



KGALAGADI DISTRICT BUSHFIRE RISK MANAGEMENT PLAN



KGALAGADI DISTRICT BUSHFIRE RISK MANAGEMENT PLAN

2020-2025



For further information, please contact

District Coordinator
Department of Forestry and Range Resources
P.O. Box 364
Tsabong

Telephone: 6540028
Fax: 6540027

Toll free number: 0800600734

LIST OF ACRONYMS

BRM	Bushfire Risk Management
BTCL	Botswana Telecommunication Corporation Limited
DAP	Department of Animal Production
BTO	Botswana Tourism Organisation
DDMC	District Disaster Management Committee
DEA	Department of Environmental Affairs
DFRR	Department of Forestry and Range Resources
DHMT	District Health Management Team
DMS	Department of Meteorological Services
DNMM	Department National Museum & Monuments
DWNP	Department of Wildlife and National Parks
EWS	Early Warning Systems
HATAB	Hospitality and Tourism Association of Botswana
KDC	Kgalagadi District Council
KGDDP	Kgalagadi District Development Plan
KTP	Kgalagadi Transfronteir Park
MENT	Ministry of Environment, Natural Resources Conservation & Tourism
MoA	Ministry of Agriculture and Food Security
MYSC	Ministry of Youth Empowerment, Sport and Culture Development
NDMO	National Disaster Management Office
ODC	Office of District Commissioner
S&CD	Social and Community Development
SFP	Special Fire Protection
VDC	Village Development Committee

TABLE OF CONTENTS

TABLE OF CONTENTS	i
LIST OF TABLES.....	ii
LIST OF FIGURES	ii
GLOSSARY	iii
FOREWORD	v
PREFACE	vi
ACKNOWLEDGEMENT	vii
CHAPTER ONE: INTRODUCTION	1
1.1 Background.....	1
1.2 Aim and Objectives	1
1.3 Description of the Kgalagadi District	2
1.3.1 Location and Size	2
1.3.2 Population and Demography	3
1.3.3 Climate and Bushfire season	4
CHAPTER TWO: LEGISLATIVE, POLICY, PLANS AND STRATEGIC FRAMEWORKS	9
2.1. Herbage Preservation Act of 1977	9
2.2 Forest Act of 1968	9
2.3 Agricultural Resources Conservation Act (1973)	9
2.4 Forest Policy of 2011	9
2.5 National Policy on Disaster Management of 1996	9
2.6. National Disaster Risk Management Plan of 2009	10
CHAPTER THREE: THE RISK MANAGEMENT PROCESS	11
3.1 The Risk Management Process.....	11
3.2 Communication and Consultation.....	11
3.3. Asset Identification and Risk Assessment	12
3.3.1 Assets Identification.....	12
3.3.2 Assessment of Bushfire Risk.....	14
3.3.2.1 Consequence Assessment	14
3.3.2.2 Likelihood Assessment	18
3.4 Identifying the level of risk.....	18
CHAPTER FOUR: RISK EVALUATION.....	23
4.1 Evaluating bushfire risk	23
4.2 Treatment Priorities	23
4.3 Risk Acceptability	23
CHAPTER FIVE: BUSHFIRE RISK TREATMENT	25
5.1. Asset specific treatment strategies	25
5.2 Risk Treatment Plan.....	25
CHAPTER SIX: IMPLEMENTATION	28
CHAPTER SEVEN: MONITORING AND REVIEWING	32
7.1 Monitoring	32
7.2 Reporting	32
7.3 Review	32
CHAPTER EIGHT: RESEARCH	33
REFERENCES.....	51

LIST OF TABLES

Table 1 Consequence ratings	16
Table 2: Likelihood ratings.....	18
Table 3. Asset risk identification	19
Table 4 :Risk Assessment.....	20
Table 5: Treatment priorities.....	23
Table 6: Asset risk register	24

LIST OF FIGURES

Figure 1 Map of Kgalagadi District	2
Figure 2 Average Maximum Temperature Distribution	4
Figure 3: Average Minimum Temperature Distribution	5
Figure 4 Kgalagadi Transfronteir Park	7
Figure 5: Kgalagadi District Fire incidents.....	8
Figure 6 Overview of the risk management process	11
Figure 7:Map showing eco regions of Botswana	13
Figure 8: Heritage sites in Kgalagadi	14
Figure 9: Risk Rating Matrix.....	19

GLOSSARY

Assets: anything valued by the community which includes houses, crops, heritage, buildings and places, infrastructure, the environment, businesses, grass and forests, that may be at risk from bushfire.

Bushfire: a general term used to describe fire in vegetation, including grassfire.

Bushfire Hazard: the potential severity of a bushfire, which is determined by fuel load, fuel arrangement and topography under a given climatic condition.

Bushfire Risk: the chance of a bushfire igniting, spreading and causing damage to the community or the assets they value.

Bushfire Risk Management: a systematic process that provides a range of treatments which contribute to the wellbeing of communities and the environment, which suffer the adverse effects of wildfire/bushfire.

Bushfire Threat: potential bushfire exposure of an asset due to the proximity and type of a hazard and the slope on which the hazard is situated.

Consequence: outcome or impact of a bushfire event.

Firefighting Authorities: The Department of Forestry and Range Resources (DFRR), Fire Brigades, the Department of Wildlife and National Parks (DWNP) Service.

Likelihood: the chance of a bushfire igniting and spreading.

Major Bushfire: A bushfire which requires the attendance of multiple fire teams, or causes damage to property or injury to one or more persons.

Display area: geographic area determined by the Kgalagadi District Disaster Management Committee which is used to provide a suitable area and scale for community participation and mapping display purposes.

Recovery costs: the capacity of an asset to recover from the impacts of a bushfire.

Acceptance: an informed decision to accept the consequences and the likelihood of a particular risk.

Risk Analysis: a systematic process to understand the nature of and to deduce the level of risk.

Risk Assessment: The overall process of risk identification, risk analysis and risk evaluation.

Risk Identification: the process of determining what, where, when, why and how something could happen.

Risk Treatment: The process of selection and implementation of measures to modify risk.

Vulnerability: the susceptibility of an asset to the impacts of bushfire.

FOREWORD

The Kgalagadi District Bushfire Management Plan (KDBFMP) is a strategic document spearheaded by the Kgalagadi District Drought and Disaster Management Committee (KDDMC) formulated by a multi-disciplinary team from various sectors. The KDDMC is comprised of Government Departments, Parastatals and Non-Governmental Organisations, property owners, farmers and land managers (both public and private). The aforementioned key stakeholders have a duty to prevent the occurrence of bush and to minimise the danger of the spread of bush fires.

Kgalagadi District has been overwhelmed by repeated incidents of bushfire year in and year out, which caused serious damages to either property, biodiversity and at times staid casualties. Upon realization of such calamity, the Government of Botswana through the Ministry of Environment, Natural Resources Conservation and Tourism in conjunction with Kgalagadi District Council, found it necessary to develop the District Bushfire Risk Management Plan which will;

- (i) identify the level of risk posed by bush fires,
- (ii) establish strategies to protect these assets from the adverse effects of bushfires; and
- (iii) achieve better integration of community preparedness and prevention strategies as key elements of bush fire management

The National Policy on Disaster Management of 1996 and the National Disaster Risk Management Plan of 2009 advocates for coordinated arrangement for managing emergencies across Botswana including bush fires. In addition, this National Disaster Risk Management Plan has laid a strong foundation for a synergic and integrated approach between the Kgalagadi District Council and the Ministry of Environment, Natural Resources Conservation and Tourism in addressing fire management. Furthermore, this document has been aligned to the national priorities such National Development Plan 11 and National Vision 2036: - "Achieving Prosperity for all", the latter which has one of the pillar on Sustainable Environment which advocates for "sustainable utilisation of natural resources, water security, energy security, sustainable human settlements, climate change resilience and disaster reduction, pollution and waste control".

I am therefore enthralled that this document will enable the people of Kgalagadi to achieve the desired goal of managing bushfires which will ultimately accord them the ability to derive benefits from abundant natural resources hence improving their livelihoods. I wish to acknowledge all those who worked persistently to deliver this document, and in particular the United Nations Development Programme (UNDP) through the Kgalagadi-Ghanzi Ecosystem Project (KGDEP) for their financial support in developing this document. We look forward to a more concerted implementation of the plan across all the sectors.

Honourable Hendrick Jacobs
Council Chairperson
Kgalagadi District

PREFACE

Natural resources form a fundamental part of the Kgalagadi District development agenda. These resources which are mainly flora (vegetation and veld products) and fauna are fundamental to the District economic development as they support agriculture development, wildlife tourism and social and community development initiatives in the District. Thus, the majority of land in Kgalagadi District is used for agricultural production and wildlife management, where these two land uses promote accumulation of biomass, which poses the risk of fires if not properly managed.

The normal bush fire season for the District is July to November every year with the peak period being from August to October. However, with the ever changing weather conditions, the fire season has been observed to extend beyond the normal duration with some areas experiencing outbreaks during the presumed wet season. In addition, most of these fires occur at the same time in different areas thus stretching the limited resources available. It is against this background that the District Drought & Disaster Management Committee embarked on the development of the District Bushfire Risk Management Plan.

The document was developed to identify bushfire risks, gaps and challenges in fire management as well as to come up with collective strategies (mitigation, treatment and control measures) to address them. This strategic document advocates for collective participation, responsibility and accountability by all stakeholders in bush fire management. We therefore believe that if well implemented, the Bushfire Risk Management Plan will improve bush fire management in the District.

Mr. B. Mangwa
Ag. District Commissioner
Kgalagadi District

Mrs. Baipelelang C. Photlokwe
Council Secretary
Kgalagadi District Council

ACKNOWLEDGEMENT

The development of the Kgalagadi District Bushfire Risk Management Plan was led by a team of officers from the District Drought and Disaster Management Committee and other District structures. We thank the team for demonstrating commitment and dedication throughout the exhausting exercise. Throughout the development of this strategic document, the community leaders, mainly Dikgosi, Councillors and Village Development Committees (VDC) have played a critical role by enabling the community consultations as well as participating in the drafting of the document.

We appreciate their support and guidance throughout this process. We also like to extend our sincere thanks all other stakeholders such as Government Departments, Non-Governmental Organisations and the local communities for their participation, input and assistance during the whole plan development process.

However, it would not have been possible without the financial support of the United Nations Development Programme (UNDP) through the Kgalagadi–Ghanzi Dryland Ecosystem Project (KGDEP). As mentioned above, this exercise was done through extensive consultative process in the form of workshops and focus group discussions as well as Working Team meetings.

CHAPTER ONE: INTRODUCTION

1.1 Background

The 2008 bushfire season in Botswana was one of the worst in terms of the area burnt and loss of property, where a large portion of land was indiscriminately burnt. Following the 2008 fire season the Botswana Government requested assistance from regional and international collaborating partners with more advanced expertise and technology in fire management. The Australian Government through the New South Wales Rural Fire Service responded to Botswana's call with regard to assistance on capacity building on Bushfire Management. The two parties entered into an agreement in 2009 and the initial period of agreement was five years (2009–2013) which was subsequently extended to date. One of the deliverables from this collaboration was the development of Bushfire Risk Management Plan (BRMP) for all districts, which includes accompanying operational plan.

The BRM Plan is a strategic document that identifies assets at risk from bushfire and their priority for treatment. The treatment programme sets out a broad spectrum of coordinated multi-stakeholder approach to address risks identified in the BRM plan. Government agencies and other land managers who have responsibilities of managing bushfire participate in the BRM planning process to ensure treatment strategies are collaborative and efficient regardless of land tenure.

Bushfire risk is defined as the chance of a bushfire igniting, spreading and causing damage to assets of value to the community. Assets of value to the community include the following:

- a) human settlement, including life and property;
- b) economic, including buildings, infrastructure, livestock, crops and forests;
- c) environmental; and
- d) cultural heritage.

1.2 Aim and Objectives

The aim of this plan is to minimise the risk of adverse impact of bushfires on life, property and the environment.

The objectives of the Kgalagadi District Bushfire Risk Management Plan are to:

- reduce the number of human-induced bushfire ignitions that cause damage to life, property and the environment;
- manage fuel loads to reduce the rate of spread and intensity of bushfires, while minimising environmental/ecological impacts;
- reduce the community's vulnerability to bushfires by improving its preparedness;

- effectively contain fires with a potential to cause damage to life, property and the environment;
- facilitate the effective use of financial and physical resources available for bushfire risk management activities.

1.3 Description of the Kgalagadi District

1.3.1 Location and Size

The Kgalagadi District is located in the south-western part of Botswana and forms part of the Western Region (which includes the Ghanzi District and North West District) (Figure 1). Kgalagadi shares its borders with Ghanzi to the north and Kweneng and Southern districts to the east. To the west is the border with Namibia, whereas the south and south-western borders are shared with the Republic of South Africa. The District covers an area of approximately 110,110 km², equivalent to 10% of Botswana's total area. The Kgalagadi Transfrontier Park (KTP) and a sizeable number of wildlife management areas (WMAs) in the region collectively occupy 63% of the District's total area. The freehold farms which lie in the south-eastern part occupy 7%, ranches/farms account for 5% and communal land occupies 25% respectively (Kgalagadi Land Board, 2016). The northern Kgalagadi, which constitutes the Hukuntsi Sub-District, covers approximately 44,044 km², while the southern Kgalagadi covers about 66,066 km² (KDDP8, 2017)

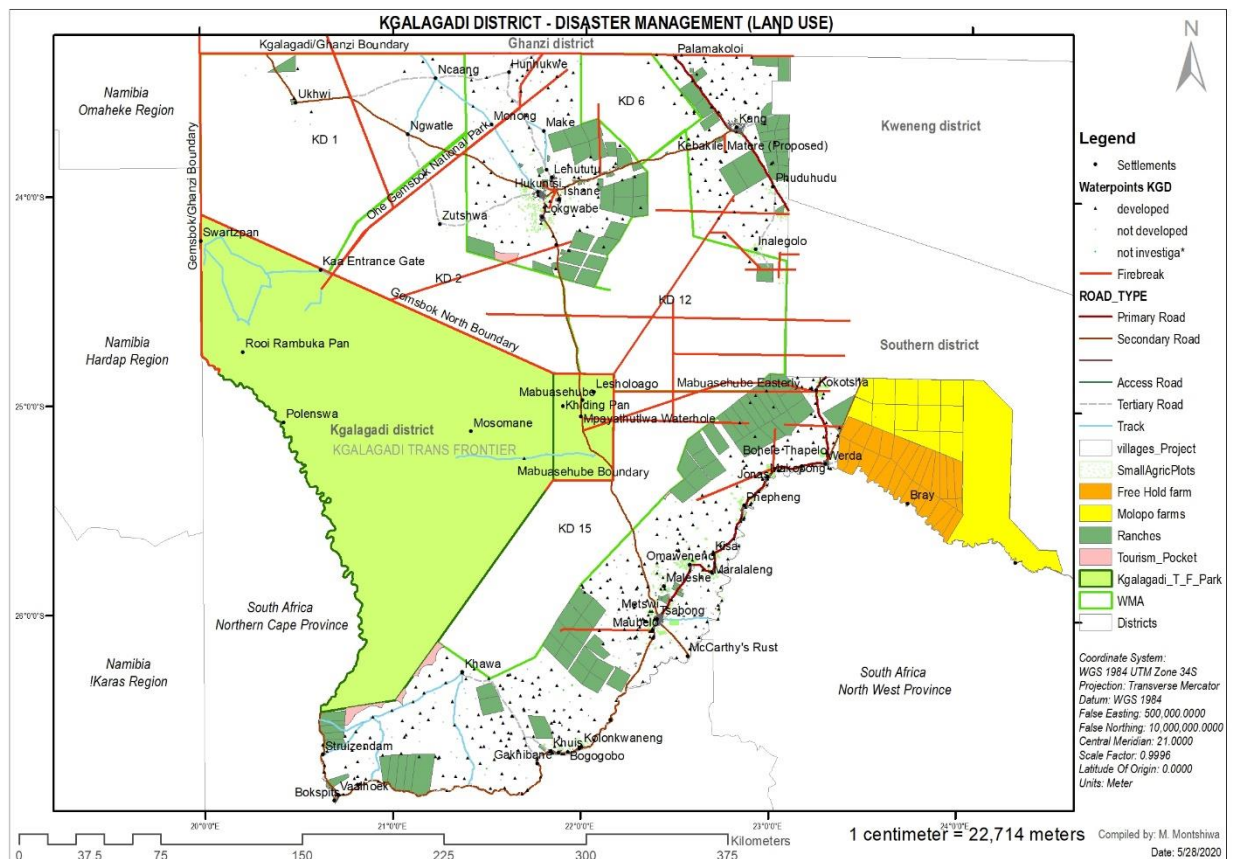


Figure 1: Map of Kgalagadi District

Tsabong serves as the district headquarters, as well as the sub-district for the southern part, while Hukuntsi serves as the sub-district of the northern part, respectively. The Tsabong sub-district covers the area from Kokotsha in the east to Struizendam in the south-west, while the Hukuntsi Sub-district stretches from Inalegolo to Ukwi and Hukuntsi.

A greater proportion of the Kgalagadi geographical space is essentially a basin into which sediments have continually been deposited and covered with sand. It is a region of great ecological, vegetative, geomorphological and climatic diversity. The terrain provides a haven for human, animal and plant life, notwithstanding extreme and difficult environmental conditions. Tsabong is located approximately 530 km from Gaborone, with the nearest urban centres in the eastern parts of the country being Kanye and Lobatse, which lies 450 km and 500 km away, respectively. The nearest urban area situated outside the district and Botswana is Kuruman in South Africa, approximately 230 km from Tsabong.

1.3.2 Population and Demography

The Population and Housing Census of 2011 estimated the population of Kgalagadi at 50,492, with the Tsabong Sub-District taking a high proportion of 30,016 and the Hukuntsi Sub-District only 20,497. This is an increase of 8,443 or 20.1% from the 2001 Census. The population of the District was estimated at 58,288 at the beginning of the KDDP 8 Plan period, and is expected to reach 63,075 at the end of the Plan in 2024. In Kgalagadi District, 60% of the population is concentrated in the southern region along the Molopo River. In the northern region, the largest population concentration estimated at 20% is found in the Matsheng villages, followed by the village of Kang with 9% of the District population. Approximately 11% of the District population lives in dispersed Rural Area Dwellers (RAD) settlements.

The socio-economic activities are largely agricultural, particularly pastoral farming with the communal system accounting for about 60% of the total livestock population, while the commercial system constitutes the other 40% (Ministry of Agriculture, 2013). The majority of the farmers in communal areas are rural agrarian farmers, mainly using traditional farming methods which have led to stagnancy in terms of industry development and growth. In addition to that, the District has veldt products of economic importance such as *Harpagophytum procumbens* (Grapple plant), *Kalaharituber pfeilii* (Mahupu), *Tylosema esculentum* (Morama bean) and *Grewia flava* (Moretlwa), which contribute immensely to the livelihoods of the local people. The District has a growing tourism industry which supports an assortment of camping sites and accommodation facilities in various locations. Therefore, it is vital to protect all human life and these assets against the potential impacts of bushfires at all costs.

1.3.3 Climate and Bushfire season

a) Temperature

i) Summer

Kgalagadi District's climate is arid associated with savannah shrub type of vegetation with maximum and minimum temperatures averages ranging from 33°C to 34°C and 23.3°C to 24°C respectively during October to February, but climatologically the highest temperature is attained during December (Figure 2). Tsabong Meteorological station attained an extreme highest temperature of 43.5°C during January 2016 (Maruatona, 2014).

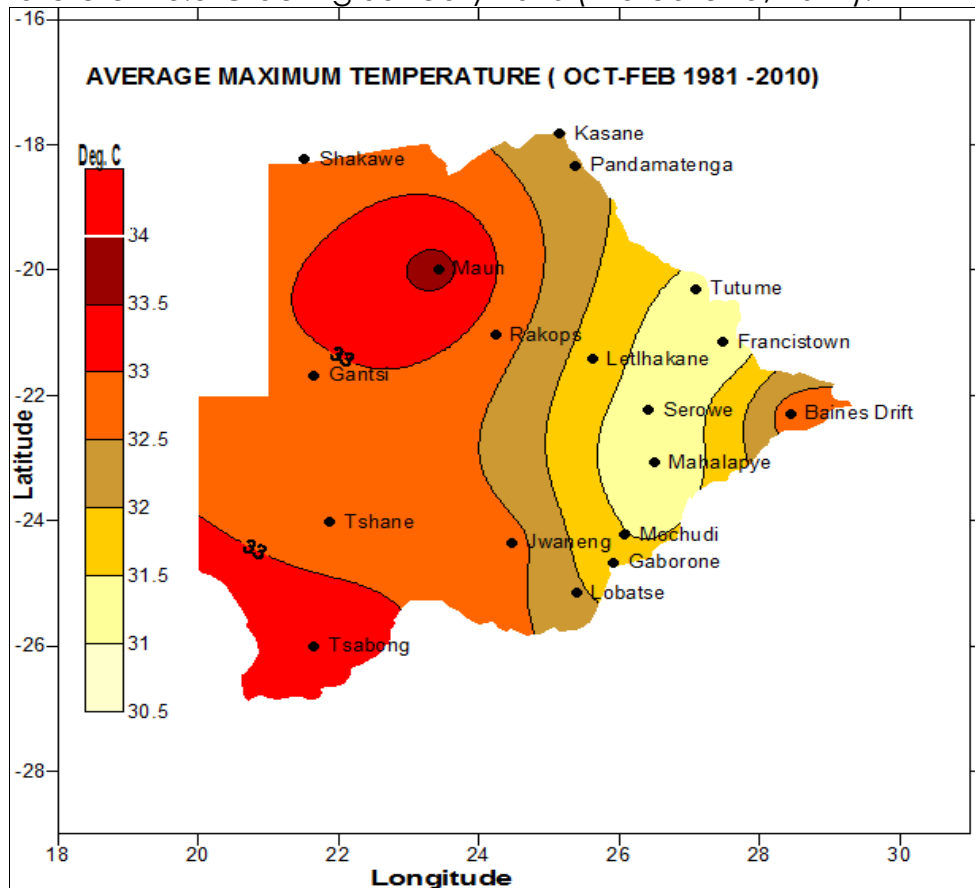


Figure 2 Average Maximum Temperature Distribution
(Source: Prudence Maruatona (2014))

ii) Winter

Average maximum and minimum temperatures ranges from 23.3°C to 24°C and 2.9°C to 6°C during May, June, and July (MJJ) respectively (Figure 3). Climatologically the lowest temperature is attained during the month of July, but Tsabong Meteorological office recorded an extreme lowest minimum temperature of -15.2°C on the 2nd August 1972 which still holds the record country wide, (Maruatona, 2014).

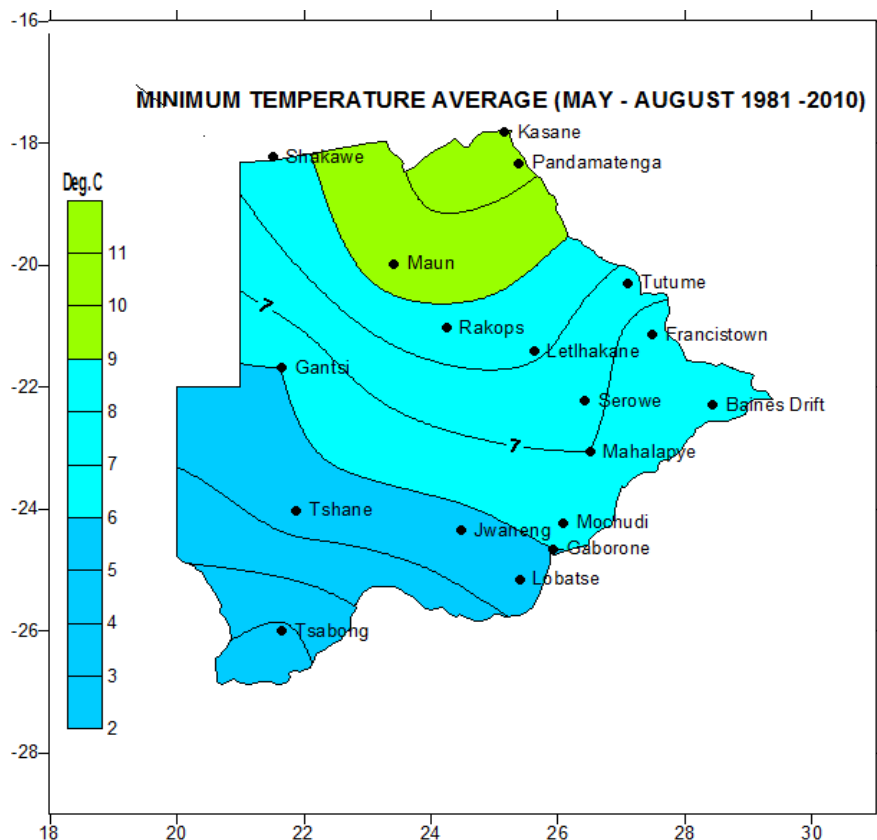


Figure 3: Average Minimum Temperature Distribution

The type of rainfall is unimodal (one rainfall season) and the season starts in October and ends in March. The normal start of the rainfall season (onset) with respect to planting has been identified as the fourth week of November and the end of the rainfall period (cessation) as the first week of April (Maruatona, 2014 unpublished). This is the district which receives the lowest annual rainfall in the country due to its arid type of climate. The District's annual rainfall average is 287 mm over the southern part and increases to 326 mm over the northern part (DMS 1981–2010 data analysis) Prudence Maruatona (2014).

iii) Evaporation

Kgalagadi District experiences high Temperatures during summer hence high evapotranspiration rate. Kgalagadi District is dominated by the north westerly component which enhances strong winds due to tight pressure gradient thus increasing fire risks. During winter season (MJJ) the south westerly component associated with its cold dry air is more pronounced, resulting in significant decrease in temperatures leading to wilting of crops and drying up of vegetation.

The bushfire season generally occurs from May to December for the majority of the District. Prevailing weather conditions associated with the bush fire season are usually easterly to south-westerly winds of high velocities accompanied by high daytime temperatures and low relative humidity making it a high-risk area for bushfires. The Sub-Herbage Preservation Act (1975) stipulates that landowners must construct and maintain 20m wide perimeter firebreaks around their properties before each fire season.

1.3.4 Natural Resources

a) Vegetation

Kgalagadi District has a basic vegetation of savannah with the south-western region being arid shrub savanna and the south-eastern being predominantly broad variations in vegetation, supporting several savanna types, namely grass, shrub and tree savanna. This habitat diversity provides vast land resources which present opportunities for both communal and commercial livestock production, game ranching and wildlife conservation with its associated tourism activities. The grasses are generally insufficient to sustain grazing, thus have an extensive impact on the carrying capacity of the veldt. The Acacia tree is predominant in the whole District.

The *Prosopis* (*Sexanana*), an exotic tree originally from South America, was introduced to the District in the 1980s in an effort to curb the encroachment of sand dunes, especially in the southern regions. Although sexanana served its purpose exceptionally well, it also is known to be invasive to indigenous vegetation and easily spreads out forming flammable dense bushes which act as fuel for bushfires.

b) Wildlife

The District supports large populations of wildlife species in the Kgalagadi Trans Frontier Park (KTP) (Figure 4), numbering several hundreds of thousands. KTP is a trans- border conservation area between Botswana and South Africa and it is an important ecosystem in the district (Kgalagadi District Profile 2016). The frequent fire outbreaks coupled with low rainfall associated with droughts affect the amount of forage available for wildlife, contributing to wildlife migrations across borders and to a large extent contributes to human-wildlife conflicts.

fatalities where five firefighters lost their lives in Zutshwa village- Kgalagadi North. These fires resulted in 3,500,000 ha (Figure 5) of area burnt. Most of these fire event was solely due to human activities (e.g. burning of debris and use during hunting) and a smaller percentage could be attributed to natural causes such lightning. The trend depicts that the area burnt has been decreasing since the year 2011 due to accelerated public awareness and education campaigns coupled with variations in climatic conditions.

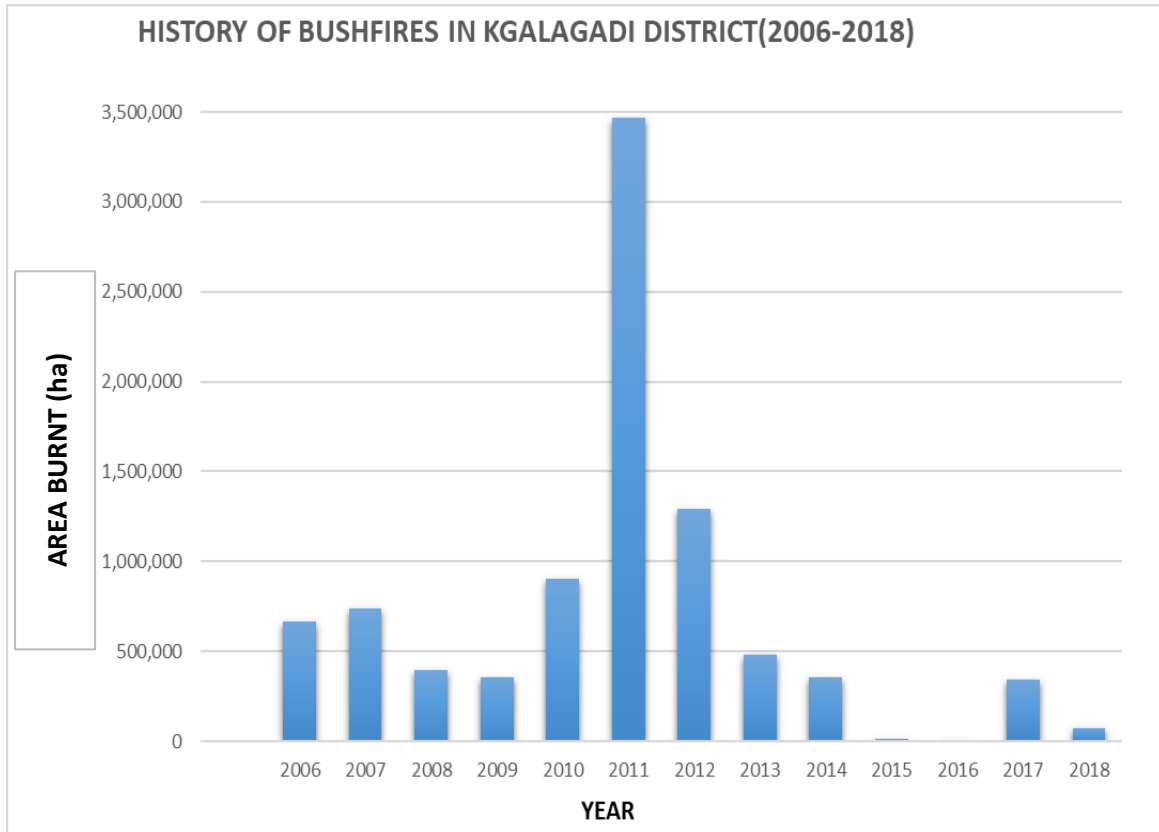


Figure 5: Kgalagadi District Fire incidents

CHAPTER TWO: LEGISLATIVE, POLICY, PLANS AND STRATEGIC FRAMEWORKS

The following frameworks are some of the most relevant legislative material to management fire in Botswana:

- National Disaster Risk Management Plan of 2009;
- Herbage Preservation Act of 1977;
- Forest Act of 1968; and
- Forest Policy of 2011.
- National Policy on Disaster Management of 1996;

2.1. Herbage Preservation Act of 1977

The Herbage Preservation Act is a legislative tool which was designed to control and/or manage the use of fire in open areas. The Act provides for:

- prohibition of burning vegetation;
- advocates for construction and maintenance of firebreaks;
- provision of notice of intention to burn;
- duty to Extinguish Fires; and
- protection of life, person and property by counter-firing (back burning).

2.2 Forest Act of 1968

The Forest Act deals with bushfires occurring in forest reserves. Section 30 of the Forest Act provides for responsibilities of individuals or persons appointed by law with regards to extinguishing bushfires in forest reserves. There is also provision for penalties for any contraventions of the Act.

2.3 Agricultural Resources Conservation Act (1973)

The Act provides for the conservation and improvement of agricultural resources such as animals, birds, plants, soils, vegetation and veldt products. The Kgalagadi District hosts these resources, hence the Act is relevant and applicable to any developments regarding the conservation of these resources.

2.4 Forest Policy of 2011

Forest Policy is a framework that provides for guidance and facilitation in the management of forest and range resources of the country through conservation, development and sustainable use. The Forest Policy provides for an integrated bushfire management approach that will enhance the fire management capacity, promote biodiversity and ecosystem integrity, enhance human health and safety, as well as promote social, cultural and economic benefits.

2.5 National Policy on Disaster Management of 1996

Bushfire is one of the identified potential disasters which may occur in Botswana. The National Policy on Disaster Management provides for a comprehensive disaster management programme based on a series of

activities aimed at reducing the impact of future disasters as well as reducing vulnerability. The policy also ensures that effective disaster preparedness measures are put in place in order to cope with disasters when they occur. It further provides for activation and effective emergency response and recovery plan.

2.6. National Disaster Risk Management Plan of 2009

The National Disaster Risk Management Plan is the central disaster risk management plan for Botswana. It provides a framework for sector Disaster Management Plans to be prepared by all Ministries and Organizations as well as contingency plans for hazard specific preparedness plans, to be prepared at National, District and Village level.

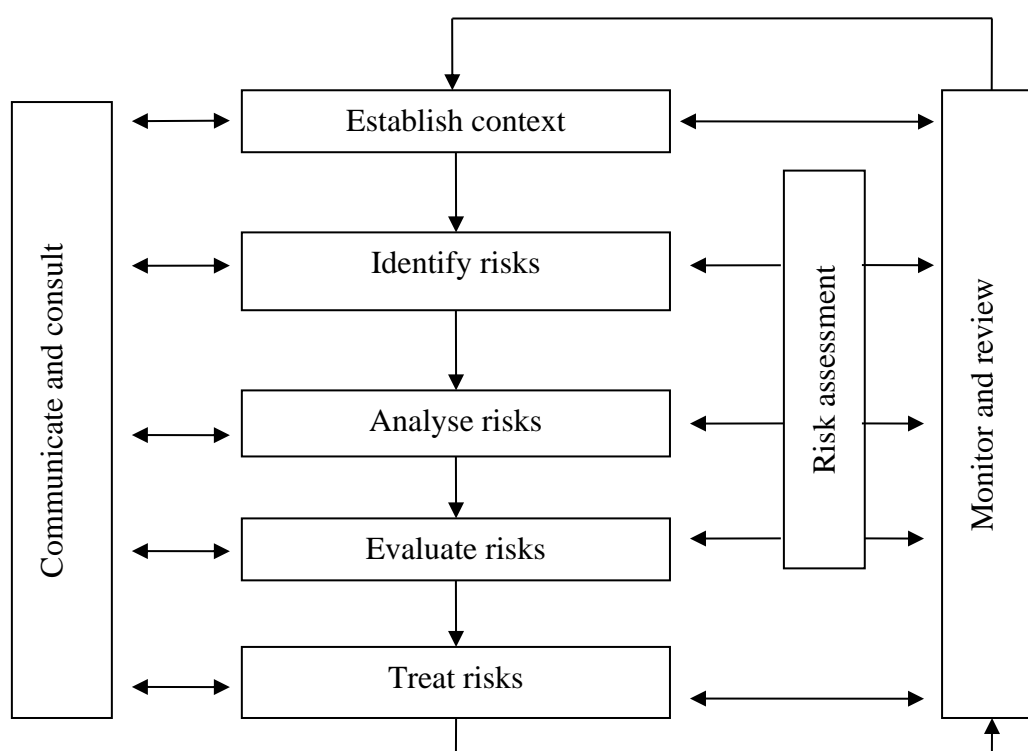
CHAPTER THREE: THE RISK MANAGEMENT PROCESS

The plan contains a number of strategies that are directed at addressing the risk to community and environmental assets. This is generally achieved by addressing those factors which comprise the risk i.e. the bushfire hazard (principally the fuel), the sources and pattern of ignitions and the vulnerability of the assets at risk. Identification of the level of bushfire risk within the Kgalagadi District area involved analysis of the following key components:

- the bushfire issues within the District;
- potential bushfire hazard;
- human settlement areas;
- economic assets;
- environmental assets; and
- cultural assets.

3.1 The Risk Management Process

The risk management process used in this plan is aligned with the international standard for risk management as outline in Figure 6 below.



(Source: Barwon Darling BRMP 2014)

Figure 6 Overview of the risk management process

3.2 Communication and Consultation

As indicated in Figure 6, communication and consultation are integral part of risk management process for the preparation of the BFRM Plan. The District Disaster

Management Committee (DDMC) consulted relevant stakeholders that included the following:

- local community leadership;
- land managers;
- business people (tourism industry); and
- ranch associations.

3.3. Asset Identification and Risk Assessment

3.3.1 Assets Identification

Kgalagadi District Disaster Management Committee members and the community used focused group discussions model to identify assets within the Kgalagadi that were believed to be at risk of bushfire. The assets were categorised into the four types:

a) Human Settlements

The human settlements (villages and towns) have the lowest fire risk as compared to other asset types. This is because the areas around human settlements have low fuel loads hence the likelihood of bushfires affecting them is very low assessed in terms of threat to life and property.

b) Economic

- Agricultural e.g. ranches, grazing land
- Infrastructure e.g. large power lines, electricity sub stations, telecommunication towers and water pump stations. It is important to highlight that the infrastructure that is at high fire risk is the one outside the built-up areas like informal villages and settlements. Within built-up areas, there the chances of bushfires occurring is very low due to low fuel load.
- Tourism and recreational facilities e.g. tourist sites and facilities, lodges; the district attracts tourist locally and internationally due to availability of natural resources.
- Drinking water catchments e.g. natural pans, boreholes; these are located in the landscape and therefore tourists who camp around these areas might start the fires.

c) Environmental

Kgalagadi district supports large populations of fauna and flora. The fauna in the region is pivotal to the tourism sector. Threatened flora species e.g. *hoodia gordonii* and species of local importance e.g. *pharpagophytum procumbens* (devil's claw) are found in the district. The local community livelihood is dependent on the environmental resources found in the area. The following ecological regions exist in Kgalagadi District (Figure 7), with *Kalahari xeric savannah* as the most dominant species.

These eco-regions are vulnerable to different factors which include, amongst others, over-exploitation, invasive species as well as bushfires.

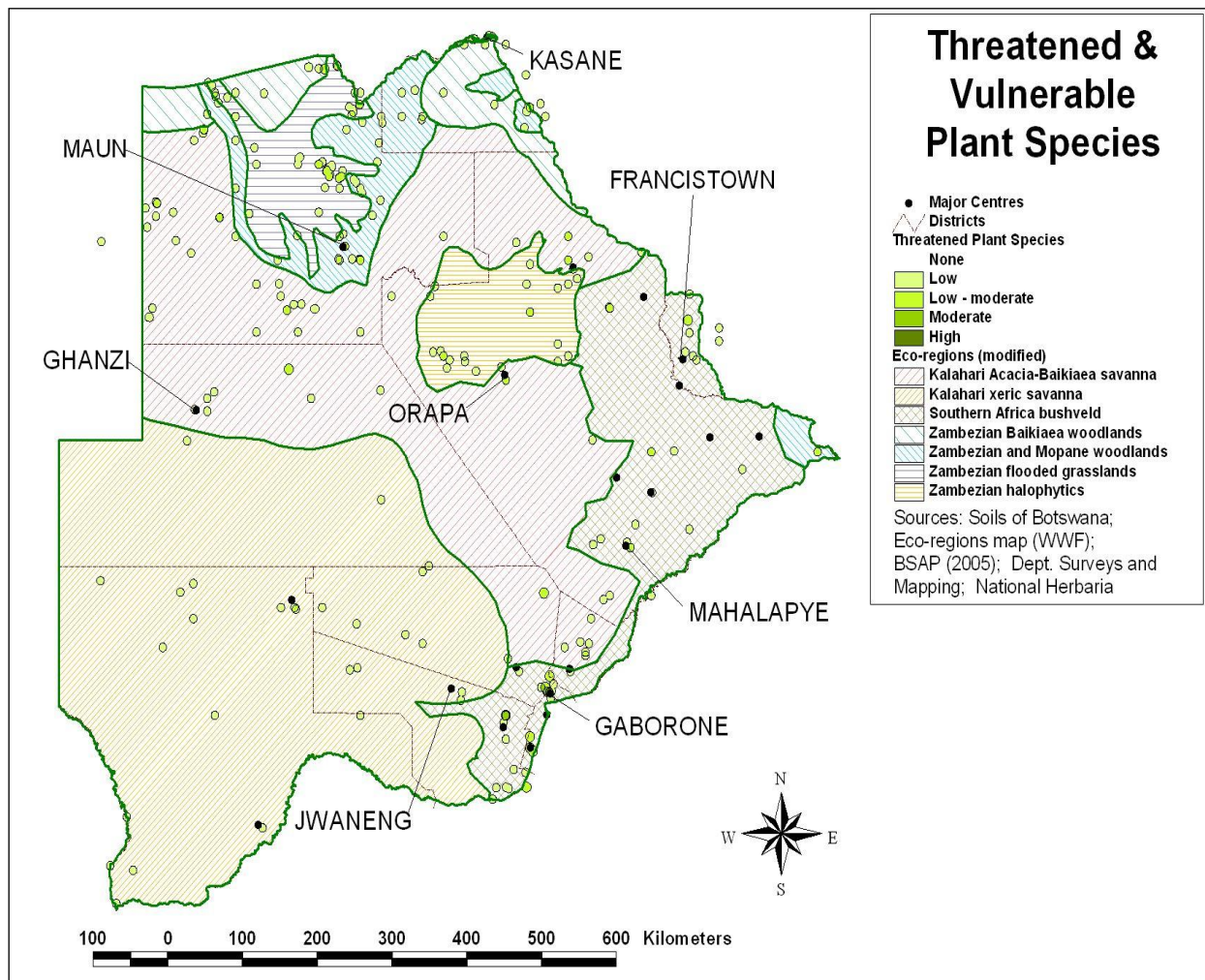


Figure 7: Map showing eco regions of Botswana

d) Cultural

- Indigenous significance- indigenous places and items of significance; the district has areas sited to be heritage sites.
- Non-indigenous heritage-places and items arising from the early occupation and other non-indigenous settlers and other assets of cultural value as shown in Figure 8 below.

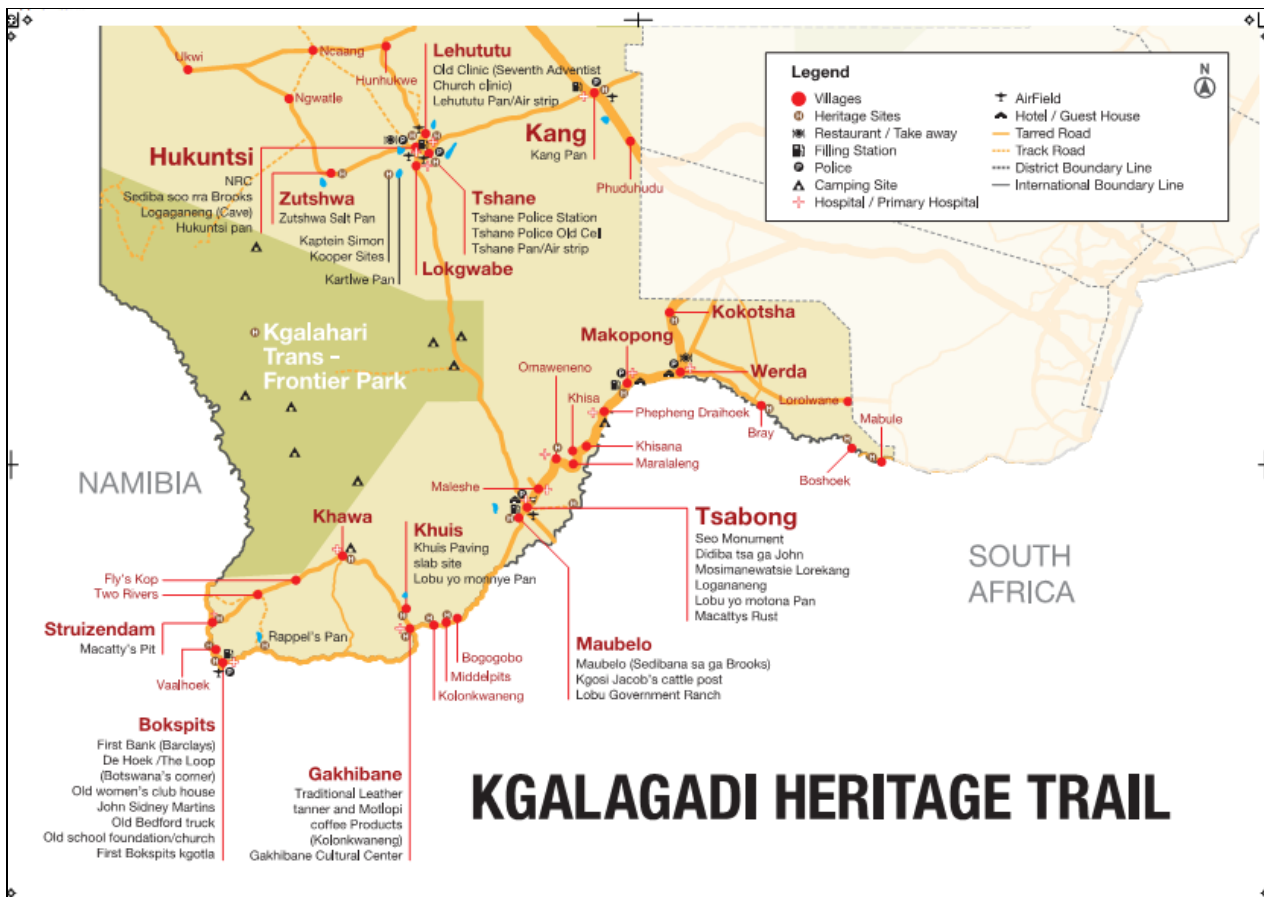


Figure 8: Heritage sites in Kgalagadi
 (Source: Department of Museum and National Monuments)

3.3.2 Assessment of Bushfire Risk

Following the identification of assets, the assessment of their risk to bushfire was undertaken. The different assets or groups of assets were subjected to different assessment processes used to determine the risk.

3.3.2.1 Consequence Assessment

Consequence is described as the outcome or impact of a bushfire event. The methodology used to determine the consequence rating was based on the following:

a) Human Safety Impact

A potential fire behaviour model using vegetation type, slope and separation distance was used to produce a threat rating for human settlement assets. The vulnerability of the asset to a bushfire was assessed and a rating assigned. These ratings were then used to assess the consequence of a bushfire impacting upon a human settlement asset.

Special Fire Protection (SFP) assets were considered inherently more vulnerable to bushfire due to mobility capacity, knowledge or other issues relating to their

inhabitants, (e.g. the elderly, children or tourists) and therefore stricter requirements for vulnerability assessment and rating were applied.

b) Business Capability

The level of business continuity impact, as well as the length of time taken for recovery (how long and complicated a normal business recovery will be) of the asset were identified. These ratings were used to assess the consequence of a bushfire impacting upon an economic asset.

c) Community Impact

The level of impact on the general Kgalagadi community, as well as the length of time taken to recover, that is, how long and complicated a normal operating community recovery will be from bushfire disaster. These ratings were used to assess the consequence of a bushfire impacting upon a community asset.

d) Environmental

Environmental assets with known minimum fire threshold were assessed to determine if they were at risk of a bush fire within the 5-year life of the BFRMP using fire history data and knowledge. The vulnerability of an environmental asset was determined by its conservation status and its geographic extent (distribution across the landscape). Vulnerability and potential impact of bushfire were used to assess the consequence of a bushfire impacting upon an environmental asset.

e) Financial Impact

The level of financial impact from a bushfire impacting on the Kgalagadi District. This includes Private and Government entities. These ratings were used to assess the consequence of a bushfire's effect financially on community, individual or commercial operations.

f) Reputational Impact

The level of damage to the reputation of the Kgalagadi from a bushfire impacting on it may be from loss of flora and fauna, loss of respect from the local, regional, and international communities, as well as the trust placed on agencies and keep them safe within the Kgalagadi. These ratings were used to assess the consequence of a bushfire's effect on the reputation of the Kgalagadi.

There are four possible consequence ratings: minor, moderate, major and catastrophic, described in Table 1.

Table 1 Consequence ratings

Description Descriptor	<i>Human life and health</i>	<i>Property, financial, environmental, cultural</i>
Minor	No fatalities. Small number of minor injuries. First aid treatment may be required. No people are displaced. Little or no personal support required (support not monetary or material)	Inconsequential or no damage Little or no disruption to community No measurable impact on environment or cultural asset. Biodiversity regimes of vegetation communities not exceeded. Little or no financial loss
Moderate	Medical treatment required but no fatalities. Some hospitalisation. Localised displacement of people who return within 24 hours. Personal support satisfied through local arrangements.	Localised damage that is rectified by routine arrangements. Normal community functioning with some inconvenience. Small impact on environment / cultural asset with no long term effects or small impact on environment with long term effect. Biodiversity regimes for vegetation communities exceeded only once. Significant financial loss (but not enough to constitute a major impact on the economic base of the area).
Major	Possible fatalities. Extensive injuries, significant hospitalisation. Large number displaced (more than 24 hours' duration). Extensive resources required for personal support.	Significant damage that requires external resources. Community only partially functioning, some services unavailable. Significant damage to the environment/cultural asset which requires major rehabilitation or recovery works. Biodiversity regimes for vegetation communities exceeded twice in the last two fire events. Localised (this may range from loss of a single population to loss of all of the species. BFMC area (for

		<p>a species which occupies a greater range than just the BFMC area) extinction of native species.</p> <p>Significant financial loss – some financial assistance required. (economic base of the community is significantly impacted for an extended period of time)</p>
Catastrophic	<p>Significant fatalities.</p> <p>Large number of severe injuries.</p> <p>Extended and large number requiring hospitalisation.</p> <p>General and widespread displacement for extended duration.</p>	<p>Extensive damage.</p> <p>Extensive personal support.</p> <p>Community unable to function without significant support.</p> <p>Permanent damage to the environment. Extinction of a native species (This category is most relevant to species that are restricted to the BRM plan area, or also occur in adjoining BRM plan areas and are likely to be impacted upon by the same fire event). In nature means wild specimens and does not include flora or fauna bred or kept in captivity.</p>

3.3.2.2 Likelihood Assessment

Likelihood is described as the chance of a bushfire igniting, spreading and reaching an asset.

For all asset types the likelihood of a bushfire occurring was assessed. This involved considering fire history including ignition cause and patterns, known fire paths and access containment potential and potential fire run (size of the vegetated area).

There are four possible likelihood ratings: almost certain, likely, possible, and unlikely, described in Table 2.

Table 2: Likelihood ratings

Rating	Description and indicative probability
Almost certain	Expected to occur, many recorded incidents, strong anecdotal evidence, high opportunity, reason or means to occur; may occur or be exceeded once in every 5 years.
Likely	Will probably occur; consistent record of incidents and good anecdotal evidence; considerable opportunity, reason or means to occur; may occur or be exceeded once in every 10 years.
Possible	Might occur; a few recorded incidents in each locality and some anecdotal evidence; some opportunity, reason or means to occur; may occur or be exceeded once in every 20 years.
Unlikely	Is not expected to occur; isolated recorded incidents in this country, anecdotal evidence in other communities; little opportunity, reason or means to occur; may occur or be exceeded once in every 30 or more years.

3.4 Identifying the level of risk

The level of bushfire risk was determined using the combination of consequence and likelihood. Table 3 shows the risk levels used in development of this plan while the level of risk was determined based on Risk Matrix. The Risk Matrix (Figure 9), is an effective tool to illustrate the importance of risk management strategies delineated on a scale of 1 to 5, it has two dimensions to depict how severe and likely a risk is. These two dimensions create a matrix, where the combination of probability and consequence will give any indication that as the likelihood and impact increases, a point is reached where a judgment was required as to whether the risk should be treated, tolerated, transferred or terminated (Hopkins,2014), the results of which is depicted on Table 4.

		CONSEQUENCE				
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	EXTREME
		1	2	3	4	5
LIKELIHOOD	HIGHLY LIKELY 5	Low	Medium	High	Critical	Critical
	LIKELY 4	Low	Medium	High	High	Critical
	POSSIBLE 3	Low	Low	Medium	High	Critical
	UNLIKELY 2	Low	Low	Low	Medium	High
	HIGHLY UNLIKELY 1	Low	Low	Low	Low	Medium

Figure 9: Risk Rating Matrix

Table 3. Asset risk identification

Likelihood \ Consequence	Consequence			
	Minor	Moderate	Major	Catastrophic
Almost certain	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	Extreme
Possible	Insignificant	Low	Medium	High
Unlikely	Insignificant	Insignificant	Low	Medium

Table 4 :Risk Assessment

PROBABILITY 5 ALMOST CERTAIN – expected to occur in most circumstances 4 LIKELY – will probably occur in most circumstances 3 POSSIBLE – might occur sometimes 2 UNLIKELY – could occur sometimes 1 RARE – may occur in exceptional circumstances		CONSEQUENCE 5 EXTREME – serious injuries, death, serious management/government intervention, sig financial loss 4 MAJOR - serious injuries, reporting to government, management intervention, media coverage, financial imp 3 MODERATE – injuries, moderate management intervention, breach of legislation, some financial impact 2 MINOR – Incident (injury) minor breach of legislation, small financial impact, limited impact on reputation 1 INSIGNIFICANT – no injuries, insignificant breach of legislation, no financial impact, no impact on reputation						
Asset Type	Detail of Risk	Causes	Worst consequences	Risk Owner (Agency)	Risk Prob	Risk Consq	Auto	Risk RTG
Human (volunteers, community members)	Serious injury or death	-Failure to identify hazards and risk -Wrong place at wrong time -Failure to follow instructions	-Serious injury or death -Disability -Trauma	-Individual agencies -Relevant departments	3	5		15
Human (firefighter)	Serious injury or death to firefighters	-Inadequate or inappropriate firefighting tools -Lack of proper access roads	-Loss of property, uncontrollable fires -Injuries or death -Getting lost Trauma	- Office of District Commissioner -KDC -DFRR -Relevant Dept	4	3		12
Human	Fire used as management tool	-Human activities, -Lack of knowledge and skills	-Serious injury or death, -Loss of life	-District Disaster Management Committee (DDMC) Social & Community Development (S&CD) Community leaders	2	5		10
Economic	Damage to tourism facilities	-Lack of proper property planning for facilities -High fuel load -Lack of implementation of management plans	-Significant financial loss -Loss of tourism attraction -Loss of employment	-Business owner -Individual ranch owners -Botswana Tourism Organisation (BTO)	3	5		15
Economic	Destruction to private ranches	-Lack of proper property planning for facilities	-Significant financial loss	-Ranch owner, DAP	2	4		8
Economic	Damage to Electric sub stations,	-Lack of proper property planning for facilities	-Significant financial loss	- Botswana Power Corporation (BPC)	2	4		8

	transmission lines, electric power lines	High fuel load -Lightning -Human activities -damage from trees	-Loss of business -Loss of property					
Economic	Destruction to Telecommunication transmitters, water reservoirs,	-High fuel load -Lightning -Human activities -damage from trees	-Significant financial loss -Loss of business -Loss of property	-BTC	2	4		8
Economic	Natural resources of high economic value (flora & fauna)	-Human activities and high fuel loads	-Loss of economic benefits from natural resources	-DFRR & DWNP	4	4		16
Economic	Annihilation of Airstrips	-Human activities and high fuel loads	-Financial loss	- Civil Aviation Authority of Botswana	2	2		4
Cultural	Extinction of Heritage sites (e.g. Gakhibane caves, Lokaleng Iwa Bakgothu, Bok's pits	Human activities, High fuel loadings	-Loss of cultural Heritage (tangible) -Loss of attachment	-Department of National Museum and Monuments (DNMM) -MYSC, Community Leadership	4	5		16
Cultural	Destruction of cultural areas (Old women's club house, Seo Pan, first Bokspits' kgotla	Human activities, High fuel loadings	-Loss of cultural Heritage (tangible) -Loss of value	DNMM, DFRR -Ministry of Youth Empowerment Sports and Cultural Development (MYSC) -Community leaders	4	5		20
Cultural	Annihilation of cultural sites of importance e.g. Khuis slates,	-Human activities -high fuel load -	-Loss of cultural Heritage (tangible) -Loss of history	-DNMM,MYSC, Community leaders DFRR,DEA,	4	5		20
Cultural	Extermination of Molopo River	-Human activities, -High fuel loadings	-Loss of cultural Heritage (tangible) -Loss of historic sites	-DNMM, DWS, Community leadership	2	3		12
Environmental	National Parks, Game Reserves, WMA	-High fuel loadings, human activities	-More frequent uncontrollable fires affecting flora and fauna negatively	-DWNP,	4	3		12

Environmental	Extermination of Natural resources (flora & fauna)	-High fuel loadings, human activities -Human activities	-Extinction of natural resources (fire intolerant species) -Climate Change - Possible extinction of species -Animal migration	-DFRR & DWNP, Community leadership	4	3		12
Environmental	Destruction of Concession areas	-High fuel loadings, human activities -Human activities -Poachers (in disguise)	-Financial loss, Extinction of natural resources (fire intolerant species) -Climate change -Disturbance to ecosystem	-DWNP -DFRR -Department of Tourism (DOT) -DEA	4	5		20

Key

Level of rating	Risk rating	Colour code
15 -25	Critical	Black
10 -14	High	Red
5 – 9	Medium	Gold
< 5	Low	Green

CHAPTER FOUR: RISK EVALUATION

4.1 Evaluating bushfire risk

Once the risk ratings for each asset were identified, they were evaluated to:

- confirm that risk levels identified in the risk analysis process are appropriate and reflect the relative seriousness of the bushfire risk;
- identify which assets require treatments; and
- Identify treatment priorities.

4.2 Treatment Priorities

No organisation has limitless resources to deal with adverse risk. It is therefore necessary to define priorities. The bushfire risk ratings determined were used to prioritise the risk treatments, i.e. areas of critical risk were considered first for treatment, then high, medium and low. Table 5 shows how consequence and likelihood combine to give a risk rating resulting in priority for treatment.

Table 5: Treatment priorities

Consequence Likelihood	<i>Minor</i>	<i>Moderate</i>	<i>Major</i>	<i>Catastrophic</i>
<i>Almost certain</i>	Medium	High	Extreme	Extreme
<i>Likely</i>	Low	Medium	High	Extreme
<i>Possible</i>	Insignificant	Low	Medium	High
<i>Unlikely</i>	Insignificant	Insignificant	Low	Medium

The treatment priority for each asset was assigned based on the asset risk rating calculated from the risk matrix as in Figure 9. The assigned treatment priorities were recorded in the asset risk register (Table 6). These consequences can be useful in identifying appropriate mitigation actions. In larger more complex projects, a separate column may be required.

Mitigation actions should include such things as:

- Preventative actions - planned actions to reduce the likelihood a risk will occur and/or reduce the impact should it occur. (What should you do now?)
- Contingency actions - planned actions to reduce the immediate seriousness of the risk when it does occur. (What should you do when?)
- Recovery actions - planned actions taken once a risk has occurred to allow you to move on. (What should you do after?)

4.3 Risk Acceptability

Risks below a certain level were assessed as not requiring treatment within the life of this plan. This is due to a combination of risk priority and capacity to undertake the works required. Within the Kgalagadi, the level of risk acceptability is the medium to low risk rating. These risks are likely to be managed by routine procedures and so do not require a specific application of resources

Table 6: Asset risk register

ASSET NAME	TENURE	ASSET TYPE	LIKELIHOOD	CONSEQUENCE	RISK RATING	PRIORITY
Tsabong Eco-Tourism Camel Park- Tented Accommodation	Communal	Economic	Highly likely	Catastrophic	Extreme	1
Tsabong Eco-Tourism Camel Park- camp site	Communal	Environment, cultural	Highly likely	Catastrophic	Extreme	1
Bartrek Game Ranches	Communal	Cultural	Highly likely	Catastrophic	Extreme	1
Polentswa Lodge	State land	Cultural	Highly likely	Catastrophic	Extreme	1
Rooiputs Lodge	State land	Cultural	Highly likely	Catastrophic	Extreme	1
Ta Shebube	State land	Cultural	Highly likely	Catastrophic	Extreme	1
Molopo Farms	Private/Communal	Economic	Highly likely	High	High	1
Free hold farms	Private	Economic	Highly likely	High	High	1
Lobu Government ranch	State land	Economic	Highly likely	High	High	1
Banyana farms	State land	Economic	Highly	High	Moderate	2
Molopo River	Communal	Environment	Highly likely	High	high	2
Lokgwabe VDC campsite	Communal	Environment	Highly likely	High	high	2
Gakhibane caves	Communal	Cultural	Unlikely	Moderate	Moderate	3
Khuis slates	Communal	Environment	Likely	High	Moderate	3
WMA KD/1	Communal	Environment	Likely	high	Moderate	3
Lokaleng Iwa Bakgothu	Communal	Cultural	Unlikely	Low	Low	4
Seo Pan	Communal	Cultural	Unlikely	Low	Low	4
WMA KD/2	Communal	Environment	Likely	high	Moderate	3
WMA KD/12	Communal	Environment	Likely	high	Moderate	3
WMA KD/15	Communal	Environment	Likely	high	Moderate	3
Concession areas	Communal	Environment	Likely	High	Moderate	3

CHAPTER FIVE: BUSHFIRE RISK TREATMENT

The purpose of treating risks is to reduce their likelihood and harmful consequences to the community and environment. This is achieved through a process of selecting and implementing risk treatment options that modify the characteristics of the hazard, the community or the environment.

There are a large number of possible risk treatment options. To implement all of them is not cost-effective or even possible. It is necessary to choose the most appropriate mix of risk treatment options. This chapter describes the bushfire risk treatment options considered by the Kgalagadi District Disaster Management Committee together with the risk treatment plan.

5.1. Asset specific treatment strategies

Asset specific treatments are applied in order to protect assets that have been identified and assessed in the BRM plan as being at risk. The types of asset specific treatments in each strategy group used in the Kgalagadi District are listed in Table 7 below while Appendix 2 depicts treatment/controls to minimise bush fire risks.

Table 7. Asset specific treatment strategies

Strategy	Targeted treatments
Fuel management	Treatment reduces the bushfire fuel through manual, chemical, prescribed burning methods and firebreak maintenance.
Ignition management	Detection of bushfire occurrence using MODIS satellite system, Patrols, signage on fire prone areas
Community engagement	Raising awareness, sensitize community through kgotla meetings and through media (radio, newspapers).
Property planning	Fire break maintenance, prescribed burning
Preparedness	Early warning system activated (all different sectors contribute to EWS, i.e. Dept. of Meteorological Services, DFRR)

5.2 Risk Treatment Plan

Risk treatment plans are action plans that identify how the chosen treatment option is to be implemented. The risk treatments for this plan (Table 8) have been agreed to by the communities' leadership and all stakeholders engaged in the development of this plan. The responsibility for implementation of the Bushfire Risk Management Plan rests with the owners or occupiers of the land (land managers) on which the bushfire risk is situated. This imposes the responsibility on both public and private land managers. See Appendix 3 for District Resources that can be accessed during bushfire outbreak.

Table 8 Risk Treatment Action Plan

Asset	Priority of Treatment/Control Actions	Action (What, Where, How, Timeframe)	Responsibility (Who)
Environmental	<ul style="list-style-type: none"> -Construction and maintenance of fire breaks in Kgalagadi North. -Law enforcement -Education and public awareness campaigns 	<ul style="list-style-type: none"> -Outsource maintenance of (970 km) fire breaks to constructors by end of September annually. -Conduct 60 km² prescribed burning by May/June annually in Inalegolo, Ncaang and Zutshwa covering 20 km² for each village. -Conduct and intensify monthly joint patrols on the hotspots. -Conduct two public awareness campaigns through kgotla meetings quarterly in each cluster. -Conduct two school campaigns through kgotla meetings by May annually in each cluster. 	<ul style="list-style-type: none"> -DFRR -DWNP -Law enforcement committee -Relevant Departments -Dikgosi -Community -Political leadership -Tsabong Fire Brigade
Human	<ul style="list-style-type: none"> -Tailor made regular fire management training/ capacity building (targeted specific groups e.g. herdboy (badisa), communities, tourists, harvesters) -Provision of proper PPE and navigation tools -First aid training 	<ul style="list-style-type: none"> -Conduct training of community-based firefighting teams annually targeting specific and marginalised groups. -Provision of appropriate PPE and tools by May 2020. -Produce asset distribution map by March 2020. -Intensify education and public awareness by 30 June annually and training of 15 people per cluster; 2 trainers per cluster by June 2021. - Conduct both pre and post counselling for every fire season. 	<ul style="list-style-type: none"> -DFRR -Fire Brigade -DHMT -DEA -Land board -S&CD -Kgalagadi District Council -ODC -DoT -BTO - Political leadership -Education
Economic (sub-stations, towers, power lines and	<ul style="list-style-type: none"> -Construction and maintenance of fire breaks around the property 	<ul style="list-style-type: none"> -Construct firebreaks around all the existing power stations and telecommunication towers and boreholes by March 2020. 	<ul style="list-style-type: none"> -BPC -BTCL -WUC -

transmitters as well as WUC-boreholes)	-Appoint technical personnel to man these stations -Education & public awareness on fire management	-By March 2020 skilled personnel to be deployed in manning all sub-stations, towers, power lines and transmitters as well as boreholes.	
Economic (WMA, ranches, protected areas, wildlife-boreholes)	-Construction and maintenance of fire breaks -Education and public awareness campaigns on fire management -Advise farmers to plant fire resistant tree species along the corridors of the ranches -Enforcement of management plans in ranches on adherence of fire management	-Construction and maintenance of firebreak in and around the protected areas, ranches & WMA areas by March 2021. -Conduct education and public awareness campaigns on fire management annually by June 2020. -Construction of internal roads/access roads inside the ranches and protected areas by March 2021. -Enforce implementation of management plans on ranches on an annual basis.	-DWNP -DFRR -Land board -DAP -Ranch owners -Political leadership -BTO -DoT -Kgalagadi District Council
Economic (Lodges & Campsites)	-Enforcement of management plans in lodges -Provide staff training on fire management to eliminate risk -Construction and maintenance of fire breaks	-Enforce management plans on the construction of fire breaks inside the lodges and camp site areas by March 2021. -Conduct training of staff on issues of fire management by June 2021.	-DFRR -DoT -BTO -Fire Brigade -Police -Lodge owners
Cultural (Simon Cooper monument in Lokgwabe, ridges)	-Public awareness -Construction and maintenance of fire breaks	-Construction of fire breaks around graveyards and Simon Cooper monument annually. - Conduct fire education and public awareness campaigns through kgotla meetings on fire management annually by June 2020.	-Dikgosi -VDC -DMNM -MYSC - Political leadership

CHAPTER SIX: IMPLEMENTATION

The implementation of the Bushfire Risk Management plan will be the responsibility of the District Disaster Management Committee led by the Office of the District Commissioner. The Department of Forestry and Range Resources as the leading agency will provide technical assistance and overall coordination of fire management activities. However, all landowners with properties susceptible or threatened by bushfires are expected to develop and implement fire management strategies. The landowners, government agencies, parastatals and other agencies are also required to implement the Annual Operations Plan (Table 9) and report to the DDMC on progress made on fire management activities for their respective agencies.

Table 9: Annual Operations Plan

ASSETS TYPE	DETAIL OF RISK	MITIGATION STRATEGY	RESPONSIBLE ORGANISATION	PERIOD												
				J	F	M	A	M	J	J	A	S	O	N	D	
Human	Firefighters (Volunteers/Government employees/NGO's)	Firefighting training, adequate PPE, Communication equipment	DFRR & Tsabong fire brigade -ODC -Kgalagadi Council													
Human	Community	Public education & extend bushfire education to schools	DFRR, Tsabong Fire brigade & Ministry of Basic Education -Department of Information services -Department of Broadcasting													
		Fire investigation and law enforcement	DFRR, Fire Brigade & Police													

Economic	Tourism facilities	Property fire protection strategies	BTO & DoT																
Economic	Private ranches	Develop & implement Fire Management Plan	-DFRR & Ranch Associations -DAP -MoA -Landboard																
		Establish Community Fire units	DFRR & Ranch Associations																
Economic	Electric sub stations, transmission lines	Property fire protection strategies	BPC																
Economic	Telecommunication transmitters	Property fire protection strategies	BTC																
Economic	Natural resources of (flora & fauna)	Research on impact of bushfires on flora & fauna	DWNP & DFRR																
Economic	Airstrips	Property fire protection strategies	CAAB																
Economic	Cordon fences	Property fire protection strategies	Department of Veterinary Services																

ASSETS TYPE	DETAIL OF RISK	MITIGATION STRATEGY	RESPONSIBLE ORGANISATION	PERIOD															
				J	F	M	A	M	J	J	A	S	O	N	D				
Cultural	Heritage sites (Gakhibane caves, Lokaleng Iwa Bakgothu, Bok's pits, Seo Pan, Khuis slates, Molop River)	Prescribed burning, Fire break construction & maintenance	DNMM, Dikgosi,MYSC,KDC																
		Develop fire management strategies for the sites	DNMM, Dikgosi,MYSC,KDC, Political leadership																
Cultural	Natural and Cultural Properties	Property fire protection strategies	DNMM, MYSC Dikgosi, VDCs, Political leadership																
Environmental	National Parks, Game Reserves, WMA	Develop fire management strategies for protected areas	DWNP & DFRR																
		Fire break maintenance & construction	DWNP & DFRR																
		Prescribed burning	DWNP & DFRR																
		Implement Community Based Fire Management Programme	DWNP & DFRR																
Environmental	Natural resources (flora & fauna)	Research on impact of bushfires on flora & fauna	DoT, DWNP & DFRR																
		Fire break maintenance & construction	DWNP & DFRR																
		Prescribed burning	DWNP & DFRR																

		Implement Community Based Fire Management Programme	DWNP & DFRR	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Environmental	Concession areas	Develop fire management strategy	BTO, DFRR, Concession owners & CBO's			■	■	■	■	■	■									
		Fire break maintenance & construction	DWNP & DFRR				■	■	■											
		Prescribed burning	DWNP & DFRR,DAP					■	■											
		Implement Community Based Fire Management Programme	DWNP & DFRR					■	■											
All Asset types	All	Fire detection & surveillance	DFRR	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

CHAPTER SEVEN: MONITORING AND REVIEWING

An essential component of the bushfire risk management planning process is the monitoring and periodic review of the plan.

7.1 Monitoring

Monitoring provides routine surveillance of actual performance for comparison with expected or required performance. Review involves periodic investigation of the current situation and reviewing ratings as per the requirement lessons learnt from the monitoring. New assets will be included in the Asset register as they are identified.

7.2 Reporting

The district will submit an annual report to KDDMC summarising the progress on the implementation of the BRM plan.

7.3 Review

A review of this plan will be undertaken every 5 years from the date of endorsement. However, there are circumstances that may result in an earlier review of this BRM plan and these include:

- changes to context and bushfire risks;
- changes to organisational responsibility or legislation; and
- following a major fire event.

CHAPTER EIGHT: RESEARCH

The regular and intense bushfires impact on biodiversity remains unknown in the district, therefore research is needed for fire prone areas so that proper measures can be applied. Research and learning institutions will therefore play a major role in future decision making and management of the biodiversity. To monitor the effect of fire management on vegetation, monitoring sites (in a range of habitats) will be established throughout the District. Each site will be marked and surveyed annually towards the end of the wet season in April. Photographs and vegetation community structure parameters will be collected.

Appendices

1. District resources summary
2. Treatment/controls to minimise risks
3. Maps of burnt area scars
4. Firebreak/Trails map

APPENDIX 1 – District Resources Summary Sheet

NB: To be accessed during bushfire operations

Agency	Roles	Resources	Contact Person	Contact numbers
Office of the District Commissioner - Tsabong - Hukuntsi	<ul style="list-style-type: none"> - Coordination of departments - Resource mobilisation - Coordination of development of bushfire risk management strategies 	<ul style="list-style-type: none"> - Manpower - Transport - Tents (temporary accommodation for victims) 	District Commissioner Deputy District commissioner- Hukuntsi	6540292 6510236
Department of Forestry and Range Resources	<ul style="list-style-type: none"> - Provision of training - Maintenance of firebreaks - Lead agency in fire suppression - Fire investigation 	<ul style="list-style-type: none"> - Manpower - Transport - Personal Protective Equipment - Firefighting Equipment - Food - Water 	Head of District Tsabong Hukuntsi Kang	6540028 (Tel) 6540027 (Fax) 6540896 6510245/6511108 6518000
Kgalagadi District Council Hukuntsi sub-district Tsabong Sub-District	<ul style="list-style-type: none"> - Psycho- social support - Information dissemination - Provision of disaster relief amenities - Information dissemination - Community mobilization 	<ul style="list-style-type: none"> - Manpower - Transport - Equipment - Fuel 	Council Secretary Senior Assistant Council Secretary- Tsabong Senior Assistant Council Secretary- Hukuntsi	6540061 6510286/249

Tsabong Fire Brigade Department	<ul style="list-style-type: none"> - Information dissemination on fire management issues - Domestic and institutional fire suppression - Fire investigation - Provision of emergency rescue operations - Training 	<ul style="list-style-type: none"> - Manpower - Equipment - Water - First aid kits 	Chief Fire Officer	6540867
Botswana Police Services	<ul style="list-style-type: none"> - Protection of life and property - Enforcement of law and order - Fire investigation 	<ul style="list-style-type: none"> - Manpower - Tents - Transport - Water 	Officer Commanding No, 9 District Tsabong Kang Tshane Werda Bokspits Middlepits	6540222 6517034 6510019 6543003 71315830
-Tribal Administration -Dikgosi	<ul style="list-style-type: none"> - Mobilisation of community - Public Awareness - Enforce law and order 	<ul style="list-style-type: none"> - Manpower - Transport - Accommodation 	Tribal Secretary Tsabong Hukuntsi	6540304 6540411 6510280/278/279
Political leaders	<ul style="list-style-type: none"> - Mobilisation of community - Public Awareness - 	<ul style="list-style-type: none"> - Manpower - Transport 	Kgalagadi Council Chairman	6540061
Department of Wildlife and National Parks	<ul style="list-style-type: none"> - Construction and maintenance of firebreaks around Wildlife Management Areas - Maintenance of access roads - Public awareness 	<ul style="list-style-type: none"> - Human resource - Transport - Water - Camping grounds (ablution facilities) - Marquee, bakkie 	District Wildlife Officer KTP Manager Hukuntsi Kang Kaagate Mabuasehube	6540280 6530075 6530075/76 6510268/6510082 6517036 6530079/080 6530081/082

	<ul style="list-style-type: none"> - Hazard reduction in Wildlife Management Areas - Information dissemination to tourists (provision of pamphlets) - Law enforcement 			
Department of Meteorological Services	<ul style="list-style-type: none"> - Weather forecasts used in determining fuel load anticipated for future fire seasons. - Provide air temperature forecasts - Information on lightning occurrences. 	<ul style="list-style-type: none"> - Manpower - Transport - Weather data 	Station Manager Tshane Werda	6540108 6530023 6543012
District Health Management Team	<ul style="list-style-type: none"> - Medical examinations - Emergency medical assistance 	<ul style="list-style-type: none"> - Manpower - First aid kits 	Tsabong Hukuntsi	6540235 6510030
Botswana Defence Force	<ul style="list-style-type: none"> - Provision of training - Provision of emergency rescue and medical services - Fire suppression activities 	<ul style="list-style-type: none"> - Manpower - Equipment - Transport - Fuel - First aid kits - Food - Water 	Base Commander Tsabong	6511356
Department of Information Services and Broadcasting	<ul style="list-style-type: none"> - Information dissemination - Facilitate construction and maintenance of firebreaks around towers 	<ul style="list-style-type: none"> - Publicity through print, radio and television 	Hukuntsi	6510269/262
Central Transport Organisation	<ul style="list-style-type: none"> - Provision transportation and technical assistance 	<ul style="list-style-type: none"> - Provide mechanics support 	CTO Manager Kang	6540262 6517107

		<ul style="list-style-type: none"> - Transport - Manpower - Fuel 	Hukuntsi	6510282
Kgalagadi Land Board -Tsabong sub-land board -Hukuntsi sub-landboard	<ul style="list-style-type: none"> - Mapping - Land use demarcation - Land allocation - Information dissemination on land use policies - Enforcement of firebreak maintenance in leased farms - Collaboration with other stakeholders during planning 	<ul style="list-style-type: none"> - Manpower - Transport - Equipment e.g. GPS 	Kgalagadi Land Board Secretary Sub- Land board Secretary: Tsabong Hukuntsi	6540213/6540429 6540884 6510113/6540293 /6510321
Ministry of Agriculture Development and Food Security	<ul style="list-style-type: none"> - Information dissemination to farmers - Construction and maintenance of firebreaks around government farms and ranches 	<ul style="list-style-type: none"> - Manpower - Transport - Firefighting equipment 	District Agricultural Coordinator DAO-Hukuntsi Veterinary	6540300 651026/242 6510260
Kgalagadi Farmers Associations	<ul style="list-style-type: none"> - Provide awareness to farmers and other workers. - Construction of firebreaks around farms 	<ul style="list-style-type: none"> - Manpower - Transport - Equipment - Communication - Food - Water - Accommodation 	Contacts from farmers associations	71305918 72464719 72792517/732360 80 75885852
Ministry of Basic Education	<ul style="list-style-type: none"> - Information dissemination to pupils - Provision of extension outreach through VET structures - Infusion of fire issues on syllabus 	<ul style="list-style-type: none"> - Manpower - Transport 	Tsabong Hukuntsi	6540210 6510234

Department of Roads	<ul style="list-style-type: none"> - Bush clearing and grass cutting along road reserves 	<ul style="list-style-type: none"> - Manpower - Transport - Machinery 	Tsabong Hukuntsi	6540874 6510984
Botswana Power Corporation	<ul style="list-style-type: none"> - Information dissemination - Construction of firebreaks around power sub-stations and power lines - Provision of support through corporate social responsibility 	<ul style="list-style-type: none"> - Training - Food - Firefighting equipment - Personal Protective Equipment 	Tsabong Kang	6540006 6527299
Water Utilities Corporation	<ul style="list-style-type: none"> - Information dissemination - Construction of firebreaks around treatment plants - Provision of support through corporate social responsibility 	<ul style="list-style-type: none"> - Training - Food - Firefighting equipment - Personal Protective Equipment - Water 	Tsabong Hukuntsi	6540216 6510309
Botswana Telecommunication Corporation	<ul style="list-style-type: none"> - Information dissemination - Construction of firebreaks around towers and cables - Provision of support through corporate social responsibility 	<ul style="list-style-type: none"> - Training - Food - Equipment - Personal Protective Equipment - Communication coverage 	Tsabong	6540299
Tertiary institutions	<ul style="list-style-type: none"> - Information dissemination to students - Provision of fire management courses - Infusion of fire issues on syllabus 	<ul style="list-style-type: none"> - Manpower - Transport 	Deputy Principal- Kgalagadi South Brigade	6540891 6517248

	- Collaboration on research		Botswana Open University-BOCODOL -Kang	
Department of Information Services	- Information dissemination	- Communication coverage	Tsabong	6540323
Tourism operators	- Construction and maintenance of firebreaks around their premises - Information dissemination - Support through corporate social responsibility	- Manpower - Food - Water - Transport - Accommodation - Training	Phofu Camp Kalahari Rest lodge Polentswa lodge Rooiputs Lodge Ta Shebube Tsabong Eco-Tourism Camel Park Bartrek Phirima	74412898 72176949 3161696 3161696 3161696 6530004 6530095
Local communities	- Participation in fire management activities - Information dissemination	- Manpower - Food - Accommodation - Training - Transport	Dikgosi/VDCs Tsabong Kokotsha Verda Makopong Middlepits Khawa Gakhibane Vaalhoek Bokspits Stuizendam Ukhwi Ncaang Inalegolo Zutshwa Hukuntsi Hunhukwe	6540411 6545503 6543008 6544014 6511140 6511143 6511142 6511153 6511152 6511151 6511150 6511891 6511144 6511145 6510279 6511149

			Lokgwabe	6510316
			Tshane	6511147
			Lehututu	6511148

APPENDIX 2: Treatment/controls to minimise risks

PROBABILITY 5 ALMOST CERTAIN – expected to occur in most circumstances 4 LIKELY – will probably occur in most circumstances 3 POSSIBLE – might occur sometimes 2 UNLIKELY – could occur sometimes 1 RARE – may occur in exceptional circumstances		CONSEQUENCE 5 EXTREME – serious injuries, death, serious management/government intervention, sig financial loss 4 MAJOR - serious injuries, reporting to government, management intervention, media coverage, financial imp 3 MODERATE – injuries, moderate management intervention, breach of legislation, some financial impact 2 MINOR – Incident (injury) minor breach of legislation, small financial impact, limited impact on reputation 1 INSIGNIFICANT – no injuries, insignificant breach of legislation, no financial impact, no impact on reputation						Treatment/Controls to eliminate/minimise risks	Task owner	
Asset Type	Detail of Risk	Causes	Worst consequences	Risk Owner (Agency)	Risk Prob	Risk Consq	Auto			Risk RTG
Human (volunteers, community members)	Serious injury or death to Firefighters	-Failure to identify hazards and risk -Wrong place at wrong time -Failure to follow instructions	-Serious injury or death -Disability -Trauma	-Individual agencies -Relevant departments	3	5		15	-Annual firefighting training, adequate PPE, Communications, -Provision of navigation equipment, Medical check-ups for fire fighters -Counselling for trauma -Tailor made training to specific groups (e.g. harvesters, herd boys)	-Department of Forestry and Range Resources (DFRR) -Department of Meteorological Services (DMS) -Social workers
Human (firefighter)	Serious injury or death to Firefighters caused by wild animals hazards	- Inadequate or inappropriate firefighting tools -Lack of access roads	-Loss of property, uncontrollable fires -Injuries or death -Disabilities	- Office of District Commissioner ODC -DFRR -Relevant Departments	4	3		12	-Provision of PPE -First aider and equipment -Renewable or maintenance of access roads -Provision of early warning systems	ODC

Human	Fire used as management tool	-Human activities, - Lack of knowledge and skills	-Serious injury or death, -Loss of life	-District Disaster Management Committee (DDMC) Social & Community Development (S&CD) Community leaders	2	5		10	-Education and awareness campaigns, law enforcement, review of the existing legislation, fire investigation	DFRR
Economic	Damage to tourism facilities	-Lack of proper property planning for facilities -High fuel load -Lack of implementation of management plans	-Significant financial loss -Loss of tourism attraction -Loss of employment	-Business owner -Individual ranch owners -Botswana Tourism Organisation (BTO)	3	5		15	-Prescribed burning (Hazard reduction) -Education on fire management -construction of fire breaks -implement bushfire management strategy for the park -proper planning -improve reaction/response time -Intensify law enforcement on the fire management and conduct spot checks -Conduct annual evacuation drills for staff	HATAB
Economic	Destruction to Private ranches	-Lack of proper property planning for facilities	-Significant financial loss	-Ranch owner	2	4		8	-Fire management planning (Property) -Intensify law enforcement on the fire management and conduct spot checks	Ranch Associations

									-Conduct annual evacuation drills for staff	
Economic	Damage to electric substations, transmission lines	-Lack of proper property planning for facilities High fuel load -Lightning -Human activities -damage from trees	-Significant financial loss -Loss of business -Loss of property	- Botswana Power Corporation (BPCO)	2	4		8	- Fire break construction and maintenance, Prescribed burning (Hazard reduction)	BPC
Economic	Destruction to telecommunication transmitters, water reservoirs,	-High fuel load -Lightning -Human activities -damage from trees	-Significant financial loss -Loss of business -Loss of property	-BTC	2	4		8	- Fire break construction and maintenance, Prescribed burning (Hazard reduction)	BTC
Economic	Destruction of natural resources of high economic value (flora & fauna)	-Human activities and high fuel loads	-Loss of economic benefits from natural resources	-DFRR & DWNP	4	4		16	-Community education, fire break maintenance, prescribed burning	DFRR & DWNP
Economic	Annihilation of airstrips	-Human activities and high fuel loads	-Financial loss	- Civil Aviation Authority of Botswana	2	2		4	- Fire break construction and maintenance, Prescribed burning (Hazard reduction)	Civil Aviation Authority of Botswana
Cultural	Extinction of heritage sites (Gakhibane caves, Lokaleng Iwa)	Human activities, High fuel loadings	-Loss of cultural Heritage (tangible) -Loss of attachment	- Department of National Museum and	4	5		16	-Fire break construction and maintenance, Prescribed burning (Hazard reduction)	DNMM

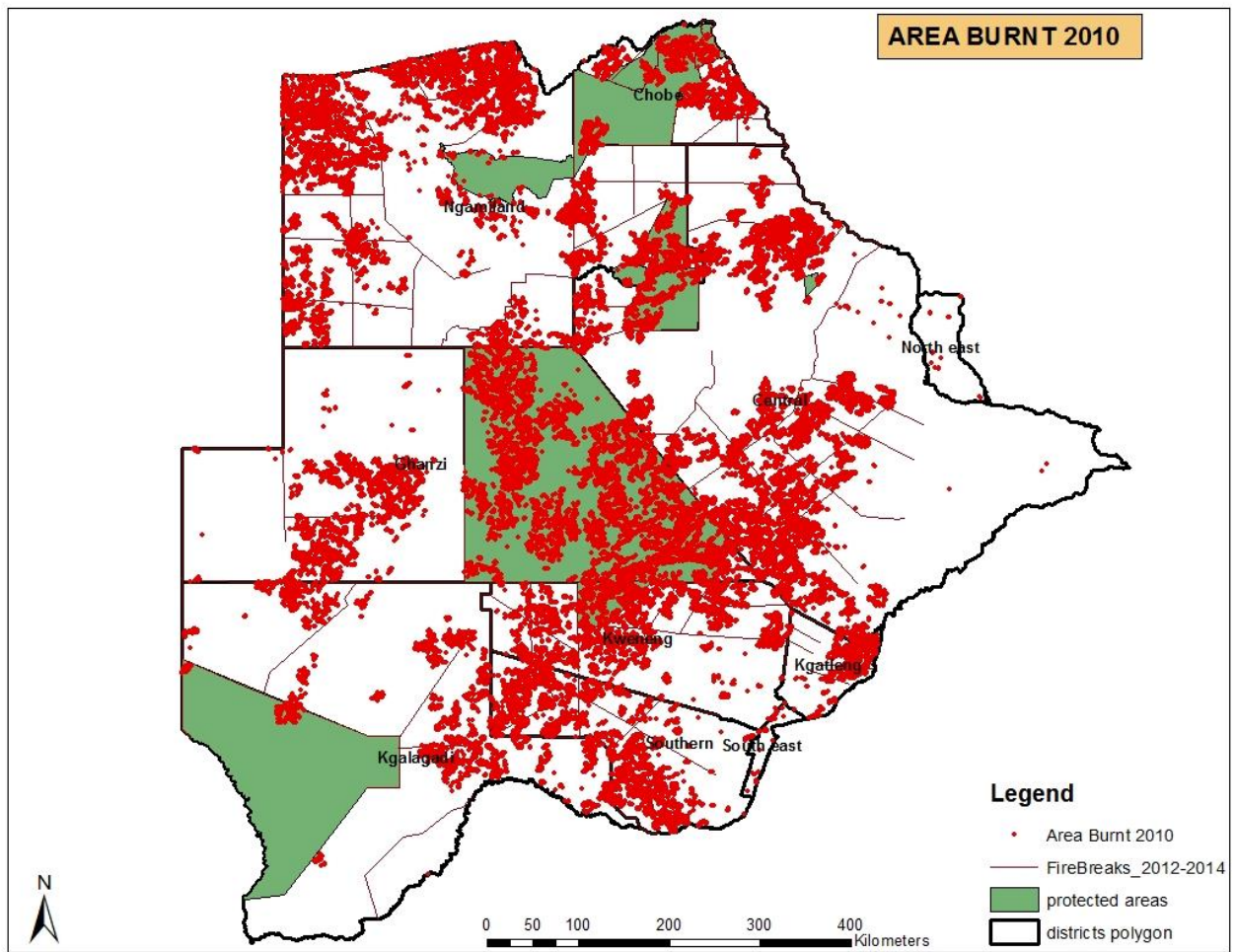
	Bakgothu, Bok's pits, Seo Pan,			Monuments (DNMM) -DFRR						
		Human activities, High fuel loadings	-Loss of cultural Heritage (tangible) -Loss of value	DNMM, DFRR -Ministry of Youth Empowerment Sports and Cultural Development(MYSC) -Community leaders	4	5		20	-Fire break construction and maintenance, Prescribed burning (Hazard reduction) -Public education -Construction of fire lines around the sites	DNMM
Cultural	Annihilation of cultural sites of importance e.g. Khuis slates,	-Human activities	-Loss of cultural Heritage (tangible) -Loss of history	- DNMM,DFRR	4	5		20	-Public education, implementation of CBNRM policy	DNMM,DFRR
Cultural	Extermination of Molopo River	-Human activities, - High fuel loadings	-Loss of cultural Heritage (tangible)	-DNMM	2	3		12	-Property protection planning, hazard reduction	DNMM
Environmental	Annihilation of National Parks, Game Reserves and WMA	-High fuel loadings, human activities	-More frequent uncontrollable fires affecting flora and fauna negatively -Climate change	-DWNP	4	3		12	-Implementation of community based fire management programme, Fire break construction and maintenance, Prescribed burning (Hazard reduction)	DWNP

Environmental	Extreme loss of natural resources (flora & fauna)	-High fuel loadings, human activities -Human activities	-Extinction of natural resources (fire intolerant species) -Climate Change - Possible extinction of species -Animal migration	-DFRR & DWNP	4	3		12	-Implementation of community based fire management programme, Fire break construction and maintenance, Prescribed burning (Hazard reduction) -Education & public awareness -Enforce legislation -intensify anti-poaching patrols -management of fuel load	DWNP DFRR DEA
Environmental	Destruction of concession areas	-High fuel loadings, human activities -Human activities -Poachers (in disguise)	-Financial loss, Extinction of natural resources (fire intolerant species) -Climate change -Disturbance to ecosystem	-DWNP -DFRR - Department of Tourism (DOT) -DEA	4	5		20	-Implementation of community based fire management programme, Fire break construction and maintenance, Prescribed burning (Hazard reduction)	DWNP, Community trusts

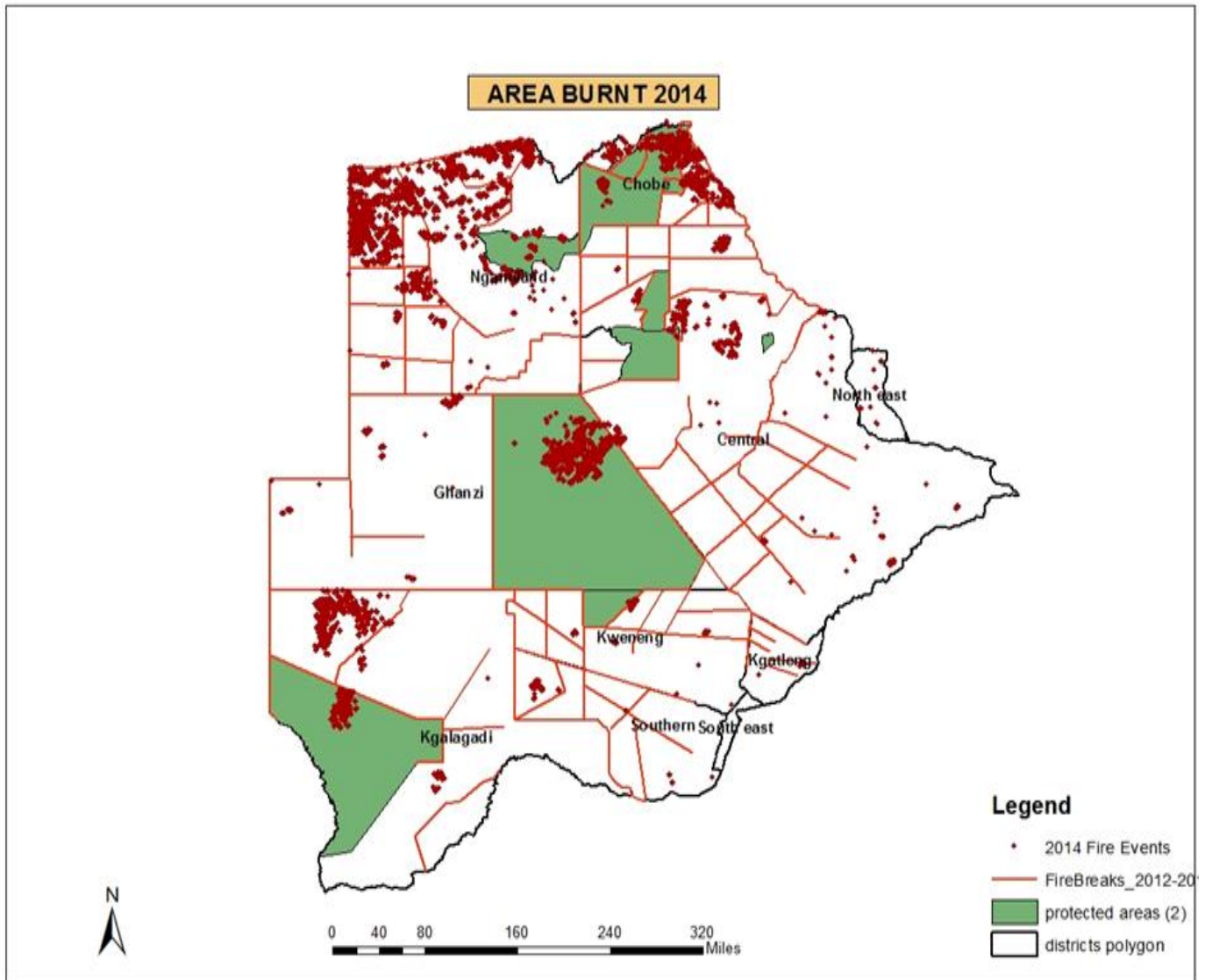
Key

Level of rating	Risk rating	Colour code
15 -25	Critical	Black
10 -14	High	Red
5 – 9	Medium	Gold
< 5	Low	Green

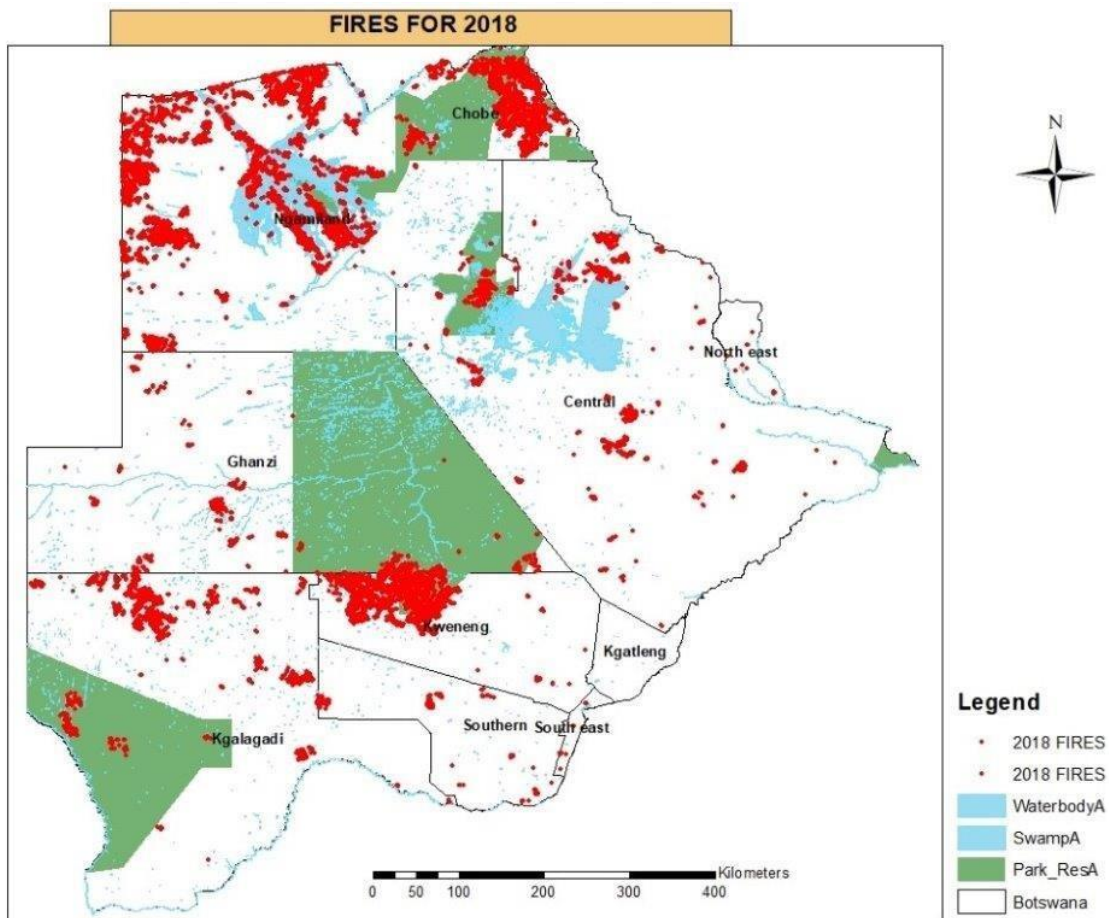
APPENDIX 3 BURNT SCAR (2010)



APPENDIX 4 – BURNT SCAR (2014)



Appendix 5 Burnt scar 2018



Appendix 6: Officers Involved in the Bushfire Plan Write Up

Name	Surname	Gender	Organisation	Contact Number	Email
Gloria	Komanyane	F	DFRR- Tsabong Sub-District	72399748	gmaikano@gov.bw
Motshidisi G.	Moshoeshoe	M	DFRR-Tsabong Sub-District	6540028	mmoshoes@gmail.com
Itumeleng	Motswidinyane	M	DFRR-Hukuntsi Sub-District	6518000	imotswidinyane@gov.bw
Belmond K.	Leitshamo	M	Farmer-Hukuntsi	75885852	
Mandy K.	Ntereke	F	Physical Planning-Tsabong Council	71670202	mntereke@yahoo.com
Masego	Serema	M	DFRR-Tsabong Sub-District	72287752	mserema1977@gmail.com
Lydia	Khutshwe	F	Landboard-Tsabong Sub-District	74006756	llkhutshwe@gmail.com
Leo	Tumaeletse	M	Farmers Association		tx14bizzbrokers@gmail.com
Juliah	Nyambe	F	ODC-Tsabong Sub-District	71694014	Joules81@gmail.com
Kooagile J.	Mathibidi	M	DFRR Hukuntsi-Hukuntsi Sub District	6510245	jjmathibidi@gov.bw
Beauty	Modise	F	Tribal Admin-Hukuntsi Sub District	6510278	
Belmond	Leitshamo	M	Hukuntsi Farmers Chairperson	75885852	
Itumeleng J	Motswidinyane	M	DFRR Kang-Hukuntsi Sub District	6518000	imotswidinyane@gov.bw
Copper L.	Sakhu	M	DFRR-Hukuntsi Sub District	6510245	csakhu@gov.bw
Motlalepula V.	Malgas	F	Inalegolo VDC	74510058	
K.E.	Hambira	F	Police- Tshane	6511767	

Keemenao	Ragontse	M	DWNP-Hukuntsi Sub District	6510083/2	
G.	Mautle	M	Kgosi- Gathaga ward, Hukuntsi		

REFERENCES

Barwon Darling BRMP (2014),
https://www.rfs.nsw.gov.au/Barwon_Darling_BFRMP.pdf (Accessed 20/05/2020).

Hopkin, P., (2014). Fundamentals of Risk Management, 3rd Ed. Understanding, Evaluating and Implementing Effective Risk Management, Kogan Page, London

Kgalagadi District Development Plan (2017), Ministry of Local Government and Rural Development. Republic of Botswana.

Kgalagadi District Profile (2016), Ministry of Finance and Economic Development. Gaborone, Botswana.

Ministry of Agriculture (2013)

Prudence Maruatona (2014), Assessment of the onset, cessation and duration of rainfall over Botswana, Department of Meteorological Services (*Unpublished*)

STOP SPREAD OF BUSHFIRES: CONSERVE BIODIVERSITY



For more information, contact:

**Office of District Commissioner
Kgalagadi District
Tel: 6540292
Fax: 6540215**