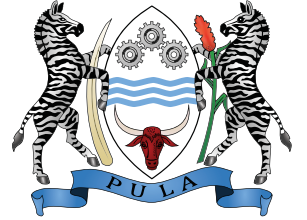




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# TSODILO ENCLAVE BUSH FIRE RISK MANAGEMENT STRATEGY

2017 – 2021



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Republic of Botswana

**Ngamiland Sustainable Land  
Management Project**

**January 2017**

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The preparation of the Tsodilo Enclave Bush Fire Risk Management Strategy was a collective effort involving many stakeholders over a two-year period. The first and the most critical stakeholder is the people of Tsodilo Enclave, which includes the villages of Nxamasere, Gani, Nxaunxau, Chukumuchu, Tsodilo, Etsha 1, Etsha 13, Sepopa and Ikoga. They have endured many training workshops on fire management, devoting time away from their daily chores to ensure that they have a fire management strategy.

The Technical Reference Group (TRG) for the Ngamiland SLM Project, which comprises of officers from different Government Departments, Academic Institutions as well as Civil Society Organizations, provided much guidance during the process of producing the strategy document. Several TRG meetings were held with the sole purpose of reviewing the strategy document.

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## ACRONYMS

APZ	Asset Protection Zone
BFMC	Bush Fire Management Control
CBD	Convention on Biological Diversity
CBFiM	Community-Based Fire Management
CHA	Controlled Hunting Area
DFRR	Department of Forestry and Range Resources
NDRMP	National Disaster Risk Management Plan
DNMM	Department of National Monuments and Museums
FEZ	Fire Exclusion Zone
GEF	Global Environment Facility
KRS	Khama Rhino Sanctuary
LMZ	Land Management Zone
MESA	Monitoring of the Environment for Security in Africa
MZCDT	Mababe Zokotsama Community Development Trust
NSLMP	Ngamiland Sustainable Land Management Project
SADC	Southern Africa Development Community
SFAZ	Strategic Fire Advantage Zone
SFP	Special Fire Protection
TCDT	Tsodilo Community Development Trust
THWHS	Tsodilo Hills World Heritage Site
TEBFRMS	Tsodilo Enclave Bush Fire Risk Management Strategy
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation

# 1.0 INTRODUCTION

This Tsodilo Enclave Bush Fire Risk Management Strategy (TEBFRMS) was developed by the Ngamiland Sustainable Land Management (NSLM) Project in partnership with the Department of Forestry and Range Resources (DFRR), Department of National Museum and Monuments (DNMM) as well as Tsodilo Community Development Trust (TCDT). It is essentially an action plan based on analysis of the nature of bush fires plaguing Tsodilo Hills and environs as proffered by representatives of various Tsodilo village institutions during a Ngamiland SLM project supported workshop held at TOCADI conference facility in Shakawe from the 22nd – 24th September 2015.

The Ngamiland District Disaster Management Committee's Bush Fire Risk Management Plan of 2015 identifies Tsodilo Hills Heritage Site as highly susceptible to bush fires with catastrophic consequences to existing cultural and environmental assets. As a result, the Tsodilo enclave's risk rating is designated 'extreme' and accorded mitigation priority level 1 (the highest rating possible). Bush fire risk analysis as depicted from fire history in the area shows that the Tsodilo enclave experiences at least 3 major bush fires on average every dry season making the location one of Ngamiland's bush fire hotspots.

The bush fire risk management strategy is therefore developed to mitigate against the negative impacts of bush fire in the Tsodilo core management area and surrounding areas. The strategy entails planning, development and implementation strategies for Tsodilo and neighboring areas. This strategy is also aligned to the North West District Bush Fire Risk Management Plan's objectives. The District BFRMP identifies strategic partners in the form of land owners who are expected to develop and implement fire management strategies for their own properties.

Although, Mababe village was the first village within Ngamiland to develop a community based wildland fire management strategy with support from the Global Environment Fund (GEF)'s Small Grants Program, the strategy has not been adequately implemented. As such, no lessons learned have as yet been documented and shared. For this reason, the strategy currently being developed is also best viewed as a pilot whose Ngamiland SLM project supported implementation is expected to generate lessons learned for sharing with like affected proximate communities.

## 1.1. Objectives

The main objectives of the strategy are to;

- Coordinate and integrate fire management planning and implementation in the Tsodilo core management area and neighbouring areas
- To build capacity of the local communities to effectively manage bush fires occurring in their area
- Reduce the negative impact of bush fires on human, economic, cultural and environmental assets



## 1.2. Description of the area

The Tsodilo Hills are a UNESCO World Heritage Site (WHS), consisting of rock art, rock shelters, depressions, and caves. It gained its WHS listing in 2001 because of its unique religious and spiritual significance to local peoples, as well as its unique record of human settlement over many millennia. UNESCO estimates that there are over 4500 rock paintings at the site. The site consists of a chain of hills known as the Child Hill, the Female Hill, and the Male Hill. These hills are of great cultural and spiritual significance to the communities who reside in the proximity of them.

### 1.2.1. Location and land use

Tsodilo World Heritage Site is situated in the North West District, towards the north western corner of Botswana. The site is approximately 400 kilometers north west of Maun and 50 kilometers west of the Okavango river pan handle. Tsodilo World Heritage Site is situated within the confines of a Wildlife Management Area (WMA) known as NG 6.

The predominant land use is Wildlife Management Area (NG 1, 2, 6 & 7). There are also pockets of communal areas (settlements, pastoral and arable agricultural areas).

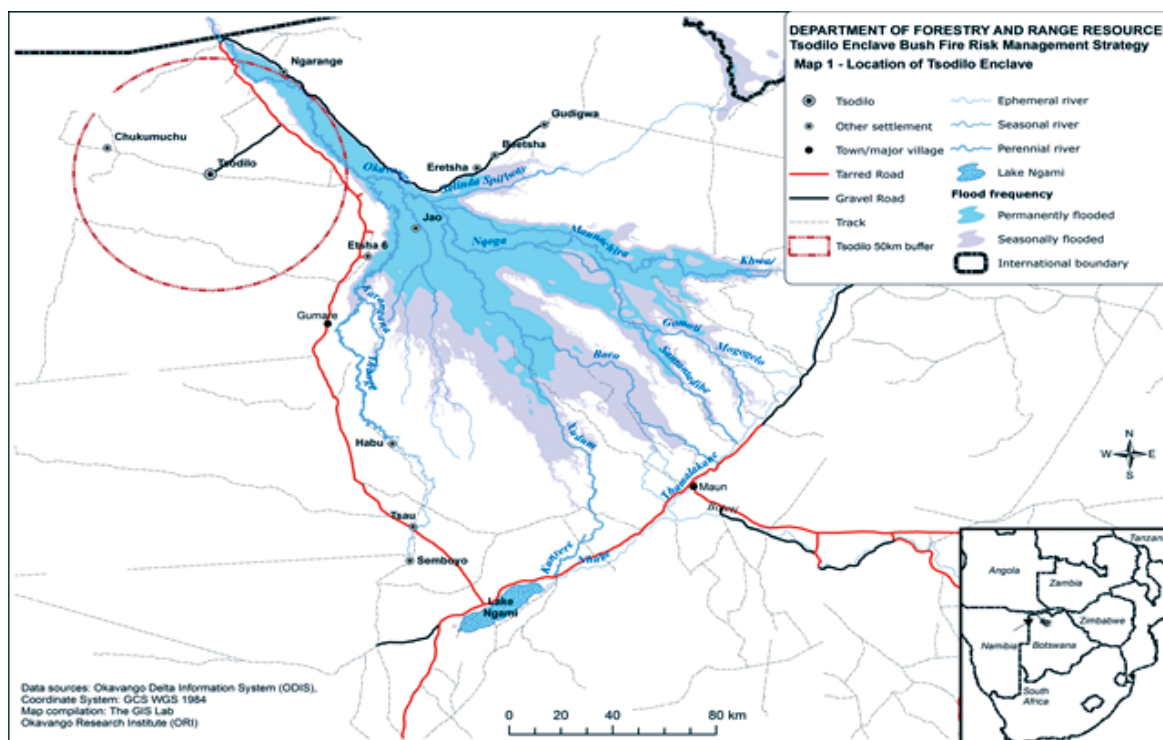


Figure 1: Location of Tsodilo Hills World Heritage Site

### 1.2.2. Population and demographic information

Tsodilo enclave falls within the Ngamiland West constituency in North West District which has a total population of 61, 748 people, according to the Botswana 2011 population census. Etsha 6 village has the highest number of people as compared to other village and settlements in the area with a population of 5,237 people. The least populated areas in the enclave are settlements such as Tsodilo and Chukumuchu. Table 1 shows the population distribution within the Tsodilo enclave.

*Table 1: Population distribution of Tsodilo enclave*

<b>Village</b>	<b>Total population</b>
Nxamasere	1584
Gani	727
Nxaunxau	672
Chukumuchu	250
Tsodilo	227
Etsha 1	1279
Etsha 6	5237
Etsha 13	2694
Sepopa	2824
Ikoga	1270
<b>TOTAL</b>	<b>16764</b>

### 1.2.3. Vegetation

The Tsodilo area is surrounded by stabilized sand dunes that have a tree cover on the upper slopes and dune tops, whilst grassland occurs in the dips between dunes. The base of Tsodilo hills themselves are characterized by *Burkea Africana*, *Acacia nigrescens* and also notably tall and thin baobabs and large cork woods (especially *commiphora cerulea*). The hill slope areas and the hill tops have shrubby trees including figs, *Combretum* and *Codylocarpon*.

Most of the plants found in Tsodilo are endemic to the larger region of Ngamiland with the exception of Mukusi, *Bauhinia pertesiana*, Mokwa, *Pterocarpus angolensis*. Most of the trees more especially the acacias and baobabs shed their leaves during winter and new ones start to grow when spring begins. Large *Acacias* are found mainly on the foot of the inselbergs on the fossil lake bed but scarce on the sand dunes. The Baobabs are relatively widespread on and around the inselbergs but Tsodilo Baobabs tend to differ from Baobabs that occur in other parts of the country in that the former does not have thick trunks and stout morphology of typical Baobabs but are tall and slender. Other trees include figs, which grow on rock crevices with roots hanging down the cliff faces.

### 1.2.4. Climate and bush fire season

Climatic conditions play a fundamental role in the potential for fires to occur and the intensity with which fire will burn during different times of the year and different times of the day.

The area receives rainfall averaging between 250 – 500mm per annum. Rainfall is one of the primary factors influencing plant growth and the production and accumulation of plant fuels that influence and sustain the occurrence of fires in the area

The highest temperatures are experienced during summer with maximum and minimum temperature averaging above 35°C and 15°C, respectively. The minimum temperatures often fall below 10°C during winter months especially months of June and July. The winter months are characterized by warm days with maximum temperatures averaging 28°C and minimum temperature averaging 6°C.

The hottest period in the area is generally from September to April and the coolest period from May to August. From a fire behaviour perspective the maximum temperatures of >30°C during August to October indicate that this is the period with the highest fire danger during the year because this is when generally grass fuel is at its driest and under these conditions high air temperatures promote high fire intensities. The lowest minimum temperatures occur between May and September generally at night and under these conditions the fire danger will be low resulting in less intense fires. However, any air temperature below 16°C will result in a relatively cool fire and a low fire danger.

Wind direction in the area is predominantly easterly. The area experiences about 44% of the easterly winds while 17% is experienced from other directions during the year. Data from Tinley (1975) showed that besides the winds blowing predominantly from the east, strong winds in excess of 20 km/h do occur for 35% of the time which will, and can have a very significant effect on the potential for fires in the area particularly during the dry late winter period i.e. August to October.

The bush fire season normally starts in May and ends in November. The fire season coincides with the dry months of the winter season. This is the period when the vegetation starts to get dry but the first winter months have low occurrences of bush fires, when bush fires occur they are normally small in size. The frequency of bush fire occurrence starts to increase in August as temperatures start to rise. The peak fire season in the District normally happens in August and September or September and October. The frequency of fire occurrences decreases during the start of the rainy season in November.

## 2.0 LEGISLATIVE, POLICY, PLANS AND STRATEGIC FRAMEWORKS

The following frameworks have an impact on fire management in Botswana:

### 2.1. Policies

#### *2.1.1. Forest Policy of 2010*

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. Bush fire management is one of the topics covered in the Forest Policy. Management of Bush fires will ultimately have a bearing on the achievement of the main objective of the policy, which is, conserved and sustained use of forest and range resources.

The Forest Policy provides for an integrated Bush fire management approach that will enhance the fire management capacity, promote biodiversity and ecosystem integrity, and enhance human health and safety, as well as promoting social, cultural and economic benefits. The Policy aims at;

- a) Developing and strengthening bush fire management institutions for effective coordination of fire management activities.
- b) Promoting the development of fire management plans.
- c) Develop capacity of interagency, local communities and land owners through knowledge transfer and skills development.

#### *2.1.2. National Policy on Disaster Management of 1996*

Bush fire is one of the identified potential disasters which may occur in Botswana. The National Policy on Disaster Management provides for 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.

### 2.2. Plans and strategic frameworks

#### *2.2.1. National Disaster Risk Management Plan*

The National Disaster Risk Management Plan is the central disaster risk management for Botswana. It provides for 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.

### ***2.2.2. Tsodilo World Heritage Cultural Landscape Core Area Management Plan***

The Tsodilo Core Area Management Plan serves as a guiding tool for the management framework of protecting and promoting the sustainable development of the outstanding value of Tsodilo World Heritage Site. The management plan has taken cognisance of the fact that the core management and buffer zone areas are prone to bush fires and highlighted that there is a need for a stakeholder driven fire management strategy for both the core and buffer zone areas of the site.

## **2.3. Legislation**

### ***2.3.1. Monuments and relics act of 2001***

The Tsodilo World Heritage Site and National Monument falls under the management of the National Museum in terms of the Monuments and Relics act of 2001. The Act provides for the preservation and protection of ancient monuments, ancient relics and other objects of aesthetic, archaeological, historical or scientific value, or interest and other matters connected therewith.

### ***2.3.2. Herbage preservation act of 1978***

The Herbage Preservation Act of 1978 provides for prevention and control of bush fires. The Act makes provision for establishment of Herbage Preservation Committees and members of these Committees are appointed by the Minister. The duties and functions of these committees in relation to the control and prevention of bush fires are provided in the Act. The following provisions are cited in the Act;

- Prohibition of Burning Vegetation
- Notice of Intention to Burn
- Firebreak construction and maintenance
- Duty to Extinguish Fires
- Protection of Life, Person and Property by Counter - firing (Back burning)

### ***2.3.3. The Wildlife conservation and National Parks Act***

The Act provides for Botswana Wildlife resources and seeks to prevent species from becoming extinct. The Act sets out how wild animals can be used in all areas of Botswana. For the purpose of wildlife management, the country has been divided into 163 Controlled Hunting Areas (CHA's) and the management of each CHA will vary given whether it is a commercially (private) operated area or a community area, a multipurpose hunting area (hunting and photography) or only a photography area (non-consumptive uses) or inside or outside Wildlife Management Area (WMA) and on state land or Tribal land. Tsodilo falls within NG 6, a Controlled Hunting Area within a Wildlife Management Area.

### *2.3.4. International treaties and conventions*

Botswana is a signatory to a number of international conventions and some of the ratified conventions have a bearing on the management of Tsodilo World Heritage Site. The UNESCO 1972 Convention concerning the protection of the World Cultural and Natural Heritage was ratified in 1988. Tsodilo was inscribed in 2001 as a World Heritage Site and is protected under this convention. The Convention aims at “the identification, protection, conservation and transmission to future generations of cultural and natural heritage of outstanding value”. Tsodilo Hills because of its exceptional qualities, the rock art and intangible heritage, is considered to be of Outstanding Universal Value and as such worthy of special protection against the dangers which increasingly threaten it. The following Conventions are also relevant to the protection of Tsodilo hills; the Convention on Biological Diversity (CBD) and Convention on Wetlands of International Importance (Ramsar Convention).

## 3.0 HISTORY OF BUSH FIRES

Tsodilo enclave which comprises of settlement such as Tsodilo, Chukumuchu, Nxamasere, and Gani experience on average three major fire outbreaks per season. Tsodilo and surrounding areas have the highest frequency of bush fire outbreaks after the Okavango Delta in North West District. The peak of the bush fire season normally occurs during September and October months. The highest number of fire incidents experienced in the area was in the 2006 fire season with eleven (11) fire outbreaks. Figure 1 Shows frequency of bush fire occurrences in Tsodilo area from 2010 to 2016.

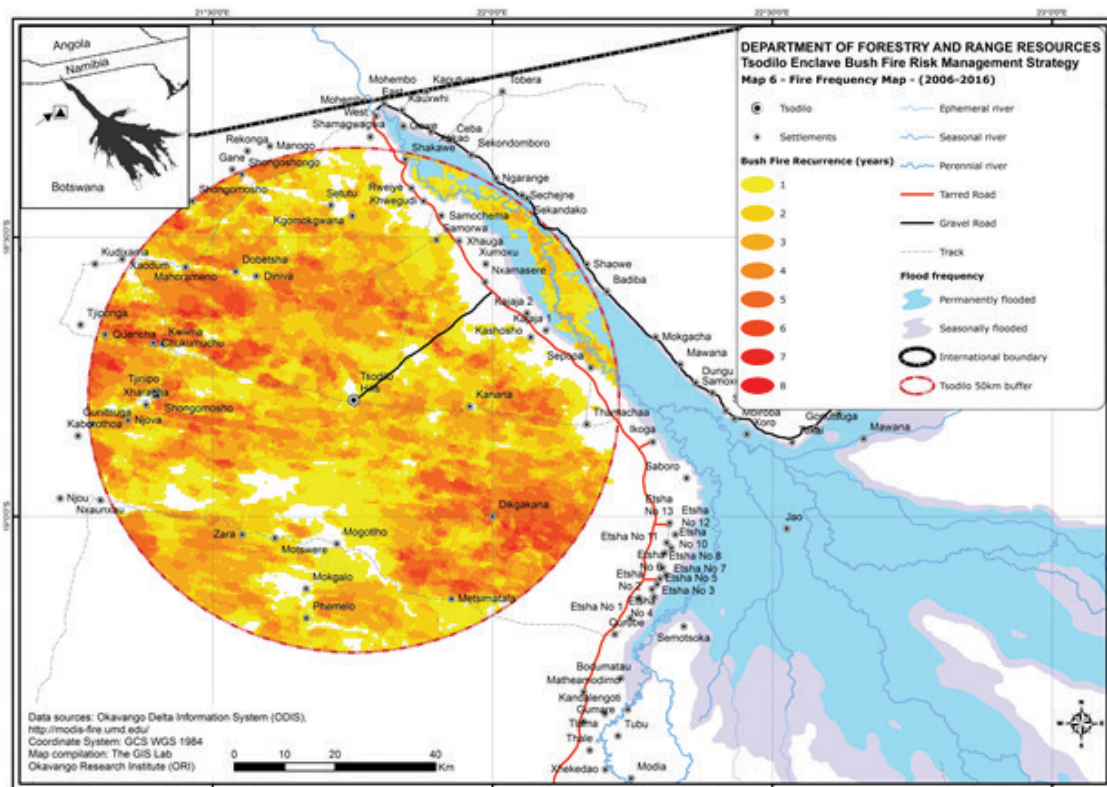


Figure 2: The number of bush fires which occurred between 2006 and 2016 in Tsodilo

### 3.1. Causes of bush fires in Tsodilo enclave

#### a) Escaped fires

The human activities such as clearing of crop fields in preparation for the upcoming crop farming season are responsible for some bush fires within the Tsodilo enclave. The crop farmers normally use fire to burn residues which resulted from clearing crop fields. The farmers most of the times do not adhere to safety measures like ensuring that the area around heaps of residues are cleared. The safety measures that farmers do not adhere to include burning under favorable weather conditions, fires left unattended, and also not making sure that the fire has been put out after burning exercise.

## b) Lightning Strikes

Lightning is one of the natural causes of bush fires in the area more especially during the rainy season which is accompanied by thunder storms. A few fire incidences which occurred in the past more especially around Tsodilo were as a result of lightning. However most of the fires are caused by human activities.

## c) Cross border fires

Some of the bush fires which threaten Tsodilo World Heritage Site originate from the neighbouring country of Namibia. However, it must be noted that the cross border fires do not only originate from Namibia but some originate from Botswana and cross into Namibia.

## 3.2. Identifying and assessing bush fire risk

This section outlines the bush fire issues in the Tsodilo enclave area, and broadly identifies the bush fire season, weather and other climatic influences, bush fire history, ignition causes and potential bush fire hazards which influence the bush fire problem in the area.

The plan contains a number of strategies that are directed at addressing the risk to community and environmental assets. This is generally achieved through addressing those factors which comprise the risk being the bush fire hazard (principally the fuel), the sources and pattern of ignitions and the vulnerability of the assets at risk.

Identification of the level of bush fire risk within the Tsodilo enclave area involved analysis of the following key components:

- The bush fire issues within the Tsodilo enclave
- Potential bush fire hazard
- Human settlement areas
- Economic assets
- Environmental assets
- Cultural assets

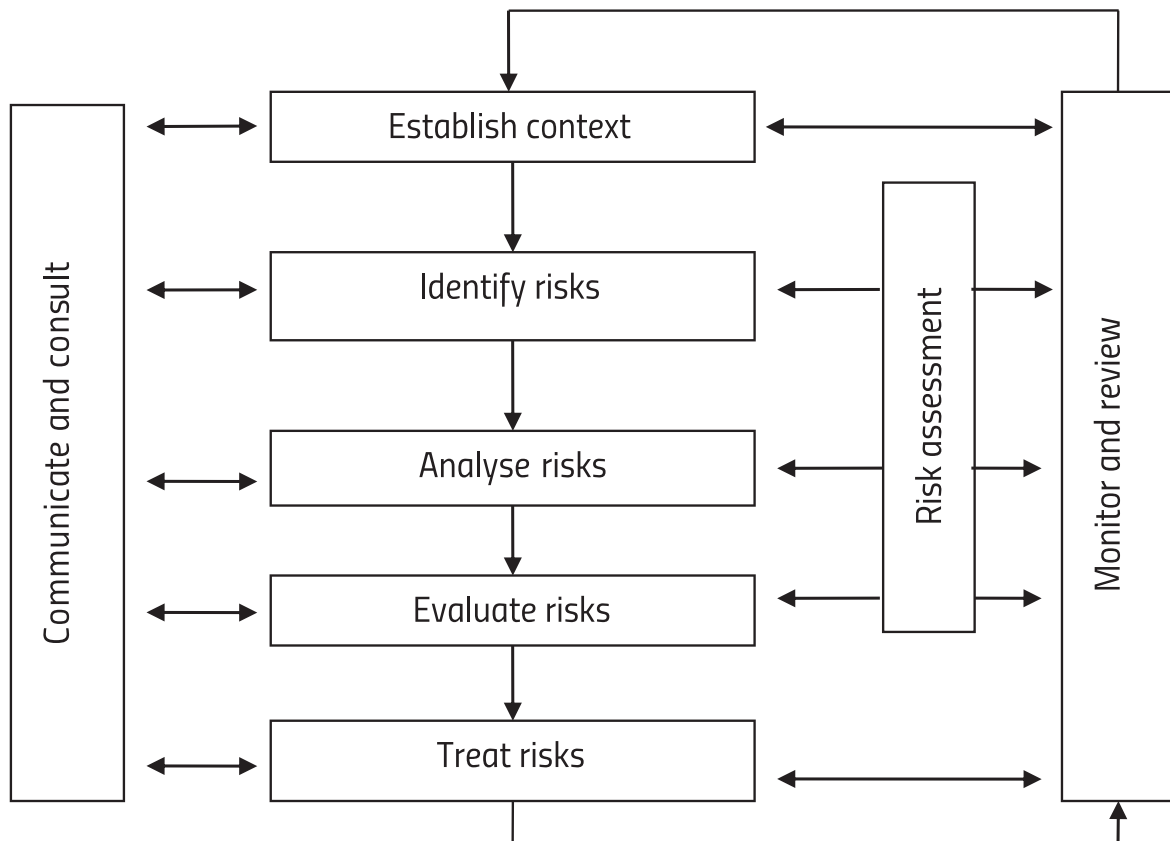


*Figure 3 Vegetation recovering from a bush fire*



## 4.0. PROCESS

The Australia/New Zealand Standard AS/NZS 31000: 2009 Risk Management was used as the basis for the risk assessment process. See Figure 4 for the steps involved.



*Figure 4: Overview of the risk assessment process*

### 4.1. Communication and Consultation

Community participation is an integral part of risk management. The following stakeholders were consulted:

- Community
- Community leadership
- Game Ranch owners



**b. Economic**

**i) The tourism sector**

Tsodilo World Heritage Site is one of the tourist attractions of North West District. The site receives approximately 20 000 visitors per annum. The visitors are mainly attracted by rock art paintings which are complemented by richness of biodiversity which is found in the area. The Community of Tsodilo through the CBNRM programme has formed a Trust so that the community can realize the benefits of conserving and preserving Tsodilo Hills World Heritage Site. The Trust has established camp sites as one of the income generating activities in addition to guiding tourists in and around the hills.

The Tsodilo Hills World Heritage Site on its own can be described as an economic asset to the community of Tsodilo and for the country as a whole. It is very important to protect the site from bush fires as they will affect the rock paintings and the biodiversity of the area which attracts the tourists.

The factors making Tsodilo World Heritage Site to be predisposed to bush fires include:

- The site is located in the area that has high fuel loadings
- Lack of asset or property protection plan which increases its vulnerability to bush fires
- The high tourist volumes during the peak season could also contribute to high level of bush fire risk.

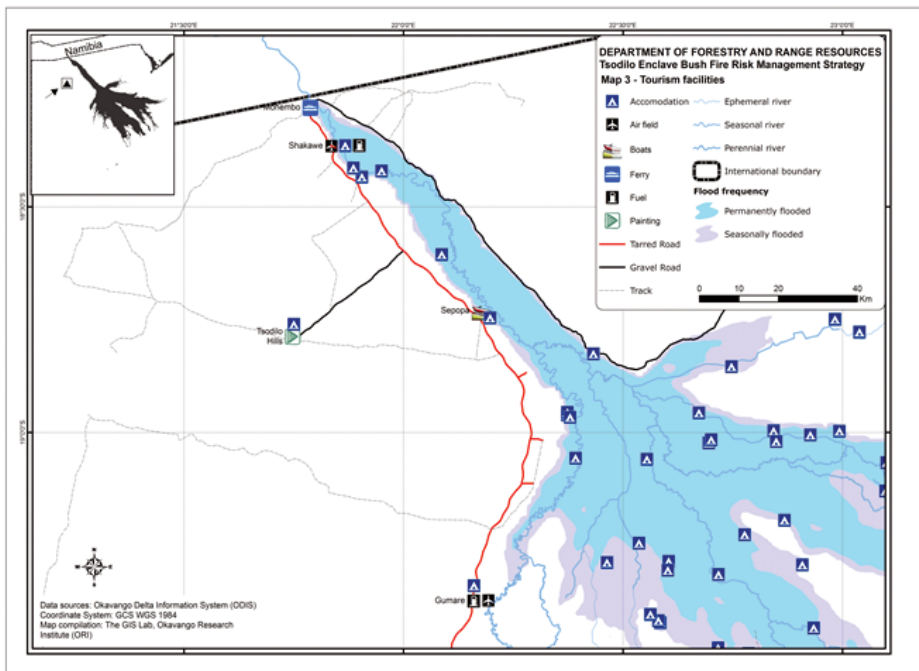


Figure 6: Tourism facilities

### ii) Infrastructure

Infrastructure within the Tsodilo enclave which could be affected by bush fires includes:

- Perimeter fence
- Buildings
- Camp sites

It is important to highlight the infrastructure which has high fire risk will be the infrastructure which is outside built up areas like towns, cities and villages. The infrastructure within the built up areas is at low risk because the likelihood of bush fires occurring in these areas is very low. All these are assets that have been mentioned above are susceptible to bush fires because of high fuel loads surrounding them.

### c. Environmental

Tsodilo enclave is endowed with natural resources that comprises of an abundance flora and fauna. These natural resources are very pivotal to the mainstay of the tourism sector in the area. The local community's livelihood is also dependent on the natural resources found in the area. The vegetation cover in the area is a mixture of shrubland and grassland as well as *Baikiaea* woodlands, refer to **(Figure 7).**

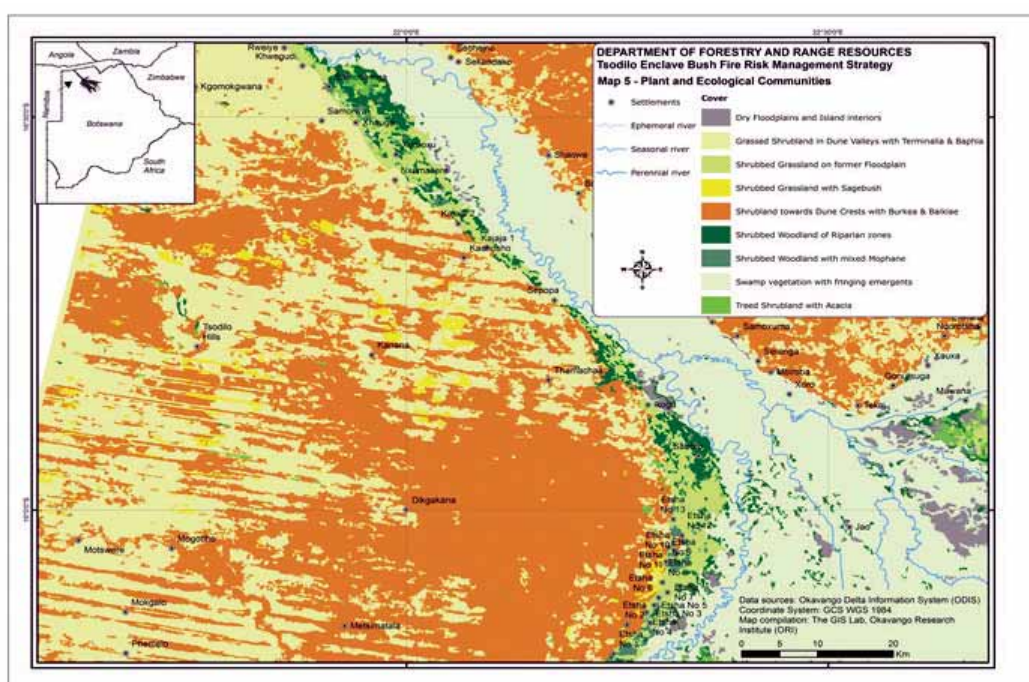


Figure 7: Plant and ecological communities in Tsodilo

#### ***d. Cultural***

Tsodilo World Heritage Site as a cultural asset does not only contribute economically to the area but also has a rich cultural and spiritual significance to the communities living around this heritage site. The tourists are also attracted by the cultural aspect of the site as they do not only get to appreciate the history of the site but also the culture of the people living around the site.

### ***4.2.2 Assessing the Bush Fire Risk - Consequence***

Once the assets were identified, the consequence of a bush fire impacting on these assets was assessed. See appendix 1 for the consequence ratings. The different asset types had different assessment processes used to determine the consequence. These processes are identified below.

#### **Human Safety Impact**

A potential fire behavior 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 bush fire was also assessed and a rating assigned. These ratings were then used to assess the consequence of a bush fire impacting upon a human settlement asset.

Special Fire Protection (SFP) assets were considered inherently more vulnerable to bush fire due to mobility capacity, knowledge or other issues relating to their inhabitants, (e.g. the elderly, infirm, children or tourists). The human settlement areas have low risk rating because these areas have a low fuel load due to land degradation caused by human activities.

#### **Business Capability**

The level of business continuity impact, as well as the length of time taken to 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.

#### **Community Impact**

The level of impact on the general Tsodilo enclave 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 bush fire disaster. These ratings were used to assess the consequence of a bush fire impacting upon a community asset.

#### **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 strategy 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 bush fire were used to assess the consequence of a bush fire impacting upon an environmental asset.

### **Financial Impact**

The level of financial impact from a bush fire impacting on Tsodilo enclave includes Private and Government entities. These ratings were used to assess the consequence of a bushfire effect financially on a community, individual or commercial operations.

### **Reputational Impact**

The level of damage to the reputation of the Tsodilo enclave community from a bush fire impacting on a heritage site 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 to keep it. These ratings were used to assess the consequence of a bushfire effect on the reputation of Tsodilo enclave community and Botswana as a country.

## ***4.2.3 Assessing the Bush Fire Risk - Likelihood***

For all asset types the likelihood of a bush fire occurring was assessed. This involves:

- considering fire history
- Including ignition cause and patterns
- Known fire paths and access
- Containment potential and potential fire run (size of the vegetated area). See appendix 1 for the likelihood ratings

## ***4.2.4 Identifying the level of risk***

The consequence and likelihood ratings were then used to identify the level of risk. See appendix 1 for the risk ratings.

## ***4.2.5 Evaluating the Bush Fire 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 bush fire risk.
- Identify which assets require treatments; and
- Identify treatment priorities.

## ***4.2.6 Prioritising Treatments***

No organisation has limitless resources to deal with adverse risk. It is therefore necessary to define priorities. The bush fire risk ratings determined were used to prioritize the risk of treatments, i.e. areas of Critical risk were considered first for treatment, then high, then medium then low.

### 4.2.7 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 Tsodilo enclave, the level of risk acceptability is the Critical to low risk rating. The low risk assets are likely to be managed by routine procedures and so do not require a specific application of resources. However, the critical and high risk assets will be prioritized and specific risk treatment plans will be developed and applied.



*Figure 8: Fire management training for community teams*

## 5.0 BUSH FIRE RISK ANALYSIS AND EVALUATION

This chapter describes the bush fire risk assessment process used for Tsodilo enclave. It provides an explanation of what is meant by the term bush fire risk, and how the level of bush fire risk across the Tsodilo area was determined and evaluated. A brief description of the key risk areas within the Tsodilo enclave is also included.

### 5.1. Bush Fire Risk

Bush fire risk is defined as the chance of a bush fire igniting, spreading and causing damage to assets of value to the community.

Three steps were used in the bush fire risk analysis process:

- Determining the likelihood of bush fire risk
- Determining the consequence of bush fire risk.
- Determining the level of bush fire risk.

### 5.2. Determining the likelihood of bush fire risk

For the purposes of bush fire risk management planning process, likelihood was described as the chance per year of a bush fire occurring in the Bush Fire Management Control (BFMC) area over the time periods identified in Table 2. The likelihood of a bush fire occurring was determined using fire history data or local knowledge.

*Table 2: Likelihood ratings for bush fire risk*

<i>Rating</i>	<i>Description and indicative probability</i>
<b>Almost certain</b>	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.
<b>Likely</b>	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.
<b>Possible</b>	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.
<b>Unlikely</b>	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.



## 5.3. Determining the Consequences of the Bush Fire Risk

The consequence of a bush fire event was determined by considering the vulnerability of the asset. Vulnerability is related to the capacity of an asset to cope with or recover from the impacts of a bush fire. Different assets have different abilities to cope with a bush fire. This means that when different assets are exposed to the same bush fire, the impact of the fire on those assets is likely to be different. Therefore, the consequence rating for the assets will be different.

To determine the consequences of bush fire risk, the task force mandated to develop the strategy used Table 3 for consequence ratings. The descriptions included within each category are statements. When determining the consequence ratings, the task force considered the vulnerability of each asset and determined which description best matched the anticipated consequences of a bush fire event.

For each asset listed on the risk register, a consequence rating was determined and incorporated into the register, (see Annexure 2).

*Table 3: Determining consequence ratings.*

<i>Description</i>	<i>Human life and health</i>	<i>Property, financial, environmental, cultural</i>
<i>Descriptor</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 hospitalization. Localized displacement of people who return within 24 hours. Personal support satisfied through local arrangements.	Localized 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).

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

## 5.4. Determining the Bush Fire Risk

The level of bush fire risk was determined using the combination of likelihood and consequence. Table 4 shows the risk levels used by the BFMC

*Table 3: Determining consequence ratings.*

<i>Consequence</i>				
	<i>Minor</i>	<i>Moderate</i>	<i>Major</i>	<i>Catastrophic</i>
<i>Likelihood</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

## 5.5. Evaluating the Bush Fire Risk

The assigned bush fire risks were evaluated to:

- determine that risk levels resulting from the risk analysis process reflect the relative seriousness of bush fire risk to each asset;
- identify treatment priorities;
- identify which risks require treatment.

## 5.6. Confirming the risk levels

Through a process of stakeholder participation, the risk levels determined during the risk analysis step were reviewed to ensure:

- they reflect the relative seriousness of bush fire risk to each asset;
- that the likelihood and consequence descriptions assigned to each asset were appropriate; and
- that local issues were considered.

## 5.7. Treatment priorities

No organisation has limitless resources to deal with adverse risk. It was therefore necessary to define priorities. The assigned treatment priorities were recorded in the risk register (Annexure 1).

### *5.7.1 Risk Acceptability*

Following community participation, any risks considered acceptable by the community were documented on the risk register. These risks did not require further analysis or treatment. They will however, be monitored or reviewed as conditions alter over time. Any risks which were considered to be unacceptable, required risk treatments to address the risk.

## 6.0 TREATING THE RISK

### 6.1 Treatments

#### 6.1.1 Asset specific treatments

There are five different strategy groups available to treat bush fire risk to identified assets. The types of asset specific treatments in each strategy group used in the Tsodilo enclave are listed below. A full list of the treatment strategies in Tsodilo enclave are in Annexure 1.

*Table 5: Asset specific treatments used in Tsodilo enclave*

<i>Strategy</i>	<i>Targeted treatments</i>
<b>Ignition Management</b>	Detection of bush fire occurrence using AFIS satellite system, Patrols, signage on fire prone areas
<b>Hazard Reduction</b>	Prescribed burning
<b>Community Education</b>	Sensitize community through Kgotla meetings and through media (radio, newspapers)
<b>Property Planning</b>	Fire break maintenance, prescribed burning
<b>Preparedness</b>	Early warning System activated (all different sectors contribute to EWS, i.e. Dept. of Meteorological Services, DFRR)

#### 6.1.2. Bush Fire Management Zones

Bush Fire Management Zones were identified within the Tsodilo enclave. These zones identify the fire management intent for a specific area. See Table 6 for descriptions of the zones and their purposes. The four categories of Bush Fire Management Zones are:

- Asset Protection Zone (APZ);
- Strategic Fire Advantage Zone (SFAZ);
- Land Management Zone (LMZ); and
- Fire Exclusion Zone (FEZ).

Some of these zones (usually Land Management Zones) may be further classified within this category by the land manager.

*Table 6: Bush fire management zones*

<b><i>ZONE</i></b>	<b><i>PURPOSE</i></b>	<b><i>SUPPRESSION OBJECTIVES</i></b>	<b><i>ZONE CHARACTERISTICS</i></b>
<b>Asset Protection zone</b>	Protection of human life, property and high valued public assets	Enable the safe use of fire suppression strategies (Direct attack) within zone. To minimise bush fire impacts on undefended assets	Village, town and city interfaces. High value assets that can be threatened by bush fires such as tourist facilities
<b>Strategic Fire Advantage Zone</b>	Provision of strategic areas of fire protection advantage to reduce fire speed and intensity	Improvement of the likelihood and safe use of: Parallel Attack suppression Strategies within the zone. and/or Indirect Attack (back Burning) in high to very high fire weather conditions within the zone.	Fire breaks, roads and trails
<b>Land Management Zone</b>	Meet relevant land management objectives in areas where Asset Protection or Strategic Fire Advantage Zones are not appropriate	Protection of assets using fire suppression strategies (offensive and Defensive)	Protected areas (National Park, Game & Forest Reserves), Ranches, Concession Areas, Wildlife Management Areas
<b>Fire Exclusion Zone</b>	Bush fires exclusion	Protection of assets using fire suppression strategies (offensive and Defensive)	Variable dependent on size of fire of sensitive area requiring protection.

## 7.0 BUSH FIRE RISK TREATMENTS

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 bush fire risk treatment options considered by the Tsodilo enclave task force.

### 7.1 Risk Treatment Options

Treatment options can include one or more of the following for managing of bush fire risk:

<b>Avoid the risk</b>	Decide not to proceed with the activity likely to generate a bush fire risk. This option is relevant to future land use decisions.
<b>Reduce the likelihood</b>	Programs to reduce the number of bush fire ignitions
<b>Reduce the consequence</b>	Programs to reduce the bush fire hazard and/or increase the resilience of community and environmental assets to bush fires.
<b>Share the risk</b>	Another party or parties share some part of the bush fire risk. This option includes sharing responsibility and community agreed fire management arrangements.
<b>Retain the risk</b>	After risks have been changed or shared, there are residual risks that are retained. These residual risks will be managed by fire response strategies.

Assets which were of unacceptable risk were considered for treatment options using a landscape approach. If assets were listed in more than one category, then the treatment option had to be appropriate for each asset category. Selecting the most appropriate treatment option or options involved balancing the costs of implementing each option against the benefits derived from it. In general, the cost of managing risks needs to be commensurate with the benefits obtained. More than one treatment option could be assigned to the asset.

## 7.2 Risk Treatment Plan

Risk treatment plans are action plans that identify how the chosen treatment option is to be implemented. The risk treatments detailed in the sections below have been agreed to by the land owner or managers. The responsibility for implementation of the Bush Fire Risk Management Plan rests with the owners or occupiers of the land (land managers) on which the bush fire risk is situated. This imposes the responsibility on both public and private land managers.

### 7.2.1 Avoid the Risk

Avoid the risk treatments means not proceeding with the activity likely to generate the bush fire risk.

### 7.2.2 Reduce the Likelihood

Reduce the likelihood means reducing the number of bush fires occurring.

#### **Notice of intention to burn off or burn firebreak**

A person who lights a fire for land clearance or burning any firebreak or in circumstances in which doing so would be likely to be dangerous to any property must give notice on the intention to light the fire.

### 7.3.3 Reduce the Consequences

Reduce the consequences treatments means reducing the extent of losses from bush fires by reducing the bush fire hazard and /or increasing the resilience of assets to bush fires

#### ***(a) Reduce the Hazards***

Hazard reduction programs aim to reduce the severity of a bush fire, by reducing the amount of fuel available to burn during a bush fire. This makes the bush fire easier to control and reduces the level of bush fire damage to community and their assets. Hazard reduction burning is the most common way to reduce the bush fire hazard, as it is the most cost effective method available. However, other methods of hazard reduction such as slashing or mowing, ploughing, grazing or hand clearing are used when appropriate.

#### ***b) Use of appropriate fire regimes***

A fire regime is essentially the combination of fire frequency (usually measured by the number of years between fires – both wild and prescribed), fire intensity, and season of fire occurrence. To identify the fire regime of an area requires assessment of the above fire attributes over a long period of time (normally decades but in some cases centuries). In many areas an 'adaptive management' approach is used by land managers such that the fire regimes applied are determined from a combination of the best fire history and fire ecology information available.



An inappropriate fire regime is considered to be one where (usually through the decisions or actions of humans) one or more of the fire attributes is occurring outside its historic range of variation for the area. Where such a change is allowed to continue, changes to the environment are likely to result. Examples of this include areas where prescribed fire is applied too frequently, areas where fire occurrence is reduced (through wildfire suppression and cessation of prescribed burning) such that fires are less frequent and more intense, and areas where the season of burning is changed.

***(c) Increase the resilience***

Programs aimed at increasing the resilience of an asset aim to reduce the impact of a bush fire on assets by increasing the ability of assets to withstand and recover from a bush fire.

## 8.0 IMPLEMENTATION

The implementation of the Bush Fire Risk Management plan will be the responsibility of the Tsodilo Community Development Trust supported by Department of Forestry and Range Resources, Department of National Museum and Monuments and the Ngamiland SLM Project. The Department of Forestry and Range Resources as the leading agency will provide technical assistance and overall coordination of fire management activities. However, all land owners with properties susceptible or threatened by bush fires are expected to develop and implement fire management strategies. The land owners, Government agencies, parastatals and other agencies are also required to implement the Annual Plan of Operations and report to the District Fire Management Committee on progress made with regards to fire management activities for their respective agencies. Refer to Annual Plan of Operations, Annexure 4.

## 9.0 MONITORING AND REVIEWING

An essential component of the bush fire risk management planning process is the monitoring and periodic review of the plan. Monitoring provides routine surveillance of actual performance for comparison with expected or required performance. Review involves periodic investigation of the current situation, usually with a specific focus.

This chapter describes how the bush fire risk management plan will be monitored and reviewed by examining:

- Changes to context and bush fire risks;
- Post event analysis;
- Annual reporting measure; and
- The effectiveness of the risk treatments (risk management performance measures).

### *Reviewing the plan*

#### **Example**

*The Strategy will be reviewed as and when it is necessary, together with the bush fire risk management plan. For example, a review of the BFRMP may be necessary if there are changes in the BFMC area, organisational responsibilities or legislative requirements. There may also be changes to the bush fire risks due to changes in potential bush fire hazard or assets.*

*Following a major fire event, the BFRMP will be reviewed to assess if the results of the bush fire risk management process was appropriate. This review will consider the following questions:*

- *Did we previously identify and analyse the risks involved?*
- *Were the consequences of the bush fire predicted by the risk analysis?*
- *Were the estimates of likelihood accurate?*
- *Were the treatment options instrumental in reducing either the consequences or the likelihood?*
- *Are other treatment options now obvious in the light of the bush fire?*
- *How could our risk management process in general be improved?*

*The results of these reviews may lead to alterations in risk analysis, evaluation or treatment plans.*

*If there are significant changes made to the BFRMP plan, then a revised draft bush fire risk management plan will be exhibited for a period of not less than 42 days during which time submissions are invited from the public.*

## 10.0 RESEARCH

The impact of regular and intense Bush fires on biodiversity remains unknown in the Tsodilo enclave, therefore research is needed to assess fire prone areas so that proper measures can be taken to assess the impact of the fire on biodiversity. Research and learning institutions will therefore need to play a major role in future decision making and management of fire and its impact on biodiversity. To monitor the effect of fire on vegetation, monitoring sites (in a range of habitats) will have to be established throughout the Tsodilo enclave. 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 and collated over time to establish trends.

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# ANNEXURE 1

## RISK ASSESSMENT – TSODILO ENCLAVE

PROBABILITY		CONSEQUENCE										Treatment/Controls to eliminate/minimise risks	Task owner		
5 ALMOST CERTAIN – expected to occur in most circumstances	4 LIKELY – will probably occur in most circumstances	3 POSSIBLE – might occur sometime	2 UNLIKELY – could occur sometime	1 RARE – may occur in exceptional circumstances	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	Risk Owner (Agency)	Risk Prob			Risk Cons	Auto
Asset Type	Detail of Risk	Causes	Worst consequences	Risk Owner (Agency)	Risk Prob	Risk Cons	Auto	Risk RTG							
Human	Fire fighters	Failure to identify hazards and risk, unfit fire fighters, lack of fire fighting equipment	Serious injury or death	Individual agency	3	5		15	Crew fire fighting training, adequate PPE and procurement of fire fighting tools						DFRR, PMU
Human	Community property	Lack of knowledge and skills	Loss of property, uncontrollable fires	TCDT	2	3		6	Conduct education and awareness campaigns						TCDT
Human	Fire used as management tool	Human activities, Lack of knowledge and skills	Serious injury or death,	DFRR	3	3		9	Education and awareness campaigns, law enforcement, review of the existing legislation, fire investigation						DFRR
Economic	Camp sites	Lack of proper property planning for facilities	Significant financial loss	TCDT	3	5		15	Prescribed burning (Hazard reduction)						TCDT
Economic	Perimeter fence for Tsodilo Core Management area	Lack of proper property planning for facilities	Significant financial loss	DMNIM	3	5			Property protection plan Maintain fuel break on either side of the fence						DMNIM
									Property protection plan						

Economic	Game ranch	Lack of proper property planning for facilities	Significant financial loss	Property Owner	3	5	15	Property protection plan	Property Owner
Cultural	Rock paintings	High fuel loads	Loss of cultural Heritage (tangible)	DNMIM, DFRR	4	5	20	Prescribed burning (Hazard reduction) and maintenance of fire breaks Property protection plan	DNMIM, DFRR
Environmental	Natural resources (flora & fauna)	High fuel loadings, human activities	Extinction of natural resources (fire intolerant species)	DFRR & DWNP	4	3	12	Conduct education and awareness campaigns	DWNP

**KEY**

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

## ANNEXURE 2

## ASSET REGISTER

ASSET NAME	TENURE	ASSET TYPE	LIKELIHOOD	CONSEQUENCE	RISK RATING	PRIORITY
Rock paintings	Communal	Cultural	Highly likely	Catastrophic	Extreme	1
Perimeter fence	Communal	Economic	Highly likely	Catastrophic	Extreme	1
Camp sites	Communal	Cultural	likely	Moderate	Moderate	2
DMNM Offices	Communal	Economic	likely	Moderate	Moderate	3
Game ranch	Communal	Economic	Highly likely	Catastrophic	Extreme	1



# ANNEXURE 3

## Project management and organizational capacity

PROJECT TITLE:TSODILO ENCLAVE WILDLAND FIRE MANAGEMENT STRATEGY				
EXECUTING AGENCY:DFRR				
KEY IMPLEMENTING PARTNERS: TSODILO COMMUNITY DEVELOPMENT TRUST;Okavango Sub-district Council; Tsodilo Tribal Authority; VDC; Game FARMERS				
Narrative Summary		Expected Results	Performance Measurement	Assumptions/Risks
<p><b>Overall Goal</b> To reduce the incidence and impact of bush fires on biodiversity, livelihoods and the Tsodilo Hills within the Tsodilo Enclave.</p>	<p><b>Impact:</b></p> <ul style="list-style-type: none"> <li>Bush fires are reduced in both numbers and size within the enclave</li> </ul>	<p><b>Performance indicators:</b></p> <ul style="list-style-type: none"> <li>Incidences of bush fires in the Tsodilo buffer and core zones reduced from 3 to 1 per fire season.</li> <li>Fuel Breaks are annually maintained prior to May 1.</li> </ul>	<ul style="list-style-type: none"> <li>The Tsodilo Community Development Trust and DFRR have the requisite financial and human resources to combat bush fires.</li> <li>Funding for fuel break maintenance is annually available immediately on April 1.</li> </ul>	
<p><b>Project purpose</b> To increase the capacity of Tsodilo village institutions to detect, prevent and suppress bush fires in their locality and to rehabilitate burned areas.</p>	<p><b>Outcomes:</b></p> <ul style="list-style-type: none"> <li>A well-resourced, trained and effective Tsodilo Hills Community Based Fire Management Team established</li> <li>Fires are detected while they are still small</li> <li>Fires are suppressed at the smallest size possible</li> </ul>	<p><b>Performance indicators:</b></p> <ul style="list-style-type: none"> <li>Tsodilo Community Fire Team and other consisting of 40 people formed and trained a</li> <li>Fire-fighting equipment procured for the team</li> <li>The Fire team meets monthly during the off season and weekly during the fire season</li> <li>Establish a lookout on peak or high spot for fire detection</li> </ul>	<ul style="list-style-type: none"> <li>Funding has been provided to equip and train</li> <li>Community members are committed to responding to bushfires.</li> <li>The team is committed to meet, determine actions and implement them</li> </ul>	
<p><b>Resources (Inputs)</b></p> <ul style="list-style-type: none"> <li>Establish a lookout on peak or high spot for fire detection</li> <li>Establish communication links with agencies (DFRR &amp; 911 Operations) using satellite monitoring for fire detection</li> <li>Protective fire suites complete with boots, trousers, jackets, helmets, goggles and gloves</li> <li>Backpack water pouches</li> <li>Aluminum fire beaters</li> <li>Water boom sprayers</li> <li>Knapsack sprayers</li> </ul>	<p><b>Outputs</b></p> <ul style="list-style-type: none"> <li>Firefighting equipment &amp; protective clothing secured and distributed amongst several communities (e.g. Tsodilo, Gani, Shakarawe etc)</li> <li>Tsodilo Community Development Trust constitution revised to incorporate bush fire management planning</li> <li>TCDT and DMNMI receiving information on detected bush fires during the fire season</li> <li>Community Based Fire Management Team (CBFMT) constituted and trained in basic firefighting and prescribed burning</li> </ul>	<p><b>Directly Responsible Individual/Institution (DRI)</b></p> <ul style="list-style-type: none"> <li>PMU</li> <li>TCDT/TAC</li> <li>DMNMI/TCDT</li> <li>PMU/DFRR/ TCDT</li> <li>DFRR</li> <li>PMU/TDT</li> </ul>		

<ul style="list-style-type: none"> <li>• Rake hoes</li> <li>• Spades and shovels</li> <li>• Fire weather kits</li> <li>• First aid kits</li> </ul>	<ul style="list-style-type: none"> <li>• Controlled burning operations demonstrated to community members</li> <li>• Guidelines governing access and lodging at Tsodilo developed and publicized using signage and leaflets</li> <li>• Periodic and preventive on site field talks with grass and honey harvesters undertaken per harvest season</li> <li>• Resource mobilization for construction and maintenance of fire break around the Tsodilo buffer zone completed.</li> <li>• Prescribed burning conducted on the buffer of Tsodilo Core Management area</li> </ul>	<ul style="list-style-type: none"> <li>• DFRR/PMU</li> <li>• TCDT/DFRR</li> <li>• TCDT/ DMNMM</li> <li>• DMNMM/TCDT</li> </ul>	
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## ANNEXURE 5

### *Tsodilo world heritage site protection plan*



*Red – Current Fuel Break, Purple – New Fuel Breaks, Yellow-Community/Site Facility, Cyan-Airstrip*

**Location:** Tsodilo Hills National Monument (18° 44.514' S, 21° 44.224' E)

**Values at Risk:** Cultural sites (cliff paintings), Community Campsites, Site facilities, local community property

#### **FIRE SUPPRESSION ASSETS:**

- Boom sprayers, first aid kit, rake hoe, back pack water beaters, shovels, drip torches, sets of PPE.
- Tsodilo employees have been training in fire suppression (6 of individuals)
- Community employees are trained and available to support (40 of individuals)
- 1 4x4 vehicle

#### **FIRE SUPPRESSION ASSETS:**

- Boom sprayers, first aid kit, rake hoe, back pack water beaters, shovels, drip torches, sets of PPE.
- Tsodilo employees have been training in fire suppression (6 of individuals)
- Community employees are trained and available to support (40 of individuals)
- 1 4x4 vehicle

### **Fuels Management strategy:**

- Near buildings – keep grass and herbaceous plants within 5m to less than 10 cm after June 30th. Shrubs should be isolated and very few within 10m of structures; trees should also be isolated with 3-5m between trees or groups of trees.
- At Campsites – ensure campsite vegetation is less than 10 cm after June 30th. Ensure fire rings are in good shape.
- Propose to create fire breaks from perimeter road/break to nearest points of each rock formation to provide the potential to burnout from and keep fire contained to smaller area (purple lines).
  - o Perimeter fire break – 25,200m (red line)
  - o Fire Break #1 – 248m (purple line)
  - o Fire Break #2 – 625m (purple line)
  - o Fire Break #3 - 1,014 (purple line)
  - o Fire Break #4 – 835m (purple line)
  - o Fire Break #5 – 520m (purple line)
  - o Administrative Site Fire Break – 895m (purple line)
  - o Community Fire Break – 7,419m (purple line)
  - o Propose to build a fire break around “Grand Child”, also to potentially connect to existing perimeter fuel break
  - o Propose to build a fire break around the community, by using existing fields and then creating new fuel break where necessary.
- Fuel Break Maintenance needs to be initiated by April 1st every year due to the early onset of dry conditions that lead to early season fire potential starting late May.
- Coordinate with local community on prescribed fire needs.
- Cultural cliff paintings – within 1-5m of face reduce density of all vegetation, no continuous pathways for fire to move towards painting.

### **Public Awareness Strategy:**

- Post Fire Danger sign, and maintain its status daily
- Inform public about fire danger and hazards of unintended ignitions, preventive measures (keep vehicles out of tall grass, smoking only in vehicle or 1 m circle cleared of burnable material), carry shovel/rake/bucket.
- During extreme fire danger ensure wood campfires are completely out using water or sand. Feel the coals.
- Notify public of their responsibility to suppress fires that they start and notify the Monument station as soon as possible.

### **Fire Identification Strategy:**

- Utilize APHIS for notification of potential bushfires in the area
- Establish a lookout if possible on one of the peaks that can be hiked to once or twice a day. Provide radio/cellphone for communication, report fires/smokes spotted to Department of Forestry and Range Resources. If fires in the area staff more often or for longer periods. Develop a sight plan of know distances for visible features from lookout.

**Fire Suppression Strategy:**

- Fire from the West – burnout the west side of the perimeter road
- Fire from East side – burnout the east side of the perimeter road
- Fire from the North – burnout the north side of the perimeter road
- Fire from the south – Burnout from beyond the community

Prepare structures - close windows/doors, remove and window coverings and move any burnable materials from window (radiant heat can ignite this items). Move any combustible materials (e.g. fire wood, fuel tanks, etc.) away from structures at least 10m.

Vehicles – any vehicles left unattended should not be parked near burnable materials (e.g. plants, wood).

**Escape Route & Safety Zone:**

- Escape Route – if time allows and winds are not pushing the fire, evacuate appropriately out of the area.
- Safety zone – the core area of the community is a good safety zone. All non-firefighters should rally here or move to other safe areas





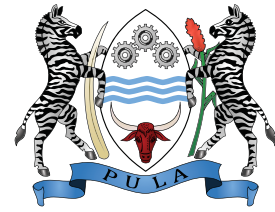




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