it is reasonable to assume that when facing natural hazards or climate risks, educated individuals, households and societies are more empowered and hence more adaptive in their response to, preparation for, and recovery from disasters.

A range of barriers as stated above limits both the implementation and effectiveness of mitigation measures. From the study some communities with a high adaptive capability remain susceptible to climate change, variability and extremes. A wide range of policies and instruments are available to local authorities to create the incentives for mitigation action.

From the study it was discovered that in spite of the various and conscious efforts by the community to combat bushfires, there have some constraints limiting the effectiveness of these efforts. These include weak legislative instruments as well as the lack of political will on the part of the government to prosecute the policy of anti-bushfires. A commitment to this will help stabilise the efforts of the local people to dealing with bushfires.

One other major constraint is limited and irregular financial assistance from responsible authorities to enable community leadership carry out sensitization activities and to also regularly monitor the activities of bushfires guards. A good knowledge of the causes of bushfires, of the related motivations and the possible mitigation strategies of bushfires is vital for policy makers for the design of prevention policies adapted to the socio-economic, cultural and environmental circumstances of each zone. Indeed, when their cause is known, bushfires are easier to eradicate and concrete actions can be taken to reduce their number. The causes of bushfires in the savanna zones are many and their distribution differs among communities, additionally, these bushfires cause may also differ spatially and temporally within the same country.

Depending on the socio-cultural context of the district under study, factors such as the unemployment rate or variables linked to their main source of livelihood which is agricultural activity can explain the ignition of intentional and unintentional bushfires. For both human and some minimal lightning-caused bushfires, there is a geographical gradient of fire ignition which is due to variations in climate and fuel composition. The timing of bushfires in most areas depends on their causes, fires due to arson occurring all over the day and being more frequent in the harmattan season than bushfires due to negligence or accident. In rural areas such as, the timing of human-induced bushfires is closely linked to human activities and peaks with strong winds.

4.15 Conclusion

Conclusively, the research revealed that the enormous nature of the causes of bushfires is both human and natural. And that these human induced causes are mainly burning for farming in the communities, burning to scare away reptiles, hunting and alleged burning by jealous neighbours and these are tired up in what is called their socio-cultural practices. It was also found that the effects are reduction in soil fertility, crop destruction and continuous reduction in yields of crops.

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CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This study sought to critically explain the socio-cultural practices and how these contribute to the incidence of bushfires in the Sissala East District. It also sought to explore interventions made by the community and government to mitigate bushfires. Furthermore the study examined the impact of the community interventions efforts in reducing bushfires in the district. In this chapter, a summary of the main findings are presented. Also, the chapter draws conclusions from the findings and makes recommendations for providing the right interventions needed to make the district more resilient to bushfires.

5.2 Summary of Major Findings

The study found that the major occupation of the people is farming. It means that their major source of livelihood and income are limited. The practice of slash and burn as a way of preparing their lands for planting contributes largely to the incidence of bushfires. The study further revealed that livestock keepers also set fires in grassland to improve pastures quality. The study also discovered that their main source of fuelwood which is charcoal contributes to the incidence of bushfires in the district.

The study indicated that the bushfires have brought untold hardships to individuals or sometimes a whole community. As discovered from the study, loss of crops was the hardest hit with a percentage of 46.8, burned houses at 15.1, loss of lives at 2.4 and loss of livestock at 2.4

It was revealed from the field survey that improvements in bushfire mitigation will better manifest only if the communities are better educated and engaged. The Sissala East District through some community leaders have held bushfire campaigns to enhance and deepen the people's understanding of their daily activities that could spark off bushfires in their communities.

5.3 Conclusions

Continuous burning or intense fires can have harmful effects on the land, but in general, guarded use of fire can be less fierce than some other forms of control. Other control methods such as use of herbicides, and animal grazing can be used to influence the amount of fire and optimize the positive effects of fire.

One other important consideration from this work is for the use of prescribed fire and understanding its effects on soils. With high-intensity recurrent fire, the most negative result will be erosion. Despite regular education carried out in the nation on the effects of bushfires on socio-economic and socio-cultural development, some inhabitants continue to indulge in the practice thus resulting in devastation of their environments and properties. Communities should intensify community education and responsible organizations with emphasis on the importance of forests and the impact of these fires to the forests. The District Assembly should assign some funds to pledgee such programmes or create a good environment to attract NGOs into conservation. These fires most often extend and destroy other farmlands.   From the field, it became clear that they are very much aware of the effects of bushfires has having environmental impacts in terms of destroying plant species.

As stated in the literature review, large pieces of land are covered with either sand or trenches and unfilled holes that may destroy plants as well as farms. Bushfires are of national concern and the

entire nation should be galvanized into action to fight the practice. We must all endeavour to protect the forests from bushfires to ensure sustainable use of their benefits. Bushfires have led to the drying-up of water-bodies; forcing the people, especially the rural communities, to travel long distances in search of water.

Some large pieces of land have also been exposed to soil erosion by bushfires. Bushfires pose a danger to a potential drought and food security every year, hence the need to draw the attention of policymakers to the fact that the environment constitutes a large part in any poverty reduction strategy.

Some effective bushfire protection measures include; controlled burning of farmlands and, around selected areas of productive forests; maintenance of fire lines by disking or hand scuffling; and the inclusion of fire protection clauses in the agreements at the local level and commercial grazing.

A good fire preventive strategy should aim at minimizing the adverse effects of bushfires, and promote sustainability of rural livelihoods, human health and community security. These are some of the social aspects of the communities affected by bushfires. Early burning is one good technique which has been used by communities that have less cases of bushfires. The essence of early burning is to reduce the increasing fuel loads and therefore minimize the occurrence of devastating late dry season fires especially during the harmattan season. Early burning creates a makeshift consequence of burnt, partially burnt and unburnt areas which leaves substantial amounts of grass and browsing material intact to support wildlife and animal populations during the late dry season.

The late hot season fires are checked by the patchwork effect ("firebreaks") created by early burning (WWF 2001). Even though bush-burnings pervade the complete farming lives of most people, bushfires not only destroy several hectares of food and cash-crops to the detriment of farmers in only Tumu and their families but also to the whole nation.

The study fits into the social practice framework which seeks to explain the link between practice and social context and thereby explains how context and cultural factors relate to common social practices of individuals in a social group (Hedegaard, 1998; Herdl, 2000). Therefore the local knowledge, skills and attitudes of the people of Sissala East district and the incidence of bushfires situate perfectly in the social practice framework. There is therefore a logical connection between community events, practices and knowledge and the regular occurrences of bushfires in the district.

5.4 Recommendations

It is recommended that education should be a priority of all Ghanaians to sensitize themselves well and other community members on the need to avoid setting bushfires, especially during the harmattan season. The incidence of bushfires in this country and its destructive effects on the environment cannot be overrated. The Fire volunteer clubs in schools and Disaster Volunteer Groups in the country through an enhanced knowledge on bushfire disaster risk reduction should make it a point to make stronger their efforts at preventing the phenomenon, and assist farmers to burn cleared vegetation in preparing the land for cropping to avoid fire outbreaks. This can be done through public education from NADMO and GNFS at the school and community levels.

The people of Sissala East through the district assembly must create the awareness on the ban on group-hunting, and anyone caught violating the law should be arrested. It is advised that security personnel should be deployed to support the fire volunteers in combating the menace. It is advised that traditional and opinion leaders should come together and help bring the situation of bushfires under control.

The traditional methods of farming in the community which slashing and burnings after the lands are also cleared, do affect the environment adversely. Sometimes bushfires occur because people

set fires in order to catch bush animals. Farmers should also be advised to create adequate fire-belts around their food barns and farms and houses.

UNIVERSITY FOR DEVELOPMENT STUDIES

REFERENCES

1. ACT Emergency Services Agency (2011) 'What is Bushfire'
(http://esa.act.gov.au/community-information/bushfires/what-is-a-bushfire/
Retrieved on 02June 2015).

2. Ainuddin, S. and J. Kumar Routray 2013. People's risk perception in earthquake prone Quetta city of Baluchistan. *International Journal of Disaster Risk Reduction, in press*. http://dx.doi.org/10.1016/j.ijdrr.2013.10.006

3. Airriess, C. A., W. Li, K. J. Leong, A. C.-C. Chen, and V. M. Keith. 2008. Church-based social capital, networks and geographical scale: Katrina evacuation, relocation, and recovery in a New Orleans Vietnamese American community. *Geoforum* 39(3):1333,1346. http://dx.doi.org/10.1016/j.geoforum.2007.11.003

4. Aldous, A (1967). *Bushfire* Leicester: Brockhampton Press.

5. Applegate GBA, Chokkalingam U, Suyanto S (2001). The underlying causes and impacts of fires in South-east Asia. Final Report, Center for International Forestry Research, International Centre for Research in Agroforestry. Bogor: USAID, US Forest Service; 2001:58.

6. Archibald S, Roy DP, van Wilgen BW, Scholes RJ (2009) What limits fire? An examination of drivers of burnt area in Southern Africa. Global Change Biology 15: 613-630.

7. Armstrong, E.K. (2005) 'Current Research on Tourism Industry Recovery After a Major Bushfire' *Australasian Parks and Leisure*, 8(2): 10-12.

8. Armstrong, E.K (2008). (in press) 'Shaping Our Territory: Strategic Tourism Planning Plays a Significant Role in Disaster Recovery'. Paper presented at the Conference of the Travel and Tourism Research Association Canada Chapter, Tourism Without Borders held at Charlottetown, Prince Edward Island.

9. Armstrong, E.K. & B.W. Ritchie (2008) 'The Heart Recovery Marketing Campaign: Destination Recovery after a Major Bushfire in Australia's National Capital' *Journal of Travel and Tourism Marketing*, 22 (2/3/4): 175-189.

10. Australian Bureau of Statistics (2004). Year Book Australia 1301.0, available from www.abs.gov.au Accessed on 13th August 2013.

11. Barber, J.M. (1986). 'Bushfires in Australia: A Study of Cause And Effect, Part 1'. Operations supplement No.162. In *The Fireman*, 19 March, Oakleigh. Retrieved from www.fireandbiodiversity.org.au/LiteratureRetrieve *on 22nd January 2015.*

12. Barton, L. (1993) Crisis in Organisations: Managing and Communicating in the Heat of Chaos. Cincinnati: South-Western Pub. Co.

13. Bath, A.J. (1993) 'Attitudes Toward Fire and Fire Management Issues in Yellowstone National Park' Unpublished PhD Thesis, University of Calgary, Calgary, Alberta, Canada.

14. Beirman, D. (2003) Restoring Tourism Destinations in Crisis: A Strategic Marketing Approach Crows Nest, NSW: Allen & Unwin.

15. Beringer J, Hutley LB, Tapper NJ, Cernusak LA: <u>Savanna fires and their impact on net ecosystem productivity in North Australia</u>**.** *Glob Chang Biol* 2007, **13:** 990–1004. 10.1111/j.1365-2486.2007.01334.x

16. Bond WJ, Keeley JE: <u>Fire as a global 'herbivore': the ecology and evolution of flammable ecosystem</u>**.** *Trends Ecol Evol* 2005,**20** (7):387–393. 10.1016/j.tree.2005.04.025

17. Bowman, D. M. J. S. and M. J. Brown (2014) <u>Bushfires in Tasmania: A Botanical Approach to Anthropological Questions'</u> *Archaeology in Oceania* 21 (3) pp. 166-171.

18. Boyce, J.K. 2000. <u>Let them eat risk: wealth, rights and disaster vulnerability</u>. Disasters 24(3): 254-261.

19. Brinkworth, A. (2003) <u>Annual Report Bushfire Bulletin</u> Australasian Fire Authorities Vol. 29 No. 4 pp. 4-8

20. Brown, J. S. and P. Duguid (2000) '<u>Knowledge and Organisation: A social-Practice Perspective'</u>: Harvard Business School *Publishing* Corporation

21. Bruce, Mary Grant (1913). <u>*Norah of Billabong*</u> Sydney: Angus and Robertson.

22. Bryant C (2008) <u>Understanding bushfire: trends in deliberate vegetation fires in Australia.</u> Technical and background paper series 27, Australian Institute of Criminology, Canberra.

23. Butry, D.T., D.E. Mercer, J.P. Prestemon, J.M. Pye & T.P. Holmes (2001) What is the Price of Catastrophic Wildfire? *Journal of Forestry* Vol. 99 No. 11, 9-17.

24. Canter D. (1985) Studies of Human Behaviour In Fire: Empirical Results and Their Implications for Education and Design University of Surrey: IHS BRE Press

25. Carr, Roger Vaughan (1985). Firestorm! Melbourne: Nelson.

26. Castellani, B. and F. W. Hafferty (2009) Sociology and Complexity Science: A New Field of Inquiry New York: Springer

27. Cavlek, N. (2002) 'Tour Operators and Destination Safety', *Annals of Tourism Research* Vol. 29 No. 2, 478-496.

28. Centre for Disaster Research and Education (CEDRE) (2015) Framework for Community-led Disaster Management Plan: Northern Region, Ghana. Accra: Ghana Red Cross society.

29. Centre for Risk and Community Safety Research (RMIT University) & OESC Victoria (2003) Halls Gap Fire Risk Management Project Melbourne: RMIT University Press.

30. Cheney, P. and A. Sullivan (1997) <u>Grassfires: Fuel, Weather and Fire Behaviour</u> Collingwood: CSIRO Publishing.

31. Christianson A, McGeeb TK, L'Hirondellec L: <u>Community support for wildfire mitigation at Peavine Métis Settlement, Alberta, Canada</u>. *Environ Hazards* 2012,**11**(3):177–193. 10.1080/17477891.2011.649710

32. Chuvieco E, Aguado I, Yebra M, Nieto H, Salas J, Martín MP, Vilar L, Martínez J, Martín S, Ibarra P, de la Riva J, Baeza J, Rodríguez F, Molina JR, Herrera MA, Zamora R (2010) <u>Development of a framework for fire risk assessment using remote sensing and geographic information system technologies.</u> Ecological Modelling 221: 46-58. doi:10.1016/ J.ECOLMODEL.2008.11.017.

33. Cioccio, L. & E. J. Michael (2007) <u>Hazard or Disaster: Tourism Management for the Inevitable in Northeast Victoria</u> *Tourism Management*, Vol.*28* No.1 pp.*1-11* ref.39

34. Clark, Mavis Thorpe (1973). <u>Wildfire Sydney</u>: Hodder and Stoughton.

35. Cohen, Erez, Peter Hughes and Peter White (2006) <u>Battling Ferocious Flames: Bushfires and the Media</u>, *Australian Journal of Emergency Management*, 21:1, 47-52.

36. Cotten, S. R., and S. S. Gupta. 2004<u>. Characteristics of online and offline health information seekers and factors that discriminate between them</u>. *Social Science*

&Medicine 59(9):1795,1806. http://dx.doi.org/10.1016/j.socscimed.2004.02.0

20

37. Crespo Cuaresma, J., S. KC, and P. Sauer. 2013. Age-specific education inequality, education mobility and income growth (WWWforEurope Working Papers series No. 6). WWWforEurope. [online] URL: http://ideas.repec.org/p/feu/wfewop/y2013m6d0i6.html

38. Croasdale, Laurine (1998). Red Golf Balls St Lucia: University of Queensland Press.

39. D'Ath, Justin (2005). Bushfire Rescue Camberwell: Penguin.

40. Davies, Chris, 1997, Analysis of fire causes on or threatening public land in Victoria 1976/77{1995/96. Research Report 49, Fire Management Branch, Department of Natural Resources and Environment, Victoria, AU.

41. Davies SJ, Unam L: Smoke-haze from the 1997 Indonesian forest fires: effects on pollution levels, local climate, atmospheric CO_2 concentrations, and tree photosynthesis. *For Ecol Manage* 1999, **124:** 137–144. 10.1016/S0378-1127(99)00060-2

42. DeBano, L.F., D.G. Neary, P.F. Folliot (1998) Fire's Effects on Ecosystems New York: John Wiley & Sons, Inc.

43. DiTomaso, J.M., M.L. Brooks, E.B. Allen, R. Minnich, P.M. Rice, and G.B. Kyser (2006) <u>Control of Invasive Weeds with Prescribed Burning</u> *Weed Technology* 20 (2):535-548.

44. Dowdy and Mills (2012) <u>Characteristics of Lightning-attributed Wildland Fires in South-east Australia</u> *International Journal of Wildland Fire 2012*, *21*, 521–524.

45. De Sausmarez, N. (2004) <u>Crisis Management for the Tourism Sector: Preliminary Considerations in Policy Development</u> *Tourism and Hospitality Planning & Development*, 1(2): 157-172.

46. Dugan, Michael (1996). <u>Bushfires</u>, Australian Disasters Series, Macmillan Educational, South Melbourne.

47. Emergency Management Australia. Disasters database (2006). Available from www.ema.gov.au; accessed 18th July 2013.

48. Enders, J (2001), <u>Measuring community awareness and preparedness for emergencies</u>. Australian Journal of Emergency Management 16(3): 52-58

49. Esfeld, M. (2003) <u>What are Social Practices?</u> *Indaga. Revista Intenacional de Cienacias y Humanas* 1(2003) pp. 19-43.

50. Esplin, Bruce, Gill, Malcolm and Enright, Neal, (2003). Report of the inquiry into the 2002-2003 Victorian bushfires, Department of Premier and Cabinet, Melbourne.

51. Fairfax (2006). Walkabout travel guide, Fairfax Digital, available from www.walkabout.com.au/tips/GeneralAdvice.shtml, accessed 18th June 2013.

52. Faulkner, B. (2001) Towards a framework for Tourism Disaster Management *Tourism Management* volume 22: 135- 147.

53. Faulkner, B. & S. Vikulov (2001) Katherine, Washed Out One Day, Back On Track The Next: A Post-Mortem of A Tourism Disaster *Tourism Management* volume 22: 331-344.

54.Faulkner*,* B. *and* Russell*,* R. Turbulence, chaos *and* complexity *in* tourism systems*:* A research direction *for the* new millennium. In *B. Faulkner*, G. Moscardo and E. Laws (eds) *Tourism* in the *21st Century* (pp. 328-349). London: Continuum.

54. Floyd, M.F., H. Gibson, L. Pennington-Gray & B. Thapa (2003) The Effect of Risk Perceptions on Intentions to Travel in the Aftermath of September 11, 2001, in C.M. Hall, D.J. Timothy and D.T. Duval (eds.*) Safety and Security in Tourism: Relationships, Management and Marketing*. Binghamton, NY: Haworth Hospitality Press, pp.19-38.

55. Foster, J., Finnis, E., & Nimon, M. (Eds.). (1995). <u>Australian Children's Literature: An exploration of genre and theme</u>. Wagga Wagga, New South Wales: Centre for Information Studies, Charles Sturt University.

56. Foster, Ted (1976). <u>Bushfire: History, Prevention and Control</u> Reed, Sydney: A.H. & A.W.

57. Franke, M. (2000) <u>Yellowstone After the Glow: Lessons from the Fire</u>. Wyoming National Parks Service Mammoth Hot Springs, Wyoming.

58. Forrestal, Elaine (2004). <u>Black Earth</u> Camberwell: Penguin.

59. Garry Jacobs and Harlan Cleveland (1999). <u>Social Development Theory</u>, World Academy of Art & Science

60. Gleeson, Libby (1984). <u>Eleanor, Elizabeth</u> Sydney: Angus and Robertson.

61. Glewwe, P. (1999). <u>Why does mother's schooling raise child health in developing countries? Evidence from Morocco</u>. *Journal of Human Resources* 34(1):124–159. http://dx.doi.org/10.2307/146305

62. Government of Australia (2004) *Year Book Australia* Canberra: Australian Bureau of Statistics

63. Hann Syme, Marguerite, and David Cox (2000). <u>Bushfire</u> Lindfield: Scholastic Press.

64. Hann Syme, Marguerite (2001). <u>Burnt-out</u> Norwood: Scholastic Press.

65. Hargreaves, T. (2011) <u>Practicing Behaviour Change: Applying Social practice Theory to Pro-environmental Behaviour Change</u> *Journal of Consumer Culture* 11 (1) 79-99.

66. Harvey, Nicole (2006). State fire investigation coordinator, Country Fire Authority Victoria, personal communication, 21 March.

67. Hedegaard, M. (1998) <u>A Cultural-historical Approach to Mind</u> *Human Development* 41 (3) pp. 205-209.

68. Herndl, C. G. and C. A. Narwold (2000) <u>Research as social practice: a case study of research on technical and professional communication</u> *Written Communication* 17 (2) 158-296.

69. Holland, D and Jeane Lave (2009) <u>Social Practice Theory and the Historical Production of Persons</u> *An International Journal of Human Activity Theory* No. 2 2009 Pp. 1-15.

70. Holtz, Georg (2014) <u>Generating Social Practices</u> *Journal of Artificial Societies and Social Simulation* 17 (1) 17 < <u>http://jasss.soc.surrey.ac.uk/17/1/17.html</u>> Retrieved 02 June 2015 at 3.11pm.

71. <u>http://www.academia.edu/7035483/FRANK_ED</u>

72. <u>http://www.int.arch-photogramm-remote-se</u>

73. <u>http://www.researchgate.net/publication</u>

74. <u>http://www.fire.uni-freiburg.de/iffn/con</u>

75. http://www.jsd-africa.com/jsda/V9N2-summ

76. Ishengoma, G. C. (1998). <u>The role of women in household food security in Morogoro rural and Kilosa districts</u>. Thesis for Award of PhD Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 204pp.

77. Ishikawa, M., and D. Ryan. 2002. <u>Schooling, basic skills and economic outcomes.</u> *Economics of Education Review* 21(3):231–243. <u>http://dx.doi.org/10.1016/S0272-7757(01)00005-X</u>

78. Kandel, E. R. (2007). <u>In search of memory: the emergence of a new science of mind.</u> New York: W.W. Norton & Co., USA.

79. Keep Australia Beautiful (2006). <u>National Litter Index</u>, prepared by McGregor Tan Research, www.kab.org.au, Retrieved on 20th May2014.

80. Kelleher, Victor (2000). <u>Beyond the Dusk</u> Sydney: Random House.

81. Kemp, R.L. 2007. <u>Vulnerability assessments for public and private facilities. Journal of Business Continuity and Emergency Planning</u> 1(3): 245-251.

82. KC, S., and W. Lutz. 2014. <u>Demographic scenarios by age, sex and education corresponding to the SSP narratives</u>. *Population and Environment* 35(3):243–260. http://dx.doi.org/10.1007/s11111-014-0205-4

83. Kuijer, S. C. (2014) <u>Implication of Social Practice Theory for Sustainable Design</u> Published PhD Thesis, Delft University of Technology, Delft, Netherlands.

84. Lafon, C. W. (2010) <u>Fire in the American South: Vegetation Impacts, History, and Climatic Relations</u> *Geographic Compass* Vol. 4 No. 8 pp 919-944.

85. Lampin C, Jappiot M, Morge D, Vennetier M (2006) Statistical and spatial analysis of forest fire ignition points: a study case in South of France. Forest Ecology and Management 234S-S12.

86. Langhart R, Bachmann A, Allgöwer B (1998) <u>Spatial and Temporal Patterns of Fire Occurrence</u> (Canton of Grison, Switzerland). In: Viegas DX (ed) Proceedings of the 3rd International Conference on Forest Fire Research / 14th Conference on Fire and Forest Meteorology, Luso, Portugal, November, 16-20, Vol.2, pp 2279-2292.

87. Lees, S. and P. McIntyre (1993) <u>The Oxford Companion to Australian Children's Literature</u> Melbourne: Oxford University Press.

88. Lekakis JN (1995) <u>Social and Ecological Correlates of Rural Fires in Greece</u>. Journal of Environmental Management 43: 41-47.

89. Le Page Y, Oom D, Silva J, Jönsson P, Pereira J (2010). <u>Seasonality of vegetation fires as modified by human action: observing the deviation from eco climatic fire regimes</u>. Global Ecology and Biogeography 19: 575- 588.

90. Lerner-Lam, A. 2007. <u>Assessing global exposure to natural hazards: progress and future trends. Environmental Hazards</u> 7(1): 10-19.

91. Liverman, D. and S. Douglas (1985) <u>Natural hazards in Novels and Films: Implications for Hazard Perception and Behaviour</u>. In Burgess, J. and J. R. Gold *Geography, the Media and Popular Culture* London: Croom Helm.

92. Lovreglio R, Leone V, Giaquinto P, Notarnicola A (2010) Wildfire cause analysis: four case-studies in southern Italy. iForest 3: 8-15.

93. Luke, R.H. and A. G. McArthur (1978) <u>Bushfires in Australia</u> Canberra: Australian Government Publishing Service.

94. Lutz, W., J. Crespo Cuaresma, and M. J. Abbasi-Shavazi. 2010. <u>Demography, education, and democracy: global trends and the case of Iran.</u> *Population and Development Review* 36(2):253–281. <u>http://dx.doi.org/10.1111/j.1728-4457.2010.00329.x</u>

95. Lutz, W., J. Crespo Cuaresma, and W. C. Sanderson. 2008. <u>The demography of educational attainment and economic growth.</u> Science 319(5866):10471048.http://dx.doi.org/10.1126/science.1151753

96. Lutz, W., and V. Skirbekk. 2013. *How education drives demography and knowledge informs projections.* International Institute for Applied Systems Analysis. Interim Report No. IR-13-016. Laxenburg, Austria. [online] URL: <u>http://webarchive.iiasa.ac.at/Admin/PUB/Documents/IR-13-016.pdf</u>

97. Macdonald, Donald (1930).<u>The boy's Bush Book </u>Sydney: Angus and Robertson.

98. Mann, Charles (2005) *1491:* <u>New Revelations of the Americas Before Columbus</u> New York: Knopf Publishing Group.

99. Mangiavillano A (2004) <u>De l'éclosion du phénomène à l'émergence d'incendie: utilisation combine de l'analyse spatiale et de la physique du feu pour localiser les espaces émetteurs.</u> Mémoire de DEA de Géographie, Université d'Avignon.

100. Martínez J, Vega-García C, Chuvieco E (2009) <u>Human-caused wildfire risk rating for prevention planning in Spain.</u> Journal of Environmental Management 90: 1241–1252.

101. Mileti, D. S., and J. H. Sorensen. 1990. <u>Communication of emergency public warnings: a social science perspective and state-of-the-art assessment</u>. Federal Emergency Management Agency (No. Report ORNL-6609). Oak Ridge, TN.

102.   Millar, D. (2006), <u>Forest in northern Ghana: Local Knowledge and Local Use of Forest.</u> SahelSudan Environmental Research Initiative. Occasional Paper nos 15.Copenhagen.

103.   Moll, I. 1994. <u>School was far away: the formal perceptions, classifications and syllogistic reasoning of Kokwane Ndlovu. Perspectives in Education</u> 15(2):189–217.

104.   Moloney, S., R. E. Horne, & J. Fien (2010) <u>Transitioning to Low Carbon communities—from Behaviour Change to Systematic Change: Lessons from Australia</u> *Energy Policy* 38 7614-7623.

105.   Moreira F, Rego FC, Ferreira PG (2001) Temporal (1958-1995) <u>Pattern of change in a cultural landscape of north western Portugal: implications for fire occurrence.</u> Landscape Ecology 16: 557-567.

106.   Moscardo G *&* E. Laws *(*Eds.*),* <u>Tourism in the 21st Century: Lessons from Experience</u> (*pp. 328-349*). London: *Continuum. ... New York*: American Association of Management. Floyd

107.   Muywanga, D. M. (2004). <u>Contribution of on-farm seed production to poverty reduction in Dodoma District</u>. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania, 140pp.

108.   NAF (National Academies Forum) (1999) <u>Fire: The Australian Experience Proceedings of the 1999 Seminar Fire! The Australian Experience</u> held at the University of Adelaide, Australia, on 30 September-1 October 1999 / National Academies Forum. www.acola.org.au/PDF/**FIRE**%20The%20Australian%20... Retrieved: 17 May 2015.

109.   Nayga, R. M. 2000. <u>Schooling, health knowledge and obesity. Applied Economics</u> 32(7):815–822. <u>http://dx.doi.org/10.1080/000368400322156</u>

110.   Neisser, U., G. Boodoo, T. J. Bouchard, A. W. Boykin, N. Brody, S. J. Ceci, D. E. Halpern, J. C. Loehlin, R. Perloff, R. J. Sternberg, and S. Urbina. (1996). Intelligence: knowns and unknowns. *American Psychologist* 51(2):77–101. <u>http://dx.doi.org/10.1037/0003-066X.51.2.77</u>

111.   NFPA (National Fire Protection Association) (2013) <u>Lightning Fires and Lightning Strikes Fact Sheet in Mary Arhens Lightning Fires and Lightning Strikes</u> Quincy, MA: NFPA Fire Analysis and Research.

112.   Neuenschwander, L. M., A. Abbott, and A. R. Mobley. (2012). <u>Assessment of low-income adults' access to technology: implications for nutrition education.</u> *Journal of Nutrition Education and Behavior* 44(1):60–65. <u>http://dx.doi.org/10.1016/j.jneb.2011.01.004</u>

113.   Nimon, Maureen and John Foster (1997) <u>The Adolescent Novel: An Australian Perspective</u> Wagga Wagga: Centre for Information Studies.

114.   Nisbett, R. E. (2009). <u>Intelligence and how to get it: why schools and cultures count</u> First edition. W. W. Norton, New York, USA.

115.   Padilla M, Vega-García C (2011). <u>On the comparative importance of fire danger rating indices and their integration with spatial and temporal variables for predicting daily human-caused fire occurrences in Spain</u>. International Journal of Wildland Fire 20: 46-58.

116.   Paul, B. K., and R. H. Bhuiyan. 2010<u>. Urban earthquake hazard: perceived seismic risk and preparedness in Dhaka City, Bangladesh</u>. *Disasters* 34(2):337–359. http://dx.doi.org/10.1111/j.1467-7717.2009.01132.x

117.   Pausacker, Jenny (1998). <u>Wall of Fire</u> Port Melbourne: Reed.

118.   Plucinski, M. (2014) <u>Fire Note</u> Melbourne: AFAC

119.   Psacharopoulos, G. 1994. <u>Returns to investment in education: A global update.</u> *World Development* 22(9):1325–1343. http://dx.doi.org/10.1016/0305-750X(94)90007-8

120.   Psacharopoulos, G., and H. A. Patrinos. 2002. <u>Returns to investment in education: a further update</u> The World Bank, Policy Research Working Paper No. WPS2881. Washington, D.C., USA.

121.   Pyne, Stephen (1997). <u>Frontiers of fire</u>. In Tom Griffiths and Libby Robin (eds), *Ecology and Empire: Environmental History of Settler Societies* Melbourne: Melbourne University Press.

122.   Pyne, Stephen J. (2004). <u>Tending Fire: Coping with America's Wildland Fires</u> Washington: Island Press.

123.   Quarantelli, Enrico (1980).<u>The Study of Disaster Movies: Research Problems, Findings and Implications</u>, Disaster Research Centre, Paper No.64. Ohio State University.

124.   Reynolds, A. J., J. A. Temple, and S.-R. Ou. 2010. <u>Preschool education, educational attainment, and crime prevention: contributions of cognitive and non-cognitive skills.</u> *Children and Youth Services Review* 32(8):1054–1063. http://dx.doi.org/10.1016/j.childyouth.2009.10.019

125.   RFS (NSW Rural Fire Service) (2005) <u>Causal Factors in New South Wales Investigated Bushfires: Part 1: Deliberate Fires'</u> *Bulletin No.* 22 Canberra: Australian Institute of Criminology.

126.   Robinson, Sue and Helen Leach (2002). *Edward's Magic Paint Box* South Melbourne: Lothian.

127.   Rodriguez, H., W. Diaz, J. M. Santos, and B. E. Aguirre. 2007. <u>Communicating risk and uncertainty: science, technology, and disasters at the crossroads.</u> Pages 476–488 *in* H. Rodriguez, E. L. Quarantelli, and R. Dynes, editors. *Handbook of Disaster Research*. Springer New York, USA. http://dx.doi.org/10.1007/978-0-387-32353-4_29

128.   Roland, Betty (1966). <u>The Bush Bandits</u> Melbourne: Lansdowne Press.

129.   Rolley, E. (2003) <u>Transcript of Evidence</u> Canberra: Government of Australia

130.   Smolka, A. L. B. (2001). Social Practice and Social Change: Activity Theory in Perspective *Human Development* 44 (6) 362-367.

131.   Saxby, Maurice (1998). Offered to Children: A History of Australian Children's Literature, *1841-1941* Gosford, Australia: Scholastic.

132.   Schnell-Anzola, B., M. L. Rowe, and R. A. LeVine. 2005. Literacy as a pathway between schooling and health-related communication skills: a study of Venezuelan mothers. *International Journal of Educational Development* 25(1):19 37.

133.   Shelley, Noreen (1972). Family at The Lookout London: Oxford University Press.

134.   Shlisky A, Waugh J, Gonzalez P, Gonzalez M, Manta M, Santoso H, Alvarado E, Ainuddin Nuruddin A,Rodríguez-Trejo DA, Swaty R, Schmidt D, Kaufmann M, Myers R, Alencar A, Kearns F, Johnson D, Smith J, Zollner D,Fulks W (2007) Fire, Ecosystems and People: Threats and Strategies for Global Biodiversity Conservation. Arlington, VA: The Nature Conservancy.

135.   Smith, Ivan, and Clifton Pugh (1972). The Death of A Wombat Melbourne: Wren.

136.   Spandorfer, J. M., D. J. Karras, L. A. Hughes, and C. Caputo. 1995. Comprehension of discharge instructions by patients in an urban emergency department. *Annals of Emergency Medicine* 25(1):71-74. http://dx.doi.org/10.1016/S0196-0644(95)70358-6

137.   Stiffen, W., L. Hughes, and Alix Pearce (2015) The Heat is on: Climate Change, Extreme Heat and Bushfires in Western Australia Perth: Climate council of Australia Ltd.

138.   Sturtevand BR, Cleland DT (2007) <u>Human and biophisical factors influencing modern fire disturbance in northern Wisconsin</u>. International Journal of Wildland Fire 16: 398-413.

139.   SZ Bonye, JS Godfred - European Journal of Social Science, 2011 - academia.edu

140.   Tabara D, Sauri D, Cerdan R (2003) <u>Forest fire risk management and public participation in changing socio environmental conditions: A case study in a Mediterranean region.</u> Risk Analysis 23: 249-260.

141.   The Cambridge Advanced Learners Dictionary & Thesaurus (2015)

(<u>http://dictionary.cambridge.org/dictionary/british/bush-fire Retrieved 02 June 2015</u>.

142.   Thomas, D., J. Strauss, and M.-H. Henriques. 2011. <u>How does mother's education affect child height?</u> *Journal of Human Resources* 26(2):183–211. <u>http://dx.doi.org/10.2307/145920</u>

143.   Vale, Thomas, R. (2000) <u>Fire, Native People, and Natural Landscape</u> Washington, DC: Island Press

144.   Van Wilgen BW: <u>The evolution of fire management practices in savanna protected areas in South Africa</u>**.** *S Afr J Sci* 2009,**105**(9–10):343–349.**Google Scholar**

145.   Weber, Rodney (2000). <u>Bushfire Causes In *FIRE! The Australian experience, proceedings of the 1999 Seminar,*</u> National Academies Forum, Canberra, available from www.atse.org.au, accessed 20th June 2013.

146.   Weir, Jessica (2013) <u>Bushfires awareness planning: preliminary focus group results from four jurisdictions, 2013</u>. *Faculty of Business, Government and Law, University of Canberra, Australian Capital Territory.*

147.   Wen, L. M., C. Rissel, L. A. Baur, E. Lee, and J. M. Simpson. 2011. <u>Who is NOT likely to access the Internet for health information? Findings from first-time mothers in southwest Sydney, Australia</u>. *International Journal of Medical Informatics* 80(6):406–411.

148.   Woodberry, Joan, and Max Angus (1968). <u>Ash Tuesday</u> Melbourne: Lothian.

APPENDICES

APPENDIX A: KEY INFORMANT QUESTIONNAIRE

UNIVERSITY FOR DEVELOPMENT STUDIES

FACULTY IF INTEGRATE DEVELOPMENT STUDIES

GRADUATE SCHOOL-MPHIL DEVELOPMENT STUDIES

Preamble

This is to solicit your responses on the study; *socio-cultural practices of the people of Tumu and the incidence of bushfires* in fulfilment of the course requirement. Your response would aid in providing an insight into the topic and this would not only be helpful in obtaining the degree programme I am pursuing but would also add to knowledge. This research requires your time, honesty and knowledge to make it a success. Any information so provided will be treated with the outmost CONFIDENTIALITY and shall be used for the purpose of the study. I therefore solicit your consent to answer the following questions.

KEY INFORMANT QUESTIONNAIRE

Please indicate your consent by ticking yes [   ] *or tick no* [   ] *if you do consent to providing responses*

PART 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENT

(Tick the appropriate field)

1. Sex of respondent. A. Male[   ]   B. Female[   ]
2. Age of respondent. A. 15-25 [   ] B. 26-35 [   ] c. 36-45[   ] D. 45 and above [   ]
3. What is your level of education? A. Primary school[   ] B. JHS[   ]   C. SHS[   ] D. Middle school [   ] E. Tertiary [   ] F. N/A [   ]
4. Marital status. A. Married[   ]   B. Divorced[   ]   C. Single [   ]   D. widowed [   ]

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5. Household size…………………………………………….

6.   Primary occupation of respondent. A. Farming [   ] B. Trading [   ] C. Teaching [

] D. others (specify)…………………….

7. What other business do you do? A. charcoal burning[   ] B. Fishing [   ] C. small

scale mining [   ] D. Hunting [   ] E.N/A [   ]

8. Does your business rely directly on the surrounding forest or bushes? A. yes [   ]

B. no [   ]

PART 2: GENERAL CAUSES OF WILDFIRES/BUSHFIRES

ANTHROPOGENIC CAUSES

9. What is the main cause of wildfires/bushfires?

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10. How do you prepare your lands before cultivation? A. weeding[   ] B. Slash&

burning [   ]   C. Planting on existing weeds [   ] D. N/A [   ]

11. How do you protect your houses from reptiles? A. spraying[   ]   B. burning to

provide fire belts/ buffer zones [   ]   C. Weeding around the house[   ]   D. N/A

[   ]

12. What is your source of fuel wood? A. Firewood [   ] B. Charcoal [   ] C. Foreign

sources [   ] D. others [   ], specify…………….

13. Where do you get this source of fuel wood from? A. market [   ] B. farmlands [

] C. Felling of trees [   ] D. others [   ], specify…………….

14. What other factors could result in bushfires? A. Hunting [   ] B. From enemies [   ]

C. Farmers neglect [   ] D. Deliberate by farmer to win sympathy[   ]

NATURAL CAUSES

15. Do you think extensive sunshine can cause bushfires? A. yes [   ]   B. no [   ]

16. Can thunder/lightening cause bushfires? A. yes[   ]   B. no[   ]

17. In your opinion, what elements of the weather can start bushfires?

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PART 3: GENERAL IMPACT OF WILDFIRES/BUSHFIRES

AT THE COMMUNITY LEVEL

18. In the last five (5) years, how often have you experienced wildfires/bushfires?

A. Once [   ] B. Twice [   ] c. Thrice [   ] D. Uncounted [   ]

19. When was the last time you experienced the occurrence of bushfire in your locality?

A Less than a year ago [   ] B Over a year ago [   ] C Exactly a year ago [   ] D. Over 5 years [   ]

20. What was the immediate impact of the last bushfire in your locality?

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AT THE INDIVIDUAL/HOUSEHOLD LEVEL

21. Did your business/property/farm experience any long term or permanent changes as a result of the bushfires? A. yes[   ]   B. no[   ]

22. How were you or your household affected as a result of bushfires?

A. Loss of crops [   ] B. Household burned [   ]   C. Loss of lives [   ] D. Loss of livestock [   ] E. N/A [   ]

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PART 4: RESPONSES TO WILDFIRES/BUSHFIRES

FROM GOVERNMENT

23. Who immediately responds to the incidence of wildfires/bushfires?

A. NADMO [   ]   B. Disaster Volunteer Groups [   ]   C. Fire Service [   ]   D. The community members themselves [   ]

24. Does your organization have any emergency response plans in the event of the bushfires in your region?

A. yes [   ] B. no [   ]

25. Are you able to give recovery assistance to victims of bushfires? A yes [   ] B no [   ], if no, skip to **question 26**

26. Where did you get the recovery/relief assistance from?

A. Government [   ]   B. NGOs [   ]   C. Community leaders [   ]   D. Individuals [   ]

27. How long does it take to give relief/ recovery assistance to victims? A. less than a week [   ]   B. Less than a month [   ]   C. Over 6 months [   ]   D. In a year's time [   ]

28. To what extent do you think victims recover one year after the bushfires?

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RESPONSES FROM THE COMMUNITY

29. Do the chiefs or opinion leaders of various communities contribute to giving assistance? Yes [   ], No [   ], if yes, how?

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30. Do the communities have any laid assistance for victims of bushfires? Yes [   ], No [   ], if yes, what form of assistance is it?

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PART 5: EXISTING COPING MECHANISMS IN THE COMMUNITY

31. What are the coping mechanisms existent in the community/household level?

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32. In your opinion, who are those responsible for ensuring that the bushes/forests are not burned?

A. Chief/opinion leaders [   ]

B. Forestry commission [   ]

C. District assembly   [   ]

D. The whole community [   ]

33. In your opinion, what do you think should be done to prevent the occurrence of bushfires?

A. Creating fire belts around farms and homes [   ]

B. Educating community members on the impact of bushfires [   ]

C. Introduce bye-laws to control bushfires [   ]

D. Do early burning before the bushes dry up [   ]

34. What mitigation strategies should be put in place to mitigate the impact of wildfires/bushfires?

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35. What punishment should be meted out to people caught burning bushes indiscriminately?

A. Culprits should be fined to pay [   ]

B. Culprits should be given manual work/ communal labour to do [   ]

C. Imprison culprits for a period of time [   ]

D. Others [   ], specify………………

APPENDIX B: HOUSEHOLD QUESTIONNAIRE

UNIVERSITY FOR DEVELOPMENT STUDIES

FACULTY IF INTEGRATE DEVELOPMENT STUDIES

GRADUATE SCHOOL-MPHIL DEVELOPMENT STUDIES

Preamble

This is to solicit your responses on the study; *socio-cultural practices of the people of Tumu and the incidence of bushfires* in fulfilment of the course requirement. Your response would aid in providing an insight into the topic and this would not only be helpful in obtaining the degree programme I am pursuing but would also add to knowledge. This research requires your time, honesty and knowledge to make it a success. Any information so provided will be treated with the outmost CONFIDENTIALITY and shall be used for the purpose of the study. I therefore solicit your consent to answer the following questions.

HOUSEHOLD QUESTIONNAIRE

Please indicate your consent by ticking yes [   ] *or tick no* [   ] *if you do consent to providing responses*

PART 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENT

(Tick the appropriate field)

36. Sex of respondent. A. Male[   ]   B. Female[   ]

37. Age of respondent. A. 15-25 [   ] B. 26-35 [   ] c. 36-45[   ] D. 45 and above [   ]

38. What is your level of education? A. Primary school[   ] B. JHS[   ]   C. SHS[   ] D. Middle school [   ] E. Tertiary [   ] F. N/A [   ]

39. Marital status. A. Married[   ]   B. Divorced[   ]   C. Single [   ]   D. widowed [   ]

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40. Household size……………………………………………….

41. Primary occupation of respondent. A. Farming [ ] B. Trading [   ] C. Teaching [   ] D. others (specify)…………………….

42. What other business do you do? A. charcoal burning[   ] B. Fishing [   ] C. small scale mining [   ] D. Hunting [   ] E.N/A [   ]

43. Does your business/occupation rely directly on the surrounding forest or bushes? A. yes [   ] B. no [   ]

PART 2: GENERAL CAUSES OF WILDFIRES/BUSHFIRES

ANTHROPOGENIC CAUSES

44. What is the main cause of wildfires/bushfires?

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45. How do you prepare your lands before cultivation? A. weeding[   ] B. Slash& burning [   ] C. Planting on existing weeds [   ] D. N/A [   ]

46. How do you protect your houses from reptiles? A. spraying[   ]   B. burning to provide fire belts/ buffer zones [   ]   C. Weeding around the house[   ]   D. N/A [   ]

47. What is your source of fuel wood? A. Firewood[   ] B. Charcoal[   ] C. Foreign sources[   ]

48. Where do you get this source of fuel wood from? A. market [   ] B. farmlands[   ] C. Felling of trees[   ]

49. What other factors could result in bushfires? A. Hunting [   ] B. From enemies [   ] C. Farmers neglect [   ] D. Deliberate by farmer to win sympathy[   ]

NATURAL CAUSES

50. Do you think extensive sunshine can cause bushfires? A. yes [   ]   B. no [   ]

51. Can thunder/lightening cause bushfires? A. yes[   ]   B. no[   ]

52. In your opinion, what do elements of the weather can start bushfires?

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PART 3: GENERAL IMPACT OF WILDFIRES/BUSHFIRES

AT THE COMMUNITY LEVEL

53. In the last five (5) years, how often have you experienced wildfires/bushfires?

A. Once [   ] B. Twice [   ] c. Thrice [   ] D. Uncounted [   ]

54. When was the last time you experienced the occurrence of bushfire in your locality?

A Less than a year ago [   ] B Over a year ago [   ] C Exactly a year ago [   ] D. Over 5 years [   ]

55. What was the immediate impact of the last bushfire in your locality?

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AT THE INDIVIDUAL/HOUSEHOLD LEVEL

56. Did your business/property/farm experience any long term or permanent changes as a result of the bushfires? A. yes[   ]   B. no[   ]

57. How were you or your household affected as a result of bushfires?

B. Loss of crops [   ] B. Household burned [   ] C. Loss of lives [   ] D. Loss of livestock [   ]

PART 4: RESPONSES TO WILDFIRES/BUSHFIRES

FROM GOVERNMENT

58. Who immediately responses to the incidence of wildfires/bushfires?

B. NADMO [   ]   B. Disaster Volunteer Groups [   ]   C. Fire Service [   ]   D. The community members themselves [   ]

59. Were you aware of any emergency response plans at the time of the fire for your locality?

A. yes [   ] B. no [   ]

60. Did you receive any recovery assistance? A yes [   ] B no [   ], if no, skip to **question 26**

61. Where did you get the recovery/relief assistance from?

B. Government [   ]   B. NGOs [   ]   C. Community leaders [   ]   D. Individuals [   ]

62. How long does it take to receive relief/ recovery assistance? A. less than a week [   ]   B. Less than a month [   ] C. Over 6 months [   ]   D. In a year's time [   ]

63. To what extent do you think you have recovered one year after the bushfires?

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RESPONSES FROM THE COMMUNITY

64. Has the chief or opinion leaders come to your assistance? Yes [   ], No [   ], if yes, how?

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65. Does the community have any laid assistance for victims of bushfires? Yes [   ], No [   ], if yes, what form of assistance is it?

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PART 5: EXISTING COPING MECHANISMS IN THE COMMUNITY

66. What are the coping mechanisms existent in the community/household level?

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67. In your opinion, who are those responsible for ensuring that the bushes/forests are not burned?

E. Chief/opinion leaders [   ]

F. Forestry commission   [   ]

G. District assembly   [   ]

H. The whole community [   ]

68. In your opinion, what do you think should be done to prevent the occurrence of bushfires?

E. Creating fire belts around farms and homes [   ]

F. Educating community members on the impact of bushfires [   ]

G. Introduce bye-laws to control bushfires [   ]

H. Do early burning before the bushes dry up [   ]

69. What mitigation strategies should be put in place to mitigate the impact of wildfires/bushfires?

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70. What punishment should be meted out to people caught burning bushes indiscriminately?

E. Culprits should be fined to pay [   ]

F. Culprits should be given manual work/ communal labour to do [   ]

G. Imprison culprits for a period of time [   ]

H. Others [   ], specify………………

Thank you for your time

UNIVERSITY FOR DEVELOPMENT STUDIES