モザンビーク共和国

土地環境省

モザンビーク共和国 持続可能な森林管理・REDD+ プロジェクト

事業完了報告書

別添資料篇

2024年4月

独立行政法人 国際協力機構(JICA) アジア航測株式会社 国際航業株式会社

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別添資料 1 プロジェクトパンフレット (ポルトガル 語)



Ministério da Terra e Ambiente Agência Japonesa de Cooperação Internacional





Projecto de Gestão Florestal Sustentável e REDD+

na República de Moçambique

Brochura









A Agência Japonesa de Cooperação Internacional (JICA), respondendo à solicitação do Governo de Moçambique, está realizando o projecto de cooperação técnica para elaborar uma base para gestão florestal sustentável e mitigar o desmatamento da floresta de Moçambique. "O Projecto de Gestão Florestal Sustentável e REDD+", ou, numa forma resumida também conhecido como "FLOMOZ", visa assistir o fortalecimento em termo de estratégias, tecnologias e capacitação humana do Ministério da Terra e Ambiente (MTA) e do governo provincial, para assim, atingir a implementação do REDD+ num patamar internacional pela gestão florestal sustentável sob o REDD+.

Esta brochura foi elaborada para apresentar o perfil das actividades do FLOMOZ desenvolvido pelo MTA e a JICA.

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ABREVIATURAS

FRIP	Plataforma de Informação de Recursos Florestais
GFS	Gestão Florestal Sustentável
MTA	Ministério da Terra e Ambiente
PPIGF	Plano Provincial Integrado de Gestão Florestal
REDD+	Redução de Emissões por Desmatamento e Degradação Florestal
SNMF	Sistema Nacional de Monitoria Florestal
SPA	Serviço Provincial do Ambiente

1 Perfil do Projecto

[Objectivo GERAL]

Promover em Moçambique a Gestão Florestal Sustentável e REDD+ através da operação do Sistema Nacional de Monitoria Florestal (SNMF).

Promover na província do Niassa a Gestão Florestal Sustentável também através do REDD+.

[Objectivo específico do PROJECTO]

Fortalecer a capacidade do MTA e do Governo Provincial do Niassa na implementação da Gestão Florestal Sustentável e REDD+.

[Resultados esperados]

Resultado 1:SNMF em operação para a Gestão Florestal Sustentável e REDD+.Resultado 2:Promovido o processo de planificação provincial para a Gestão Florestal
Sustentável incluindo o REDD+ e o exercício da sua implementação.

(Área-alvo das actividades do Projecto)

Resultado 1: Ao nível nacional

Resultado 2: Na Província do Niassa

[Período do Projecto]

Abril de 2019 \sim Abril de 2024 (5 anos)

Como atingir as metas?



2 Actividades

2-1. Actividades para o Resultado 1: Operacionalizar o SNMF

[Antecedentes]

O Sistema Nacional de Monitoria Florestal (SNMF) é um dos 4 elementos do REDD+ estabelecidos pela COP, sendo também requisito para receber o financiamento baseado em resultado.



Definição do SNMF de Moçambique:

"O SNMF é um sistema que possibilita o relato de resultados de actividades de REDD+; a monitoria eficaz da PaMs para a gestão sustentável de florestas, que incluem objetivos nacionais e internacionais para além do REDD+; e a estrutura de sistema informático robusto para aprimorar a gestão de dados e transparência."

(Mecanismo de Coordenação)

Reconhecendo que a implementação do SNMF seja abrangente, foram identificadas várias instituições que estão trabalhando na sua estruturação. Esta medida facilitará o seu desenho e operacionalização no futuro.

Para o efeito, foi estabelecida uma força-tarefa (Task Force-TF) constituída principalmente pela DINAF e o FNDS que discutem questões como a definição, conceito e alvos da monitoria do SNMF. Uma vez estruturado o SNMF, a operacionalização desta será conduzida também pelo TF.

Os trabalhos do TF serão reportados ao Grupo de Trabalho (Working Group-WG), que avaliará o relatório e fornecerá informações e recomendações ao TF. O WG é constituído por instituições como: DINAB, DINAT, UEM, IIAM, FAO, Banco Mundial, WWF, IUCN, ANAC, FEDEMOMA, etc.

O Projecto FLOMOZ fornecerá apoio na operacionalização e recomendações técnicas do TF e o WG.

[Documento SNMF]

O Projecto FLOMOZ está apoiando a documentação do SNMF (esclarecendo questões como: antecedentes, objectivo, metodologia, cronograma, estrutura de implementação, orçamento, etc.).

A versão provisória do Documento SNMF foi elaborada em 12/2019, seguida pela Versão 1 elaborada em 06/2021 o qual foi aprovada pelo MTA em 09/2021.

Sendo que o SNMF deve ser sempre actualizado dependendo das necessidades de reporte, o Projecto FLOMOZ continuará apoiando a revisão deste documento,

[Conceito do SNMF]

O SNMF de Moçambique é constituído por 3 funções nomeadamente: Monitoria, MRV e GESTÃO DE DADOS.

MONITORIA

A floresta será monitorada através de metodologias que permitam a identificação da alteração da área (desmatamento/ degradação/ recuperação). Esta função servirá para obter informações da condição actual da floresta e a monitoria do efeito da Política e Medidas (PAMs).

MRV

O sistema MRV destina-se a estimativa precisa e reporte de emissão/ remoção de Gases de Efeito Estufa (GEE), de forma transparente e consistente. Todas as acções de REDD+ baseadas em resultados devem ser medidas, reportadas e verificadas através desta função.

GESTÃO DE DADOS

As informações colectadas pelas funções MONITORIA e MRV serão agregadas em sistemas TI (ex. plataforma FRIP e plataforma do FNDS). Parte dos dados e relatórios serão abertos ao público.



JJ-FAST: Sist. JICA-JAXA de alerta precoce florestal nos trópicos, **GLAD:** Análise e descoberta globais de terrenos, **GFW:** Global Forest Watch, **MODIS:** MODerate resolution Imaging Spectroradio-meter, **PSP:** Parcela de Amostragem Permanente, **IFN:** Inventário Florestal Nacional, **SIF:** Sist.de Informação Florestal

[Princípios do SNMF] O SNMF será:

- ① Desenhado e operado sob orientações do MTA junto às instituições relacionadas,
- 2 Adoptado em relatórios nacionais, sub-nacionais e internacionais,
- ③ Desenvolvido com base nos sistemas já existentes,
- ④ A ser desenvolvido gradualmente por etapas de melhoria, sendo sustentável por longo prazo refletindo a implementação de actividades REDD + por etapas, e
- (5) Adequado às boas práticas nacionais e internacionais respondendo aos requisitos do REDD +.

[Actualização da Plataforma FRIP]

O FLOMOZ continuará assistindo o fortalecimento e melhoria operacional da Plataforma FRIP desenvolvida pelo projecto anterior da DINAF-JICA para que esta possa exercer o papel principal como sistema do SNMF.

http://www.dinaf.gov.mz/pirf_mreddplus/index.php/en/

Exemplo de MONITORIA

Sistema de Referência de Desmatamento baseado em Satélite (SDRS)

O SDRS aproveita os múltiplos tipos de monitoria e exibe cada resultado de desmatamento no FRIP.





Mostra uma lista das 200 principais áreas detectadas por ordem decrescente de alertas GLAD por área do polígono.
Mostra uma lista das 200 principais áreas detectadas nas quais os Alertas GLAD são mesclados com a função de dissolução em ordem decrescente do ArcMap por área do polígono

O sistema fornecerá informações estatísticas sobre a tendência do desmatamento por área (província, distrito ou local específico). Observe-se que estes são dados globais somente para referência.

2-2. Actividades para o Resultado 2: Promover o processo de elaboração do PPIGF e implementar a actividade-piloto

O Governo de Moçambique tem envidado esforços para desenvolver políticas e estratégias para a gestão florestal sustentável. Como forma de assegurar a implementação da gestão sistemática e efectiva, está sendo avaliada a proposta de planos de gestão florestal a nível nacional, provincial, distrital e individual. O Projecto FLOMOZ está apoiando a formulação do **Plano Provincial Integrado de Gestão Florestal (PPIGF)** na Província do Niassa, como província-piloto. Esta actividade é liderada pela DINAF e o Serviço Provincial do Ambiente (SPA), sob concordância das intervenientes relevantes.



[Princípio para a elaboração do PPIGF]

A floresta é um recurso valioso que além de fornecer madeira, combustível e produtos não-madeireiros, mas também proporciona uma variedade de habitat para a flora e fauna. Ainda mais, exerce múltipla função de protecção ambiental como prevenção de erosão, protecção das fontes de água, absorção de CO₂.

O PPIGF visa a gestão integrada sustentável conservando e aproveitando a floresta. O Plano irá orientar tecnologias para actividades que correspondam a realidade local, de modo a expor no máximo possível as múltiplas funções que a floresta nos oferece.

A elaboração do PPIGF tomará em conta:

- <u>Concordância aos planos nacionais</u>: O PPIGF será elaborado para ser consistente ao rumo traçado pelo Governo Nacional, seguindo as linhas legais tais como a Política Florestal/ Estratégia de Implementação e Programa Nacional de Florestas 2018-2035.
- <u>Concordância aos outros sectores</u>: Algumas causas de desmatamento são provenientes de outros sectores como a agricultura ou urbanização. O PPIGF será elaborado para estar em concordância aos outros sectores, coordenado às estratégias promovidas por estes, por exemplo, tomando em conta o Plano de Desenvolvimento Provincial e Plano de Uso de Terra.
- Aproveitamento de dados florestais já existentes: Moçambique possui vários dados florestais. Por exemplo o Mapa Nacional de Cobertura Florestal e o Inventário Florestal Nacional. O PPIGF será elaborado aproveitando no máximo possível os dados existentes, também para que a metodologia do PPIGF possa ser adequada às outras províncias.

• **<u>Procedimento transparente e participativo</u>**: A elaboração do PPIGF passará por revisões e auscultações para absorver a ampla opinião das pessoas relacionadas e assegurar uma suficiente concordância.

[Conteúdo do PPIGF]

Estudando e identificando a condição actual da floresta no Niassa e as suas preocupações; a elaboração do PPIGF indicará as estratégias básicas do plano e actividades para a gestão florestal sustentável e o seu arranjo institucional. A tabela abaixo ilustra a proposta do documento.

O índice		
Capítulo	Τόριςο	
	1.1 Cobertura Florestal Recente, Volume Florestal e Mudança Florestal1.2 Desmatamento, Degradação Florestal e Desastres	
	Naturais	
Capítulo 1 Visão Geral da Floresta e Gestão Florestal no	1.3 Plano provincial de Uso da Terra e actuais Áreas Florestais	
Niassa: Estado e Questões	1.4 Gestão de Áreas de Conservação	
	1.5 Gestão de Florestas Produtivas	
	1.6 Plantações florestais e produtos florestais não madeieiros	
	1.7 Gestão de Queimadas Florestais	
	1.8 Gestão de indústriais florestais	
	2.1 Princípios e Políticas de Conservação, Protecção e Floresta Produtiva	
Capítulo 2 Zoneamento e Gestão Florestal	2.2 Conservação, Protecção e Zona de Floresta Produtiva	
	2.3 Estimativa de Corte Anual Admissível para a Exploração Sustentável	
	3.1 Visão	
	3.2 Objectivos estratégicos	
Capítulo 3 Plano Provincial de Gestão Florestal	3.3 Período de planeamento	
	3.4 Teoria das Mudanças	
	3.5 Áreas de Prioridade da Gestão Florestal no Niassa	
	Objectivo 1 - Reforçar o desenvolvimento socioeconómico e a segurança alimentar com enfoque no envolvimento da comunidade	
Capítulo 4 Actividades sobre gestão florestal	Objectivo 2 - Aumentar a resistência às alterações climáticas e às catástrofes naturais	
	Objectivo 3 - Criar capacidade e integrar os princípios da boa governação no desenvolvimento florestal	
	5.1 Disposições institucionais e de implementação	
Capítulo 5 Plano Operacional e Financeiro	5.2 Orçamento Indicativo	
	5.3 Fonte de financiamento	
Capítulo 6 Monitoria e Avaliação		

[Procedimentos da elaboração do PPIGF]

Os procedimentos e cronograma de trabalho para elaborar o PPIGF serão:

	Etapas
1	Reunião inicial do Plano de Provincial de Gestão Florestal (PPIGF)
2	Colecta, análise e elaboração de dados do PPIGF
3	Preparar 1º Draft do PPIGF (inglês e português)
4	Distribuição para revisão às instituições/intervenientes interessados a nível Central e Provincial
5	Reunião de Apresentação a nível Central e Provincial
6	Revisão pelo Conselho Técnico, MTA
7	Revisão pelo Conselho Consultivo, MTA
8	Preparar Draft final do PPIGF
9	Apresentação ao Secretário de Estado e Governadora Provincial

[Actividade-piloto para a gestão florestal sustentável]



Actividades Piloto baseadas no PPIGF

As Actividades Piloto são conduzidas como contramedidas dos factores de desmatamento e degradação florestal com base no Plano Provincial Integrado de Gestão Florestal (PPIGF) no Niassa. O Governo de Moçambique pretende disseminar, no futuro, as actividades piloto para outras províncias e distritos do país.

Gestão de queimadas florestais incluindo sensibilização das comunidades do Distrito de Majune O objectivo é prevenir queimadas florestais descontroladas, reduzir a degradação florestal e, promover a manutenção e maneio sustentável de florestas, com actividades de queimadas controladas pela comunidade. Esta actividade consiste em queimadas frias e controladas como estratégia de gestão e treinamento para sensibilização da comunidade na prevenção e combate as queimadas florestais.







Antes (em cima) e depois (abaixo) do fogo controlado



Abertura de aceiros



Equipa da comunidade local de Maneio de fogo

2-3. Mobilização sustentável de fundos

[Mobilização de fundos para a gestão florestal sustentável]

Garantir a sustentabilidade financeira da gestão florestal sustentável é um desafio comum de muitos países. Assim, será importante mostrar o papel da gestão e os benefícios económicos/ sociais/ ambientais, isto, para atrair um amplo apoio da opinião social e captar fundos por longo prazo. Neste sentido, o SNMF e a Plataforma FRIP apoiado pelo FLOMOZ poderão ser bem usufruídos.

O financiamento externo de parceiros ou pagamento por resultado do REDD+ poderá incentivar acções e preencher lacunas financeiras de curto e médio prazo. A longo prazo, será almejado o estímulo de investimento do sector privado sob a melhoria do ambiente de investimento fluxo financeiro natural para a conservação florestal.

Nesta reflexão, o Projecto contempla como base de promoção de investimento os tipos de financiamentos abaixo listados

Tipo de investimento	Exemplos de opções do investimento	Como atrair o investimento	
ESTADO	Orçamento do Governo, taxa florestal (concessão e licença simples), taxas ambientais, etc.	Coerência à política, coordenação multisectorial e promoção do investimento pelo sector privado.	
PARCEIROS	Fundos relacionados à Alteração Climática, Conservação Florestal ou colaboração com projectos de outros parceiros.	Ser coerente à: estratégia do Governo, alteração de paradigma, posse de liderança, múltiplos benefícios (combate á pobreza, igualdade do género, etc.), colaboração/ mistura de fundos, colaboração PPP.	
PRIVADOS	Investidores do sector agrário e madeireiro, Responsabilidade social empresarial, Carbon Offset, etc.	Sustentabilidade do negócio, ambiente estável de investimento e valorização empresarial.	

[Mobilização de fundos para o PPIGF]

Para viabilizar a implementação do PPIGF, serão estudadas as melhores opções para captação de fundos combinados provenientes do Orçamento do Estado, parceiros e privados.



[Reflectir o resultado do FLOMOZ à políticas e planos relacionados e empenhar a mobilização de fundos para ampliar o resultado]

O FLOMOZ procurará incentivar o aproveitamento dos resultados gerados procurando o caminho para reflectir os resultados do Projecto nas elaborações de estratégias e políticas do MTA. Para tal propósito, o Projecto apoiará a avaliação da melhor metodologia de mobilização de fundos.

3 Estrutura de implementação e colaboração

A estrutura de implementação do FLOMOZ é mostrada no diagrama abaixo. De modo a vitalizar ainda mais o impacto das actividades, haverá uma relação colaborativa entre o assessor da JICA no MTA, outros parceiros e privados entre outros.

Comité de Coordenação Conjunto (JCC)

- Presidente: Secretária Permanente do MTA
- **Membros:** Representantes da Equipa de Implementação do Projecto e organizações relacionadas (DINAF, ANAC, FNDS, DINAT, DINAB, DINOTER, DPC, AQUA, outras organizações envolvidas, SPA de Niassa, DPDTA de Niassa, Embaixada do Japão, JICA, etc.)
- Observadores (para o Lado Moçambicano e para o Lado Japonês)





Ver. Outubro 2022

別添資料2プロジェクトパンフレット(英語)



Project for Sustainable Forest Management and REDD+

in Mozambique (FLOMOZ)

Project Pamphlet







Japan International Cooperation Agency

Ministry of Land and Environment

ASIA AIR SURVEY CO., LTD.



Background

The Republic of Mozambique has approximately 38 million hectares of forest which accounts about 48% of the national land. The country is losing 220,000 hectares every year. The Ministry of Land and Environment (MTA) and local government agencies have intention to continuously promote sustainable forest management and to advance REDD+ to meet international requirements. In these context, in order to provide further support on the sustainable forest management and REDD+ in terms of the policy, technical and human resource development aspects, Japan International Cooperation Agency (JICA) decided to implement a technical cooperation project on establishment and operation of a national forest monitoring system (NFMS) and formulation of sustainable forest management plan in the provincial level, and efforts to control deforestation in response to the request of the Government of Mozambique. This pamphlet outlines the activities of "the Project for Sustainable Forest Management and REDD+" being implemented by MTA and JICA.

Outline of the Project

Overall Goal

Sustainable forest management and REDD+ are promoted through the operationalization of the National Forest Monitoring System (NFMS) in Mozambique, and sustainable forest management including through REDD+ in Niassa is promoted.

[Project Purpose]

The capacity of MTA and Niassa Province is strengthened for implementing sustainable forest management and REDD+.

[Outputs]

Output 1

National Forest Monitoring System (NFMS) (/M&MRV System) is operational for REDD+ and sustainable forest management (SFM).

Output 2

Provincial planning process for sustainable forest management including REDD+ and its implementation exercise are promoted.

[Project Site]

National (Output 1) and Niassa Province (Output 2)

[Project Period]

April 2019 to April 2024 (5 years)

Output 1: Operation of National Forest Monitoring System (NFMS)

The NFMS Document Version 1 prepared on 06/2021 which was approved by the MTA on 09/2021.Mozambique's NFMS consisting of following three functions is established and operationalized.

Monitoring Function

Monitoring Function works to monitor forests to identify forest area change (e.g. Deforestation, Forest degradation, Restoration) through several method. The objectives of function is to provide basic condition of forest and understand the effect of the Policy and Measures (PAMs).

MRV Function

MRV system is for the providing accurate estimates of emission/removal carbon accounting of GHG

that must be transparent and consistent, and for the reporting REDD+ activities. Results of all REDD+ actions should be fully measured, reported and verified through this function.

Data management Function

Relevant information/data collected through Monitoring and MRV activities is stored in IT system (FRIP and FNDS platforms, etc.) and some selected data and reports are published



<u>Output 2: Formulation of The Integrated Provincial Forest Management Plan (PPIGF) and Pilot</u> <u>activity</u>

The Integrated Provincial Forest Management Plan (PPIGF)

The integrated provincial forest management plan in Niassa Province which has following contents (draft) is formulated as the model for other provinces.

Chapter	Contents
	1.1. Recent Forest Cover, Forest Volume and Forest Change
Chapter 1:	1.2. Deforestation, Forest Degradation and Natural Disersters
Overview of	1.3. Provincial Land Use Planning and Current Forest Zones
Forest and Forest	1.4. Conservation Forest Management
Management in	1.5. Productive Forest Management
Niassa: Status and	1.6. Tree and NTFP plantation
Issues	1.7. Forest Fire Management
	1.8. Wood factory/industry Management
Chapter 2: Forest	2.1. Principles and Policies of Conservation, Protection and Productive Forest
Zoning and	2.2. Conservation, Protection and Productive Forest Zone
Management	2.3. Estimation of Allowable Annual Cut for Sustainable Wood Harvesting
Chapter 3:	3.1. Vison
Provincial Forest	3.2. Strategic Objectives
Management Plan	3.3. Theory of Changes
Chapter 4:	Objective 1 - Strengthening the socio-economic development and food security with a focus on community involvement
Activities on	Objective 2 - Enhancing resilience to climate change and natural disasters
Management	Objective 3 - To build capacity and integrate the principles of good governance in forestry development
Chapter 5:	5.1. Institutional and implementation arrangements
Operational and	5.2. Indicative Budget
Financial Plan	5.3. Funding Source
Chapter 6: Monito	ing and Evaluation

Pilot Activity based on PPIGF

Pilot Activity is conducted for the countermeasures against deforestation and forest degradation drivers based on the PPIGF in Niassa. Mozambique Government aims at desseminating the pilot activities to other provinces and districts in the future.

Management of forest fire and community awareness of fire management in Majune district

as one of the pilot activities

The objective is to prevent uncontrolled forest fires and reduce forest degradation, and to promote the maintenance and management of healthy forests with controlled burning activities by the community. This activity consists of Early Controlled Burning for management strategy and training for community awareness in prevention and fight of forest fires.

Institutional Arrangement of the Project

The implementation structure of FLOMOZ is shown in the diagram below. In order to further vitalize the impact of the activities, there will be a collaborative relationship between the JICA advisor in the MTA, other partners and private individuals among others.



別添資料 3 プロジェクトパンフレット改訂版 (ポル トガル語)



Project for Sustainable Forest Management and REDD+

in Mozambique

(FLOMOZ)

Project Pamphlet







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Ministry of Land and Environment

ASIA AIR SURVEY CO., LTD.



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[Project Site]

National (Output 1) and Niassa Province (Output 2)

(Project Period) April 2019 to April 2024 (5 years)

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The NFMS Document Version 1 prepared on 06/2021 which was approved by the MTA on 09/2021.Mozambique's NFMS consisting of following three functions is established and operationalized.

Monitoring Function

Monitoring Function works to monitor forests to identify forest area change (e.g. Deforestation, Forest degradation, Restoration) through several method. The objectives of function is to provide basic condition of forest and understand the effect of the Policy and Measures (PAMs).

MRV Function

MRV system is for the providing accurate estimates of emission/removal carbon accounting of GHG

that must be transparent and consistent, and for the reporting REDD+ activities. Results of all REDD+ actions should be fully measured, reported and verified through this function.

Data management Function

Relevant information/data collected through Monitoring and MRV activities is stored in IT system (FRIP and FNDS platforms, etc.) and some selected data and reports are published



Updating the forest resource information platform (FRIP) and developing the satellite-based deforestation reference system (SDRS)

The FRIP website (https://www.dinaf.gov.mz/portal/apps/sites/#/frip-contents) (Figure 1), which is

responsible for data management, has been updated and the SDRS has been developed that can be used for monitoring function. The SDRS is to aggregate deforested areas detected by the existing (early) warning systems operated by JJ-FAST ¹ and GLAD Alerts², and other relevant data such as Hansen Tree Loss, Planet mosaic images and NASA FIRMS ³, and to utilize the monitoring of conservation area, concession, and field patrols in fire detection area, etc.



Figure 1 New FRIP website

Examples of the use of the SDRS are shown below.

¹ JJ-FAST: JICA-JAXA Forest Early Warning System in the Tropics

 $^{^2\,}$ GLAD Alerts: Global Land Analysis and Discovery by University of Maryland

³ FIRMS: Fire Information for Resoruce Management System



The SDRS can overlay the monthly Planet mosaic images published by the NICFI program with deforested areas detected by the early warining system. User can switch between the mosaic images to better understand the status of deforested area (**Figure 2**).

Figure 2 Utilization of monthly Planet mosaic images

The SDRS can handle the 24-hours and 7-days fire information provided by NASA FIMRS. The field staff can see the location of the fire on the SDRS and use it for field patrols (Figure 3).





Deforestation areas detected by the exiting (early) warning system are tabulated by province, distict and month and presented as a slideshow to help identify trends in deforestation (Figure 4).

Figure 4 Monitoring of detections by month, province and district using JJ-FAST and GLAD

Upload the results of field surveys around concession or simple license areas onto the SDRS and share them with field surveyors and stakeholders (Figure 5).



Figure 5 Sharing of field survey results

<u>Output 2: Formulation of The Integrated Provincial Forest Management Plan (PPIGF) and Pilot</u> <u>activity</u>

The Integrated Provincial Forest Management Plan (PPIGF)

The integrated provincial forest management plan in Niassa Province which has following contents is formulated as the model for other provinces.

Chapter		Contents
	1.1.	Recent Forest Cover, Forest Volume and Forest Change
Chapter 1:	1.2.	Deforestation, Forest Degradation and Natural Disersters
Overview of	1.3.	Provincial Land Use Planning and Current Forest Zones
Forest and Forest	1.4.	Conservation Forest Management
Management in	1.5.	Productive Forest Management
Niassa: Status and	1.6.	Tree and NTFP plantation
Issues	1.7.	Forest Fire Management
	1.8.	Wood factory/industry Management
Chapter 2: Forest	2.1.	Principles and Policies of Conservation, Protection and Productive Forest
Zoning and	2.2.	Conservation, Protection and Productive Forest Zone
Management	2.3.	Estimation of Allowable Annual Cut for Sustainable Wood Harvesting
Chapter 3:	3.1.	Vison
Provincial Forest	3.2.	Strategic Objectives
Management Plan	3.3.	Theory of Changes
Chapter 4:	Obje on co	ctive 1 - Strengthening the socio-economic development and food security with a focus ommunity involvement
Earost	Obje	ctive 2 - Enhancing resilience to climate change and natural disasters
Management	Obje	ctive 3 - To build capacity and integrate the principles of good governance in forestry
Wanagement	deve	lopment
Chapter 5:	5.1.	Institutional and implementation arrangements
Operational and	5.2.	Indicative Budget
Financial Plan	5.3.	Funding Source
Chapter 6: Monitor	ing a	and Evaluation

Pilot Activity based on PPIGF

Pilot Activity is conducted for the countermeasures against deforestation and forest degradation drivers based on the PPIGF in Niassa. Mozambique Government aims at desseminating the pilot activities to other provinces and districts in the future.

Early Controlled Burning and community awareness of forest fire management in Majune, Marrupa, Maua and Sanga district as one of the pilot activities

The objective is to prevent uncontroled forest fires, to reduce forest degradation and to promote the sustainable forest management with early controlled burning activities in the community. This activity consists of early controlled burning and training for community awareness. In addition, forest and wildlife concession operators have been involved in the pilot activities, so that the fire management activities also will be sustained by the concession operators in their respective concession areas.

Institutional Arrangement of the Project

The implementation structure of FLOMOZ is shown in the diagram below. In order to further vitalize the impact of the activities, there will be a collaborative relationship between the JICA advisor in the MTA, other partners and private individuals among others.

Joint Coordination Committee(JCC)

- Chair: Permanent secretary MTA
- **Members:** Representatives pf project implementation e team and organizations concerned (DINAF, ANAC, FNDS, DINAT, DINAB, DINOTER, DPC, AQUA, others related organizations, SPA of Niassa, DPTA of Niassa, Embassy of do Japan, JICA, etc.)
- Observers (For Mozambican side and Japanese side)





別添資料 4 プロジェクトパンフレット改訂版 (英語)



Ministério da Terra e Ambiente Agência Japonesa de Cooperação Internacional





Projecto de Gestão Florestal Sustentável e REDD+

na República de Moçambique

Brochura









A Agência Japonesa de Cooperação Internacional (JICA), respondendo à solicitação do Governo de Moçambique, está realizando o projecto de cooperação técnica para elaborar uma base para gestão florestal sustentável e mitigar o desmatamento da floresta de Moçambique. "O Projecto de Gestão Florestal Sustentável e REDD+", ou, numa forma resumida também conhecido como "FLOMOZ", visa assistir o fortalecimento em termo de estratégias, tecnologias e capacitação humana do Ministério da Terra e Ambiente (MTA) e do governo provincial, para assim, atingir a implementação do REDD+ num patamar internacional pela gestão florestal sustentável sob o REDD+.

Esta brochura foi elaborada para apresentar o perfil das actividades do FLOMOZ desenvolvido pelo MTA e a JICA.

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ABREVIATURAS

FRIP	Plataforma de Informação de Recursos Florestais
GFS	Gestão Florestal Sustentável
MTA	Ministério da Terra e Ambiente
PPIGF	Plano Provincial Integrado de Gestão Florestal
REDD+	Redução de Emissões por Desmatamento e Degradação Florestal
SNMF	Sistema Nacional de Monitoria Florestal
SPA	Serviço Provincial do Ambiente

1 Perfil do Projecto

[Objectivo GERAL]

Promover em Moçambique a Gestão Florestal Sustentável e REDD+ através da operação do Sistema Nacional de Monitoria Florestal (SNMF).

Promover na província do Niassa a Gestão Florestal Sustentável também através do REDD+.

[Objectivo específico do PROJECTO]

Fortalecer a capacidade do MTA e do Governo Provincial do Niassa na implementação da Gestão Florestal Sustentável e REDD+.

[Resultados esperados]

Resultado 1:SNMF em operação para a Gestão Florestal Sustentável e REDD+.Resultado 2:Promovido o processo de planificação provincial para a Gestão Florestal
Sustentável incluindo o REDD+ e o exercício da sua implementação.

[Área-alvo das actividades do Projecto]

Resultado 1: Ao nível nacional

Resultado 2: Na Província do Niassa

[Período do Projecto]

Abril de 2019 \sim Abril de 2024 (5 anos)

Como atingir as metas?



2 Actividades

2-1. Actividades para o Resultado 1: Operacionalizar o SNMF

[Antecedentes]

O Sistema Nacional de Monitoria Florestal (SNMF) é um dos 4 elementos do REDD+ estabelecidos pela COP, sendo também requisito para receber o financiamento baseado em resultado.

Definição do SNMF de Moçambique:

"O SNMF é um sistema que possibilita o relato de

resultados de actividades de REDD+; a monitoria eficaz da PaMs para a gestão sustentável de florestas, que incluem objetivos nacionais e internacionais para além do REDD+; e a estrutura de sistema informático robusto para aprimorar a gestão de dados e transparência."

[Mecanismo de Coordenação]

Reconhecendo que a implementação do SNMF seja abrangente, foram identificadas várias instituições que estão trabalhando na sua estruturação. Esta medida facilitará o seu desenho e operacionalização no futuro.

Para o efeito, foi estabelecida uma força-tarefa (Task Force-TF) constituída principalmente pela DINAF e o FNDS que discutem questões como a definição, conceito e alvos da monitoria do SNMF. Uma vez estruturado o SNMF, a operacionalização desta será conduzida também pelo TF.

Os trabalhos do TF serão reportados ao Grupo de Trabalho (Working Group-WG), que avaliará o relatório e fornecerá informações e recomendações ao TF. O WG é constituído por instituições como: DINAB, DINAT, UEM, IIAM, FAO, Banco Mundial, WWF, IUCN, ANAC, FEDEMOMA, etc.

O Projecto FLOMOZ fornecerá apoio na operacionalização e recomendações técnicas do TF e o WG.

[Documento SNMF]

O Projecto FLOMOZ está apoiando a documentação do SNMF (esclarecendo questões como: antecedentes, objectivo, metodologia, cronograma, estrutura de implementação, orçamento, etc.).

A versão provisória do Documento SNMF foi elaborada em 12/2019, seguida pela Versão 1 elaborada em 06/2021 o qual foi aprovada pelo MTA em 09/2021.

Sendo que o SNMF deve ser sempre actualizado dependendo das necessidades de reporte, o Projecto FLOMOZ continuará apoiando a revisão deste documento,

[Conceito do SNMF]

O SNMF de Moçambique é constituído por 3 funções nomeadamente: Monitoria, MRV e GESTÃO DE DADOS.

MONITORIA

A floresta será monitorada através de metodologias que permitam a identificação da alteração da área (desmatamento/ degradação/ recuperação). Esta função servirá para obter informações da condição actual da floresta e a monitoria do efeito da Política e Medidas (PAMs).

MRV

O sistema MRV destina-se a estimativa precisa e reporte de emissão/ remoção de Gases de Efeito Estufa (GEE),



de forma transparente e consistente. Todas as acções de REDD+ baseadas em resultados devem ser medidas, reportadas e verificadas através desta função.

GESTÃO DE DADOS

As informações colectadas pelas funções MONITORIA e MRV serão agregadas em sistemas TI (ex. plataforma FRIP e plataforma do FNDS). Parte dos dados e relatórios serão abertos ao público.



<u>JJ-FAST:</u> Sist. JICA-JAXA de alerta precoce florestal nos trópicos, <u>GLAD:</u> Análise e descoberta globais de terrenos, <u>GFW:</u> Global Forest Watch, <u>MODIS:</u> MODerate resolution Imaging Spectroradio-meter, <u>PSP:</u> Parcela de Amostragem Permanente, <u>IFN:</u> Inventário Florestal Nacional, <u>SIF:</u> Sist.de Informação Florestal

[Princípios do SNMF] O SNMF será:

- ① Desenhado e operado sob orientações do MTA junto às instituições relacionadas,
- 2 Adoptado em relatórios nacionais, sub-nacionais e internacionais,
- ③ Desenvolvido com base nos sistemas já existentes,
- ④ A ser desenvolvido gradualmente por etapas de melhoria, sendo sustentável por longo prazo refletindo a implementação de actividades REDD + por etapas, e
- (5) Adequado às boas práticas nacionais e internacionais respondendo aos requisitos do REDD +.

[Actualização da Plataforma FRIP]

O FLOMOZ continuará assistindo o fortalecimento e melhoria operacional da Plataforma FRIP desenvolvida pelo projecto anterior da DINAF-JICA para que esta possa exercer o papel principal como sistema do SNMF.

http://www.dinaf.gov.mz/pirf_mreddplus/index.php/en/

Atualização da plataforma de informação sobre recursos florestais (FRIP) e desenvolvimento do sistema de referência de desflorestação por satélite (SDRS)

O website da FRIP (https://www.dinaf.gov.mz/portal/apps/sites/#/frip-contents) (Figura 1), responsável pela gestão



dos dados, foi atualizado e foi desenvolvido o SDRS que pode ser utilizado para a função de monitorização. O SDRS destina-se a agregar as áreas desflorestadas detetadas pelos sistemas de alerta (precoce) existentes operados pelos alertas JJ-FAST¹ e GLAD ALERTS², e outros dados relevantes, como perda de árvores Hansen, imagens de mosaico de planetas e empresas da NASA FIRMS³, e para utilizar o monitoramento de área de conservação, concessão e de detecção de incêndios, etc.

Seguem-se exemplos da utilização dos DSE



O SDRS pode sobrepor as imagens mensais do mosaico do planeta publicadas pelo programa NICFI com áreas desmatadas detetadas pelo sistema de alerta inicial. O usuário pode alternar entre as imagens de mosaico para entender melhor o status da área desmatada (Figura 1)

Figura 1 Utilização de imagens mensais do mosaico do planeta

O SDRS pode lidar com as informações de incêndio de 24 horas e 7 dias fornecidas pela NASA FIMRS. A equipe de campo pode ver a localização do incêndio no SDRS e usá-lo para patrulhas de campo (Figura 2)



Figure 2 Referece to FIRMS information

¹ JJ-FAST: JICA-JAXA Sistema de Alerta Precoce Florestal nos Trópicos

 $^{^2\,}$ GLAD Alerts Analise e descoberta Global de terra pela Universidade de Maryland

³ FIRMS, Informação de incêndios para sistema de gestão de recursos



As áreas de desmatamento detectadas pelo sistema de alerta (precoce) de saída são tabuladas por província, distrito e mês e apresentadas em slides para ajudar a identificar tendências no desmatamento (Figura 3).

Figure 3 Monitoramento de detecções por mês, província e distrito usando JJ-FAST e GLAD



Figura 4 Partilha dos resultados do inquérito no terreno

2-2. Actividades para o Resultado 2: Promover o processo de elaboração do PPIGF e implementar a actividade-piloto

O Governo de Moçambique tem envidado esforços para desenvolver políticas e estratégias para a gestão florestal sustentável. Como forma de assegurar a implementação da gestão sistemática e efectiva, está sendo avaliada a proposta de planos de gestão florestal a nível nacional, provincial, distrital e individual. O Projecto FLOMOZ está apoiando a formulação do **Plano Provincial Integrado de Gestão Florestal (PPIGF)** na Província do Niassa, como província-piloto. Esta actividade é liderada pela DINAF e o Serviço Provincial do Ambiente (SPA), sob concordância das intervenientes relevantes.


[Princípio para a elaboração do PPIGF]

A floresta é um recurso valioso que além de fornecer madeira, combustível e produtos não-madeireiros, também proporciona uma variedade de habitat para a flora e fauna. Ainda mais, exerce múltipla função de protecção ambiental como prevenção de erosão, protecção das fontes de água, absorção de CO₂.

O PPIGF visa a gestão integrada sustentável conservando e aproveitando a floresta. O Plano irá orientar tecnologias para actividades que correspondam a realidade local, de modo a expor no máximo possível as múltiplas funções que a floresta nos oferece.

A elaboração do PPIGF tomará em conta:

- <u>Concordância aos planos nacionais</u>: O PPIGF será elaborado para ser consistente ao rumo traçado pelo Governo Nacional, seguindo as linhas legais tais como a Política Florestal/ Estratégia de Implementação e Programa Nacional de Florestas 2018-2035.
- <u>Concordância aos outros sectores</u>: Algumas causas de desmatamento são provenientes de outros sectores como a agricultura ou urbanização. O PPIGF será elaborado para estar em concordância aos outros sectores, coordenado às estratégias promovidas por estes, por exemplo, tomando em conta o Plano de Desenvolvimento Provincial e Plano de Uso de Terra.
- <u>Aproveitamento de dados florestais já existentes</u>: Moçambique possui vários dados florestais. Por exemplo o Mapa Nacional de Cobertura Florestal e o Inventário Florestal Nacional. O PPIGF será elaborado aproveitando no máximo possível os dados existentes, também para que a metodologia do PPIGF possa ser adequada às outras províncias.
- **<u>Procedimento transparente e participativo</u>**: A elaboração do PPIGF passará por revisões e auscultações para absorver a ampla opinião das pessoas relacionadas e assegurar uma suficiente concordância.

[Conteúdo do PPIGF]

Estudando e identificando a condição actual da floresta no Niassa e as suas preocupações; a elaboração do PPIGF indicará as estratégias básicas do plano e actividades para a gestão florestal sustentável e o seu arranjo institucional. A tabela abaixo ilustra a proposta do documento.

O índice	
Capítulo	Tópico
	1.1 Cobertura Florestal Recente, Volume Florestal e Mudança Florestal
	1.2 Desmatamento, Degradação Florestal e Desastres Naturais
Canítulo I. Visão Geral da Floresta e Gestão Florestal no	1.3 Plano provincial de Uso da Terra e actuais Áreas Florestais
Niassa: Estado e Questões	1.4 Gestão de Áreas de Conservação
``	1.5 Gestão de Florestas Produtivas
	1.6 Plantações florestais e produtos florestais não madeieiros
	1.7 Gestão de Queimadas Florestais
	1.8 Gestão de indústriais florestais
	2.1 Princípios e Políticas de Conservação, Protecção e Floresta Produtiva
Capítulo 2 Zoneamento e Gestão Florestal	2.2 Conservação, Protecção e Zona de Floresta Produtiva
	2.3 Estimativa de Corte Anual Admissível para a Exploração Sustentável
	3.1 Visão
	3.2 Objectivos estratégicos
Capítulo 3 Plano Provincial de Gestão Florestal	3.3 Período de planeamento
	3.4 Teoria das Mudanças
	3.5 Áreas de Prioridade da Gestão Florestal no Niassa
	Objectivo 1 - Reforçar o desenvolvimento socioeconómico e a segurança alimentar com enfoque no envolvimento da comunidade
Capítulo 4 Actividades sobre gestão florestal	Objectivo 2 - Aumentar a resistência às alterações climáticas e às catástrofes naturais
	Objectivo 3 - Criar capacidade e integrar os princípios da boa governação no desenvolvimento florestal
	5.1 Disposições institucionais e de implementação
Capítulo 5 Plano Operacional e Financeiro	5.2 Orçamento Indicativo
	5.3 Fonte de financiamento
Capítulo 6 Monitoria e Avaliação	

[Procedimentos da elaboração do PPIGF]

Os procedimentos e cronograma de trabalho para elaborar o PPIGF serão:

	Etapas
1	Reunião inicial do Plano de Provincial de Gestão Florestal (PPIGF)
2	Colecta, análise e elaboração de dados do PPIGF
3	Preparar 1º Draft do PPIGF (inglês e português)
4	Distribuição para revisão às instituições/intervenientes interessados a nível Central e Provincial
5	Reunião de Apresentação a nível Central e Provincial
6	Revisão pelo Conselho Técnico, MTA
7	Revisão pelo Conselho Consultivo, MTA
8	Preparar Draft final do PPIGF
9	Apresentação ao Secretário de Estado e Governadora Provincial

[Actividade-piloto para a gestão florestal sustentável]



Actividades Piloto baseadas no PPIGF

As Actividades Piloto são conduzidas como contramedidas dos factores de desmatamento e degradação florestal com base no Plano Provincial Integrado de Gestão Florestal (PPIGF) no Niassa. O Governo de Moçambique pretende disseminar, no futuro, as actividades piloto para outras províncias e distritos do país.

Gestão de queimadas florestais incluindo sensibilização das comunidades nos Distritos de Majune, Marrupa, Maua e Sanga

O objetivo é prevenir incêndios florestais não controlados, reduzir a degradação florestal e promover a gestão florestal sustentável com actividades de queimadas controladas precocemente na comunidade. Esta actividade consiste em queima controlada precoce e treinamento para conscientização da comunidade. Além disso, os operadores das concessões florestais e de vida selvagem têm estado envolvidos nas actividades-piloto, pelo que as atividades de gestão do fogo também serão sustentadas pelos operadores da concessão nas suas respectivas áreas de concessão.



Educação ambiental



Antes (em cima) e depois (abaixo) do fogo controlado

2-3. Mobilização sustentável de fundos

[Mobilização de fundos para a gestão florestal sustentável]

Garantir a sustentabilidade financeira da gestão florestal sustentável é um desafio comum de muitos países. Assim, será importante mostrar o papel da gestão e os benefícios económicos/ sociais/ ambientais, isto, para atrair um amplo apoio da opinião social e captar fundos por longo prazo. Neste sentido, o SNMF e a Plataforma FRIP apoiado pelo FLOMOZ poderão ser bem usufruídos.

O financiamento externo de parceiros ou pagamento por resultado do REDD+ poderá incentivar acções e preencher lacunas financeiras de curto e médio prazo. A longo prazo, será almejado o estímulo de investimento do sector privado sob a melhoria do ambiente de investimento fluxo financeiro natural para a conservação florestal.

Nesta reflexão, o Projecto contempla como base de promoção de investimento os tipos de financiamentos abaixo listados

Tipo de	Exemplos de opções do investimento	Como atrair o investimento
investimento		
	Orçamento do Governo, taxa florestal	Coerência à política, coordenação
ESTADO	(concessão e licença simples), taxas	multisectorial e promoção do investimento
	ambientais, etc.	pelo sector privado.
DADCEIDOS	Fundos relacionados à Alteração	Ser coerente à: estratégia do Governo,
PARCEIRUS	Climática,	alteração de paradigma, posse de liderança,

	Conservação Florestal ou colaboração	múltiplos benefícios (combate á pobreza,
	com projectos de outros parceiros.	igualdade do género, etc.), colaboração/
		mistura de fundos, colaboração PPP.
	Investidores do sector agrário e	Sustentabilidade do negócio, ambiente
PRIVADOS	madeireiro, Responsabilidade social	estável de investimento e valorização
	empresarial, Carbon Offset, etc.	empresarial.

[Mobilização de fundos para o PPIGF]

Para viabilizar a implementação do PPIGF, serão estudadas as melhores opções para captação de fundos combinados provenientes do Orçamento do Estado, parceiros e privados.



Como opção de financiamento externo, estamos a colaborar com o DINAF e a IUCN para formular um projeto para o Fundo Verde para o Clima.

[Reflectir o resultado do FLOMOZ à políticas e planos relacionados e empenhar a mobilização de fundos para ampliar o resultado]

O FLOMOZ procurará incentivar o aproveitamento dos resultados gerados procurando o caminho para reflectir os resultados do Projecto nas elaborações de estratégias e políticas do MTA. Para tal propósito, o Projecto apoiará a avaliação da melhor metodologia de mobilização de fundos.

3 Estrutura de implementação e colaboração

A estrutura de implementação do FLOMOZ é mostrada no diagrama abaixo. De modo a vitalizar ainda mais o impacto das actividades, haverá uma relação colaborativa entre o assessor da JICA no MTA, outros parceiros e privados entre outros.



別添資料5ニュースレター(1)

モザンビーク国 持続可能な森林管理・REDD+プロジェクト S LETTER 01 あけましておめでとうございます!!





プロジェクト開始のお知らせ

チーフアドバイザーからの一言

はじめまして(じゃない方も沢山いらっしゃると思いますが)、 JICAが2019年4月から5年の期間で開始した「モザンビーク国持続 可能な森林管理・REDD+プロジェクト」のチーフアドバイザーを 務めております加藤和久と申します。このプロジェクトの前のプロ ジェクトでも総括を務めましのたで、モザンビークの森林と森林セ クターに関わって早6年が過ぎようとしております。今年還暦を迎 える老体にむち打って、あと4年と少し頑張る所存です。我々が対 峙する森林は、非常に多様な生態系世界を構築しており、人間が個 々人で違うように、森林も個々に異なり、簡単には分からせてもら えません。でも分からないことにロマンがあります。ロジックで しっかり構築することも重要ではありますが、何なんやろうこの状 況はということ(森林相手だけではなく人間相手でも起こりますが)を楽しむという余裕を持ち、かつ常に新たな興味を持ちながら、 プロジェクトを運営していければと思っています。

本プロジェクト団員 ニアッサ州現地事務所前にて撮影

プロジェクト愛称について:FLOMOZ

多くの人が関わる「モザンビーク国持続可能な森林管理・REDD+プロジェクト」は研究者からコミュニティー住 民まで、皆が覚えてくれる愛称を持っています。FLOMOZは単にFloresta Mocambicana(モザンビークの森)の短 縮ではありません。この6文字はモザンビークの森林に対する愛情・尊敬・プライドを込めて「モザンビークの森の 仕事をするのだ」と関係者一人一人に呼びかけています。FLOMOZの応援を今後とも宜しくお願い致します。

FLOMOZの概要

モザンビーク国は、2013年森林被覆/土地利用図によると国土の約54%にあたる約4190万haを森林が占めています。 しかし、毎年森林減少が発生しており、この対策として、持続可能な森林管理(SFM)や国連気候変動枠組み条約のパ リ合意でも定められたREDD+(※)の実践はとても大切です。本プロジェクトは、政府のSFM及びREDD+を実施する ための能力強化を目標にしており、そのために2つの成果を設定しております。一つ目の成果は、国家森林モニタリン グシステム(NFMS)をREDD+とSFMの為に運用できるようにすることです。NFMSはREDD+活動の実施・成果払いに 必要な要件の一つであるため、NFMSの構築・運用のために、関連機関やドナーとの調整を行い、構築・運営支援や組 織間調整を行います。また、2つ目の成果は、 SFM等のための州政府の計画プロセス及び実践の試行を推進することで

あり、ニアッサ州を対象に州森林管理計画 を策定し、その中で特定されたSFMや森林 減少対策としての活動を現場にてパイロッ ト活動として行っていきます。

※途上国における森林減少・劣化の抑制や持 続可能な森林経営などによって温室効果ガス 排出量を削減あるいは吸収量を増大させる努 カにインセンティブを与える気候変動対策

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モザンビーク国の位置とニアッサ州の位置



FLOMOZ

プロジェクトカウンターパートと合同調整委員会後に撮影

発行日:2020年1月

Direcção Nacional de Florestas (DINAF) Av. Josina Machel 537 2º andar, Maputo, República de Moçambique

成果1:国家森林モニタリングシステムの構築関連の活動について

モザンビーク国における国家森林モニタリングシステム(NFMS)を構築・運用していくためには、多くのス テークホルダーとの協力が不可欠です。森林総局(DINAF)、国家持続的開発基金(FNDS)、保護区国家管理 庁(ANAC)をタスクフォース(TF)メンバとしてNFMSの定義、コンセプト、方法論等を複数回のTF会議にお いて集中して議論し、NFMS文書を作成しています。

また、TFメンバに加え、他省庁、大学、研究機関、他ドナー等をワーキンググループメンバとしてTFにおいて議論した結果や、NFMS文書の記載内容等について意見交換する会議を2019年11月に首都マプトにて開催しました。

2020年6月のNFMS文書ver1の完成、NFMSの構築・運用に向けて引き続き関係者で協力して取り組んでいきます。



成果2:州森林管理計画策定等の活動について



ニアッサ州で開催されたキックオフミーティングの様子



ニアッサ州に広がるミオンボ林

成果2では、モザンビーク国の北西部に位置するニアッサ州において、国家森林プログラム(策定中)等、国の 森林政策に準拠した州の森林林管理計画(PPIGF)を策定し、地方における長期的で効率的な持続的森林管理の 推進を目指しています。

2019年11月に二アッサ州の州都リシンガで、州森林管理計画策定に係るキックオフミーティングを開催しました。会議には中央及び地方政府関係部局、大学、研究機関、民間企業、NGO及びドナー等から合計76名の関係者が参加しました。会議ではPPIGFの概要(目的や計画項目等)、策定プロセス、担当部局及びスケジュールについて説明するとともに、二アッサ州における森林の現状と課題について発表し、活発な意見交換が行われました。 今後、関連情報収集や分析、計画ドラフトの作成、技術レビューやコンサルテーション会合の実施、等を通じて、計画策定を進める予定ですが、中央と州のカウンターパートと共に、地域の関係者の意見や提案を踏まえた、モザンビーク初の地方森林管理計画の策定に取り組んでいきます。

モザンビーク&プロジェクト情報

ニアッサ州の森林

本プロジェクトで州森林管理計画を策定する ニアッサ州は面積が約12,282千haを超える国 内最大の州です。 2013年森林被覆/土地利用図 によると州の森林面積は約8,375千haで(北海 道約8,345千haとほぼ同じ)、多くはミオンボ 林と呼ばれる森林が占めています。ミオンボ林 は半乾燥地帯から半湿潤熱帯地域(年間降水 量:1,000±数百mm) に乾燥熱帯林として成 立します。ミオンボ林の代表樹種としてブラキ ステジア属(Brachystegia)があげられます。 ニアッサ州では多くの同属種を見かけますが、 いくつかの成木で剝皮が見られました(写真)。 現地の方の話では、剥ぎ取った樹皮は円筒形に 成形して養蜂の巣箱として用いられるとのこと でした。また同種若木の表皮はロープとして利 用され、家屋で竹を用いた屋根組を作成する際 などに用いられます。



ロゴマーク決定!

本プロジェクトのロゴマークが決まりました。ロ ゴマークは森林総局技術委員会で厳選なる投票に よって決められました。虹のような架け橋がモザン ビークの森林と人を繋ぐことができるようにとの思 いで作られたロゴマークです。



選挙委員による開票

ニアッサ名物

ニアッサ湖の魚、チャンボ。白身魚で、焼い ても揚げても美味しいです。 焼く際にニンニ クと塩の味付けをして、トマトベースのソース とシマ(トウモロコシの粉とお湯を合わせたモ ザンビークの主食の一つ)等と食べます。実は このチャンボは湖畔で採れるわけでは無く、船 で沖まで行き、網を用いて捕まえていると、漁 師の方に伺いました。





ニアッサ湖と、ニアッサ湖で有名なチャンボという淡水魚

モザンビークの樹の話

日本ではバオバブで知られるエンボンデイロ (Embondeiro)の実(マランビMalambe)を 紹介します。この樹木はモザンビーク国北部で 多く見られます。雨期に収穫した実を割って中 身を種ごと乾燥させたマランビは人気の北部土 産です。黒い種の周りの白い果肉が少し酸っぱ く本当に美味しい。しかも、糖尿病に良い事で モザンビークでは有名。乾燥マランビをぬるま 湯に浸して種を取り出した後、牛乳に混ぜて食 べます。ミキサーにかけてムースにすると絶品 ですよ。



【投稿:森林総局 イザックさん(左)とサラさん(右)】

編集後記

さて、本文にも記載させて頂きましたキックオフミー ティングですが、なんとテレビ、ラジオ、新聞でモザン ビーク全土で広報されました。モザンビーク国民も注目 の森林プロジェクト、ついに本格始動です。本ニュース レターではこれからもプロジェクトの旬な情報をお届け します。これからもよろしくお願いします。【嶋岡啓太】

別添資料6ニュースレター(2)

モザンビーク国 持続可能な森林管理・REDD+プロジェクト NEWS LETTER 02



プロジェクトからのお知らせ

第2回JCCの実施について

2020年3月12日に第2回JCCが開催され ました。1月の大統領就任を受けて、省庁再 編が行われ、プロジェクト開始当初の土地 ・環境・農村開発省(MITADER)が、土地・ 環境省(MTA)に改編されたことから、MTA としての初めてのJCCとなりました。JCCの チェアは、後日MTAの次官となられた Emília Fumo氏(写真の赤い服の方)が務め て下さいました。JCCでは、昨年10月の R/D改訂に基づいたプロジェクトの構造、 第2年次の活動計画(2020年1月~2020年 12月)等が協議され、承認されました。こ のうちプロジェクト活動については、ニア ッサ州での森林管理計画の策定に当たって



ニアッサ保護区の管理計画や生物多様性の確保に向けたホットスポット指定等既存の計画や戦略等との整合性を図 る必要性について意見が出されました。なお、第2年次の活動計画については、新型コロナウィルスの影響が見通 せないため、今後のコロナウィルスの状況に適時対応して必要に応じて計画を変更していくことになることも確認 しました。何とかコロナウィルスが早く収束し、通常のプロジェクト活動に戻ることを願って、第2年次のプロジ ェクト活動を実施しています。

成果1:国家森林モニタリングシステムの構築関連の活動について

モザンビーク国の国家森林モニタリングシステム (NFMS)は主要な3つの機能(MRV、モニタリング、 データ管理)で構成されます。森林概況及びPaMsの効 果を把握するためのモニタリング機能は、衛星画像・ 現場活動・アクティビティ(記録)をベースに行われ ます。モザンビーク国は国土面積が約80万km²と広大 なため、衛星画像を利用したモニタリングが中心とな ります。既にLANDSATやSAR画像を利用した早期警戒 システムおよびそれに準ずるシステムがインターネッ ト上で公開され、これらの情報を集約し、モザンビー ク国全域における森林減少地を抽出する仕組み (Satellite-based Deforestation Reference System: SDRS)を構築中です。SDRSの対象となる システムは、JJ-FAST (JAXA)や、GLAD Alert(メ



ダッシュボード形式による森林減少地の表示イメージ

リーランド大学)、Hansen Tree Loss(同大学)、 FIRMS(NASA)を想定しています。各システムから得られ た情報を森林資源情報プラットフォームに集約することにより、森林減少地の把握や分析、保護区の監視、コン セッション管理に活用でき、NFMSの構築・運用に貢献できるものとなります。

Facebook : https://fb.me/FLOMOZ2019 Twitter : https://twitter.com/FLOMOZ4







Direcção Nacional de Florestas (DINAF) Av. Josina Machel 537 2º andar, Maputo, República de Moçambique

成果2:州森林管理計画策定等の活動について

地方における森林管理を推進するために、モザンビーク国 の北西部に位置するニアッサ州を対象とした、州森林管理計 画(PPIGF)の策定を進めています。昨年11月のキックオフ 会議で、中央・地方の森林セクターの関係者と、PPIGFの概要 と計画策定ステップを合意し、その合意に基づいて、計画策 定に必要な情報収集や分析を進めています。

コロナ禍により、日本人の渡航予定を延期せざるを得ない 中で、ニアッサ州の森林や森林管理の現状や課題を整理する のは、特にニアッサ州の状況を十全に理解していない日本人 にとっては至難の業です。ただ、昨年のキックオフ会議の後、 カウンターパートと共に、ニアッサ州内を6日かけて縦走して、 州内の森林植生や土地利用、村落を視察し、また地方の森林 行政官、ドナー、保護区の森林レンジャー、木材伐採業者、



C/Pとニアッサ州内の森林植生の視察を実施

タバコ栽培業者、焼畑農民、等と個別にお話を聞く機会がありました。今思えば、カウンターパートやスタッフ と朝昼晩、寝食を共にして過ごしたあの6日間が、PPIGFの骨子をつくる上で貴重な機会になっています。 同国にとって初めての州森林管理計画であり、計画策定ガイドラインや先行モデルもないことから、まさに手 探りで進めているところですが、カウンターパートやナショナルスタッフと遠隔ながら緊密に連絡を取り合いな がら、PPIGFの策定を進めていきます。

モザンビーク&プロジェクト情報 MTAの新たな体制について

MITADER時代に森林総局(DINAF)で副局長として FLOMOZに関与していたImede Chafim Falume氏がMTA に改編された後にDINAF総局長に就任しました。既に FLOMOZを把握しているImede氏が就任したことで、プロ ジェクト運営を腹蔵なく協議していく環境が継続できるこ ととなりました。Sailors前局長は引退して故郷テテ州へ戻 られました。忙しくとも必ずFLOMOZに時間をあけて相談 に乗って下ったSailors氏へ感謝します。

地方の組織改編で州土地環境農村開発局(DPTADER) は、州環境サービス(SPA)に改組されました。州森林野 生動物サービス(SPFFB)はSPA内の部に構築されました。



引継ぎ式: イメデ新局長(左) サイロース前局長(右)

モザンビークの樹の話

ニアッサ州では換金作物としてタバコが生産 されています。各農家がタバコを栽培・収穫し て、乾燥したタバコの葉がタバコ会社に買い取 られる形態が生産体制の一つです。タバコの葉 の乾燥には、木質バイオマスが燃材として利用 されます。タバコ生産は、その生産地の開発と ともに、各タバコ農家のタバコ乾燥のための薪 炭生産・消費がニアッサ州での森林減少・劣化 の要因の一つと考えられています。

現地でタバコ生産者に聞き取り調査をした際 に、庭先で見かけた樹がGmelina arboreaです。 写真の個体は植栽して4年目とのことですが、

胸高直径は15cm以上、樹高は5m以上と、旺盛な成長が見られます。将来的にタバコ生産者の近隣の森林 からの薪炭材の供給が枯渇することも想定され、そうした際に、薪炭材の材料として利用される可能性が あります。なお、苗木はタバコ会社から配布されており、この活動はタバコ会社としての持続可能なタバ コ生産に向けた活動の一環であります。



COVID-19感染動向 (8月3日)

陽性者累計2029、回復者765、現陽性者1247、死者15(関連要因死者2)



法が定め る上限4カ月 間に達した 非常事態宣 言が7月29 日夜に解除 されました。 しかしなが ら、状況を 慎重に見極 める必要が あるとし、 次の措置を 決定するま で政府は同 レベルの警 戒を維持し ています。

ニアッサ名物

ニアッサ土産ならば、標高1,400メートル高 原の露地栽培で育った苺を迷うことなくお勧め します。我が家の子供たちはこの苺が大好きで す!! 南ア産のよりも安く、採りたてで甘い。 価格はマグカップ1杯で約1ドル、籠で約10ド



ルで売ま是ぞのらす空時てのど乾れ旬。

【投稿: FLOMOZチー ムスタッフ ステラさん】

緊急事態宣言下の近況

こんにちは、皆様お元気で すか?我々DINAFは全員元 気で感染者はまだいません。 モザンビークは4月から非常 事態が続いています。職場の 人数も各部署2~3人に制限 され、交代で出社しています。 スーパーの買い物は私と夫で 月に1回にまとめています。 子供の外出が禁止なので、我 が子たちは小学校どころか、 角のパン屋へさえも行けず、



毎日ベランダで遊んでいます。先生が学校の授業を YouTube配信して宿題を出しますが、その宿題を2 週間以内に返信するために、子よりも親である私た ちが苦労します。勉強を教え、新しい遊びを考え、 家中が散らかって、流しに食器がたまっています。 我慢の日々です。

【投稿: DINAFのカルメンさん】



写真は2020年7月20日のモザンビー クとの遠隔協議の際の写真です。今は 現地に渡航が出来ないため、Skypeな どのツールを活用して打ち合わせを行 います。プロジェクトはコロナ禍でも C/Pと協議を重ねながら、前進してい ます!

今回はモザンビークのコロナ感染状 況も掲載させて頂きました。一日でも 早く、コロナが落ち着くことを祈って います。 【嶋岡啓太】

別添資料7ニュースレター(3)

モザンビーク国 持続可能な森林管理・REDD+プロジェクト NEWS LETTER 03



FLOMOZからのお知らせ

新年のご挨拶と2021年の活動の振り返り

明けましておめでとうございます。本年もどうかよろしくお願いします。 プロジェクト業務主任の加藤和久です。新年冒頭にあたり、まず、2021年の活動 を振り返っておきたいと思います。

本プロジェクトの第2期が開始したのは、2021年3月で、約1年ぶりの2021年5 月から専門家によるモザンビークへの渡航を再開致しました。4月と7月に行われ たC/Pによる州森林管理計画(PPIGF)策定のためのニアッサ現地調査結果を確認 ・分析したり、衛星ベースの森林減少参照システムのパイロットバージョンのイン ストールやOJTも行われました。また、10月からはニアッサ州に日本人専門家もい けるようになり、PPIGF策定の協議やパイロット活動の選定の調査やワークショッ プも開催できました。やはり、現地で活動すると、遠隔での業務と違いC/Pともス ムースに協働が出来、物事が進むと改めて感じました。

一方で、それまで実施してきた遠隔での作業の経験を活かし、第3回のJCCを Zoomを利用し実施したり、8月にはモザンビーク国でのコロナ感染者数が大幅に 増加したことで、再度渡航制限が発生しましたが、遠隔での作業により、NFMS文 書を完成させ、土地環境省技術委員会での承認も得ました。

本年は、PPIGFの完成やパイロット活動の開始等が見込まれております。With コロナで、プロジェクトは力強く活動を継続していきます。活動の進捗等について は、本ニュースレターでご確認ください!



写真 : パイロット活動選定WSを終 えて



写真:ルリオ大学との協議を終え

成果1:国家森林モニタリングシステムの構築関連の活動について

REDD+の実施、成果払いを受け取るために必要な4つの要素の内の1つが NFMS(国家森林モニタリングシステム)です。NFMSの対象は極めて広い ため、関係する機関も多岐にわたりますが、DINAF(森林総局)とFNDSを 中心にNFMS タスクフォースを構築し、2019年以降議論を重ねてきました 。NFMSの背景、目的、方法、アクションカレンダー、実施体制、予算等の 項目から成るNFMS 文書がついに2021年9月に完成され、DINAF技術委員会 承認をふまえ、MTA技術委員会で承認されました!!

文書で定めた活動の実施および将来的な文章の更新を引き続き支援していき ます。

衛星ベースの森林減少参照システム(Satellite-based Deforestation Reference System: SDRS)は、日本の環境プログラム無償で供与されたサ ーバー及びEsri社のArcGIS Enterprise製品を利用してテスト運用が開始され ました。SDRSでは、JICA及びJAXAの協働事業である熱帯雨林早期警戒シス テム(JJ-FAST)やメリーランド大学が提供しているGLAD Alertsにより検 出された森林減少地のデータが一つのプロットフォームで参照できる仕組み を構築しています。また、年更新データとしてFNDSやHansen Tree Lossの 情報や、NASAが提供するFIRMSの森林火災状況も重ね合わせ表示できます 。さらに、Planet Labs社が提供する最新の衛星画像を表示することで、土 地利用及び土地被覆を確認することができます。今後、テスト運用を通じて 、利用者からの意見を元に修正し、本格運用に移行する予定です。



写真: 2021年8月実施のTFの様子



図:SDRSの活用例

FLOMOZ

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Direcção Nacional de Florestas (DINAF) Av. Josina Machel 537 2º andar, Maputo, República de Mocambigue



成果2:州森林管理計画策定等の活動について

成果2では、モザンビーク初となる州レベルの森林管理計画の策定を目指し ていますが、これまで中央や州のカウンターパートと協力しながら計画立案を 進めてきました。

まず、対象としているニアッサ州における森林管理の現状と課題を把握する ために、2021年4月と7月に、DINAFやSPA(州環境サービス)の担当者がニアッ サ州の各郡を回り、それぞれの郡における森林減少要因や森林管理の現状につ いて聞き取り調査を行いました。また、森林管理の目的に応じて、二アッサ州 を保全林、保護林、生産林にゾーニングする作業も、DIRF職員が中心となって 進めています。過去に日本の技術協力プロジェクトや環境プログラム無償に よって作成された森林被覆図などを元に、区分基準や方法を検討しながらゾー ニングをし、又その区分結果を確認するための現地踏査も実施しました。これ らの調査結果を取りまとめ、州森林管理計画案の作成をしているところです。 コロナ禍で日本人専門家の渡航に制約がかかり、思うように作業が進まずに もどかしい思いをしていますが、計画策定に必要な調査や分析作業をカウン

ターパートが中心となって進めることで、中央や州の森林官が、改めてニアッ サ州の森林管理の現状と課題を認識し、又その対策を検討することを通じて、 計画立案に必要な能力強化を図る機会となっていると考えています。



写真:郡調査の様子



写真:郡調査の結果をDIRF(森林資源イ ンベントリ部)内で取りまとめる様子

パイロット活動の実施について

成果2では、二アッサ州森林管理計画の策定と併せて、森林減少・劣化対策となるパイロット活動の実施を計画し ています。ニアッサ州森林管理計画策定に向けて実施された森林減少要因の聞き取り調査では、1)農地転用、2)薪 炭生産、および3)森林火災、が森林減少・劣化の主な要因として挙げられました。プロジェクトでは、聞き取り調 査結果とともに、DINAFやSPA等の関係機関からの森林減少・劣化対策の活動要望等を参考にして、ニアッサ州内で 実施が可能なパイロット活動リストを作成しました。このパイロット活動リストを基に2021年11月に関係者による コンサルテーションワークショップを開催して、プロジェクトで実施するパイロット活動内容を選定しました。選定 されたパイロット活動内容は2つです(表参照)。今後は、それぞれのパイロット活動を実施する集落の選定等を進 め、2022年4月頃からパイロット活動をスタートする予定です。

表:選定されたパイロット活動内容

ビーク&プロジェクト情報

No 活動内容 1 帯状伐採(5m幅)による保全区域のゾーニングと、住民活動 地域における生計向上活動(養蜂、果樹栽培等) 2 森林火災対策及び住民の森林火災に対する意識啓発



写真:ワークショップの様子

ニアッサ州での調査を終えて

【モザンビーク国の木工品】

モザンビークの樹の話

マプト市内のお土産さんでは、伝統布カプラナを 用いたバックや小物入れ、定番のキーホルダーなど とともに、木材を利用した人形や器などの木工品を 見ることができます。また、マプト市のマルジナル 通り沿いには、木工品の専門店があります。お店の 外にはテーブルなどの大物の家具類が(写真1)、店 内には人形や器、木箱などの小さな木工品がたくさ ん並べられています。中には、幅約1m×長さ約 2.5mの一枚板など、日本ではなかなか見ることので きない板材なども見ることができます(写真2)。



ニアッサ州森林/アグロフォレストリー植林部長のハウ ル・メッソです。州森林管理計画の策定に必要な情報収 集調査を4月と7月の2回に分けて実施しました。日本人 専門家が渡航できない事を理由に活動を止めない為に、 ニアッサ州の悪路に苦労しながら全16郡のフィールド調 査を達成しました。私は二アッサ州に着任したばかりな ので、今回の調査は現場を知って郡職員の苦労と森林セ クターの問題を知る貴重な機会となりました。郡ごとに 独自の森林減少要因があり、郡職員が対策を懸命に模索

している事も分かりました。 郡は今後のFLOMOZの 活動に期待をしています。 だからこそ、私もこの調査 結果を活かして具体的な

編集後記



写真:郡調査の様子

2019年4月から開始した本プロジェクトもついに折り返 し地点!カウンターパートも遠隔での協議にも慣れたよ うに感じます。【嶋岡啓太】

別添資料8ニュースレター(4)

モザンビーク国 持続可能な森林管理・REDD+プロジェクト NEWS LETTER 04



FLOMOZからのお知らせ

ニアッサ州森林管理計画のレビュー会合の開催と最終化に向けて

FLOMOZでは、ニアッサ州において、モザンビークで 初めてとなる州レベルの森林管理計画(PPIGF)の策定 を支援してきました。2022年の6月頃に州森林管理計 画の素案が完成しましたが、 PPIGFの最終化に向け て、関係者からの意見を徴収することを目的としたレ ビュー会合を、中央レベル及びニアッサ州レベルでそ れぞれ開催しました。レビュー会合は、中央・地方政 府関係部局、大学、研究機関、民間企業、NGO、ド ナーなど、ニアッサの森林に関わる幅広い関係者を招 待し、中央・地方合わせて100名近い関係者が参加す る会合となりました。

この会合は、森林総局(DINAF)総局長と州環境サービス(SPA)局長の議長の下、DINAF及び州SPAのカウンターパートが会議を主導し、 PPIGFの内容の発表から質疑応答まで、ほぼすべてカウンターパートが説明し、対応しました。

参加者からの質疑応答や意見交換では、会議の予定時 刻を大幅に超える活発な意見交換がなされました。特 にニアッサ州の参加者からは「移動耕作や薪炭材を利 用しているコミュニティへの支援こそ重要だ!」、

「州と郡でより情報共有や連携を図る必要がある!」 といった現場で日々活動する中での経験や問題意識に 基づいた意見が数多く表明されたのが印象的でした。

なお、ニアッサのレビュー会合は、モザンビークTV やラジオモザンビーク等の取材があり、会議の様子は テレビ、ラジオや新聞等を通じて、全国及びニアッサ 州内に広く周知されました。

今後、この会合を通じて参加者から出されたコメント を集約した上で、現在のPPIGF案を改善し、さらに土 地・環境省(MTA)の技術委員会及び諮問委員会のレ ビューや州レベルの審査を経て、PPIGFの最終化を進 める予定です。





中央及びニアッサ州のレビュー会合



de gestão de florestas



モザンビークTV、新聞記事

FLOMOZ

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成果1:国家森林モニタリングシステムの構築関連の活動について

2022年8月、衛星ベースの森林減少参照システム (Satellite-based Deforestation Reference System: SDRS)のDINAF職員向けの研修会が開催されました。事 前にJICA専門家からToT研修を受けたDIRF職員が講師を 務め、DINAF職員6名、学生インターン3名の合計9名が参 加し、SDRSの概要を理解した上で、使い方を学びました。 SDRSの活用方法についても議論が行われ、コンセッショ ンモニタリング時の申請書の確認、州から提出される現場 検証報告書確認時の活用可能性等が検討され、前者につい ては、コンセッション担当者向けのアプリケーションが JICA専門家の指導の下、DIRF職員により構築されました。 今後様々な分野に活用の幅が拡がることを期待します。 SDRSの構築に合わせて、森林資源情報プラットフォーム (FRIP)も併せて刷新され、NFMS文書や森林被覆図、関 連資料等の参照・ダウンロードができます。

https://www.dinaf.gov.mz/portal/apps/sites/#/frip-contents



SDRS研修の様子



成果2:パイロット活動の実施

州森林管理計画(PPIGF)策定で洗い出し、分析されたニアッ サ州における森林減少・劣化対策の一環として、本プロジェク トでパイロット活動に取り組んでいます。

2022年5月からMajune郡の集落において、 Eduardo Mondlane大学及びLurio大学と「森林火災管理及び住民の森林 火災に対する意識啓発」活動を開始しました。本活動はミオン ボ林に代表される熱帯乾燥林において、乾燥後期に発生する大 規模な森林火災の被害軽減を目的としたものです。対象区域に 防火帯を設置して、乾燥初期に燃材となる草本類や地衣類等を 安全に燃焼することで乾燥後期の森林火災の発生抑制、被害軽 減を図ります。また火入れにより農業や狩猟を行う慣習がある ことから、地域住民に対する森林火災管理の意識啓発も併せて 実施しています。



防火帯設置作業



将来を見据えた資金の確保に向けて



タスクチームのキックオフ

将来を見据えた森林保全活動と、FLOMOZの協力成果の 発展を資金面から促進すべく、緑の気候基金(GCF)へ の申請と、他ドナー資金との協調を目指しています。 GCFについてはIUCNが認証機関となり、DINAFをリー ダーとして他の政府機関、IUCN、FLOMOZ専門家により 構成されるタスクチームが動き始めました。現在、急 ピッチでコンセプトノートの作成が進行中です。また、 ニアッサ州ではPPIGFを求心力として、世界銀行やWCS などのドナー支援の協調が進むことが期待されます。

編集後記

日本は立冬を越えて肌寒い日々が多くなりました。モザンビークはこれから雨季に入ります。さて、プロジェクト第 2期も12月で終わります。今年はPPIGFもパイロット活動も動き出し、具体的にプロジェクト成果が見えてきました。2023年からの第3期もよろしくお願いします!(嶋岡啓太)

別添資料9ニュースレター(5)

モザンビーク国 持続可能な森林管理・REDD+プロジェクト NEWS LETTER 05



FLOMOZからのお知らせ

ニアッサ州森林管理計画の策定

FLOMOZでは、二アッサ州において、モザンビークで初めてとなる州 レベルの森林管理計画(PPIGF)の策定を支援していますが、いよい よ最終化に向けた協議を進めています。

2022年にニアッサ州PPIGFの原案を作成し、中央・地方政府関係部 局、大学、研究機関、民間企業、NGO、ドナーなど、二アッサの森林 に関わる幅広い関係者、合わせて100名近い関係者と協議をして提案 やコメントを取りまとめ、PPIGFの最終ドラフトを作成しました。

2023年4月より、同ドラフトを元に、中央レベルや地方レベルで PPIGFの最終承認に向けたハイレベル協議が開催されました。まず土 地環境省の技術委員会や諮問委員会で検討され、さらにニアッサ州の トップである州国務長官や州知事への説明会が開催されました。出席 した関係者は口をそろえて、「森林管理の方向性や取り組むべき活動 が示された」と好意的に評価しており、PPIGFの承認に賛同の意を示 していました。一方、同計画の実効性を高めるために、どのように予 算や人材を確保するのかについては、引き続き協議が必要となってい ます。

なお、上記のハイレベル協議では、すべてカウンターパートである森 林総局(DINAF)や二アッサ州環境サービス(SPA)がPPIGFを説明 し、また参加者からの質問にも対応しており、少しずつPPIGFに対す るオーナーシップが高まってきたことを実感できた機会となりました。 モザンビーク初のPPIGFの策定がプロジェクトの目指す成果ではあり ますが、5年かけてカウンターパートと七転八倒しながら取り組んで きた計画策定のプロセスそのものが、森林管理能力の強化に向けた一 助になったことを願っています。

PPIGF普及セミナーについて

FLOMOZは、これまでの二アッサ州の森林管理計画(PPIGF)策定 の取り組みを踏まえて、モザンビーク国PPIGF策定ガイドラインを 作成しました。2023年11月2日にはDINAF及び関係中央政府機関、 モザンビーク国内の全てのSPA及び州国土開発環境局(DPDTA)、 並びに関係機関(ドナー、大学等)から担当者を参集して、PPIGF 普及セミナーをマプト市で開催しました。二アッサ州PPIGFの策定 手法、手続き等をモデルとしたPPIGF策定ガイドラインを説明する とともに、グループワークとして各州の森林減少分析、森林管理の 課題、課題解決方法等を実施しました。



中央レベル(写真上)及び地方レベル (写真下) でのPPIGF承認にかかる協 議の様子



PPIGF普及セミナー開催状況 (2023年11月2日マプト市)

発行日:2024年2月

Facebook : https://fb.me/FLOMOZ2019 Twitter : https://twitter.com/FLOMOZ4











Direcção Nacional de Florestas (DINAF) Av. Josina Machel 537 2º andar, Maputo, República de Moçambique

NFMS文書について

成果1に関する活動は、「国家森林モニタリングシステム(NFMS)がREDD+と持続可能な森林管理の 為に運用されている」ことを達成するために実施されました。

NFMSは、REDD+の成果払いを得るためには構築が必要でなもので、その構築に際しては、UNFCCCでは、「NFMSは、透明性が確保され、時系列の一貫したデータ、情報を提供すること」が要求されてます。また、モザンビークが持続的森林管理を実践していくためにも重要です。

NFMS文書では、森林(面積や蓄積等)をどのように測定するかの方法論や、その方法でモニタリン グした結果をデータとして管理・分析する方法、 NFMSの実施体制や実施カレンダー等が規定される 必要があります。

FLOMOZでは、NFMS文書作成を支援して おり、NFMS文書Ver1が21年8月に開催 された第2回NFMS ワーキンググループ (WG)において承認され、同年9月にMTA (土地環境省)技術委員会において承認 されたことで、モザンビーク国として正 式な文書として位置づけられました。ま た、2022年12月にUNFCCCに提出された 第1次BUR(隔年報告書)においても本 NFMS文書について言及されています。

各種活動の進捗をふまえ、NFMS 文書を Ver2として2024年2月までに更新し、同 年2月または3月に開催予定の第3回WGに おいて承認するスケジュールで準備を進 めています。



SDRS関連の活動について

衛星ベースの森林減少参照システム(SDRS)は、 JJ-FASTやGLAD Alertsが運用する既存の(早期) 警報システムによって検出された森林伐採地や Hansen Tree Loss、Planetモザイク画像、NASA FIRMS等の森林モニタリングに資するデータが集 約されています。

SDRSは、2022年5月からテスト運用が開始され、 その活用方法について森林総局で検討が進められ てきました。

その結果、SDRSに搭載されているデータ(森林減 少地/衛星画像/火災情報)の検索・照会、森林 減少地抽出結果の月/年別・州/県別の視覚化、現地 調査結果の共有、コンセッションエリア周辺(域 外)の森林減少検出地の把握、現地調査用アプリ ケーションデータ設定が挙げられました。

これらの事例に併せて準備されたチュートリアル は、森林総局及び地方の森林行政官への研修資料 として活用される予定です。





SDRS活用事例 JJ-FAST/GLADによる森林減少地の月別・ 州/郡別の視覚化 (左: 2018年8月、右: 2023年8月)

編集後記

2019年に開始したFLOMOZプロジェクトも残すところ、あと少しとなり、カウンターパートたちとラストスパート をかけています。プロジェクト終了までの残りの期間も、本ニュースレターにお付き合いください。(嶋岡啓太)

別添資料10ニュースレター(6)

モザンビーク国 持続可能な森林管理・REDD+プロジェクト NEWS LETTER 06



FLOMOZからのお知らせ

プロジェクト終了のご挨拶

2019年4月8日に始まったFLOMOZは、この4月7日に無 事終了しました。思い起こせば、このNL1号を発行した のは、2020年1月とFLOMOZが始まって約10カ月後の ことでした。NL1号発行までの間に州森林管理計画の策 定等の対象州を治安面から変更せざるを得ず、開始直後 から、プロジェクトの枠組みにとって大きな変更に取り 組み、大変だったことが思い出されます。また、ようや くプロジェクト活動を進められることになったと思った ら、今度はコロナ禍に襲われ、これまた、特に州を対象 とした活動では、遅延が生じ、さて、どうなることかと 大変焦りも致しました。しかしながら、何とか成果とプ ロジェクト目標を達成して終了させることができました。 国レベルでは、NFMS文書を策定・更新し、モザンビー クのNFMSのベースを作りあげ、今後も更新していくシ ステムも作ることができました。また、ニアッサ州を対 象とした森林管理計画(PPIGF)を作成し、承認までこ ぎつけることができました。さらに、このPPIGFを他州



2024年3月15日に実施された第6回JCCの集合写真



ぎつけることができました。さらに、このPPIGFを他州 PPIGFがft或されたニアッサ州のミオンボ林 に広げるためのガイドラインも作成しました。また、ニアッサ州PPIGFや他州でのPPIGF展 開のための資金を組み入れたGCFの申請にも取り組みました。今後、これらの成果を使っ て、DINAFがより主体的に持続可能な森林管理を実践していくことを切に願う次第です。 皆様、本当に長い間のご支援有難うございました!(業務主任者・加藤和久)

第6回JCCの実施

2024年3月15日にFLOMOZプロジェクト最後のJCCが開催されました。JCCでは本プロジェ クトの目標と成果の指標の達成状況が確認されたり、プロジェクト終了後の展開について協 議されたりしました。NFMS文書の定期的な更新やPPIGFの他州への展開等について、モザ ンビーク国がプロジェクト終了後も継続的に実施することを期待してます! また、JCCに参加した次官からは、サプライズでニアッサ州PPIGFが承認されることが報告 されました!

編集後記

FLOMOZプロジェクトは、2024年3月にモザンビークでの現地活動を終えました。FLOMOZ開始時から業務進捗やモザンビーク情報をお伝えした本ニュースレターも今回が最終号です。今までありがとうございました!!(嶋岡啓太)

Facebook : https://fb.me/FLOMOZ2019 Twitter : https://twitter.com/FLOMOZ4







Direcção Nacional de Florestas (DINAF)

別添資料 11 NFMS 文書 Ver.2 の要約



モザンビーク国土地環境省 (独)国際協力機構



モザンビーク国

持続可能な森林管理・REDD+プロジェクト

技術協力成果品

NFMS 文書

和文要約



2024年4月

アジア航測株式会社

国際航業株式会社

本プロジェクトにおける成果 1 に関する活動は、「国家森林モニタリングシステム(NFMS)が REDD+と持続可能な森林管理の為に運用されている」ことを達成するために実施されるものであ る。NFMS は、REDD+の成果払い(例:緑の気候基金(GCF))を得るためには構築が必要であり、 その構築に際し、UNFCCC では、NFMS は、透明性が確保され、時系列の一貫したデータ、情報 を提供することが要求されている。また、モザンビークが持続的森林管理を実践していくために も NFMS は重要である。一般的に NFMS は、森林(面積や蓄積等)をどのように測定するかの方 法論や、その方法でモニタリングした結果をデータとして管理・分析する方法等が規定される必 要がある。そのような NFMS を構築し運用していくためには、指針となる NFMS 文書の作成が必 要であり、モザンビーク国内で共通かつ唯一の NFMS 文書作成を本プロジェクトでは支援した。

NFMSの構築ならびにNFMS文書を作成していく上で、NFMSの組織間調整メカニズムの確立と 運用が必要であった。そこで、組織間調整メカニズムの目的、体制、役割、メンバー、タスクフ ォース(TF)及びワーキンググループ(WG)概要等が記載された定義文書にDINAFのDIRF部長 及びFNDS MRV Unit長が合意してサインした(2019年8月)。

2019年から2024年の6年の間に、7回のTFと3回のWGを開催した。TFでは、NFMSの目的、方 法論、各組織の役割、モニタリング対象などの協議を通じて文書を作成し、2021年6月に開催し た第2回WG、同年8月のDINAF技術委員会の承認をふまえ、同年9月のMTA技術委員会にてNFMS 文書Ver1が承認された。その後、2022年8月に開催された第6回TFでNFMSVer1.1が承認され、 2024年3月に開催された第3回WGにてNFMSVer2.0が承認された。

以下にNFMS文書Ver2.0の目次と各章の概要を示す。

章1. 背景と目的

NFMS の構築及び運営を実施する背景として、以下の戦略、計画、報告書を整理した。

- ・国家 REDD +戦略(NRS)(2016 年)
- ・国家 REDD +行動計画(2016年)
- ・UNFCCCに提出された森林参照排出レベル(FREL)の修正版(2018年)、
- ・排出削減支払い協定(ERPA)(ZILMAP)(2019年)
- ・2035 年森林アジェンダ
- National Forestry Program (NFP)

NFMS は UNFCCC の下で REDD+を実施するために必要な 4 要件の一つであるだけでなく、成果 払いの対象となるための要件の一つでもある。

モザンビーク政府は、透明性、正確性、一貫性、完全性を備えた森林管理を強化するために、長期的な森林モニタリングを可能にする NFMS の構築に取り組んでいる。

また、NFMS は上記で整理された戦略、計画、モニタリング等に貢献することが期待されている。

NFMS 文書の目的としては、モザンビークとしての NFMS を定義し、開発し、運用するための明確な方向性を提供する。これにより、背景で述べられているような目的の達成が可能になる。

<u>章 2.</u> NFMS の目的

NFMS の目的は、以下とした(原文まま)。

NFMS is a system which enables accountable reporting of REDD+ results; monitoring the implementation and effectiveness of Policies and Measures (PaMs) for sustainable forest management which include national and international purposes and beyond REDD+; and robust IT system to support data management and transparency.

章3. コミュニケーションプロセスとアクションカレンダー

NFMS が活用可能なモザンビーク国内及び国際的に必要な報告対象を図1のように整理した。



上記を踏まえた報告カレンダーを表1に示す。

表 1 報告カレンダー

年			国際			準国			
	NDC	FREL/FRL	NC/BUR	REDD+ Technical Annex	FRA	NFP(2019-35)	NRS&AP(2016- 30)	ZILMP	州森林管理計画
状況	INDC 提出 (2015)	提出(2018) (期間は2003-13)	1st NC 提出 (2006) (対象年:2000)	現状計画なし	FRA2020 公開 (2020).	作成中	承認済(2016)	ERPA承認 (2019),改定 (2020)	ニアッサ州対象に 作成中
2020						作成中	年間森林減少、他	排出報告書 1 提 出	
2021	更新					必要に応じた更新	同上		
2022		有効期限10年の 終わり年					同上	排出報告書 2 提 出	
2023			1st BUR* 2nd NC**	BURのAnnexとし て提出済			同上		
2024		2ndNationalFRE/F RLの提出			tbc		同上		aaa州,bbb 州
2025	提出および更新		2nd BUR?				同上		ccc 州, ddd 州
2026			3rd NC2			+ +	同上		
2028					1	i	同上		
2029			3rd BUR?		tbc		同上		
2030	提出および更新					Ť.	同上		

報告カレンダーを達成する上で必要なデータのカレンダーを表2のように整理した。

表 2	必要なデータのカレンダー
-----	--------------

Year			LULC data	バイオマ	州MRV			
	Wall-to-wall	サンプ	゚リング	年間森	林減少	NFI	PSP	
スケール	全国	全国	ZILMP	全国	ZILMP	全国	全国	FNDSにて計 画中
最新の データ	2016	2016	2018	2018	2018	完了(2018)	IIAM, DINAF, FNDS, UEM	
2020			x	x	x		ステップワイズ で 実施	
2021			х	х	х		I	
2022			x	x	x			
2023			x	x	x			
2024	x	具体な計画は 現時点ではな し				具体な計画は 現時点ではな し		
2025				i			*	
2026		i						
2027				i		1		
2028		i		+				
2029	X					Ļ		
2030		•						

章 4. モザンビークの森林

章1 で述べられた参考資料等を中心にモザンビークの森林概況を整理した(表 3)。特に、NFMS が貢献可能な点を中心に整理した。

表3 モザンビークの森林概況

節	内容
4.1. 森林概況	森林と生態系、森林と社会経済、森林の所有権と使用権等
4.2 森林減少及び劣化原 因	過去の森林減少概況及び主要な森林減少及び劣化ドライバー
4.3 国家森林戦略及び組 織体制	政策及び法的枠組みの概況。機関毎の責任範疇

章 5. NFMS の技術的スコープ概要

各機能のスコープは以下のように整理された。

Monitoring

モニタリング機能は、種々の方法で森林のモニタリングを行い、森林面積の変化(森林破壊、森林劣化など)を特定するような活動とする。この機能は、政策と対応策(PaMs)の効果と森林の基本的な状態をモニタリングする。

MRV

 MRV システムは、REDD +活動のモニタリング及び報告するためのものであり、透明性、 一貫性及び(実施能力を踏まえた)精度を確保した上で、排出量及び吸収量の炭素勘定を 行う。 - すべての REDD +活動は、この機能を通じて完全に測定、報告、検証する必要がある。

Data management

 データ管理機能は、既存の IT システム(森林資源情報プラットフォーム(Forest Resource Information Platform: FRIP)や FNDS プラットフォーム等)において、モニタリングや MRV を通じて収集された関連情報/データを格納することによってデータベースを更新するように機能する。

章 6. 森林モニタリングの技術的プロセス

3つの機能毎の対象及び内容を以下のように整理した。

Monitoring

モニタリング機能には、3つのアプローチがある。

①衛星ベース

SDRS を含めた、衛星を活用した森林被覆及び被覆変化のモニタリングアプローチ。定期/不定期の森林区分図作成もここの機能に含まれる。

②フィールドベース

森林調査用の永久サンプリングプロット (PSP) やコミュニティベースの森林減少及び森林回復の モニタリングアプローチ

③記録ベース

コンセッションデータや木炭生産量といった記録ベースの森林減少/劣化、ロギングのモニタリン グアプローチ

MRV

2018年にUNFCCCに提出している FREL報告書でも用いられているデータセットは4km グリッドの格子点を Collect Earth を使って判読結果した値を元に面積を推計し、Activity data を作成している。Emission Factor は国家森林インベントリのデータを用いて推計された炭素量及び IPCC ガイドラインから引用した値を用いて作成されている。一方で世界銀行の FCPF 炭素基金に提出された排出削減プログラム文書(ERPD)においては同様のデータセットを用いて対象地域に特化したAD 及び EF を作成している。

モザンビークにおいては国レベルの MRV 実施時期は決まっていない。FREL 開発手法及びデータ と一貫性を維持して MRV を実施されることが国連気候変動枠組条約 COP において推奨されてい るため、FREL に準じた方法で炭素量の変化を推計していく。

Data management

FRIP や FNDS、FAO の支援で構築された森林行政分野における IT システムは、基本的には相互 にリンクすることでデータ重複や重複開発を避ける方針が示されている。データの共有を図る際 は ArcGIS Enterprise を活用し、効率的に実施する。以下に既存システム間の関係性を整理した図 を示す(図 2)。



図2FRIPと他システムとの関連性

章7. 将来の改善点

NFMS は順次、必要に応じて改善されていくシステムである点を踏まえて、以下の点が改善点として示されている。

- a) モニタリングを目的としたツールや方法、データの改善及び追加
 - ▶ 木炭生産データ
 - ▶ 植林計画データ
 - ▶ 森林火災
- b) IT システムの開発と更新

IT システムの連携に関して、より詳細にデータのダウンロード/編集/使用/相互利用するためのアクセスレベルを明確にして合意、開発する。また、各組織の役割と責任も同時により明確にする。

c) SDRS の活用

詳細は後述するが、開発予定のシステムをよりユーザーが使いやすいように改良する。

ただし、JJ-FASTは2024年4月以降サービスが更新されないことに留意する。

章 8. 組織間調整(実施体制)

NFMS 運営に関係する組織、DINAF、FNDS、ANAC、DINAB、DINAMC、DINAT、AQUA、IIAM、 UEM、AMOMA 等の組織概要が整理された。 データ管理の責任組織をデータ作成、質の評価、承認の観点から整理された表を以下に示す(表 4)。

	データ作成	質の評価	承認		
	サンプリング				
	FNDS MRV ユニット				
LULC data	Wall-to-wall	DINAF 及び UEM (as a technical	MTA-DINAF		
Lobe data	FNDS MRV ユニット及び DINAF(DIRF)	resource)			
	年間森林減少				
	FNDS MRV ユニット				
	国家森林インベントリ				
バイオマス	DINAF (DIRF) 及び FNDS MRV ユニット		MTA-DINAF		
データ	永久サンプリングプロット	DINAF			
	IIAM、FNDS, DINAF, UEM				
州 MRV	FNDS 及び支援を受けた地元コミュニティ	DINAF	MTA-DINAF		

表4 データ管理責任

次に、国内外への各種報告における役割分担を表5に示す。

表5 報告プロセス

	報告書作成	報告書確認	承認	提出
UNFCCC (FREL/FRL, NC/BUR, REDD+ TA)	FNDS MRV ユニッ ト及び DINAF (DIRF)	DINAF 及び UEM (as a technical resource)	МТА	DINAMC
FRA	DINAF (DIRF)	DINAF	MTA	DINAF
NFP	DINAF	DINAF	MTA	—
NRS&AP	FNDS	DINAF	MTA	—.
ZILMP	FNDS MRV Unit	FNDS	MADER	FNDS

<u>章 9. 予算</u>

NFMS 運営に必要と想定される予算を表 6にまとめた。

表6 予算

							年						
	アクション	タイプ	スケール	2020	2021	2022	2023	2024	2025	2025-2030	Sub-total	資金源	備考
													(協議中)
													Wall-to-wall マップ x 1
		Wall-to-wall	王					260,000	60,000	60,000	380,000	未定	変化抽出 x 2
			Ξ								-	ditto	同上
2		ADのためのサン											資金:MOZFIPおよび ERPA支
Ë		プリング	ZILMP		100,000	100,000	100,000	100,000	100,000		500,000	FNDS	払い
		年間森林減少モ	H				上記に含む				上記に含む	FNDS	同上
		ニタリング	ZILMP				ditto				上記に含む	FNDS	同上
	1111111111	NFI	H							2,700,000	2,700,000	未定	時期協議中
	117 477-3	PSP	Ξ		180,000	180,000	180,000	180,000	180,000		900,000	未定	協議中
	コミュニティ	#MRV	計画中								-	FNDS	
S.	準リアルタイム森林												
- 8	減少モニタリング	SDRS									-		
1	森林劣化モニタリン												
쁖	コンセッション												
- Ř	モニタリング										-		
											-		
45 mil	DINAF IT システム	FRIP	Ξ		49,000	49,000	49,000	49,000	49,000	195,000	440,000	未定	
1.2		FNDS MRV	国/準国/プロ										
11 T	THEOT PATA	プラットフォーム	ジェクト								-	FNDS検討	
	1	合計			329,000	329.000	329.000	589.000	389.000	2.955.000	4.920.000		

別添資料 12 新 FRIP/SDRS システム運用管理マニュ アルの要約



モザンビーク国土地環境省 (独)国際協力機構



モザンビーク国

持続可能な森林管理・REDD+プロジェクト

技術協力成果品

新 FRIP/SRDS 運用管理マニュアル

和文要約



2024 年 4 月 独立行政法人 国際協力機構 アジア航測株式会社

国際航業株式会社

第1章 概要

1.1.目的

新森林資源情報プラットフォーム (Forest Resource Information Platform: FRIP) /衛星ベースの森林減少参照システム (Satellite-based Deforestation Reference System: SDRS)の運用管理マニュアル(以下「本マニュアル」という)の目 的は、FRIP/SDRS のシステム運用に必要な内容について記述し、FRIP/SDRS が適切に 運用管理されること支援するものである。

本マニュアルを理解するためには、以下の知識が必要となる。

- 1) オペレーティングシステム: Windows Server 2016 Standard
- 2) GIS ソフトウェア:
 - a) ArcGIS Enterprise and Portal for ArcGIS Ver. 10.8.1 (Esri 社製)
 - b) ArcGIS Desktop Ver. 10. 8.1 or later (Esri 社製)
- 3) データベース管理システム: PostgreSQL 11
- 4) ハードウェア運用管理

ArcGIS Enterprise の管理者向け及び利用者向けのマニュアルは、Esri 社が提供している以下の Web サイトを参照のこと。

i) 利用者向け Portal for ArcGIS の使い方

<u>https://enterprise.arcgis.com/en/portal/10.8/use/what-is-portal-for-arcgis-.htm</u>

ii) 管理者向け Portal for ArcGIS のインストール、管理、セキュリティ保護

<u>https://enterprise.arcgis.com/en/portal/10.8/administer/windows/what-is-</u> portal-for-arcgis-.htm

1.2. 運用管理ポリシー

運用管理ポリシーは次の通りとする。

1.2.1. システム管理体制

FRIP/SDRS のシステム管理体制 (グループ)は以下の通り。

- 1) FRIP/SDRS 所有者: MTA
- 2) FRIP/SDRS 管理者: DINAF
- 3) FRIP/SDRS 利用者:
 - a) システム管理者: DIRF 及び MTA のネットワーク管理者
 - b) データベース管理者: DIRF
 - c) データ提供者: DIRF
 - d)利用者:政府機関、大学やNGOを含む森林管理関係機関、一般利用者
- 4) 技術サポート:
 - a) ハードウェア納入者: サーバー、ストレージ装置、無停電電源装置 (NEC)
 - b) ソフトウェア納入者: ArcGIS (Esri 南アフリカ (GIMS))

1.2.2. 各グループの責任と役割

各グループの責任と役割を表 1-1 に示す。

グループ	責任と役割
FRIP/SDRS 所有者	a) FRIP/SDRS の業務プロセスの範囲を決定する。
	b)FRIP/SDRS を活用し、業務プロセスを効率化する。
	c) FRIP/SDRS を運用するための人的資源、予算、機材を確保する。
FRIP/SDRS 所有者	a) FRIP/SDRS に搭載する情報資産の価値と重要性を判断する。
	b)情報公開レベルを特定する。
	c)監査及びモニタリングを適切に行う。
システム管理者	a) FRIP/SDRS のハードウェア及びネットワーク装置を管理する。
	b) FRIP/SDRS のハードウェア及びネットワーク装置の稼働状況を確
	認する。
	c)セキュリティ対策を行う。
データベース管理者	a) FRIP/SDRS のデータベースを管理する。
	b) データベースをバックアップする。
データ提供者	a) FRIP/SDRS で利用するデータベースを作成する。
	b) FRIP/SDRS で利用するデータベースを維持管理する。
政府機関	a) インターネット経由で FRIP/SDRS の情報を閲覧する。
	b) Portal for ArcGIS を通じて森林管理に関する地理空間情報を活

表 1-1 各グループの責任と役割

グループ	責任と役割		
	用する。		
一般利用者	a) インターネット経由で FRIP/SDRS で公開されている情報を閲覧す		
	る。		
	b)インターネット経由で森林資源に関する情報を検索する。		
ハードウェア納入者	a) ハードウェアのテクニカルサポート		
	b) トラブルシューティング		
ソフトウェア納入者	a) ソフトウェアのテクニカルサポート		
	b)トラブルシューティング		

出典: FLOMOZ

1.3.FRIP/SDRS の機器構成

1.3.1. ハードウェア機器

FRIP/SDRS の機器は DINAF 内のサーバー室及び国立電子政府研究所 (Instituto Nacional de Governo Electónico: INAGE)に設置されている (表 1-2)。

機器	製品名	数量	備考
仮想サーバー/GIS サーバ	NEC Express 5800/R 120h-2M	1	無償資金協力
<u> </u>			
ストレージ装置	NEC iStorage M12e	1	無償資金協力
無停電電源装置	APC SMX3000RMHV2U	1	無償資金協力
サーバーラック	NEC N8140-510	1	無償資金協力
スイッチングハブ	TP-Link 8 port	1	
Web サーバー	Virtual server	1	INGAGE

表 1-2 DINAF サーバー室及び INAGE に設置されているハードウェア機器

出典: FLOMOZ

1.3.2. ソフトウェア

FRIP/SDRS で利用している Web サーバー、GIS サーバーは表 1-3 とおりである。 ArcGIS やマルウェア対策ソフトウェア (Kaspersky)は商用製品であり、システムを適 切に運用するためには年間保守費用が必要となる。

表 1-3 FRIP/SDRS で利用しているソフトウェア

項目	製品名	数量	備考
GIS ソフトウェア	Esri ArcGIS Enterprise	1	無償資金協力
	Advance Ver. 10.8.1		
GIS ソフトウェア	Esri ArcGIS License manager	1	無償資金協力/
(ライセンス管理)	Ver. 10. 2. 2		但し、保守期限切れ
GIS ソフトウェア	Esri ArcGIS Desktop (SU)	1	FAO/
	Ver. 10.8.1		GIS サーバー用
データベース管理ソ	PostgreSQL 11	1	オープンソースソフトウ
フトウェア			エア
仮想化ソフトウェア	VMware ESXi 6.7.0 Update 3 (Build 14320388)	1	
-------------------	---	---	--
マルウェア対策ソフ トウェア	Kaspersky Endpoint Security for Windows 11.1.0.15919	1	

出典: FLOMOZ

1.4. FRIP/SDRS のネットワーク構成

1.4.1. ネットワーク構成

FRIP/SDRS の GIS サーバーは仮想サーバーソフトウェア (VMware)上にインストー ルされ DINAF のサーバー室に設置されている。Web サーバーは、INAGE が運営するデ ータセンター内の仮想サーバー内にインストールされている。GIS サーバーとWeb サ ーバーは国家ネットワーク網 (Gov. net)を経由して接続されている。

一般利用者は、Web サーバーを経由して FRIP/SDRS ヘアクセスすることができる。

1.4.2. SSL 証明書

ArcGIS Server と Portal for ArcGIS は、全ての通信で暗号化(HTTPS)する必要があるため、Web サーバーに SSL 証明書をインストールする。

第2章 サーバー構成

2.1. FRIP/SDRS のサーバー関連機器

DINAF のサーバー室に設置されている FRIP/SDRS のサーバー関連機器は、一つのサ ーバーとストレージ装置で構成されている。サーバーには仮想化ソフトウェアである VMware ESXi がインストールされ、FRIP/SDRS はその仮想環境上で動作している。

2.1.1. サーバーとストレージ装置の設定

サーバーとストレージ装置の設定情報は表 2-1 及び表 2-2 のとおり。

ホスト	卜名						
		localhost.DINAT.Local					
IPアドレス		***. ***. ***. ***					
サブネ	ネットマスク	***. ***. ***. ***					
MAC ア	イドレス	***. ***. ***. ***					
デフォ	ォルトゲートウェイ	***. ***. ***. ***					
DNS サ	-ーバー1	***. ***. ***. ***					
DNS サ	バー2	***. ***. ***. ***					
NTP サ							
ドメイ	イン/ワークグループ						
製造者		NEC					
モデル	u	Express 5800/R 120h-2M					
製品番	6号	JPN9114073					
C	CPU	8 CPUs x Intel(R) Xeon(R) Silver 4110 CPU @					
		2.10GHz					
2	メモリ	31.65 GB					
機ノ	ハードディスク	1. OTB					
器 R	RAID						
\sim	ネットワークコントローラー						
ッう	光学ドライブ	_					
クジ	グラフィックボード						
5	キーボード	None					
~	マウス	None					
	ディスプレイ	-					
SC 0	OS	VMware ESXi 6.7.0 Update 3 (Build 14320388)					
Ľ	UPS 管理ソフトウェア						
ユ 1	管理者ユーザー	Root					

表 2-1 サーバーの設定情報

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_			1, + 1 on an joi	110010 9979 976
	管理者パスワード	*****		

*1: ソフトウェア構成

出典: FLOMOZ

表 2-2 ストレージ装置の設定値

_						
項目		内容				
製造者		NEC				
モデル		iStorage M12e				
製品	番号					
松松	ホストインターフェース	Fiber Channel				
器	ドライブ数					
7ス	ディスプレイ容量	14. 55TB				
\sim	ディスクタイプ					
ッ	キャッシュメモリ	32GB				

出典: FLOMOZ

2.1.2. サーバー及びストレージ装置の設置場所

サーバー及びストレージ装置、無停電電源装置は DINAF のサーバー室内のラックに 格納されている。

2.2. 仮想化ソフトウェア

サーバーには仮想化ソフトウェア「VMware ESXi」がインストールされ、ハイパーバ イザーが稼働している。仮想マシンを管理するためには、他の端末からサーバーへア クセスして行う。現在は一つの仮想環境が設定されている。

2.3. 仮想環境設定

2.3.1. GIS サーバーの設定

GIS サーバーには 4 コアの CPU、16GB メモリ、3.0TB のディスク容量を割当てている。GIS サーバーの役割は、地理空間情報を格納し、そのデータを Web マップ形式で 公開することである。

2.3.2. Web サーバーの設定

Web サーバーは INAGE 内の物理サーバー内に、2 コアの CPU、8GB メモリ、800GB の ディスク容量が割り当てられている。Web サーバーの役割は、Gov.Net 及びインター ネット回線を通じて、利用者のリクエストに基づいてWeb アプリケーションを表示す ることである。

2.3.3. グローバル IP アドレス

Web サーバーの FQDN (Full Qualified Domain Name)は<u>www.dinaf.gov.mz</u>であり、 グローバル IP アドレスが割り当てられている。

2.3.4. Hosts ファイルの設定

各端末からシステム管理用に GoV. Net を通じて GIS サーバーや Web サーバーにアク セスするためには、各端末の Hosts ファイルを設定する必要がある。

2.3.5. アクセスポイント

GIS サーバー及び Web サーバーにシステム管理のためにアクセスする場合は、アク セスポイントを変更する必要がある。

2.3.6. サーバー疎通テスト

GIS サーバーや Web サーバーとの疎通ができているか、コマンドプロンプトの Ping コマンドで確認する。

2.3.7. GIS サーバーへのアクセス

GIS サーバーのシステム管理、サーバー管理を行う際は、リモートデスクトップ等のアプリケーションを利用してアクセスする。

2.3.8. エクスプローラーによる GIS サーバーへのアクセス

GIS サーバーへのファイルコピーは、Windows エクスプローラーを用いてアクセス する。

2.3.9. Web サーバーへのアクセス

Web サーバーのシステム管理、サーバー管理を行う際は、リモートデスクトップ等のアプリケーションを利用してアクセスする。

2.3.10. エクスプローラーによる GIS サーバーへのアクセス

Web サーバーへのファイルコピーは、Windows エクスプローラーを用いてアクセス する。

第3章 データベース構成

3.1. PostgreSQL の設定

PostgreSQL はオープンソースのリレーショナルデータベースである。ArcGIS 製品 はPostgreSQLをサポートし、ArcGISで利用可能なジオメトリデータに対応している。

3.1.1. PostgreSQL のインストール

(1) インストーラーファイル

PostgreSQL11のインストーラーは GIS サーバー内のフォルダに格納されている。

(2) インストール

PostgreSQL のインストールはデフォルト設定で行う。インストール作業中に設定し

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たデータベースの管理者のパスワードは忘れないようにすること。

3.1.2. PostgreSQLの設定

(1) PostgreSQL の設定情報

PostgreSQLの設定情報はのとおり。

項目	内容	備考
管理者名	postgres	データベース管理用
管理者パスワード	****	
Sde ユーザー名	Sde	ArcMap や ArcCatalog 上で新 規にデータベース作成用
Sde ユーザーパスワ ード	****	
インストール先	C:¥Program Files¥PostgreSQL¥11	
データフォルダ	C:¥Program Files¥PostgreSQL¥11¥data	
コンポーネント	PostgreSQL Server, pgAdmin 4, Stack Builder, Command Line Tools	
ポート	5432	

出典: FLOMOZ

(2) pg_hba. conf ファイルの修正

外部端末から PostgreSQL ヘアクセスするために pg_hba. conf ファイルを修正する。

(3) st_geometry.dllの設定

PostgreSQL 上でエンタープライズジオデータベースを新規に作成するため、 st_geometry.dllを所定のフォルダに格納する。

3.2.pgAdmin 4

pgAdmin は PostgreSQL を管理するためのアプリケーションである。

3.2.1. pgAdmin 4 へのアクセス

pgAdmin 4はWebベースのアプリケーションであるため、Webブラウザ経由で使用 する。

3.2.2. GIS サーバーへの接続

pgAdmin4のWebアプリケーション起動後、設定したパスワードを入力し、GISサーバーへ接続する。

3.3. データベースのバックアップ

ハードディスクの障害や誤操作によるデータ損傷を防止するために、データベース は定期的にバックアップする必要がある。pgAdmin4を用いてバックアップする。デー タベースバックアップに関する資料は、以下のEsriのWebサイトを参照のこと。

https://www.pgadmin.org/docs/pgadmin4/development/backup_dialog.html

3.3.1. データベースバックアップ手順

バックアップ対象のデータベースを選択し、バックアップツールを起動し、バック アップファイル名、フォーマット、エンコーディング等を設定し実行する。

3.3.2. データベース全体のバックアップ手順 Procedure of server backup

pgAdmin 4 はデータベース全体をバックアップすることが可能である。pgAdmin4 の アプリケーション上で、バックアップサーバーツールを起動し、ファイル名及びエン コーディングを設定して実行する。

第4章 ArcGIS Enterprise 構成

FRIP/SDRS 用の GIS サーバー及び Web サーバーには、ArcGIS Enterprise Ver. 10. 8. 1 がインストールされている。ArcGIS Enterprise は ArcGIS Server、ArcGIS Data Store、 ArcGIS Web Adaptor、 Portal for ArcGIS のアプリケーションで構成され、 サーバー の役割に応じてアプリケーションがインストールされる。

4.1. GIS サーバー上の ArcGIS Enterprise 設定

4.1.1. GIS サーバーのインストールアプリケーション

GIS サーバーには表 4-1 のアプリケーションがインストールされている。

アプリケーション名	バージョン	備考
ArcGIS Server	10.8.1	
ArcGIS Data Store	10.8.1	Arecis Fretoring Adversed
Portal for ArcGIS	10.8.1	ArcGIS Enterprise Advanced
ArcGIS Web Adaptor (IIS) – portal	10. 8. 1	

表 4-1 GIS サーバー上にインストールされているアプリケーション

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ArcGIS Web Adaptor (IIS) - server (443)	10. 8. 1	
ArcGIS Desktop SU	10.8.1	FAO のライセンスを移行
ArcGIS License Manager	10.2.2	旧サーバーから移行

出典: FLOMOZ

4.1.2. ArcGIS ライセンスサーバー

GIS サーバーには、旧サーバーで利用していた ArcGIS 10.2.2 のライセンスマネー ジャーをインストールしている。DINAF は計 12 の ArcGIS Desktop 製品のライセンス を保有している。

但し、ArcGIS Enterprise Ver.10.8.1 のジオデータベースを管理するためには、 ArcGIS Desktop Ver.10.6 以降が必要になる。

4.1.3. ArcGIS Desktop 用 ArcGIS Administrator

ArcGIS Desktop 10.2.2 を各端末から利用するためには、ライセンスマネージャー に GI サーバーの IP アドレスを登録する。

4.1.4. ArcGIS Server のインストール

(1) インストーラーファイル

ArcGIS Server のインストーラーは GIS サーバー内のフォルダに格納されている。

(2) インストール

Basically, the default setting are fine for installing ArcGIS Server のイ ンストールはデフォルト設定で行う。インストール作業中に設定した ArcGIS Server のアカウント「arcgis」のパスワードは忘れないこと。ArcGIS Server のインストー ル方法は以下の Esri 社の Web サイトを参照のこと。

<u>https://enterprise.arcgis.com/en/server/10.8/install/windows/install-</u> arcgis-server-on-one-machine.htm

(3) ArcGIS Server Manager へのアクセス

ArcGIS Server Manager へは、Web ブラウザに以下のURL を入力しアクセスする。 ログイン画面後、ユーザー名、パスワードを入力する。

4.1.5. ArcGIS Web Adaptor のインストール (GIS サーバー)

(1) インストーラーファイル

ArcGIS Web Adaptor のインストーラーは GIS サーバー内のフォルダに格納されて

いる。

(2) インストール

ArcGIS Web Adaptor のインストールはデフォルト設定で行う。ArcGIS Web Adaptor のインストール方法は以下の Esri 社の Web サイトを参照のこと。

<u>https://enterprise.arcgis.com/en/web-adaptor/10.8/install/iis/install-</u> arcgis-web-adaptor-portal.htm

4.1.6. ArcGIS Data Store のインストール

```
(1) インストーラーファイル
```

ArcGIS Data Store のインストーラーは GIS サーバー内のフォルダに格納されている。

(2) インストール

ArcGIS Data Store のインストールはデフォルト設定で行う。.ArcGIS Data Store のインストール方法は以下の Esri 社の Web サイトを参照のこと。

<u>https://enterprise.arcgis.com/en/data-store/10.8/install/windows/welcome-</u> to-arcgis-data-store-installation-guide.htm

4.1.7. Portal for ArcGIS のインストール

(1) インストーラーファイル

Portal for ArcGIS のインストーラーは GIS サーバー内のフォルダに格納されている。

(2) インストール

Portal for ArcGIS のインストールはデフォルト設定で行う。インストール作業中 に設定した Portal for ArcGIS のアカウント「portaladmin」のパスワードは忘れな いこと。Portal for ArcGIS のインストール方法は以下の Esri 社の Web サイトを参照 のこと。

<u>https://enterprise.arcgis.com/en/portal/10.8/install/windows/welcome-to-</u> the-portal-for-arcgis-installation-guide.htm

4.1.8. ArcGIS Web Adaptor のインストール (GIS サーバーポータル用)

(1) インストーラーファイル

ArcGIS Web Adaptor のインストーラーは GIS サーバー内のフォルダに格納されて

いる。

(2) インストール

ArcGIS Web Adaptor のインストールはデフォルト設定で行う。

4.1.9. ArcGIS Server と Porta for ArcGIS の連携

(1) ArcGIS Server を連携サーバーとして登録

Portal for ArcGIS と ArcGIS Server を連携するために ArcGIS Server を連携サー バーとして登録する。登録は、Portal for ArcGIS 上で行う。

(2) ArcGIS Server をホスティングサーバーとして登録

続いて、Portal for ArcGIS を使用するために ArcGIS Server をホスティングサー バーとして登録する。

4.2. Web サーバー上の ArcGIS Enterprise の設定

4.2.1. Web サーバーのインストールアプリケーション

Web サーバーには表 4-2 のアプリケーションがインストールされている。

表 4-2 Web サーバー上にインストールされているアプリケーション

アプリケーション名	バージョン	備考
ArcGIS Web Adaptor (IIS) - portal	10.8.1	
ArcGIS Web Adaptor (IIS) - server (443)	10. 8. 1	ArcGIS Enterprise Advanced
ArcGIS License Manager	2020.0	現在、未使用

出典: FLOMOZ

4.2.2. ArcGIS Web Adaptor のインストール (Web サーバー)

(1) インストーラーファイル

ArcGIS Web Adaptor のインストーラーは Web サーバー内のフォルダに格納されている。

(2) インストール

ArcGIS Web Adaptor のインストールはデフォルト設定で行う。ArcGIS Web Adaptor のインストール方法は以下の Esri 社の Web サイトを参照のこと。

https://enterprise.arcgis.com/en/web-adaptor/10.8/install/iis/install-

arcgis-web-adaptor-portal.htm

- 4.2.3. ArcGIS Web Adaptor のインストール (Web サーバーポータル用)
 - (1) インストーラーファイル

ArcGIS Web Adaptor のインストーラーは Web サーバー内のフォルダに格納されている。

(2) インストール

ArcGIS Web Adaptor のインストールはデフォルト設定で行う。

第5章 ジオデータベース利用手順

ArcGIS Server 上で管理されているエンタープライズジオデータベースは ArcGIS Desktop から接続することができる。

5.1. ArcGIS Desktop によるジオデータベースへの接続

ArcGIS Desktop からデータベース接続を選択し、データベース、インスタンス、ユ ーザー名、パスワードを入力して接続する。

5.2. 新規エンタープライズジオデータベースの作成

ArcGIS Desktop のデータ管理ツールより新規エンタープライズデータベースの作成を実行し、データベース、インスタンス、データベース名、データベース管理者、 データベース管理者パスワード、ジオデータベース管理者を入力し実行する。

データベースを新規に作成する場合はライセンス管理ファイル (keycodes) が必要 となる。

5.3. 新規フィーチャクラスの作成

データベース接続後、ArcGIS Desktop の新規フィーチャクラスを実行し、フィーチャクラス名、ジオメトリタイプ、座標系、属性フィールド等を設定し、作成する。

5.4.登録済みジオデータベース

5.4.1. ジオデータベースの一覧

登録済みジオデータベースは表 5-1 のとおり。

ジオデータベース名 内容 備考 dinafdb DINAF 内共有用ジオデータベース DIRF 内共有ジオデータベース dirf 旧サーバーで公開されていた空間情報 現在未使用 moz_frip 土地利用被覆図 2013 年版 moz_frip_lulc SDRS 用データベース。JJ-FAST、GLAD moz_sdrs Alert 等のデータを格納 SDRS 用データベース。FNDS からのデータ moz_sdrs_FNDS を格納。 SDRS 用データベース。Hansen Tree Loss moz_sdrs_Hansen データを格納

表 5-1 FRIP/SDRS の登録済みジオデータベース

出典: FLOMOZ

5.4.2. 各ジオデータベースの内容

(1) moz_sdrs

本データベースは、JJ-FAST や GLAD Alert から収集された森林減少地データ及び SDRS の運用に必要な情報が格納されている。

(2) moz_frip_lulc

本データベースは、州単位の土地利用被覆図 2013 年版が格納されている。

(3) moz_sdrs_FNDS

本データベースは、FNDS が作成している年間森林減少データが格納されている。

(4) moz_sdrs_Hansen

本データベースは、Global Forest Change から収集した Hansen Tree Loss が格納 されている。

(5) moz_firp

本データベースは、前 FRIP で使用されていた森林管理に関する空間データが格納 されている。

(6) diafdb

本データベースは、DINAF内で空間データを共有するためのデータベースとして準備された。FRIP/SDRSでは使用しない。

(7) dirf

本データベースは、DIRF内で空間データを共有するためのデータベースとして準備 された。FRIP/SDRSでは使用しない。

第6章 ArcGIS Server 利用手順

ArcGIS Server へは ArcGIS Desktop から接続して設定することができる。

6.1.GIS サーバーへの接続

ArcGIS Desktop から GIS サーバー接続を選択し、サーバーURL、サーバー種別、ユ ーザー名、パスワードを入力して接続する。

6.2. マップサービスの確認

GIS サーバー接続後、マップサービスを選択し、マップサービスの内容を確認する。

6.3.登録済みマップサービス

6.3.1. マップサービスの一覧

登録済みマップサービスの一覧は表 6-1 のとおり。

モザンビーク共和国持続可能な森林管理・REDD+プロジェクト

新森林資源情報プラットフォーム(FRIP)/衛星ベースの森林減少参照システム(SDRS))

運用管理マニュアル 第1版 (要約版) 第7章 Portal for ArcGIS 利用手順

マップサービス名	フォル ダ	MXD ファイル名	MXD フ オルダ	内容	
JJ_FAST	SDRS	JJ-FAST_pgsql.mxd	(A)	JJ-FAST	
GLAD_alert	SDRS	GLAD_alert_pgsql.mx d	(A)	GLAD Alerts (現年)	
MZ_NFMS	SDRS	MZ_NFMS_pgsql.mxd	(A)	行政界等	
SDRS_archive_data	SDRS	SDRS_archive_data_p gsql.mxd	(A)	GLAD Alerts (過年度 分)、FNDS, Hansen Tree Loss	
SDRS_CF_LS	SDRS	SDRS_CF_LS. mxd	(A)	コンセッション、シンプ ルライセンス	
Mz_FRIP_FCLUM_201 3	LULC	Mz_FRIP_FCLUM_2013p gsql.mxd	(B)	Tile cache (Level 5 to 17)	
Mz_FRIP_20180228	FRIP	Mz_FRIP_20180228_pg sql.mxd	(C)	前 FRIP のデータ	

表 6-1 登録済みマップサービス

GIS サーバー上の MXD ファイルが格納されているフォルダ名:

(A) C:\FRIP\SDRS\MXD\PostgreSQL, (B) C:\FRIP\Tilesevice, (C) C:\FRIP

出典: FLOMOZ

6.3.2. マップサービスの内容

(1) JJ_FAST

本マップサービスは、JJ-FAST から収集した森林減少地データ (JJ-FAST Quality Check 及び JJ-FAST Quick Look Product)が含まれている。

(2) GLAD_alert

本マップサービスは、GLAD Alert から収集した森林減少地データから抽出したポリ ゴンデータ (当該年度)が含まれている。

(3) MZ_NFMS

本マップサービスは、行政界やニアッサ保護区等のデータが含まれている。

(4) SDRS_archive_data

本マップサービスは、GLAD Alert (過年度分)や FNDS の年間森林減少地、Hansen Tree Loss のデータが含まれている。

(5) SDRS_CF_LS

本マップサービスは、森林コンセッションやシンプルライセンスのデータが含まれている。

(6) Mz_FRIP_FCLUM_2013

本マップサービスは、土地利用被覆図 2013 年版のデータが含まれている。

第7章 Portal for ArcGIS 利用手順

Portal for ArcGIS は、データやマップ、シーン、アプリケーションを組織内で共 有することができる ArcGIS Enterprise 製品のコンポートネントである。

7.1. Portal for ArcGIS への接続

Portal for ArcGISはWebアプリケーションであるため、Webブラウザを経由して アクセスする。WebブラウザのPortal for ArcGISのURLを入力し、ユーザー名、パ スワードを入力してサインインする。

7.2. ユーザー管理

7.2.1. ユーザータイプ

DINAF は ArcGIS Enterprise Advance のライセンスを保有しており、10の Creator ライセンス、50の Viewer ライセンスが有効である。

Creator ユーザーは、Portal for ArcGIS へのデータのアップロード、マップやア プリケーションの作成、解析ツール等が利用できる。

Viewer ユーザーは、Portal for ArcGIS 上に登録され、一般公開されているコンテ ンツの他に組織内に公開されたデータやマップ、アプリケーションを

7.2.2. メンバーアカウントリスト

Portal for ArcGIS に登録できるユーザ数は限られています。そのため、ユーザの 登録状況を適切に管理する必要がある。管理者は、会員アカウントの管理や Portal for ArcGIS の利用状況の確認を行うことができる

7.2.3. 新規ユーザー作成

アカウントを持たないユーザーは公開されたものしか参照できないため、組織内で

モザンビーク共和国持続可能な森林管理・REDD+プロジェクト 新森林資源情報プラットフォーム(FRIP)/衛星ベースの森林減少参照システム(SDRS)) **運用管理マニュアル 第1版 (要約版)** 第7章 Portal for ArcGIS 利用手順

共有された情報を参照したい場合は、システム管理者からユーザーアカウントを発行 してもらう必要がある。

システム管理者は、Portal for ArcGIS 上で、新規にユーザーアカウントを作成す ることができる。

7.3. コンテンツ管理

コンテンツページで ArcGIS Server 上で公開されているマップサービスや Web アプリケーション等を管理することができる。

7.4.新 FRIP の Web サイト

新 FRIP の Web サイトは Portal for ArcGIS Ver. 10.8.1 で構築され、新 FRIP の Web サイトの URL (英語版、ポルトガル語版)は以下のとおり。

英語版:

https://www.dinaf.gov.mz/portal/apps/sites/#/frip-contents

ポルトガル語版:

https://www.dinaf.gov.mz/portal/apps/sites/#/frip-contents-pt

7.4.1. 新 FRIP の概要

(1) 新 FRIP の構成

新しい FRIP のウェブサイトは、1 つのトップレベルページ、9 つの第 2 レベルページ、3 つの第 3 レベルページ、3 つのウェブアプリケーションで構成されている。これらのコンテンツは、以前の FRIP サイトから移行され、更新されたものである。サイト管理者は、HTML やプログラミングをすることなく、サイトやページの新規作成、コンテンツの編集・公開、Web アプリケーションの設定、他サイトとの URL リンク設定などを行うことができる。

(2) 新 FRIP のページリスト

新 FRIP の各ページは表 7-1 及び表 7-2 のとおり。

#	タイトル	フォルダ	作成者	公開レ ベル	内容
1	Monitoring-EN	FLOMOZ	FLOMOZ	公開	モニタリング

表 7-1 新 FRIP ページリスト (英語版)

モザンビーク共和国持続可能な森林管理・REDD+プロジェクト 新森林資源情報プラットフォーム(FRIP)/衛星ベースの森林減少参照システム(SDRS))

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2	SDRS-EN	FLOMOZ	FLOMOZ	公開	SDRS
3	FREL/FRL-EN	FLOMOZ	FLOMOZ	公開	FREL/FRL
4	MRV-EN	FLOMOZ	FLOMOZ	公開	MRV
5	Strategy-EN	FLOMOZ	FLOMOZ	公開	関連文書
6	Safeguarding-EN	FLOMOZ	FLOMOZ	公開	セーフガード
7	Registry-EN	FLOMOZ	FLOMOZ	公開	REDD+ プロジェクト
8	Administration-EN	FLOMOZ	FLOMOZ	公開	森林管理
9	Additional-EN	FLOMOZ	FLOMOZ	公開	公開
10	Forestcover-EN	FLOMOZ	FLOMOZ	公開	土地利用被覆図
11	ForestInventory-EN	FLOMOZ	FLOMOZ	公開	森林インベントリ
12	BiomassInformation- EN	FLOMOZ	FLOMOZ	公開	バイオマス情報
13	ForestCoverMap		FLOMOZ	公開	土地利用被覆図 Web マップア プリケーション
14	SDRS-Dashboard		FLOMOZ	公開	SDRS ダッシュボード
15	SDRS		FLOMOZ	公開	SDRS Webマップアプリケーション

出典: FLOMOZ

S1	タイトル	フォルダ	作成者	公開レ ベル	内容
1	Monitoring-PT	FLOMOZ	FLOMOZ	公開	モニタリング
2	SDRS-PT	FLOMOZ	FLOMOZ	公開	SDRS
3	FREL/FRL-PT	FLOMOZ	FLOMOZ	公開	FREL/FRL
4	MRV-PT	FLOMOZ	FLOMOZ	公開	MRV
5	Estrategia-PT	FLOMOZ	FLOMOZ	公開	関連文書
6	Safeguarding- PT	FLOMOZ	FLOMOZ	公開	セーフガード
7	Registo-PT	FLOMOZ	FLOMOZ	公開	REDD+ プロジェクト
8	Administracao- PT	FLOMOZ	FLOMOZ	公開	管理者
9	Adicional-PT	FLOMOZ	FLOMOZ	公開	公開
10	CoberturaFlore stal-PT	FLOMOZ	FLOMOZ	公開	土地利用被覆図
11 出止	ForestInventor L ^y FFOMOZ	FLOMOZ	FLOMOZ	公開	森林インベントリ
12	Biomassa-PT	FLOMOZ	FLOMOZ	公開	バイオマス情報

表 7-2 新 FRIP ページリスト (英語版)

7.4.2. 新 FRIP の第2・第3 レベルのページの概要

(1) モニタリングページ

本ページは、全国森林モニタリングシステム、森林被覆マップ、森林資源参照マッ プのアトラスを提供し、SDRSページやウェブベースのアプリケーションとのリンクが 設定されている。

(2) SDRS ページ (第3 レベル)d level)

本ページは、SDRS の概要、SDRS ダッシュボードおよび Web マップアプリケーショ ンとのリンク設定、JJ-FAST および GLAD アラートのアーカイブデータのダウンロード ができる。このページはモニタリングページの下位にある。

(3) FREL/FRL ページ

本ページは、活動データの概要、排出係数、排出量/除去量の推計を提供し、森林 被覆、森林インベントリ、バイオマス情報の各ページ、森林被覆図の Web マップアプ リケーションへのリンクが設定されている。

(4) 土地利用被覆図ページ(第3レベル)

本ページでは、モザンビークの森林被覆の概要と、モザンビーク森林資源参照地図 2013 (PDF)を提供し、土地利用被覆地図用 Web マップアプリケーションへのリンクが 設定されている。このページは FREL/FRL ページの下位にある。

(5) 森林インベントリページ(第3レベル)

本ページはモザンビークの森林インベントリの概要を提供する。このページは FREL/FRLページの下位にある。

(6) バイオマス情報ページ(第3レベル)

本ページは森林タイプ別のアロメトリック方程式を提供する。このページは FREL/FRLページの下位にある。

(7) MRV ページ

本ページは、MRV と NFMS の概要を説明し、NFMS 文書とのリンクが設定されている。

(8) 関連文書ページ

本ページは、REDD+、森林管理、モニタリングなどに関する文書を提供する。

(9) セーフガードページ

本ページは現在準備中で、保護に関する情報を提供する予定である。

(10) REDD+ プロジェクトページ

本ページは、モザンビークの REDD+プロジェクト情報を提供する。

(11) 森林管理ページ

本ページは、森林管理の法的管轄権や REDD+に関する国の責任など、森林管理に関

する情報を提供する。

(12) その他関連データページ

本ページは、森林管理と REDD+に関するその他の関連データを提供する。

7.4.3. Web サイト・ページの編集

サイト管理者は Portal for ArcGIS のサイトアプリケーションを利用して、Web サ イトやページを作成、編集することができる。

(1) トップページのカスタマイズ設定

本機能は、サイト名やサマリ、サイトのURLを設定することができる。

(2) トップページのヘッダーの編集

本機能は、外観、名前、ロゴ、メニューリンクを設定することができる。

(3) バナーの編集

バナーを選択し、見出しや背景画像を設定することができる。

(4) コンテンツの編集

コンテンツを選択し、文章を入力・編集、他のウェブサイトや文書とのリンクを設 定することができる。

(5) ギャラリーの登録

ギャラリーとして登録することで、ユーザーは簡単にコンテンツやドキュメント、 データにアクセスすることができる。現在、新 FRIP サイトには 8 つのコンテンツが ギャラリーに登録されている。

7.5. Web マップアプリケーション

Portal for ArcGISは、地理空間情報などの閲覧、公開、更新が可能なWebマップ アプリケーションを、プログラミングなしで簡単に作成することができる。現在、FRIP には3つのWebマップアプリケーションがある(表 7-3)。

表 7-3 作成済 Web マップアプリケーション

モザンビーク共和国持続可能な森林管理・REDD+プロジェクト 新森林資源情報プラットフォーム(FRIP)/衛星ベースの森林減少参照システム(SDRS))

Web-based GIS application FLOMOZ Public ForestCoverMap Web map for forest cover map Dashboard application of SDRS-Dashboard Dashboard FLOMOZ Public SDRS Web-based GIS application SDRS Web map FLOMOZ Public for SDRS

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出典: FLOMOZ

1

2

3

7.5.1. 土地利用被覆図 Web マップアプリケーション

本アプリケーションは 2013 年のモザンビークの土地利用被覆図を表示することが できる。本アプリケーションは、5つの機能(データ追加、スワイプ、測定、描画、 印刷)が設定されている。ユーザーは任意のレイヤーを重ね合わせ、フィーチャー(点、 線、矩形、多角形等)を一時的に描画することができる。

7.5.2. SDRS ダッシュボードアプリケーション

ダッシュボードは、地理的な情報やデータを表示するもので、イベントの監視、意 思決定、他者への情報提供、傾向の確認などを可能にする。ダッシュボードは、1 つ の画面上で連動する複数の視覚化を表示するように設計されている。

本アプリケーションは、モザンビークの JJ-FAST と GLAD Alert による検出地域の 現状を1つの画面で表示することができる。

7.5.3. SDRS Web マップアプリケーション

本アプリケーションは、モザンビークの JJ-FAST と GLAD Alerts で検出された森林 減少地データを表示することができる。11 種類の機能(スワイプ、クエリ、データ追 加、解析、グラフ、フィルタ、印刷、描画、選択)が設定されている。ユーザーは、 日付や地域などの条件設定することができ、その条件に合致する検出地のみが表示さ れる。権限のあるユーザーは、分析ツール(データ抽出等)を使用することができる。

7.5.4. Web マップアプリケーションの編集

システム管理者や Creator ライセンスを保有するユーザーは、Web AppBuilder を利 用し、Java スクリプトの知識がなくても、Web マップアプリケーションを作成編集す ることができる。

Web マップアプリケーションの編集は、Web マップアプリケーションの概要ページ を表示から「アプリケーションの編集」をクリックして行う。

別添資料 13 GCF コンセプト・ノート(2024 年 3 月 27 日版)

Concept Note

Project/Programme Title:	Accelerating climate change mitigation and resilience of forest ecosystems and communities through sustainable management of Miombo woodlands in the Zambezi River Basin
Country(ies):	Mozambique
National Designated Authority(ies) (NDA):	Ministry of Economy and Finance, National Directorate for Monitoring and Evaluation
Accredited Entity(ies) (AE):	International Union for Conservation of Nature
Date of first submission/ version number:	[YYYY-MM-DD] [V.0]
Date of current submission/ version number	[YYYY-MM-DD] [V.0]



Please submit the completed form to **fundingproposal@gcfund.org** Please use the following naming convention in the subject line and the file name: "ON-[Accredized Entitly or Courtry]-gygymmidd"

PROPOSAL | 2017



Notes	
•	The maximum number of pages should <u>not exceed 12 pages</u> , excluding annexes. Proposals exceeding the prescribed length will not be assessed within the indicative service standard time of 30 days.
•	As per the Information Disclosure Policy, the concept note, and additional documents provided to the Secretariat can be disclosed unless marked by the Accredited Entity(ies) (or NDAs) as confidential.
•	The relevant National Designated Authority(ies) will be informed by the Secretariat of the concept note upon receipt.
•	NDA can also submit the concept note directly with or without an identified accredited entity at this stage. In this case, they can leave blank the section related to the accredited entity. The Secretariat will inform the accredited entity(ies) nominated by the NDA, if any.
•	Accredited Entities and/or NDAs are encouraged to submit a Concept Note before making a request for project preparation support from the Project Preparation Facility (PPF).
•	Further information on GCF concept note preparation can be found on GCF website <u>Funding</u> <u>Projects Fine Print</u> .



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A. Project/Programme Summary (max. 1 page)						
A.1. Project or programme	☑ Project□ Programme	A.2. Public or private sector	Public sectorPrivate sector			
A.3. Is the CN submitted in response to an RFP?	Yes □ No ⊠ If yes, specify the RFP:	A.4. Confidentiality ¹	 □ Confidential ⊠ Not confidential 			
	Mitigation: Reduced emissions from:					
	Energy access and power generation					
	□ Low emission transport					
A.F. Indicate the result	Buildings, cities and industries and appliances					
areas for the project/programme	Forestry and land use (60%) <u>Adaptation:</u> Increased resilience of:					
	Most vulnerable people and communities (10%)					
	\boxtimes Health and well-being, and food and water security (10%)					
	Infrastructure and built environment					
	Ecosystem and ecosystem services (20%)					
A.6. Estimated mitigation impact (tCO2eq over lifespan)	5,8 million tCOeq through the project duration	A.7. Estimated adaptation impact (number of direct beneficiaries and % of population)	876,319 people (10 % of the total population of the target provinces)			
A.8. Indicative total project cost (GCF + co-finance)	Amount: USD 72,577,230	A.9. Indicative GCF funding requested	Amount: USD 28,377,230			
A.10. Mark the type of financial instrument requested for the GCF funding	 ☑ Grant □ Reimbursable grant □ Subordinated loan □ Senior Loa 	□ Guarantees □ Equity an □ Other: specify				
A.11. Estimated duration of project/ programme:	2026-2031 (6 years)	A.12. Estimated project/ Programme lifespan	20 years			
A.13. Is funding from the Project Preparation Facility requested? ²	Yes ⊠ No □ Other support received □ If so, by who:	A.14. ESS category ³	□ A or I-1 ⊠ B or I-2 □ C or I-3			
A.15. Is the CN aligned with your accreditation standard?	Yes 🛛 No 🗆	A.16. Has the CN been shared with the NDA?	Yes 🛛 No 🗆			
A.17. AMA signed (if submitted by AE)	Yes ⊠ No □ If no, specify the status of AMA negotiations and expected date of signing:	A.18. Is the CN included in the Entity Work Programme?	Yes 🛛 No 🗆			
A.19. Project/Programme rationale, objectives and	Mozambique's NDC defines priority targets for climate change mitigation and adaptation, where forest and ecosystem play important roles. However, deforestation and forest					

¹ Concept notes (or sections of) not marked as confidential may be published in accordance with the Information Disclosure Policy (<u>Decision B.12/35</u>) and the Review of the Initial Proposal Approval Process (<u>Decision B.17/18</u>).

²See <u>here</u> for access to project preparation support request template and guidelines

³ Refer to the Fund's environmental and social safeguards (Decision B.07/02)



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approach of	degradation are continuing, and the progress of forest landscape restoration is slow. The				
programme/project (max	barriers lie within and outside the forestry sector, often interacting with each other and				
100 words)	are difficult to separate. Shortage in sector financing is a persistent challenge.				
	The objectives of the project is to support a paradigm shift in the forest and land-use				
	sector of Mozambique in a way that reduces GHG emissions and increase				
	sequestrations. Climate adaptation and other co-benefits will be considered throughout				
	the planning and implementation. This will be achieved through two layers of				
	interventions: a) creation of enabling environment at the national level (Output 1), and b)				
	implementation of field intervention activities at the sub-national level (Output 3). Various				
	financing options, such as climate financing and private sector investments will be				
	explored (Output 2). Global and regional collaborations are also incorporated as the				
	country's climate change commitment (Output 4).				

B. Project/Programme Information (max. 8 pages)

B.1. Context and baseline (max. 2 pages)

Climate Rationale

Mozambique is on the southeast coast of Africa with a land area of 786,380 km2 and a population of 28.8 million inhabitants, with 40% of the land territory covered by natural forests. The forest area in Mozambique in 2016 was estimated at 34 million hectares (47% of the national territory)⁴. The provinces of Niassa, Zambézia and Inhambane are the ones that have greater forest area (MITADER, 2018) ⁵ (see the table below). Miombo woodland occupies most of the forest area, with about 21 million hectares (62% of the forest area). The planted forests occupy only about 65 thousand hectares, mainly in the provinces of Niassa, Nampula and Manica. Forests in Mozambique provide ecosystem services of both global and local value. These include climate change mitigation through carbon sequestration and storage; climate change resilience against storm, flooding, coastal erosion/intrusion and drought; protection of nearly 104 watersheds across the country; provision of basic livelihood needs and security such as sources for food, non-timber forest products (NTFPs), energy (firewood and charcoal), building materials and diverse income⁶; and habitat for wildlife including globally important species. Forest carbon credit is also a new type of ecosystem service which Mozambique has been accumulating significant experiences in the recent years, such as through the FCPF Carbon Fund⁷.

Province	Forest area (ha), %	Target of the project	
Niassa	7,979,446 (63%)	Х	
Zambézia ⁸	5,161,225 (48%)		
Inhambane	4,381,875 (58%)		
Tete	3,968,110 (38%)	Х	
Cabo Delgado ⁹	3,962,592 (49%)		
Gaza	3,223,145 (39%)		
Manica	1,945,513 (29%)	Х	
Sofala	1,706,956 (24%)	Х	
Nampula	1,405,069 (17%)		
Maputo	436,199 (17%)		
Maputo Capital	1,550		
Total	34,171,685	15,600,027 (46%)	

Forest areas per province in 2016

Climate vulnerabilities and impacts

Mozambique hosts the lower basin of nine regional river systems and 2,700 km of coastlines. More than 60% of the country's population live under these areas which makes the country one of the most vulnerable to climate change hazards. Mozambique has a long history of catastrophic floods occurring almost annually and is largely influenced by the

⁷ Mozambique became the first FCPF country to issue certified emission reductions and to receive payments of \$7 million. https://www.forestcarbonpartnership.org/country/mozambique

⁴ Based on the full land classification assessment by the Government of Mozambique. The proposed project is expected to update this under Output 1.

⁵ MITADER (2018), Desflorestamento em Moçambique (2003 - 2016), MITADER. Maputo. 42p

⁶ In fact, the value of Miombo woodlands is known to be significant for the rual population. In addition to the use of timber for selling, firewood/charcoal and building materials, NTFPs harvested from Miombo woodlands are important for their daily subsistence as well as for their economic, spiritual and cultural needs (<u>Bruschi et al, 2014</u>). DINAF has a list of key tree species in Miombo woodlands that have multi-purpose values, such as for food, fodder, medicinial, bulding, handicrafts, etc.

⁸ Zambeiza is already receiving large support through, e.g. FIP and FCPF Carbon Fund, therefore, the need of support was assessed as low.

⁹ The security risk in Cabo Delgado is currently too high for running a project due to social disorder.



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La Niña and Intertropical Convergence Zone¹⁰.

The country ranks 156 out of 182 countries in the Notre Dame Global Adaptation Initiative (ND-GAIN) index (score as for 2020) (http://index.gain.org/country/mozambique), the 48th most vulnerable country and the 171st most ready country, meaning it has very low adaptive capacity to respond to the negative impacts of climate change, including the food system (agriculture) and ecosystem service (forestry).

In fact, frequency of cyclones and flood events are increasing and become more intense. In 2000 the country was hit by Cyclone Eline which caused the worst floods in over 50 years, 140,000 hectares of crops were destroyed, affecting millions of people. In 2019 cyclone Idai killed over 1,000 people and destroyed more than 100,000 houses¹¹. More recently in 2022 the cyclone Gombe affected 736,055 people¹² and, in 2023 cyclone Freddy affected 253,466 people¹³. This cyclic occurrence of catastrophic events are already serious threats to crop production, food security and human health, and also risk the health of entire ecosystem including forests.

The mean temperature and precipitation of Mozambique have shown an increase of 0.9^aC and 2.5 mm (3.1%) respectively in the last 60 years. The future climate projections show that the annual temperatures are expected to increase by 1°C in the next 20 years, and by 1.4-3.7°C by 2060. Although the changes in temperature and weather patterns are considered to vary across the country, the projection tells that heavy rainfall events will increase even in the dry season (January-June), and the central and southern regions will face more droughts during the dry season and more floods during the rainy seasons¹⁴.

Other human-induced problems, such as commercial and subsistence agriculture, unsustainable logging and charcoal production, escalates the challenges of forests in adapting to the changing environment¹⁵. The role of Mozambique's forests in climate change resilience is becoming even more crucial.

Green-House Gas emissions profile

Seeing the Mozambique's Green-House Gas (GHG) emission profile of 2019, land-use change and forestry emitted 71.34 million tCO₂e of GHG which is more than 70% of the total emission of the country¹⁶. Mozambique's forests have tremendous value and unrealized potential for storing carbon. Based on the recent National Forest Inventory (NFI, 2018¹⁷), the country's above- and below-ground carbon stock totals more than 5.2 billion tCO₂e. This carbon storage is central to the country's climate change mitigation commitments, but still facing depletion.

According to the 2018 NFI, the average deforestation rate between 2003 and 2016 was estimated at 0.79% per year, corresponding to an average of 267 thousand hectares deforested annually. Expansion of shifting agriculture, expansion of housing zones and infrastructure, timber logging and biomass energy are the main causes of deforestation. This led to almost 40 million tCO2 being emitted each year. However, the trend of forest-related emission have been showing positive change. According to the 1st Biennial Update Report (BUR)¹⁸ submitted in November 2022, between 2014 and 2016 alone, the reduction in the rate of deforestation prevented the emission of 78.8 million tCO2e. Mozambique is committed to continue its efforts towards achieving the ambitious goal.

National Priorities

The Nationally Determined Contribution (NDC), submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in 2016, sets targets for greenhouse gas emission reductions of 23 million tCO2e from 2020 to 2024, and 53 million tCO2e from 2025 to 2030. The updated National Determined Contribution (The Update of First NDC for the Period 2020-2025, November 2021)¹⁹ defines priority targets for climate change mitigation and adaptation, where forest and ecosystem play important roles.

Climate change mitigation measures

In its NDC (2021), Mozambique expects to reduce approximately 40 million tCO2e through the period of 2020-2025. This represent a mitigation effort of about 1.2 tCO2e per capita by 2025, compared to about 2 tCO2e as the baseline. The actions related to forests broadly include development of low-emission agricultural practices, reducing uncontrolled

¹⁰ <u>https://dicf.unepgrid.ch/mozambique/climate-change#section-drivers</u>

¹¹ <u>https://dicf.unepgrid.ch/mozambique/climate-change#section-drivers</u>

¹² <u>https://www.unicef.org/mozambique/ciclone-tropical-gombe-em-mo%C3%A7ambique</u>

¹³ <u>https://reliefweb.int/report/mozambique/mozambique-severe-tropical-storm-freddy-flash-update-no-10-15-march-</u>

^{2023#:~:}text=According%20to%20latest%20data%20from,and%20Niassa%20(231)%20provinces

¹⁴ Rito Mabunda, 2023, Status of Forest Management and Forest Financing in Mozambique. UNFF

¹⁵ <u>https://www.epa.gov/climateimpacts/climate-change-impacts-forests#impacts</u>

¹⁶ <u>Mozambique: CO2 Country Profile - Our World in Data</u>

¹⁷ MITADER (2018), Inventário Florestal Nacional. MITADER. Maputo. 124p

¹⁸ https://unfccc.int/documents/624696

¹⁹ https://unfccc.int/sites/default/files/NDC/2022-06/NDC_EN_Final.pdf



shifting cultivation and forest fire.

The National REDD+ Strategy (NRS)²⁰ approved in November, 2016 specifies more clearly, the actions to be undertaken by the forestry sector and beyond. It has set ambitous goal of reducing 170 million tCO2e of forest-related emissions by 2030 through five main actions: 1) strengthening institutions for coordination 2) promote sustainable alternative practices to slash and agriculture to ensure increase in productivity of subsistence and income generating crops; 3) increase access to and utilization of alternative biomass sources; 4) promote the system of forest concession, community based natural resource management and strengthen forest governance; and 5) restoration of degraded forests through commercialbased tree plantations and regeneration of natural forests.

Climate change adaptation measures

The NDC (2021) calls for actions to increasing climate resilience of agriculture and forestry-oriented livelihoods, improving planning and adaptive management of forest and ecosystem (including biodiversity) and restoration and forest landscapes.

The National Adaptation Plan (2020 – 2025) defines increasing forests' resilience as one of the sixteen strategic actions with a focus on sustainable management of forests: this includes wood and NTFP processing, biodiversity conservation, and ecotourism. Climate-resilient agriculture (including agroforestry) is another strategic action expected to counter shifting cultivation and other agricultural land-use. The aim is to strengthen agricultural production value-chain (production, processing, marketing, and also pest and crop disease control) while balancing with forest conservation objectives,

The Government of five years plan (2020-2024)

The Mozambique government's five year plan sets out the national development targets. Under its second priority to "boost the economic growth, productivity and employment generation", strong emphasis is given to promotion of investment into local small medium enterprises. Primary sectors such as agriculture, forestry and fishery are in the center of such target, however with expected linkage with food processing, nature-based tourism and biomass energy. Continuing, the third priority is to "strengthen the sustainable management of natural resources and environment". The approach is to incentivize the establishment of partnerships between local communities and private sector in the management and conservation of biodiversity, stimulating job creation and development of income generating activities. Furthermore, to "reduce the climate vulnerability of local communities, economy and infrastructures to climatic risks and natural and anthropogenic hazards", use of climate risk insurance will be pursed. These policy orientations will likely succeeded in the next planning cycle.

Problem statement, root causes and barriers

Mozambique has established forest reserves with the objective of ensuring biodiversity conservation, provision of multiple ecosystems services and sustainable use of natural resources. The reality is that sustainable management of those areas are not fully in place yet, leading to continued deforestation, forest degradation and slow progress in forest restoration.

The main causes of deforestation and forest degradation are embedded both within the forestry sector and in other nonforest sectors:

- Within the forestry sector, the direct causes are unsustainable commercial timber exploration and unsustainable extraction of wood for domestic uses, particularly firewood and charcoal mainly in the urban/sub-urban areas. Unsustainable or illegal logging leads to the degradation of native forest stands, and eventually carbon emission. Lack of investments and incentives have been limiting the opportunities for promoting sustainable management and use of forest resources. This is seen in the weak participation of the local communities in forest conservation and restoration.
- Meanwhile, the most dominant driver of deforestation and forest degradation outside of the forestry sector is land conversion as the result of strong demands for agricultural land and production. This includes both commercial and subsistence agricultures often applying slash-and-burn and shifting land use practices associated with livestock grazing. Particularly the challenge is severe under the increasing needs for food security. Other drivers include land-use for urban and industrial development, and lack of energy options which can reduce the demand for wood and charcoal.

In fact, the causes are complex, often interacting with each other and are difficult to separate. The situation implies the importance of mainstreaming climate change into the political commitments and messages, so that effective actions across different sectors involved in natural resource management can be implemented. The sector has been historically relied on donor funds mostly for forest conservation, and private sector investment is scarce compared to its large

²⁰ https://redd.unfccc.int/submissions.html?country=moz



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potential. At the ground level, balancing the needs of rural population is apparently the biggest challenge. In addition forestry business operators need to be guided towards becoming responsible and green business.

The following sections discuss each of the barriers in further detail.

Barrier 1:

Challenges in addressing land and forest resource exploitation by the rural poor communities who rely their subsistence and livelihoods on land-based economy.

In Mozambique, miombo woodlands provide food sources in a variety of form for subsistence, and providing as a safety net during crop failure caused by unfavourable weather conditions, natural disasters such as flooding and fire, and pest infestation. Such values are often overlooked particularly in the regions with higher poverty rate - which are the target of the proposed project - where food security is critical for their survival.

Small-scale agriculture (65% of forest-related emissions) mostly in the form of shifting cultivation, both for subsistence farming and cash cropping, is the dominant direct deforestation driver. About 80% of the food is produced via small-scale low-input, low technology, rain-fed production systems characterized by negative feedback loops that link slash and burn and other poor land management practices to rapid loss of soil fertility and yields, deforestation, forest and land degradation, food insecurity and poverty. When accompanied by a growing population and increased demand for food in the rural areas, small-scale agriculture increases pressure on arable land, leading to the opening of forest areas. Lack of alternative options and knowledge drive the rural and vulnerable communities to apply short-sighted and exploitative farming practices in exchange of longer-term sustainability.

Limited access to markets and technologies that enhance productivity exacerbate demand on the land. The practice of using fires to prepare fields has often resulted in uncontrolled fires, leading to biodiversity and carbon loss in addition to damage on people's livelihoods. Forest fire is also a regional concern as the impact can cross the national boundaries.

Although the law stipulates the rights of the communities to benefit from use of forest and forest land by private operators in their community areas (e.g. logging, mining and tourism), and also a part of the fines from forest law enforcement can be shared to the communities participated, actual implementation is limited. This is due to lack of recognitions of such rights, lack of access to information, or the cumbersome process and weak enforcement of the benefit sharing mechanism. Even when their rights are conveyed, the local communities concerned often do not have enough capacity to govern, manage, and develop their resources sustainably.

Overall, the participation of local communities and community-based organizations in decisions related to resource management is weak. There is also limited knowledge generation, sharing, and collective learning to promote awareness and understanding by communities.

Barrier 2:

Lack of enabling environment to unlock forest landscape restoration (FLR) potential

The National Reforestation Strategy targets restoring one million ha by 2030. An estimated 3.5 million ha are considered suitable for forest plantations in the central and northern areas of the country (target of this project). Mozambique has adequate conditions for expanding multipurpose plantation forestry supported by growing demand for forest products and availability of land (although the land management regime is a challenge as explained below). An assessment²¹ based on the Restoration Opportunities Assessment Methodology (ROAM) also suggests a high potential of landscape restoration in contributing to the achievement of Mozambique's NDC. The ROAM analysis also showed that new forest plantations offer more opportunities of employment and more carbon sequestration potential, while agroforestry and natural forest rehabilitation have high employment but with medium carbon sequestration potential. Over all, increasing the country's forest plantation area from the current 60,000 ha to more than one million hectares by 2030 would have the potential to create 250,000 jobs and produce US\$1.5 billion worth of manufactured products and exports.

Challenges lye in the weakness of creating enabling conditions for FLR. Finding lands with suitable condition for restoration and tree plantation are often a challenge due to unclear land management regime (as also explained in Barrier 5). Initial funds for the restoration activities are in constant shortage. Optimal mixture of native species and fast-growing species need to be decided depending on the land-type and its restoration purposes, also in linkage with soil conservation/improvement and carbon sequestration potentials.

Barrier 3:

Shortcomings in sector coordination and institutional capacities of the stakeholders to optimize forest governance.

²¹ MITADER. (2018). Forest landscape restoration opportunities assessment: Ten districts of Zambezia and Nampula. IUCN Gland, Switzerland.



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A forest governance assessment in 2016 using PROFOR-FAO tool revealed a general consensus among stakeholders that governance was weak, particularly around institutional capacity and trust among the stakeholders. Law enforcement is often overlooked, sector policies contradict those of other sectors, and transparency and stakeholder participation in planning and decision-making is low particularly with the inclusion of women.

In many cases, information management still rely on conventional system (e.g. paper-based reporting), thus a shift to modern ICT-based system would significantly improve the efficiency, reliability and transparency. Examples such as the Mozambique's <u>MRV platform</u>, Forestry Information System for concession management, <u>Forest Resource Information</u> <u>Platform</u> and '<u>Digital MRV</u>' being piloted present potentials for digital transformation in the forestry sector (noting the need of effective coordination among them)²².

Although agriculture is the main source of income for 70% of Mozambicans²³, yields are low; Mozambique has one of the lowest cereal yields per hectare²⁴. In recognition of the fact that agricultural growth would reduce poverty and inequality over three times faster than growth in any of the other sectors, agricultural strategies call for an additional 1.8 million ha to be put under agriculture (in addition to increasing yield by 100%), without any mention of mitigating against deforestation in the expansion²⁵. Policies to don't offer comprehensive and adequate financial incentives for the establishment of forest plantations and associated industries.

Improvement of forest governance capacity at the provincial level and lower will have particular importance under the recent trends of decentralization and community-oriented forest management. This can be realized through the revitalization of the forest dialogue platforms, establishment of private and community partnerships to reinforce the benefit-sharing mechanisms, raising awareness and accountability under the rule of law, and informed evidence-based decision making.

Barrier 4:

Lack of objective information in forest resources, forest concessions, timber harvesting, sales and trade hindering evidence-based decision making.

The government and related stakeholders still have limited technical and financial capacity to generate, analyse and transfer forest management information in a practical and timely mode. Lack of evidence-based planning at the national and subnational scales undermine the sustainability of the resource base.

In fact, the government capacity to generate forestry data have been significantly progressed in the recent years through government programs and donor support (e.g. FIP, FCPF, World Bank, FAO, Japan): those are land and forest cover change data, forest concession management data, national forest inventory, and estimation of GHG emissions and removals, among others. Challenges are still within how such data can be continuously generated with stepwise improvement, and how the use of such data can be facilitated for optimal decision-making and implementation. Land-use zoning is an approach that needs to be incorporated, applying the definition of permanent forest, and through optimum planning or areas for forest restoration and tree plantation using both natural and exotics species.

Barrier 5:

Unclarity on land tenure, land and forest use rights, and their geographical boundaries among the local communities, forest companies and the government causing inconfidence and conflicts in land and forest use regimes.

The high dependence of the population on natural resources and land-based economy, especially on subsistence and commercial agriculture, livestock grazing, use of firewood and charcoal for energy, legal and illegal timber logging for sales and rural constructions, all posing fundamental challenge to Mozambique forests. Whether deliberate or undeliberate, lack of recognition of land tenure, land and forest use rights and associated spatial boundaries are in many cases the underlying causes.

The land administration agency's capacity to issue land licenses and monitoring is still limited and slow. Lack of, or inadequate decentralized registration services at district level, with poor or no coordination between relevant actors, has inhibited efforts to systematically execute the cadastre (property registry) and registering of land rights. The absence of

²² In 2020, the country had around 680 forest inspectors which is far below the ideal minimum of 1,800 that would allow adequate monitoring with a coverage of one supervisor per 50 km2. Advancement in the use of ICT technologies is obvoiusly an opportunity to address this challenge,

²³ Agriculture provides employment for 80% of the workforce, 90% of them women.

 ²⁴ OCHA: https://reliefweb.int/report/mozambique/mozambique-economic-update-getting-agricultural-support-right-enpt
 ²⁵ AFDB, 2023: Mozambique Food and Agriculture Delivery Compact.
 <u>https://www.afdb.org/sites/default/files/documents/publications/mozambique_country_food_and_agriculture_delivery_compact.pdf</u>



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a common methodology also undermines effective land and forest management. More resources are needed, both human and financial.

Urbanisation and infrastructure development have grown significantly since the end of the civil war. Further driven by population growth and development, majority of it occurs through unorganised expansion of the settlement areas at the expense of forests. Urbanization of agricultural land has also caused conversion of forests to agriculture in other places to offset losses. Urbanization directly alters forest ecosystems by removing or fragmenting forest cover. It also indirectly alters forest ecosystems by modifying hydrology, altering nutrient cycling, introducing non-native species, modifying disturbance regimes, and changing atmospheric conditions. Collectively, these changes significantly affect forest health and modify the goods and services provided by forest ecosystems.

With support from donors, the government's Terra Segura program aims to register five million individual parcels of land and delimit four thousand communities. There are accumulation of experiences and capacity to extend packaged interventions, often involving the participatory preparation of local land use plans, Community Development Action Plans (CDAPs), the creation of a Natural Resources Management Committee, associated with capacity building activities. The experiences show that farmers with land tenure are more willing to adopt sustainable and multi-purpose use of their lands. The legal registration of land use rights is a first step towards the protection of communities and individual land rights and is seen as a fundamental criterion for engaging in Community-Based Natural Resources Management (CBNRM) initiatives, particularly for attracting investors.

Barrier 6:

Lack of capacity, investments and incentives to promote sustainable and viable forest economy. a. Timber production and management of supply chain.

By 2016, the annual timber products harvested exceeded the annual allowable cut by approximately 40%, while around 60% of timber was harvested without license. Furthermore, a 2013 analysis concluded that the then domination of the timber industry by 1st and precious class species – for both export and domestic markets – in combination with the then high rate of illegality in the sector raised the likelihood that commercial stocks would be largely depleted by 2029. There are 15 forest reserves in the country, however, most of them have been invaded by local communities and loggers. Indeed, Forest Trends' <u>lllegal Deforestation and Associated Trade Risk</u> score is currently 81.6 out of 100; and the risk that timber from Mozambique was illegally harvested is high, <u>ranked at 178 out of 211 countries</u>^{26 27}.

The issues include illegal logging, lack of adherence to management plans by concessionaires and license holders, and weak enforcement. Timber licensing statistics have been referred to as incomplete, and a recent assessment of forest operators by the Ministry of Land and Environment (MTA) revealed a low level of compliance with the legal, environmental and social standards. Illegal logging is widespread and forgone tax revenues were estimated at US\$540 million between 2003 and 2013 from unreported wood exports (mostly logs), mainly to Asian markets. This also relates to the economic losses of local communities who are entitled to receive 20% of concession taxes. As many families are inhabiting and practicing agriculture in the production forest areas, issue of logging and agriculture become ever more complex.

According to a study by the IUCN, logging & wood harvesting had the second highest STAR (Species Threat Abatement and Restoration) threat reduction score²⁸. This implies that the current patterns of timber exploitation in Mozambique directed to supply to the global market is causing over-exploitation of certain types of tree species. A wider range of marketable tree species need to be explored²⁹.

Productivity is also a challenge. For example, logging is still practiced in high-impact mode to the forest ecology as well as carbon stock, thus dissemination of reduced impact logging (RIL) models is awaited. Skilled labor and adequate technologies are still in shortage. Particularly in Miombo forest where the growth is relatively slow compared to other fast-growing species, viable scale and years of operation need to be proven for the forest businesses.

The above capacity gaps have led to inadequate knowledge generation and use in Sustainable Forest Management (SFM) at all levels, and still inadequate appreciation of the importance of forest resources and SFM in mitigating impacts of climate hazards. Research in forestry is still weak, especially at the sub-national levels; the weak knowledge about the main environmental services and consequently their valorization makes it difficult to attribute benefits derived from their conservation. For example, while demand has grown for NTFPs (e.g. honey, berries, natural dyes, and medicinal plants) used in the food, pharmaceutical, hygiene, beauty and welfare industries, inadequate data/information and knowledge about value chains leads to poor exploitation of the potential of these products and their exclusion from the agenda and

²⁶ <u>https://www.forest-trends.org/idat_countries/mozambique/</u>

²⁷ Methodology used to calculate Illegal Deforestation and Associated Trade Risk score found here - <u>https://www.forest-trends.org/wp-content/uploads/2022/03/Methodology-for-State-ILAT-project-website_Feb-2022-1.pdf</u>

²⁸ IUCN (2021). Avaliação do Estado, Tendências e Ameaças à Biodiversidade em Moçambique BIODEV2030. Maputo. 190pp

²⁹ Rito Mabunda, 2023, Status of Forest Management and Forest Financing in Mozambique. UNFF.



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development plans of the forest sector. Furthermore, the forestry sector has not done enough to focus the research targeted at timber processing and can define the priority areas on how the timber products can be improved to meet customer needs and also to be used in construction.

Timber business is considered to contain certain risks, such as weak implementation of law and regulations, market volatility, wildfires and tree diseases, illegal logging, and challenges in effective land concession management. Policy needs to be in place to reduce the investment risks, and to develop financing opportunities for promoting sustainable forest management principles and practices.

In term of operation, the new approach expected is the Forest Management Unit (FMU)³⁰. Promotion of outgrower schemes is another. For both of these scenarios, a combination of improvement in policy environment, forest and business management capacities, and market accessibility need to be addressed. Improvement of road and transport infrastructures are offering more opportunities, and transparent timber supply chain will increase credibility of Mozambique's timber to be sourced to the global market. As such, developing a thriving forestry sector is a long collaborative process that will require inputs and commitment from all stakeholders.

b. Wood and charcoal

Unsustainable exploitation of wood for charcoals (7% of forest-related emissions) in the rural areas are driven more by the informal markets for biomass energy in the urban/sub-urban areas (in addition to the consumptions in the rural areas). Around 70% of the rural population, including part of the urban population, rely on woody biomass as their energy source (Mozambique FRA 2020)³¹. The annual consumption volume of fuelwood and charcoal is estimated at 14.8 million tons nationally, an amount that is even higher than the allowable cut volume for commercial wood.

Pedro et al³² argues that although the energy policies and regulations recognize the importance of energy security, efficiency improvement, energy waste reduction, research and technological innovations, they have not effectively achieved these objectives since woody biomass has remained the main source of energy. Furthermore, the regulations on renewable energy are focused on the biomass energy sector, with inadequate focus on the use of alternative sources of energy. Moreover, existing regulations are inadequately enforced and often not adhered to. For example, the majority of charcoal producers operate outside existing government regulation, since the current regulations frame fuelwood production as an environmental problem and not as a rural livelihood activity, and therefore the formal licensing of charcoal is currently unlikely, especially to small producers, who are often marginalised. Moreover, there is still a grey area on the differentiation between fuelwood production for household consumption and production for commercial purposes, and this vagueness, in addition to the current regulation on taxation mechanisms, favours illegal logging. In general, it is much cheaper to produce illegally than legally and sustainably. There have been some attempts to formalize the production and markets for charcoals, and good practices could be extended country-wide

Barrier 7:

Gender inequality and inequity in the access to land and productive resources

Gender inequalities in Mozambique is persistent in forms of less access to education, finance, health services, water, sanitation and social protection. Cultural and traditional beliefs contribute to women's and young women's being less educated compared to young men, although the female population is larger than the male. Illiteracy rate among rural women is 62% forces them in secondary role in the decision-making process in the family, community and workplace.

It is evident that women play an important role, both in agriculture and in household food security. However, there are gender inequalities in agriculture, in terms of access to and control of productive resources and assets such as lands, natural resources and credits. For example, women account more than 60% of the labor force in agriculture, but only 25% of them formally possess land-user rights. They are often more exposed to the impacts of natural disasters such as droughts, cyclones and floods.

³⁰ The aim of the FMU is to not only promote the sustainable use of forest resources but also ensure the restoration of productive forest and community participation in its management. The FMU approach was developed and tested by the MozFIP project, through the formation of a national working group on productive forests, resulting in the establishment of a pilot unit in Zambezia Province and the preparation of a manual to operationalize the approach in the other 10 provinces of the country. More information can be found in the <u>MozFIP Implementation Completion and Results Report</u>.

³¹ https://www.fao.org/3/cb0034en/cb0034en.pdf

³² Pedro A. S. et al, 220: A Review of Mozambican Wood Exploitation. Luleå University of Technology, Department of Wood Science and Technology.

https://www.researchgate.net/publication/373067329_Sustainability_of_Forest_Development_in_China_from_the_Perspec tive_of_the_Illegal_Logging_Trade/link/64d63ff41290c33cce88a19c/download?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI 6InB1YmxpY2F0aW9uliwicGFnZSI6InB1YmxpY2F0aW9uln19



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The project propose to consider key goals³³ in order to ensure the gender, youth and elders, participation, benefit-sharing and empowerment. First to increase access to SFM and FLR-related knowledge, as well as educational and training opportunities, for women, young people, elderly people and persons with disabilities. Second increase SFM and FLR-related employment opportunities for women, young people, elderly people and persons with disabilities. Third design monitoring SFM and FLM technologies that are relevant and accessible to women, young people, elderly people and persons with disabilities. Fourth, improve access to land rights for women, young people, elderly people and persons with disabilities. Firth monitor gender equality and social inclusion in forest and landscape restoration programmes. Sixth improve access to microcredit and loans linked to sustainable forest management and restoration for women, young people, elderly people and persons with disabilities. Finally seventh increase the participation of women, young people, elderly people, elderly people and persons with disabilities in decision-making related to forest restoration.

Financial constraints

The NDC estimated the cost of adaptation and mitigation for 2020 to 2025 to be around USD 7.6 billion; in a country who's 2020 GDP was USD 14 billion. Although there have been positive progress made in recent years, Mozambique's forestry sector still lack effective financial mechanism to scale up and create a paradigm shift towards a sustainable pathway. Historically, the sector has been heavily relying on donor support. The GCF finance proposed here is expected to support the transformation of forestry sector from donor-reliant to self-sustainable sector.

Mozambique government acknowledges the importance of sustainable use of forests and forest resources to promote integrated and inclusive territorial development based on diversification of the economy. The forestry sector is said to annually contribute about 2% of GDP, 2% of direct jobs and 200 million USD of foreign exchange in exports (AGRIPRO, 2019). The figure likely underestimates the actual contribution of the sector because of the incompleteness in dataset due to under-developed statistical system and difficulties in quantifying particularly illegal loggings and trades. But there is still a vast potential to increase its contribution.

Expansion of rural electrification is a simple way of reducing the use of wood fuels. A major obstacle is the lack of sustainability in the funding of the country's Energy Fund (FUNAE). The cost of electrification programs is not covered by the electricity utility company (EDM) tariffs, due to electricity users not being able to afford them, even though the tariffs are highly subsidised and potential clients live within the reach of the grid: FUNAE does not receive government funding, and relies on external investments and donations³⁴.

Climate smart, low emissions agriculture could increase yields and reduce the country's dependence on food imports³⁵; however replicating the strategies across the country will require significant financial resources. AfDB estimates that doubling the yield of key cereals and the creation of 1.8 million hectares of additional farmland and processing at least 50-60% of the food supply would cost USD 4.031 billion in additional investment³⁶. Until these investments are mobilized, it is likely that shifting agriculture will continue to cause deforestation and forest degradation in critical forest areas.

There is a high expectation, for example on REDD+, as a climate financing mechanism, and the government has already started receiving sub-national level emission reduction payment from the FCPF Carbon Fund. However, the national level mechanism is still incomplete and lacking concrete plan to seek for national-level payment (or sub-national programs as an interim-measure).

Mozambique does not yet have a Direct Access Entity (DAE) for the GCF. Moving forward, this project will work towards fostering to have a DAE so that Mozambique's capacity to access GCF finance will be significantly improved.

State of private sector in Mozambique's forestry

The private sector involved in the forestry sector are mainly the logging companies operating in natural forests under simple license and forest concession regimes. Some of them have processing capacities while others only conduct logging and selling of logs. Planting of exotic and fast growing species are permitted with conditions.

The number of timber companies operating under the simple license always surpassed by far the number of companies under forest concessions. In 2015, DINAF reported that 1,081 timber companies exist in Mozambique with 707 under

³³ Adapted from: FAO, 2023. Monitoring Gender Equality and Social Inclusion in forest and landscape restoration programmes. Rome

³⁴ https://energypedia.info/wiki/Mozambique_Electricity_Situation#cite_note-:7-22

 ³⁵ According to AFDB, in 2020, agricultural products represented 21% of all imports at a value of USD 1,204 million and 17.5% of total exports, valued at USD 557 million. Rice, wheat, palm oil, and maize are the primary food imports
 ³⁶ AFDB, 2023: Mozambique Food and Agriculture Delivery Compact.

https://www.afdb.org/sites/default/files/documents/publications/mozambique_country_food_and_agriculture_delivery_com pact.pdf



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simple license and 374 under forest concession^{37 38}. According to the recent data compiled by DINAF, the total forest area occupied by the two regimes is vast, reaching a total of 17,121,526ha (9,982,383ha under forest concession and 7,139,143ha under simple licensing), accounting nearly half of the entire forests in the country. However, it should be also noted that not all of them are actually operational. There are criticisms around the effectiveness of the two dominant forest management regimes where a 2018 rapid assessment of compliance with forest law and regulations found 45% compliance under simple licenses and 57% for forest concessions. DINAF is trying to revisit and update the concessions/licensing status, and to guide them towards applying sustainable forest management standards and responsible investment principles.

Compared to the use of natural forests, tree plantation has been far behind its potential and expectation. According to the World Bank study back in 2016, approximately 750,000ha of lands were permitted for tree plantation, but only 8% were planted. Most of them were in Niassa, Zambezia, Sofala and Manica provinces. This clearly indicates the need of transforming the current tree plantation regime through, such as revisiting the land and foreset data, land and forest use conditions, policy incentives, engagement and development of rural labor, improved value chain and supporting infrastructures.

The Confederation of Economic Association (CTA) is an important platform that brings together various private sectors to negotiate in common voice with the Government for improving the business environment. The CTA's Country Strategic Plan declares the need for a new paradigm for the private sector to progress towards green growth and sustainable development. Forestry sector falls under the branch of land and environment, and the IUCN (as the accredited entity of this proposal) have a Memorandum of Understanding envisaging to capacitate and involve private sector into responsibility investment and operation (e.g. integration of conservation principles). Under the framework of the CTA, the Mozambican Federation of Timber Operators (FEDEMOMA) has been established, by bringing together timber companies operating under simple license and forest concession as well as charcoal producers. Currently, there are 17 provincial associations covering southern, central and northern provinces in the country. The opinions from the FEDEMOMA needs to be effectively reflected into the discussions at the CTA, and then channelled to the government.

There are some good practices in SFM led by the private sector. Examples are Levasflor and TCT Dalmmanni practicing high-quality management of forests, both operating in Sofala Province, and Ifloma in Sofala and Manica Provinces. The TCT Dalmmanni has developed an array of business activities which includes timber exploitation, processing and export of furniture with an area of approximately 25,000ha. TCT is also engaged with the local communities in developing nature-based tourism and beekeeping business model (instead of wild honey collection using fires which often lead to forest fires), to help them generate more income while protecting the forests. Levasflor is the only FSC certified company in Mozambique yet, and dedicated to plywood and veneer exporting to the European markets from their 46,000ha of forests³⁹. These good practices could be share through the project interventions for extension to other forestry operators.

Overview of donor supports in Mozambique's forestry

Mozambique's forestry sector has been supported by development partners, such as FIP, FCPF, World Bank, FAO, Japan, IUCN, WCS among others. Following table presents the donor projects supporting the target provinces.

Project	Donor	Province (# of districts)	Area for synergy
MozNorte (2021-2026)	World Bank	Niassa (6),	Output 1, 3
<u>MozRural (2021-2026)</u>	World Bank Multiphase Programmatic Approach envisaged to 2031.	Niassa (7), Zambezia (11), Tete (8), Manica (8), Sofala (7)	Output 1, 3
ZILMP (2019-2025)	FCPF Carbon Fund REDD+ results-based payment	Zambezia (9)	Output 1, 2, 3
FLOMOZ (2019-2024)	JICA Technical assistance	Niassa	Output 1, 3
ECOSMART-2 (2021-2026)	USAID and WCS	Niassa (Niassa Special Reserve)	Output 3
Resilient Gorongosa (2020- 2025)	USAID	Sofala (Gorongosa National Park and bufferzone districts)	Output 3

Expected co-financing information is explained further in Section C.2.

³⁸ Rito Mabunda, 2023, Status of Forest Management and Forest Financing in Mozambique. UNFF

³⁷ Further, in 2016, WWF reported the existence of 1,236 timber companies with 1,025 under simple license and 211 under forest concession. In 2018, IUCN and WWF reported 801 timber companies with 608 under simple license and 193 under forest concessions.

³⁹ Rito Mabunda, 2023, Status of Forest Management and Forest Financing in Mozambique. UNFF



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B.2. Project/Programme description (max. 3 pages)

Main objectives and outputs

The objectives of the project is to support a paradigm shift in the forest and land-use sector of Mozambique in a way that **reduces GHG emissions and increase sequestrations**. As the other side of the coin, this will enhance **climate resilience of the ecosystem**, increase the **food security** and contribute to **poverty alleviation** through strengthening the foundation for sustainable livelihood of the rural communities. The target provinces have 15,600,027ha or 46% of the total forest area of the country; and 8,763,185 people or 30% of the total population of the country (the direct impact will be fully estimated through the preparation of the Funding Proposal).

Following Mozambique's land and forest governance system, and in order to enable maximization of the project impacts (and also to mitigate leakage of negative impact), jurisdictional approach will be undertaken through two layers of interventions:

a) creation of enabling environment at the national level; and

b) implementation of field intervention activities at the sub-national level.

The project will aim to significantly improving access for financing forestry sector, such as potential climate finance sources (including accreditation of the first Direct Access Entity for Mozambique) and promotion of private-sector investments into forestry sector to encourage new business models and technologies. Facilitation of global and regional collaboration is also incorporated in order to ensure Mozambique's climate change commitment is ambitiously linked to the climate context, particularly for the management of Miombo woodlands in south-African region.

The project consists of four outputs supported by effective project management component (cross-cutting component) as described below. A full logical framework including the target indicators, refined structure of outputs, activities, sub-activities and deliverables will be prepared for the funding proposal.

Output 1.

(National level): Forest governance arrangement and institutional capacity of the sector is enhanced to create enabling environment

Output 1 aims to enhance forest governance arrangement and institutional capacity of the stakeholders, improve policy and planning, regulatory framework, and decision-making in order to create enabling environment to optimize forest and land use.

This Output will be led by the National Directorate of Forest (DINAF) - Ministry of Land and Environment as it is the primary role of the central government to create enabling environment that support maximize the performance of the site-level interventions. It will be technically supported by the IUCN. Generation of robust and transparent information and data will support evidence-based planning, implementation and decision making. The global interests in Nature-based solution and responsible forest/agriculture commodities for example driven by the <u>EU's Regulation on Deforestation-free</u> <u>products</u> are also important areas to be looked into (Activity 1.2, 1.3). Replication, scaling-up and generation of transformational change will be targeted for mid-to- longer term horizon. Training, dissemination, and opportunities for dialogue will be provided for both the financers and the recipients to ensure the vision is clearly shared, and the associated opportunities and risks are correctly understood (Activity 1.1, 1.4).

The targeted provinces will prepare a Provincial Plan for Integrated Forest Management (PPIGF) as required under the Forest Law 2023 (Activity 1.5)⁴⁰. The common but differentiated plans will guide investment for the sustainable management of Miombo woodlands. This approach supports the recent decentralization policy of the Mozambique government, and also addresses the risk of displacement of deforestation and forest degradation within and among the provinces,

Activities include:

1.1 Strengthen institutional arrangement and coordination of forestry sector stakeholders.

⁴⁰ This provincial approach was supported by FLOMOZ Project/JICA and the first example of the PPIGF has been developed for Niassa Province. The PPIGF consolidates the strategies and actions for forest management in the province, including climate change mitigation and adaptation measures, challenges, needs of the stakeholders, opportunities and financing plan in order to serve as a long-term management tool for the province.



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- 1.2 Improve forest monitoring through stepwise implementation of the national forest monitoring system (NFMS)⁴¹ and safeguards for informed decision-making.
- 1.3 Prepare and implement the national forestry and territorial planning (National Plan for Integrated Forest Management: NPIGF as a master plan to balance forest and land use), and related policies and measures to guide sustainable use of forestry goods and services.
- 1.4 Promote training and research to build human and technological capacities for the forestry sector.
- 1.5 Prepare and implement the provincial forestry and territorial planning (Provincial Plan for Integrated Forest Management: PPIGF) to balance forest and land use, and to guide sustainable use of forestry goods and services.

Example outcomes: Policies and legal frameworks strengthened, increased governance, capacity and coordination enhanced.

Output 2. (National-level) Identify sustainable financing pathways

Output 2 aims to identify sustainable in financing pathways for driving the forestry sector in the longer-term. The results will be harnessed with the investment guidance for miombo woodlands to be produced through Output 1. This Output will also be led by DINAF with technical support and facilitation by the IUCN. This will be an important transformation for Mozambique as sector financing has been heavily dependent on public finance mostly from donor support. Financing options will look into two pathways: (i) the project will actively pursue accessing the existing and future climate finance sources including the ones in discussion⁴² (Activity 2.1) in order to supplement the financial gap, and more importantly to catalyze private-sector investments though de-risking; and (ii) in parallel, existing financing models, such as microfinance and other new initiatives being discussed will be explored to boost the impact of interventions in selected rural community areas (Activity 2.2). This activity includes exploration of on-granting schemes⁴³ targeting community organizations and eligible private entities, etc., which their needs are significant but often hard to reach.

For example, Gapi is a public development finance institution founded in 1990 that manages more than US\$40 million in funds from international development partners. It operates in over 100 districts in Mozambique and has given out more than US\$90 million in loans since its establishment. Its success derives from its transparent, multistakeholder governance structure; its capacity building coupled with the provision of credit; and loan programmes designed to overcome barriers to SMEs in accessing finance (Hou-jones et al., 2018). Another promising institution is the Institute for Promotion of Small and Medium Enterprises (IPEME), which has a mandate to support SMEs. IPEME identifies emerging and existing SMEs, provides training for the development of business plans and financial reporting, and facilitates access to finance by acting as a link between SMEs and bank. Catalytic fund from Zambezi Valley Development Agency (ADVZ) for small and medium enterprises (SMEs) is also an opportunity. Discussion with private financial entities (private banks, micro-credit providers) are in progress and the funding proposal will provide further details.

- 2.1 Explore potential climate finance sources, such as fund-based and/or market-based results-based climate finance, and funds for implementation of adaptation and mitigation actions.
- 2.2 Create financing mechanisms for forestry operators and community-based organizations to catalyze shift towards sustainable forest management and livelihoods development practices.

Output 3.

DGM.

(Sub-national level) Climate-responsive planning and interventions are implemented in the selected provinces and landscapes through enhanced partnership with the local communities, CSOs and private sectors to reinforce climate change mitigation and adaptation capacities.

Output 3 will be led by DINAF, Provincial authorities, forest communities, private sector, CSOs, with technical support by IUCN. It aims to support the field operation and implementation of climate responsive forest and land management activities at the sub-national level. Strong emphasis associated with budget (60% of GCF financing) will be given to this Output, with the benefit of local communities as the center of the intervention strategy. Strong emphasis will also be given

⁴² For example: the Italian Agency for Development and FAO have agreed to collaborate in <u>transboundary integrated</u> sustainable management of the mimobo woodlands targeting Mozambique and Zimbabwe; the Government of Mozambique is co-hosting an <u>International Conference on Miombo</u> in April 2024 to call for collaboration and support; and there is a project under the GEF 8 cycle aiming to support the forestry sector which could bring in synergy with this proposed project.
⁴³ The proposed project can benefit from e.g. the <u>IUCN's global knowledge</u> in the Dedicated Grant Mechansim (DGM) for Indigenous Peoples and Local Communities, and also the unique experiences of Mozambique in implementing the <u>MozFIP</u>

⁴¹ Mozambique NFMS consists of functions for Measurement, Reporting and Verification (MRV), Forest Monitoring and Data Management. In collaboration with the FLOMOZ Project/JICA, DINAF and FNDS have formed an NFMS task force to coordinate the step-wise development of the NFMS. Key stakeholders join this through the NFMS Working Group. The NFMS document can be found in this <u>link</u>.



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on introducing low-emission and climate-adaptive models, such as in agriculture, forestry/agroforestry, alternative energy, and supporting community infrastructure in a manner that safeguards food security and other essential needs.

Miombo woodland along the Zambezi River Basin and in the north, namely Manica, Niassa, Sofala, and Tete provinces are considered as the target provinces (Annex I). These provinces are selected based on combination of criteria, such as' sites that can achieve high climate mitigation and adaptation impacts; sites that can achieve high outcomes as identified in the key country policies (e.g. protected area network); complementarity with other projects and initiatives; and alignment with the country's strategic interest that reflects strong project ownership.

Specific sites will be selected for intervention will be explored in details through the development of funding proposal, taking into account the aspects presented above, showcase effect, coherence and complementarity with existing donor support in forestry, biodiversity conservation, agriculture and rural development (e.g. World Bank, IUCN, FAO and WCS) and also taking into account the revitalization of forest reserves (Activity 3.1).

This output will also support the establishment/improved management of the FMUs ensuring the co-management and sharing of benefits from forest use among the communities, private sector and government. In collaboration with Output 1 and particularly with the forest monitoring activities (Activity 1.2), adherence of forestry operators to the sustainability standards and regulations will be enhanced (Activity 3.2).

Effective community engagement is crucial since they can be either act as drivers of deforestation/forest degradation, or guardians of forests. Mozambique has been accumulating good practices and capacity in land titling (called DUATs) (also as explained in Barrier 5) to small and medium landholders engaged in forest plantation and agroforestry, and community land delimitation certifications as a basis for community-level land use planning and management. Climate-smart agriculture practices will be introduced and up-scaled through this project. Gender and climate sensitive approaches that truly harmonize with the community interest will be pursued. For example, community finance approaches such as Community Environment Conservation Funds (CECF) and other local climate fund mechanisms can be introduced (Activity 3.3 and 3.5).

By synergizing with the enabling environment created through Output 1 and Output 2, sustainable forest management practices will be introduced to the forestry business operators and outgrowers, to maximize forest utilization (including NTFPs) and restoration. New and viable value chains and markets will be explored, including for value-added products, certified timber, and use of a wider range of species currently not marketable (Activity 3.4 and 3.6).

Activities include:

- 3.1 Decide the intervention sites, setup implementation mechanism and plan intervention activities for each site.
- 3.2 Operationalize robust mechanism and improved forest inspection system to promote effective control and transparency of production, marketing and trade of wood products.
- 3.3 Support extension of community-oriented forest management and climate-smart agriculture to increase community benefits.
- 3.4 Promote improved value chain for wood and NTFPs to develop economically viable forestry sector.
- 3.5 Promote improved planning and production techniques, alternative energy sources, and awareness raising, to enable shift towards sustainable use or reduction of woody biomass for energy.
- 3.6 Assess forest landscape restoration potential, and implement restoration activities (e.g. native and exotic species, natural regeneration, agroforestry (multi-purpose plantation forestry)) in partnership with local communities, CSOs and private sector including forest concession and tourism operators.

Example outcomes: climate-responsive planning and interventions materialized, enhanced partnership with and ownership of the communities (e.g. natural resources committees), stronger engagement of CSOs and private sectors in sustainable management systems.

Output 4.

Regional and Global Cooperation are facilitated to further integrate Mozambique into the global effort on addressing climate change.

The project aims to further integrate Mozambique into the global effort on addressing climate change. Building on Mozambique's commitments under the Paris Agreement and other climate initiatives, the project will contribute to enrich international debates through exchange. Lessons obtained through the project approach, activities and outputs from the policy level down to the community level will be shared to enrich the global learning.


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The Maputo Declaration on Sustainable and Integrated Management of Miombo Woodland for the Zambezi River Basin by the Southern African Development Community (SADC) Region in August 2022⁴⁴ is another backbone which this output aims to materialize. Through this output, Mozambique and the SADC countries will have vibrant opportunities to discuss the future and vision for the Miombo woodlands management in Mozambique and in the region. In fact, DINAF has already started discussing with potential donor(s) for facilitating a programmatic approach for miombo woodlands, such as through GEF 8 cycle (project proposal under finalization), support by <u>Italy and FAO</u> (project agreement under finalization), and the upcoming <u>International Conference on Miombo</u>. The project experiences including knowledge and lessons will be shared. And in alignment with this output, the Government of Mozambique is ambitiously advocating to collect further support for **replicability and scaling-up** in the region.

Activities include:

- 4.1 Strengthening Mozambique's engagement in international climate debate (e.g. knowledge sharing, participate in international conferences).
- 4.2 Promote cooperation and knowledge sharing among SADC countries in line with the MAPUTO DECLARATION ON SUSTAINABLE AND INTEGRATED MANAGEMENT OF MIOMBO WOODLANDS, e.g. regional knowledge sharing and collaboration, Miombo forest monitoring center, fund-raising for replicability and scaling-up.
- 4.3 Knowledge sharing through South-South cooperation, research collaboration, etc.

Example outcomes: Enhanced international commitment and reporting, promotion of regional collaboration and knowledge exchange, south-south cooperation and capacity enhancement.

5. (Cross-cutting): Project Management, Monitoring and Evaluation to inform the progress and contribution in climate change approach

The project will have a strong management team to be supervised by the IUCN as the AE. The IUCN has tracked experiences on management of donor funds in Mozambique, and also in the region and at the global level including the GCF-funded projects. A project-specific management structure will be established, however by utilizing the existing mechanisms to the extent possible for efficiency (See the section on Implementation Arrangement).

The Monitoring and Evaluation activities will ensure the results are in compliance with the AE's requirement to fulfil the GCF standards. The monitoring and evaluation of project activities is crucial to inform the progress and contribution in climate change approach and the process will involve all implementers.

Mozambique's experiences of safeguards and gender and youth inclusion in various donor projects (e.g. World Bank, Forest Carbon Partnership Facility, FAO) will be fully utilized. This will be additionally supported by the IUCN's national, regional and global experiences (e.g. GCF, GEF, etc. projects)

Activities include:

- 5.1 Implement project management activities (e.g. meetings, equipment, travel and day-to-day operation);
- 5.2 Monitor and evaluate project operation including financial management and procurement management; and
- 5.3 Monitor and evaluate technical issues, such as project impacts, safeguards and gender in accordance with the GCF standards.

The responsible project personnel at all levels will be trained on technical and administrative issues related to project management, M&E and reporting. The project management shall be adaptive accordingly, both in technical and operational aspects, and allow constructive learnings through the course of implementation.

Theory of change and alignment with the GCF goals and objectives.

The proposed project will contribute largely to the GCF's mitigation results area of **Forestry and Land use**, and also to the adaptation results area of **Most vulnerable people and communities**, **Health, well-being, food and water security**, and **Ecosystems and ecosystem services**. The impact targets and key indicators are assumed as in the table below, and will be fully elaborated through the Funding Proposal development. The project contributes to the GCF Fund-level outcomes **M5.0**, **M9.0**, **A5.0** and **A7.0**. These will be achieved through integrated implementation of the five outputs described above.

GCF indicators	Narrative	Delivered through
Estimated mitigation impact	is xxxx tCO2eq over lifespan (as stated in Section	Output 1, 2 and 3
(IRMF Core Indicator 1)	A.6)	-

⁴⁴ https://www.mta.gov.mz/wp-content/uploads/2022/08/Miombo-Declaration_Maputo.pdf



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Estimated adaptation impact (Core Indicator 2)	xxxxx of direct beneficiaries and % of population (as stated in Section A.7)	Output 1, 2 and 3
Scale of intervention area (Core Indicator 3)	Hectares of natural resource areas brought under improved low emission and/or climate-resilient management practices	Output 2 and 3
Institutional and regulatory framework (Core Indicator 4)	Degree to which GCF projects/programmes contribute to strengthening institutional and regulatory frameworks for low-emission climate- resilient development pathways in a country- driven manner	Output 1
Market development/transformation (Core Indicator 7)	Degree to which GCF projects/programmes contribute to market development/transformation at the sectoral, local or national level	Output 1 and 2
Knoweledge generation and learning processes (Core Indicator 8)	Degree to which GCF projects/programmes contribute to effective knowledge generation and learning processes, and use of good practices, methodologies and standards	Output 4

The project's theory of change is provided below and in Annex ii. The project aims at catalysing transformative changes that will result in strengthening the role of Mozambique forests as national assets for realizing low-emissions and climate resilient development. The project rational in the Theory of Change is as follows:

IF (Project Outputs) the forest management in targeted Miombo woodlands is strengthened through improved governance, planning and implementation supported by sustainable financing options,

THEN (Paradigm shift/impact) the role of Miombo woodlands for climate change mitigation, adaptation and community benefits will be enhanced,

BECAUSE (Project Outcome) there will be stronger motivation for all the stakeholders to pursue longer-term impacts and benefits under clear roles.



Consistency with national regulatory and legal framework

The Government of Mozambique's strong commitment to reducing deforestation and forest degradation, and to improving forest governance, is presented in the recent progresses in its policy and regulatory frameworks.



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- The National REDD+ Strategy (NRS) aims to reduce deforestation by 40% and restore 1 million ha of forests by 2030. The National REDD+ Strategy Action Plan 2016-2030 (NRS Action Plan) sets out list of actions and timelines for the implementation of the National REDD+ Strategy.
- The Nationally Determined Contribution (NDC), submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in 2016, sets targets for greenhouse gas emission reductions of 23 million tCO2e from 2020 to 2024, and 53 million tCO2e from 2025 to 2030. The Update of First NDC for the Period 2020-2025 (November 2021) explicitly includes REDD+ as a key measure to achieve its climate change mitigation ambition, and even suggests to uplift the mitigation target to emission reductions of about 40 million tCO2e between 2020 and 2025 as a whole. This represent a mitigation effort of about 1.2 tCO2e per capita by 2025, compared to about 2 tCO2e today.
- **National Forest Policy** defines as its general objective is to guarantee the perpetuation of the national forest heritage and generation of benefits derived from environmental goods and services through sustainable use and adding value to forest products, encouraging inclusive and participatory management, for the economic, social and environmental benefit of current and future generations.
- The Strategic Agenda 2019 -2035 and National Forest Program of Mozambique (NFP) serves as strategic document of the forestry sector towards 2035. The central objective of the NFP is to promote development of institutional systems for sustainable management of forests, build capabilities to address climate change, and contribute to the achievement of the Sustainable Development Goals."
- The revised **Forest Law** was approved in November 2023 with stronger incorporation of climate change into its agenda, requiring strengthened coordination among relevant sectors towards conservation and low-emission development pathway.
- The project aim to support the country's development priorities in alignment with the Government Five-Years Plan (2020 – 2024). One of its three priorities is to strengthen the sustainable management of natural resources and environment through its strategic objectives: by ensuring the conservation of ecosystems, biodiversity and the sustainable use of natural resources; and improving territorial planning and management and strengthen monitoring and inspection of its implementation.
- The National Biodiversity Strategy and Action Plan (2015 2035) reinforce the need of biodiversity restoration by 2030 at least 15% of degraded ecosystems/habitats, restore their biodiversity, and ensure their sustainability, with a view to mitigating climate effects and combating desertification and, the need of engagement of economic sectors for the biodiversity integration
- Apart from the above, the **National Adaptation Plan** with the objective to build climate resilience socio-economy including the use of nature-based solutions is under preparation.
- The Government of Mozambique is shaping 'Green Mozambique (MozVerde)' as a set of strategic actions for enhancing climate resilience and adaptation through land-based interventions, e.g. land and forest conservation, restoration, nature-positive socio-economic development.
- Other sector policies including: Mozambique Energy Transition Plan; National Strategies and Policies to Improve Energy Access; Zambezi Watercourse Commission; and The Master Plan For Disaster Prevention and Mitigation (2006).

Although still in its initial stage, the government has been progressing in decentralization of natural resource management to the provincial and local levels, with greater partnership with non-government actors, such as the local communities, private sectors and CSOs. Such decentralization approach is adopted and will be supported by this project.

Implementation arrangement

The AE will ensure compliance with all the regulations issued by the authorities, on matters relating to forest development, forest restoration, carbon sequestration, environmental impact assessments, sustainable agriculture practices, renewable energy technologies, and water resources management.



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funds are managed to the required fiduciary standards.

Implementation structures have been designed considering the need to coordinate between the various sectors involved in project implementation at also various levels. The Project Steering Committee (PSC), with the key function of project oversight and guidance, will consist of eleven institutions: MTA, as a chair, represented by six department's, the Accredited Entity (IUCN), the NDA (Ministry of Economy and Finance, National Directorate of M&E), the Local Governments representatives of Sofala, Manica, Tete and Niassa provinces and a private sector representative – a full implementation structure will be identified during the funding proposal development.

The MTA will be responsible for Project implementation oversight and overall supervision including coordinating the linkage between central and local activities, as well as with other sector agencies. Conversely, IUCN will be responsible for financial management to ensure that project milestones are completed as stipulated in the logical framework and that

DINAF under the MTA will implement the project in partnership with provincial authorities, forest communities, private sector and CSOs responsible for has the mandate and experience of implementing large donor projects in the forestry sector. DINAF has the mandate and experience of implementing large donor projects in the forestry sector.

The IUCN will also be responsible to deliver technical assistance building on its excellent technical capacities and track record of providing technical support, particularly knowledge on climate change projects in Mozambique, the wider region and globally. This includes the ground activities and training the local actors in policies and strategies applicable, restoration of forest reserve, develop the smart agriculture techniques and integration of all activities in line of country strategies and milestone to be achieve in different plans. FLR concept and nature based solutions to climate hazards are particularly among its strength.

Initial assessment of risks and mitigation measures

Below are initial risks identified and mitigation measures. A full assessment of the financial and operational risks including environment and social risk analysis will be performed for the full proposal as required by the GCF standards.

Technical and	Medium	Risk of inadequate stakeholder engagement and coordination will be addressed
operational		through Output 1. Intensive awareness raising and capacity building on technical
		and operational capacity will be offered through respective project Outputs.
Governance	Medium	The project approach is fully aligned to the country's strategy and priority. Risks
		to consistency that can be caused by, e.g. changes in government structure and
		staff turnover will be minimized through application of operational guideline and knowledge sharing activities
Lagal	Law	The Covernment of Morenthing has been enhanced in its constitute encode
Legal	LOW	The Government of Mozambique has been enhanced in its capacity to engage
		with the GCF through the GCF Readiness Support. The IUCN has proven track
		record as an AE to deliver GCF projects.
Reputational	Medium	The project aims to enhance broad climate, economic and social benefits through
		forestry-based climate change mitigation and adaptation actions. Local context will
		be fully respected through transparent consolation applying Free, Prior and
		Informed Consent (FPIC) throughout.
Money-	Low	Establish robust and transparent fund management mechanism and operational
laundering/terrorism		guidelines that allows early-detection and minimization of risks.
financing		Internal and third party audit and control.
Prohibited practices	Low	Establish robust and transparent fund management mechanism and operational
•		guidelines that allows early-detection and minimization of risks.
		Internal and third party audit and control.
	1	

B.3. Expected project results aligned with the GCF investment criteria (max. 3 pages)

1. Impact potential

The project impact is expected as follows:

• Primarily through Output 3, the project will **mitigate approximately 5.8 million tCO2e of greenhouse gas** through direct avoidance of deforestation and forest degradation which is a most conservative estimate. Expected removals



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enhancement through forest landscape restoration is modestly included here. For instance, FAO⁴⁵ reported that modelled scenarios (illustrative) for miombo woodlands indicate that the introduction of multiple interventions along the charcoal value chain could contribute in reducing GHG emissions of 86 percent. Furthermore, according to IUCN⁴⁶, regenerative agriculture is a cost-effective solution for Africa to combat climate change and restore degraded land with the inclusion of agroforestry systems. Application of jurisdictional approach includes various activities that will positively contribute to mitigation benefits throughout the province including outside of the direct intervention areas. By assuming these, the ambition could increase up to 17.5 million⁴⁷ tCO2e from 15.6 million ha of forests (46% of the national forest area) including degraded forests under protection and/or rehabilitation.

• Also primarily through Output 3, approximately 876,319 people (424,412 male, 451,906 female)⁴⁸ (10 % of the total population of the target provinces) are expected to directly benefit in increased climate adaptation impact. For instance, accelerated implementation of FLR, including transition to regenerative, climate-smart agriculture and adoption of alternative and efficient energy technologies, will increase resilience of food production and forest ecosystems. The consequent benefits are increase in household incomes, capacities and awareness of the importance of SFM in securing resilience of livelihoods – hence adaptive capacities. There are multiple evidences that acknowledges the potential of regenerative agriculture in improving crop yields through increased soil nutrients, organic content and water retention while reducing production costs^{49 50} The impact could lead up to indirectly benefiting 8,763,185 people (30% of the national population) who live in the targeted provinces.

It should be also highlighted that through Output 4, the experiences and knowledge generated through this project will be extended beyond the country to enhance regional cooperation in miombo woodlands management.

As a result, the project supports the *Strategic Plan for the Green Climate Fund 2024–2027* and its targeted results mainly (but not limited to) in the following areas:

- Advance the implementation of their NDCs, NAPs or LTS.
- Enable smallholder farmers adopt low-emission climate-resilient agricultural and fisheries practices and securing livelihoods while reconfiguring food systems.
- Conserve, restore or bring under sustainable management terrestrial and marine areas.
- Access adaptation funding, including for locally-led action.
- Expand access to sustainable, affordable, resilient, reliable renewable energy, particularly for hardest to reach, and to increase renewable energy sources in the energy mix.
- Enable national and regional financial institutions to access GCF resources, and other green finance, particularly for MSMEs

The funding proposal will provide refined updates for the above, as well as other quantitative and qualitative impacts. They will include activity-specific indicators such as rural job creation, enhancement in gender equality, forest areas restored, progress in law enforcement, among others.

2. Paradigm shift

Through sustainable management of forests with increased benefits to all the stakeholders under clear understanding of their roles and responsibilities, the project will enable shift of Mozambique's forests for climate change mitigation and adaptation, sustainable forestry value chain, and green growth of the rural communities. This will contribute to overall objective of climate change mitigation as targeted in the NRS and the NDC among other key national strategies.

Following aspects will be incorporated into the full project design to reinforce paradigm shift beyond one-off investment:

• Optimize long-term investments through national and provincial forestry and terrestrial planning. For the provincial level, provincial forestry and terrestrial planning (so called PPIGF) for each of the target provinces (Manica, Niassa, Sofala, and Tete) will be developed as priority. This will result in supporting a total of **15.6 million ha of forests** (46% of the national forest area) and **8,763,185 people** (30% of the national population) under the framework of its planning and management. Note that the plan for Niassa provinces has already completed in early 2023 as a first case, and will be replicated to the other four target provinces (at minimum).

⁴⁹ https://climatechampions.unfccc.int/regenerative-agriculture-works-new-research-and-african-businesses-show-how/
 ⁵⁰ Regenerative Agriculture Report: An opportunity for businesses and society to restore degraded land in Africa:

⁴⁵ FAO, online - <u>https://www.fao.org/3/i6934e/i6934e.pdf</u> The Charcoal Transition: Greening the charcoal value chain to mitigate climate change and improve local livelihoods.

⁴⁶ Regenerative Agriculture Report: An opportunity for businesses and society to restore degraded land in Africa: <u>https://www.iucn.org/resources/grey-literature/regenerative-agriculture-report-opportunity-businesses-and-society</u>

⁴⁷ This indicative estimation was done using the data of the national FREL/FRL, and the data of the Emissions Reduction Motoring Reports for the FCPF Carbon Fund Emission Reduction Program (namely ZILMP).

⁴⁸ Calculated from the national population statistics of year 2017 <<u>www.ine.gov.mz</u>>, it assumes that 10% of the population of the targeted provinces will directly benefit.

https://www.iucn.org/resources/grey-literature/regenerative-agriculture-report-opportunity-businesses-and-society



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- Explore potential climate finance sources, such as results-based climate finance, international carbon markets, and other fund sources. Explore opportunities to reinvest such revenues for scaling-up climate change mitigation and adaptation actions. It can also create income streams for delivering climate results that incentivize private sector investments.
- Catalyse private sector investments in low-emission, deforestation-free and climate-resilient production practices. The project will bridge economic activities (e.g. forestry, agriculture, livestock, fishery and tourism) with financial sectors and (localized) production technologies to generate real changes in the commodity and food production systems. Financing options will be explored building on both the existing financing models as well as the new initiatives being discussed.
- Scale-up investments in sustainable and climate-responsive forest landscape management. This includes shift towards SFM through improved value-chain for wood and NTFPs, strengthened supply-chain control for transparent wood business including domestic taxes and fees, livelihood opportunities, such as outgrowers scheme for local forest-dependent communities from the sustainable management of forest resources, creation of income generation opportunities through forest landscape restoration activities.
- The project will generate useful knowledge lessons that will be shared through the coordination platform, in-county seminars, and moreover through regional and global arena. In particular, the actions adopted in The Maputo Declaration on Sustainable and Integrated Management of Miombo Woodland in August 2022, namely enhanced collaboration and knowledge sharing, will promote Mozambique to play further active role in the region.

3. Sustainable Development

Economic (SDG-12 Sustainable Consumption and Production): Improved production and value-chain system of forest resources, both timber and non-timber forest products, will improve forest-based economies with increased productivity, job opportunities, and compliance with the regulating systems. Improved efficiency in the use of wood fuel including provision of alternatives fuel sources also contributes to sustainability in the use of forest resources. FLR also have a large potential to attract investments by private sector and communities that will realize economic return, as well as climate mitigation and adaptation benefits.

Environmental (SDG-13 Climate Action, SDG-15: Life on Land): In addition to the mitigation of 5.8 million tCO2e of emissions as described in "Impact potential" above, the project will benefit approximately 876,319 people through climate-responsive interventions (Output 3). The environmental co-benefits include biodiversity conservation through protection and restoration of important habitats, climate resilience against floods, land-slides and droughts through enhancement of watershed forests. In the long run, restoration of forest ecosystems services (watershed, soil regeneration, biodiversity, etc.) will increase the resilience of the production systems and livelihoods, thereby reducing vulnerability to climate change (benefitting individuals, households and communities).

Social (SDG-1 No Poverty): The project will improve livelihoods of the forest dependent communities in the rural areas that tend to be marginalized from socio-economic development. It should be noted that targeted provinces are higher in their poverty rate (see table below). Maximization of social benefits will be built-in as a core value throughout the project activities. Local communities, including marginalized groups with women, indigenous peoples and poor rural communities, will be empowered through increased participation, awareness raising and capacity building in sustainable forest management practices, increased land tenure security and use rights, and protection of forests as part of their cultural value. Improvement in agricultural productivity will have large food security co-benefits. Introduction of alternative and/or more efficient technologies for energy will have health co-benefits.

Province Poverty rate Cabo Delgado 50% Gaza 44% Inhambane 35% 37% Manica Maputo 12% Nampula 65% Niassa 67% Sofala 50% 42% Tete Zambezia 62%

Gender (SDG-5 Gender Equality): The project will also contribute to reduce gender inequalities not only by avoiding the continuation of existing gender

stereotypes and norms which are of disadvantage, but by offering significant potential to contribute positively to gender equality. A Gender Assessment and a Gender Action Plan will be developed as a part of the funding proposal and will include full assessment of gender issues, and propose detailed gender actions including quantitative targets. All project activities will proactively involve empowerment elements for women to promote gender equality and social inclusion, such as by ensuring minimum quota of women in decision-making, offer training on climate-resilient and economically advanced production and business skills including financial support.

Inclusiveness and sustainability (SDG-17 Partnerships for the Goals): The project is designed on the key forestry strategies and policies (as explained in previous sections) of the country. It will serve as a platform to strengthen domestic and international resource mobilization; to improve domestic capacity for tax and other revenue collection from forestry businesses; and to facilitate optimal coordination of various resources from horizontal (central to local) and vertical (intersectorial) sources.



Co-benefits from the project will be fully explored, and quantitative targets will be set for the funding proposal.

4. Needs of recipients

Mozambique is ranked 180th out of 189 countries on the 2019 Human Development Index (HDI) and the country is still today classified as Least Developed Country (LDC) according to the United Nations. More than 50% of its people live in extreme poverty, this number reaches 57.8% for women (against 53.9% for men) and the majority of them are dependent on natural resources (90% of women labour force and 70% of men labour force work in agriculture, livestock and fisheries). According to UNDP's Gender Inequality Index, Mozambique ranked 127th out of 162 countries showing important remaining levels of gender inequality in 2019.

According to the World Bank study (World Bank, 2018)⁵¹ rate of poverty remain high in the Northern and the Central Regions of the country relative to the South. By 2014/15, poverty rates in Niassa (67 percent) and Sofala (50%) provinces are well above the national average (48.4 percent). This also justifies the project's objective to support the Northern and Central regions.

Despite the greater need, Mozambique has been still struggling to allocate sufficient amount of its national budget for financing climate actions. External fund sources are expected to fill the gap, and there is a strong expectation to access the GCF fund. So far there are only two Readiness support projects⁵² (NDA Strengthening and Country Programming National and one Simplified Approval Process (SAP)⁵³ funded by the GCF for Mozambique. The country has been progressing in strategically mainstreaming climate actions into its socio-economic development planning, and the GCF support is expected as an important opportunity to facilitate such effort.

5. Country ownership

The project strongly aligns with Mozambique's policies and plans, such as:

- National REDD+ Strategy and National REDD+ Strategy Action Plan 2016-2030.
- Nationally Determined Contribution (NDC)
- National Strategy for Climate Change Adaptation and Mitigation (NCCAMS) 2013 2025
- Strategic Agenda 2019 2035 and National Forest Program of Mozambique (NFP)
- National Adaptation Plan (NAP)
- Revision of Forest Law (2024) and related legislations (in progress)

The proposed activities have been designed through participatory review and analysis of the objectives and actions proposed or already being implemented by the above policies and plans. National REDD+ Strategy Action Plan, National Forest Program, Revised Forest Law and National Adaptation Plan were particularly looked into for this purpose. The commonalities were streamlined into a goal statement, project results and activities as shown in Section B.2.

The country has recently renewed its commitment under the NDC. The National Forest Program (approved in 2021) and Forest Law revision (2023) present orientation to the forestry sector to address emerging and pressing challenges. Having those new policy frameworks in place, it is an important timing for the Mozambique's forestry sector to make concrete steps for implementation through this project. Furthermore, the government's commitment to the sustainable management of mimbo woodlands is strongly represented in The Maputo Declaration on Sustainable and Integrated Management of Miombo Woodland for the Zambezi River Basin by the SADC Region and on-going actions, which this project will align with.

Under the leadership of MTA, a taskforce was formulated to prepare this Concept Note. The taskforce was led by DINAF and included appointed members from ANAC, AQUA, DMC and FNDS from the government, and IUCN as the AE and JICA as a technical partner. MTA has informed its intention from its early stage to the NDA (Ministry of Finance). The final draft was endorsed by the MTA, and then cleared immediately afterwards by the NDA in March 2024 for submission by the AE to the GCF.

Consultation at this stage of concept development was however limited by limited project development funds. Further consultation, including community groups in the targeted provinces, will be undertaken during the formulation of the full project proposal, in an inclusive and gender responsive process. A stakeholder participation plan, gender action plan and environmental and social impacts management plans will be developed during the project preparation, to guide project implementation. These plans will provide mechanisms for future engagement with stakeholders and ensure that the project is implemented in line with the GCF environmental and social safeguards and stakeholder consultation guidelines.

⁵² <u>NDA Strengthening and Country Programming support for Mozambique through FNDS</u>, and <u>Strategic frameworks</u> support for Mozambique through GGGI.

⁵¹ Mozambique Poverty Assessment: Strong But Not Broadly Shared Growth, World Bank, 2018.

⁵³ <u>Climate-resilient food security for women and men smallholders in Mozambique through integrated risk management,</u> <u>WFP</u>.



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6. Efficiency and effectiveness

The Project will result in 5.8 million tCO2eq of mitigation benefits emission reductions over the 6 year project implementation period (expected lifetime emission reductions will be analysed for the funding proposal). The cost per tCO2eq of the GCF intervention is USD 4.82 / tCO2eq (GCF Financing USD 28 million / 5.8 million tCO2eq).

The ratio of expected co-financing is 156% (Co-financing / GCF financing). Leveraging of co-financing other than the ones currently included here will be further explore through the preparation of the funding proposal.

Mozambique's forestry sector has been accumulating experiences and capacities through its own initiatives and also with support from development partners, such as FIP, FCPF, World Bank, FAO, Japan, IUCN, WCS among others. For instance, Mozambique has been making significant progress in REDD+ and became the first country to receive emission reduction payment from the FCPF Carbon Fund. Experiences have been accumulated in the areas of forest-based climate mitigation interventions, forest monitoring, and benefit sharing. Particularly, the project aims to scale up the FIP in Mozambique (MozFIP). The MozFIP served as the central project to support national level actions of the forestry sector, with pilot interventions in Zambezia Province and Cabo Delgado⁵⁴ Province. As the FIP completed in 2022, the proposed GCF project is expected to up-scale the good results achieved.

Other on-going efforts include, land-use planning and registration, community-based natural resource management, timber legality, concession management and the new Forest Management Unit scheme, and so forth. Several donor support have contributed to strengthening safeguards and gender-sensitive implementation towards meeting international practices. The project, particularly through Output 1 and Output 4, will create active platforms to build on the best practise available in the country and the region.

Although a detailed economic analysis will be conducted at the funding proposal stage, promising scenario of FLR intervention can be derived from the ROAM⁵⁵ assessment. The assessment found that all restoration options present higher NPV than degraded natural forest and grassland; a scenario of district-wide portion of carbon sequestration in under 4 years based on the lowest-potential carbon sequestration actions; forest plantations could reduce sediment export by nearly 8 tons per hectare per year; replacing degraded nature forests by any restoration intervention will lead to emissions reduction up to the year 2030; and new forest plantations offer higher opportunities for employment and carbon sequestration potential while agroforestry and natural forest rehabilitation have high employment but medium carbon sequestration potential. These facts prove that FLR is an efficient technology for mitigation as well as contributing to food security and securing other ecosystems services, well beyond the GCF investment period.

B.4. Engagement among the NDA, AE, and/or other relevant stakeholders in the country (max 1/2 page)

Under the overall supervision of the MTA, a task team headed by DINAF, and includes the key forestry sector agencies such as ANAC, AQUA, DMC, FNDS was formulated. The task team was technically supported by the IUCN Mozambique and JICA, in elaborating the Concept Note presented. The project concept was consulted through formal government process, with the attendance of forestry and non-forestry stakeholders as outlined below:

- DINAF Technical Committee Meeting on 2 February 2023
- MTA Technical Committee on 21 February 2023
- Minister of MTA Consultative Council on 19 April 2023
- MEF (as the NDA) technical team meeting on 8 May 2023

The project concept received positive feedback and support. The Concept Note addressed the feedback, revised and completed the Government of Mozambique's no-objection procedure in March 2024.

For the preparation of the funding proposal, a comprehensive consultation plan will be developed to guide the formulation process. Indicatively, the stakeholder groups will consist of central government agencies (main implementing entity); provincial and district government agencies (field level implementing entity); private sector (implementing partner and beneficiary); local community (implementing partner and beneficiary); CSOs and women organizations (implementing partner); development partners (collaborating partner).

C. Indicative Financing/Cost Information (max. 3 pages)

C.1. Financing by components (max ¹/₂ page)

Total Project financing is USD 73 million of which USD 28 million is requested from the GCF and USD 44 million is

⁵⁴ Following the benefit sharing plan of the Carbon Fund, the results-based payment is reinvested into the two provinces.

⁵⁵ Source - MITADER. (2018). Forest Landscape Restoration Opportunities Assessment: 10 Districts of Zambezia and Nampula. IUCN. x+203pp.



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expected as co-financing. The breakdowns of project cost estimates by Output are presented below. Further cofinancing and/or collaboration with other support in discussions (see the information in Output 2 and Output 4) will be explored during the funding proposal development stage.

	Indicative cost	GC	F fina	ncing	Co-financing							
Component/Output	(USD)	Amount (USD)	%	Financial Instrument	Amount (USD)	Financial Instrument	Name of Institutions					
Output 1: (National level): Forest governance arrangement and institutional canacity	5,335,556	5,335,556	19%	Grant								
1.1 Strengthen institutional arrangement and coordination		1,595,556										
1.2 Improve monitoring of forests and												
safeguards for informed decision-		2,660,000										
making.												
1.3 Prepare national forestry and		200.000										
territorial planning		200,000										
1.4 Promote training and research		400,000										
1.5 Prepare and implement provincial		480,000										
forestry and territorial planning (PPIGF)		,										
Output 2: (national) identify		1,050,000	4%									
2.1 Explore potential climate finance												
sources		550,000										
2.2 Create financing mechanisms for												
SFM		500,000										
Output 3: (Sub-national level) Climate-							MozNorte/World Bank 14.0					
responsive planning and	61 193 234	16 993 234	60%	Grant	44 200 000	Grant	million					
interventions in the selected	01,100,204	10,000,204	00/0	orun		orun	MozRural/World Bank 30.2					
provinces and landscapes							million					
3.1 Decide the intervention sites, setup		800.000										
implementation mechanism and plan		800,000										
3.2 Operationalize robust mechanism												
and improved forest inspection system		2,154,096										
3.3 Support extension of community-												
oriented forest management and climate-		6,924,400										
smart agriculture												
2.5 Promote good practices in												
improved value chain for wood and		1,709,296										
NIFPS												
2.6 Promote good practices to enable		2 430 472										
reduction of woody biomass for energy		2,439,472										
2.7 Assess of forest landscape												
restoration potential, and implement		2,965,970										
restoration activities.												
Output 4: Regional and Global	2 840 000	2 840 000	10%	Grant								
Cooperation	2,040,000	2,040,000	10/0	oran								
3.1 Strengthening Mozambique's												
engagement in international climate		300,000										
3.2 Promote cooperation and												
knowledge sharing among SADC												
countries in line with the Maputo		1,720,000										
Declaration for Miombo Woodlands.												
3.3 Knowledge sharing through South-												
South cooperation, research		820,000										
collaboration, etc.												
Project Management, Monitoring and	2,158,440	2,158,440	8%	Grant		In-kind, tbd	Government of Mozambique					
Evaluation												
4. i implement project management		629,220										
4.2 Monitor and evaluate project												
operation		629,220										
4.3 Monitor and evaluate technical												
issues (e.g. project impacts, safeguards		900,000										
and gender)												
Indicative total cost (USD)	72,577,230			28,377,230			44,200,000					

C.2. Justification of GCF funding request (max. 1 page)

Mozambique is one of the world's poorest countries. The majority of the poor population reside in rural areas, highly dependent on primary production and exploitation of natural resources. Due to its proximity and reliance on nature, and difficult living conditions, they are also the most vulnerable to climate impacts and natural hazards. The Government of Mozambique strongly recognizes the need of public support to these people.

However, as a Least Developed Country and a Low-Income Economy with high level of debt (108% of its GDP in 2019), country capacity for applying concessional financing for climate change is limited, although support for a climate action and a green recovery to the COVID-19 pandemic is urgently needed.



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The Project builds on the efforts of Mozambique and other development partners, seizing every opportunity to exploit synergies. The Project is planned to fill the gap to catalyze transformative change, and strong focus is given to the creation of enabling environment in collaboration with the following donor supports and investments. The World Bank group has been the largest donor supporting forestry, land use and rural development sector. Synergy and complementarity with these projects, and others also listed in Section B.1. will be fully identified through the preparation of a funding proposal. The GCF funding is expected to catalyze further investment from both international and domestic, public and private financing as already described in this concept note.

Project	Donor	Province (# of districts)	Activities	Funding amount (USD)					
MozNorte	World Bank	Niassa (6), Cabo Delgado (4), Nampula (8)	Output 1: Improving Access to Livelihoods and Community. Infrastructure Output 2: Improved management of natural resources. Output 3: Multi-stakeholder Coordination and Project Management.	of which 14.0 million is expected as co-financing for Niassa					
MozRural	World Bank	Niassa (7), Nampula (14), Zambezia (11), Tete (8), Manica (8), Sofala (7)	Output 1: Increasing productivity and market access. Output 2: Enhancing natural resource management. Output 3: Strengthening institution and policies.	USD 150 million (2021-2026) of which 30.2 million is expected as co-financing for Niassa, Zambezia, Tete, Manica and Sofala					

As its nature, a large part of the project aims to enhance the role of forests as a public goods. The project does not intend to displace or substitute private sector finance that may have occurred, either concessional or commercial financing sources.

The rural communities targeted in the project is cash constrained and significantly disadvantaged in their income opport unities and livelihoods stability, and therefore their chances of engaging in commercial initiatives are still low. A large pa rt of the beneficiary groups, who are rural forest-dependent population, are among the poorest and most constrained in financial assets to raise their livelihoods, with a high dependence on natural resources and poor access to markets and financial services. Grant financing combined with technical assistance has been determined to be the most appropriate financing instrument for these beneficiary groups.

C.3. Sustainability and replicability of the project (exit strategy) (max. 1 page)

The principles for sustainability and replicability will be incorporated throughout the detailed project design for the funding proposal. Furthermore, a specific project exit strategy will be designed; this strategy should be finalized two years before the end of the GCF funding to ensure mobilization of additional resources to sustain project results, where necessary and appropriate. A brief summary of sustainability and replicability strategy are provided below:

Institutional

As already explained, the Project is firmly designed to support the implementation of the key national programs and policies, i.e. NRS, NFP, NAP and revised Forestry Law. This will generate a positive cycle for creating enabling environment, and reinforces technical and operational capacities of the stakeholders in sustaining the project outcomes. Furthermore, the Project will provide an important coordination platform for replication and upscaling, including lessons learned and knowledge products.

Throughout the project activities the capacity of local communities and the relevant technical institutions (CSO, staff of line ministries, private sector, and academia) will be built to plan, implement, and monitor, learn from and share the lessons with others in order to promote sustainability of the project results and further replication of these innovative measures in the country. Implementing the project through government and local institutions mandated to support the rural communities and other development in the rural areas will build practical skills, operational capacities and ownership of the project initiatives, creating powerful incentives for upscaling, sustaining and monitoring results post GCF funding.

Financial

Enhancement of forest economy and community benefits, such as development of forestry value-chain, appropriate taxation and acknowledgment of community benefits, will promote conversion of the Mozambique forest sector into an economically viable sector. Mainstreaming of climate, SFM and FLR considerations in all relevant sectors will reduce the



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negative impacts of these sectors on forest resources while simultaneously increasing incentives and financial resources available for SFM and FLR.

Through its Output 1, the project will support Mozambique to build a robust national REDD+ mechanism that helps the country to access various types of results-based climate financing. Output 3 will produce actual mitigation benefit through field-level intervention. Mitigation benefits from non-targeted provinces also can be expected as a results of Output 1 that creates enabling environment at the national level. Received finance will be re-invested to reinforce and extend the project outcomes geographically, and beyond this GCF project lifetime. In addition, the Government ensure its activities are integrated into government budget system beyond the lifespan of the project.

Technical

The project management will ensure that the main results, knowledge and lessons generated with the GCF support are consolidated and will remain available for future replication by the national and local governments, civil society or other relevant stakeholders. This will include good practices on planning and implementation for replication. Partnership with the local resources such as academia and civil-society organizations will be explored to the extent possible. The interventions will be designed adequately under the local context, and can be further scaled-up after the project lifetime. Learning from regional and global knowledge (and also contribution of Mozambique in sharing its experiences) will be promoted through Output 4.

Environmental

Well planned, professionally executed and maintained FLR is environmentally sustainable by nature. As a Nature Based Solution, FLR by definition helps societies to meet today's needs for adaptation and mitigation without compromising the ability of future generations to meet their needs. Indeed, they allow communities to meet these needs while promoting the ability of ecosystems to continue the regeneration of the services without harming other important aspects of environmental sustainability such as biological diversity, emission's reduction and land degradation neutrality.

Social and economic

The project design is aimed at empowering communities to embrace incentives and financial resources and advance the course of deforestation free agriculture and domestic energy provision, to increase productivity, food security and income generation while simultaneously regenerating forest resources. Within this context, the building blocks of social sustainability are inclusive, just, and resilient societies where citizens have voice and governments listen and respond. This project follows this school of thought closely by ensuring that the project design and selected mode of implementation promote the building blocks of social sustainability.

Project implementation will be guided by a gender and stakeholder participation plan to ensure that opportunities for benefiting from the costs and benefits of the project are equitably availed to all social groups.

D. Supporting documents submitted (OPTIONAL)

- Map indicating the location of the project/programme
- \square Diagram of the theory of change
- Economic and financial model with key assumptions and potential stressed scenarios
- □ Pre-feasibility study
- □ Evaluation report of previous project
- □ Results of environmental and social risk screening

Self-awareness check boxes



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Are you aware that the full Funding Proposal and Annexes will require these documents? Yes 🛛 No 🗆	I
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- Feasibility Study
- Environmental and social impact assessment or environmental and social management framework
- Stakeholder consultations at national and project level implementation including with indigenous people if relevant
- Gender assessment and action plan
- Operations and maintenance plan if relevant
- Loan or grant operation manual as appropriate
- Co-financing commitment letters

Are you aware that a <u>funding proposal</u> from an accredited entity without a signed AMA will be reviewed but not sent to the Board for consideration? Yes \boxtimes No \square



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ANNEX I: Map of the Target Provinces





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ANNEX II: Theory of change (ToC) and alignment with the GCF goals and objectives

別添資料 14 Simplified PPF 申請書案

Project Preparation Facility (PPF) Application

Application Title	Upscaling FLR to secure in the Zambesi basin to enhance the role of forests in climate change adaptation and mitigation and sustainable development in Mozambique
Country	Mozambique
Accredited Entity	International Union For Conservation of Nature (IUCN)
Date of first submission/ Version number	
Date of current submission/ version number	[YYYY-MM-DD] [V.0]

2020





List of acronyms

AE: Accredited Entity GCF: Green Climate Funds LDCs: Least Developed Countries PPF: Project Preparation Facility PMC: Project Management Costs SIDs: Small Island Developing States TORs: Terms of Reference USD: United States Dollars [Please add any other acronyms used in the PPF application here]



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	Name: IUCN											
Accredited	Position: Country Representative											
Entity	Email: Mauricio.Xerinda@iucn.org											
(AE)	Full Office address: IUCN Mozambique Country Office: 23, 1	y Office: 23, Fernão Melo e Castro Str; Tel: +258-										
	21-490599; Fax: +258-21-490812; P.O.Box 4770, Maputo, M	lozambique (www.iucn.o	rg/esaro)									
Has a Concept Note ^(note 2) been submitted in association with PPF?	S a Concept te (note 2) been omitted in ic enhance the role of forests in climate change adaptation and mitigation and sustainable development in MozambiqueHas a No- Objection Letter been submitted for this request for support from the PPF?West No □											
Total Cost	Total cost of Project Preparation activities: US\$ 435,000 Amount requested from GCF PPF: US\$ 300,000 Grant ⊠ (amount: US\$ 300,000) Counterpart funding from the AE: US\$ 135,000											
Anticipated Duration	Number of months to implement the Project Preparation activities:24											
Summary of the request for Project Preparation support	 The objective of the proposed project is to accelerate FLR in t of forests in climate change adaptation and mitigation Mozambique. The CN was informed by a review of relevisupplemented by consultations with civil society, academia departments, international organizations and the donor cor was limited by inadequate funds. Funds provided via this appligender responsive consultation as the basis of the project dworkshops, write-shops and informant group discussions a levels. The information gathered will identify and match relevation project interventions, partnerships matched to intervention establish the baseline values and targets to be achieved by the baseline values). The funds will enable the preparation assessments, environmental, social and gender assessment information will be packaged into the full project proposal and of project implementation partners with clear rolls and resport plan, gender action plan and environmental and social impace. As described in Section D (Implementation Arrangements), I place the team to undertake relevant technical assessments process will include: Elaborations of the TORs Hiring experts Desk review and elaboration of the inception reports committee Data collection and analysis Submission and approval of the first draft by the advis Submission of the final version Update the project proposal considering the feasibilities 	he Zambezi basin to enha a and sustainable dever ant documents (Table 1 a, private sector, line mi mmunity. However, the ication will enable a deep esign. The consultations at the national, provinci ant stakeholder groups to as across stakeholder groups to as across stakeholder groups to as across stakeholder groups to an of pre-feasibility and its annexes, including in sibilities, a stakeholder p ts management plans. UCN will use the GCF fur s and use it design the and approval by the proj isory committee ty study result	ance the role elopment in of the CN), nistries and consultation er, inclusive, will include al and local appropriate oups. It will icators (with d feasibility Trisks. This dentification participation nds to put in project. The ect advisory									



В																								
Activities and Outputs											ľ	Мo	ntł	1										
	1	2	3	4	5	6	7	8	9	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
Activity 1. PPF activity area: Pro-fossibility										0	1	2	3	4	5	0	1	ð	9	0	1	2	3	4
feasibility studies and project design. The first step	x	x	x	x	x	x	x	x	x	X	x	x	x	x	x	x	x	x	х					
will be to develop and apply criteria to select specific																								
project intervention areas upon which the various																								
prefeasibility and technical studies/assessments will																								
target. For each site and/or intervention, feasibility																								
conducted, building on the CN and the comments																								
received by GCF on the CN to provide information and																								
justification for project design. The following																								
assessments will be undertaken:																								
 Selection of project sites based on agreed oritoria 																								
 Establish baseline conditions on: 																								
 climate vulnerabilities and impacts (current 																								
and projected impacts);																								
• GHG emissions profile and importance of																								
forests in mitigation and adaptation;																								
 Forestry and agriculture based value chain analysis 																								
Policy analysis																								
 Stakeholder capacity assessment 																								
• Identification of lessons from past, current																								
and planned projects and initiatives to																								
identify lessons to integrate into the project																								
 Refining the baseline information in the CN to 																								
reflect the data and statistics for the selected																								
project sites.																								
 Climate vulnerabilities and impacts 																								
Mitigation profiles																								
 Drivers of deforestation and forest degradation in the selected sites: 																								
 Barriers to be addressed by the project 																								
• Developing problem tree and theory of change																								
including identification and costing of																								
objective, outcomes, outputs and activities;																								
• Assess suitability of the accredited entity to																								
undertake the planned activities and project																								
implementation arrangements; identify																								
capacity-building and technology																								
development/ transfer needs.																								
This information will be used to design the full project																								
proposal outlining the following:																								
1.1 Specific project sites and stakeholders identified.																								
matched to relevant project interventions;																								
1.2 Forest and natural resources profiles per site																								
(forest resources, state of degradation and/or																								
costs and benefits).																								
1.3 Socio-economics profiles (identify community																								
groups, resource use patterns and their impacts																								
on the forests and natural resources,																								

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 opportunities for sustainable use and requirements to actualize the opportunities sustainably); 1.4 Adaptation profile – current and projected climate and related hazards, vulnerabilities to climate hazards, impacts of climate driven hazards on livelihoods, forest resources and the contribution of forests to adaptation and mitigation in the context of accelerated inclusive green/sustainable development; 1.5 Mitigation profile – current and project mitigation by sources 1.6 Site specific drivers of forest degradation and deforestation, and their impacts; 1.7 Theory of change to address the drivers of deforestation (desirable state, barriers to achieving that state and suggested interventions – in the form of costed outcomes and project results); 1.8 Suggested partnerships for the effective implementation of the project outcomes; 1.9 Cost benefit analysis of the selected interventions as input to selection of final project interventions and contribute to the narrative on justification, cet effectiveness and efficiency of the project; 																			
 1.10 Identification of project benefits (economic, environment, social) 1.11 Analysis of sustainability issues (financial, institutional, socio and environmental) 																			
Activity 2: PPF activity area: Environmental, social and gender studies				x	x	x	x	x											
Output 2: Environmental and social impact assessment and Gender assessment and action plan																			
Activity 3:							х	x	x	x	x								
PPF activity area: Risk assessment																			
During the project design the project design team will identify the risk and propose the mitigation measures. The risks will be identified for the implementation of each project outputs and activities.																			
Output 3: Risk assessment framework																			
Activity 4:								ſ		x	x	x	x	x		ſ			
PPF activity area: Identification of																			
programme/project level indicators The Monitoring, Evaluation and Learning (MEL) will be elaborated and included in final full project proposal. Indicators will be identified in accordance with the GCF categories, thus: mitigation and adaptation, impact, paradigm shift and co-benefit sharing. Others will include project alignment with the NDC and engagement with key stakeholders and the efficiency and effectiveness of a project. The work will include: Output 4: Monitoring, Evaluation and Learning (MEL)																			
Estimated time for submission corresponding full Funding Proposal to the GCF															X	x	X	X	x



C. Justification of the Project Preparation Request

As stated in the NDC (2020-2025), Mozambique's commitment to actions to address global climate change is real, measurable and grounded in genuine national sovereignty: however, there are still significant barriers to progress, including inadequate finance, weak institutional capacities and scarcity of knowledge to inform planning. These challenges affect the ability of the country, particularly DINAF, to prepare bankable/fundable projects to take advantage of the significant resources available from international funding mechanisms (especially climate financing). This has, to a great extent, limited resources available for SFM and upscaling FLR in the country.

The Global Forest Financing Facilitation Network or GFFFN has supported the development of this CN by providing training and financial resources to undertake limited consultations and write up the concept. IUCN and DINAF have provided co-finance to the process via staff time of senior scientists, SFM and FLR expertise at national (both), regional and international levels (for IUCN). This support will continue to be availed during the design of the full proposal as well as its eventual implementation. However, GCF project development funds are now required to finance in-depth consultation at the project sites, feasibility assessments and the design of the project and its annexes, as described in above.



The Task Force established to guide the development of this CN has expressed intent to continue as the Steering Committee to guide the implementation of this PPF, and to guide the PPF Team, including the review and endorsement of the PPF deliverables (described in Section B and ToRs in Annex 1). Members of the Task Force included appointed members from ANAC, AQUA, DMC and FNDS from the government, and IUCN and FLOMOZ Project/JICA (as technical partners). This will be expanded to include representatives from civil society, academia, private sector, communities and other relevant closely related line ministries and departments, international organizations and the donor community. The Steering Committee is responsible for ensuring that the deliverables outlined in this PPF are completed on time and in line with IUCN, the Government of Mozambique and GCF requirements. The Steering Committee will be co-chaired by IUCN and DINAF.

The GCF requires robust stakeholder engagement during project formulation, along its principles of stakeholder engagement – transparency, accountability, inclusiveness, non-discrimination, do no harm. The PPF will therefore engage in meaningful consultation and engagement process inclusive of all relevant societal groups, such as technical staff of relevant institutions/organisations, civil society, academia, the private sector and community groups – ensuring the contribution (as applicable and relevant) from vulnerable and marginalised groups and individuals -- including indigenous communities, women, young and the elderly who are likely to affected - or potentially affected - by proposed GCF-funded activities. The consultation and engagement will be guided by the GCF-recommended stakeholder engagement plan and a list of these stakeholders will be prepared and included in an Annex to the project document.



E. Budget Details and Dist	oursement S	Schedule				
Outputs and Activities	Quantity	Unit cost	Duration	Total USD	AE (USD)	GCF (USD)
Activity 1:						
1.1: Selection of project sites based on agreed criteria and refine baseline conditions (vulnerabilities/emissions profiles, drivers of forest degradation and deforestation, barriers to be addressed by the project)	Days	US\$ 500	20	10,000		10,000
1.2: Forestry and agriculture based value chain analysis	Days	US\$ 1,000	44	44,000		44,000
1.3: Policy analysis and identification of lessons from past, current and planned projects and initiatives to identify lessons to integrate into the project design	Days	US\$ 500	20	10,000		10,000
1.4: Stakeholder capacity assessment and development of capacity building programmes	Days	US\$ 1,000	40	40,000		40,000
1.5: Develop the full project d costing of objective, outcome planned activities and pro development/transfer needs; (admin assistant)	nge including i credited entity acity-building ject and all its a	dentification and to undertake the and technology innexes (IC, NPC,				
Cost of the PPF Team Leader	Days	40	1,000	40,000		40,000
Cost of the National PPF Coordinator	Days	30	500	15,000		15,000
Consultation workshops, travel for all the consultants under activity 1 to 4	various	N/A		200,000	135,000	65,000
Audits	events	2,500	2	5,000		5,000
Sub-total (a)				229,000	135,000	229,000
Activity 2: Activity 2: Envir	ronment an	d Social Saf	eguards an	d Gender Ass	essment	
Consultant on Environment and Social Safeguards and Gender Assessment	Days	15	500	7,500		7,500
Activity 3: MEL and Know	ledge Mana	gement				
Consultant on MEL and KM	Days	15	500	7,500		7,500
Activity 4: Risk assessmen	t					
Consultant on Risk assessment	Days	4	500	2,000		2,000
Sub-total (b)				17,000		
Total (a)+(b)				246,000		
Contingency (up to 5%)				12,000		
РМС				21,000		
Agency Fee				21,000		
Grand total				435,000	135,000	300,000



Annex 1: Detailed Terms of reference for the various consultancies to support development of the full project document

Position, Type	Role, Deliverables and Qualifications
Activity 1: Feasib	ility assessments, technical studies and design of the full project (and writing
of the project pro	oposal)
1.1 Position:	Role
Project Development Specialist (PPF Team Leader)	The Project Development Specialist will be the PPL Team Leader (PTL) and will be responsible for quality assurance and timely preparation of all reports and documentation, including the finalized IUCN Project Document (ProDoc), with all mandatory and project specific annexes and supporting documentation. S/he will be responsible for managing all consultants on the GCF Team, and coordinating the Team's work
Type: IC	
	 Deliverables Management of the GCF Team Define and submit a detailed methodology and work plan in consultation with the other consultants with clear delegation of responsibilities for the International Consultants (ICs) and National Consultants (NCs); Ensure that project development is participatory, gender-responsive and based on extensive stakeholder engagements; and Verify and ensure that all project components are technically sound and cost effective.
	•
	 Preparatory Technical Studies and Reviews : With inputs from the other national and international consultants, as detailed in their respective TORs: Compile baseline/situational analysis for the project. This will include a precise definition of baseline projects, activities, budgets, goals and co-financial links to GCF outcomes; Conduct/oversee the identification of the project sites, with documentation of selection criteria; Oversee the technical studies (policy reviews, capacity assessment, value chains analysis, stakeholder and gender analysis, review of past, current and planned initiatives of relevance to the project objectives and identify lessons and synergies); Ensure that the studies are complete and comprehensive and the findings are meaningfully integrated into the project's strategy, theory of change and results framework; Ensure action points, including risk assessments, from the IUCN Social and Environmental Screening Procedure at the CN stage ("pre-screening") are fully implemented during the PPF, and update that screening in an iterative fashion throughout the PPF, as appropriate; Oversee the consultations with partners regarding financial planning; and Ensure completion of any additional studies that are determined to be needed for the preparation of the ProDoc and all other final outputs.
	 3) Formulation of the ProDoc and Mandatory and Project Specific Annexes: With inputs from the other national and international consultants, as detailed in their respective TORs, and based on international best practice: a. Develop, present and articulate the project's theory of change; b. Develop the Results Framework in line with IUCN-GCF policy; c. Develop a detailed Monitoring and Evaluation Plan and Budget; d. Oversee and ensure the preparation of a Stakeholder Engagement Plan; e. Oversee and ensure the preparation of a Gender and Youth Action Plan and Budget; f. Update the SESP based on assessments undertaken in the initial stages and ensure the development of any incomparatel and/or special



	 management plan(s) for all risks identified as Moderate or High in the SESP; g. Prepare the required GCF Indicators; h. Secure and present agreements on project management arrangements; i. Ensure the completion of the required official endorsement letters; and j. Synthesize all analyses, studies, etc. to produce the draft ProDoc and all mandatory and project specific Annexes, using the required templates.
	 4) Validation Workshop: a. Lead the validation workshop to present, discuss and validate the final draft ProDoc and mandatory and project specific annexes, with a special focus on the SESP and any management plans; and b. Oversee all necessary revisions that arise during the workshop. c. Ensure completion of Validation Workshop Report.
	 5) Final Deliverables: a. Consolidation of all technical and consultation inputs including from national stakeholders, the Government, IUCN and GCF Secretariat, into a well written and concise IUCN ProDoc with all required sections and Annexes, in line with the standard GCF ProDoc template and annotated guidance; b. All documentation from GCF (including technical reports, etc.); and
10 D 11	 Valuation workshop Report. Qualifications Master's degree or higher in a relevant field, such as Environmental or Biological Sciences, International Development Proven and extensive international experience in environment and natural resources management projects with specific focus on INRM and SLM Proven past experience in IUCN-GCF project formulation/design, including the drafting of GCF-compliant project documents. At least 10 years' experience designing and/or implementing environment and natural resources management (including SFM/FLR/SLM focused) activities in developing countries; direct experience in FLR or similar projects is desirable Ability to conduct research and analysis, with strong synthesis skills. Experience working with international organizations, including IUCN, is preferred but not required. Fluency in written and spoken English is required, working knowledge of Portuguese is desirable.
 1.2 Position: National PPF Coordinator and climate change in the context of SFM/ FLR expert Type: NC 	Role The PPF National Coordinator (PNC) will be the overall lead for project preparation at the national level, working closely with the International Team Leader, and coordinating the national counterparts. The PNC will have two roles, administrative and technical. Under administrative, the PNC will coordinate the PPF activities, ensuring smooth recruitment of relevant national and international consultants, facilitating their operations to fulfil their specific terms of reference, organizing and facilitating consultation workshops and/or meetings, and ensuring smooth partnerships as appropriate, to promote effective implementation of the PPF and delivery of the Prodoc and its annexes within the stipulated time and budget. The PNC will also ensure the completeness of the required annexes such as the Institutional Capacity scorecards and co-financing letters.
	Under technical, the PNC will provide climate change (adaptation and mitigation) expertise in the context of SFM/FLR and the role of forests in economic development. The PNC will therefore refine the baseline information provided in the CN, providing updates specific to the selected project sites. The consultant will review and update the following sections of the CN into the updated sections of the project document:

1. ≻

Climate vulnerabilities and impacts current and projected climate change information;



≻ vi	ulnerabilities to climate hazards for selected sites;
> ci	urrent and projected impacts from climate hazards;
> m	itigation profiles for the selected sites,
2. D	rivers of deforestation and forest degradation in the selected sites;
3. B	arriers to be addressed by the project
Prohl	em tree. Theory of change and hudgeting
The P	NC will contribute to the crafting of problem tree and the theory of change to
ensure	e that the recommendations on the analyses and the refinements provided via this
part o	f the work are well reflected in all three (problem tree, theory of change and
budge	ts). The PNC will assist the PTL to address all comments from relevant reviews,
partic	ularly regarding the NPC's technical areas.
Fools	
asns	• I and the development and application of criteria for selecting project sites:
	 Update the climate change information for the selected sites:
	 Identify and apply best practice methodologies for assessing vulnerabilities.
	of the communities and their resources to climate hazards for the selected
	sites and give recommendations for increasing adaptive capacities:
	 Identify and apply best practices methodology for assessing mitigation.
	notiles of the selected sites (providing baseline and projected change in
	emissions estimates) and give recommendations for slowing down
	emissions and/or increasing mitigation.
	Review of current forestry, agricultural and other relevant practices and
	assess related threats to forest resources in the selected sites and the
	consequent risks and vulnerability for the agriculture. livestock production
	and water-use related livelihoods in project areas;
	• Lead the collection and analysis of baseline information about the socio-
	economic situation in the forestry and agriculture sectors and the targeted
	rural communities that is of relevance to the scope of the proposed project.
	This will be conducted in close liaison with and inputs from the Livelihoods,
	Gender and Stakeholder Engagement Expert;
	• Identify required additional investments for improving the climate
	resilience of agriculture and livelihood activities in the targeted
	communities that the project could finance;
	• Support the identification of adaptation measures that the project can
	support;
	Assess/identify incentives for effective SFM/FLR to increase the role of
	forestry in economic development, livelihoods and incomes while
	simultaneously halting and/or reversing deforestation and forest
	degradation
Dutp Projec	ut t document with undated sections CN to reflect the data and statistics for the
solocta	ad project sites
	Climate vulnerabilities and impacts
•	current and projected climate change information:
•	vulnerabilities to climate hazards for selected sites:
•	current and projected impacts from climate hazards
•	mitigation profiles for the selected sites
•	Drivers of deforestation and forest degradation in the selected sites:
•	Barriers to be addressed by the project
•	A section on incentives for effective SFM/FLR to increase the role of forestry in
	economic development, livelihoods and incomes while simultaneously halting
	and/or reversing deforestation and forest degradation
Quali	fications:
ine co	onsultant should possess a high-level of experience in conducting policy research
uuu al	iaiysis anu/ or designing, managing or evaluating projects in the torestry and/or

and analysis and/or designing, managing or evaluating projects in the forestry and/or agricultural sectors in Mozambique and other countries, preferably Southern Africa. This should include proven ability to verify, critically analyse data and information and to present finished work with a high degree of accuracy and technical quality under tight deadlines with minimal supervision.



	 The minimum qualifications are as follows: An advanced degree (i.e. Masters or equivalent) in Forestry, Environmental Science, Natural Resource Management, Land Use/Environment Planning or Development Studies – Environment Development; Training and experience in applying Results Based Management concepts to project development, management and evaluations; Experience in preparation and review of policies and legal and regulatory frameworks; Experience in designing and GCF-financed projects is an added advantage; Ability to communicate effectively orally and in writing, to communicate complex, technical information to both technical, policy and general audiences,
	 Full command of and fluency in English, with a high degree of proficiency in writing in this language is a requirement; Working knowledge of Portuguese is highly desirable.
1.3 Position: National Policy analysis and identification of lessons to	Role This consultancy has two objectives: (i) to undertake National Policy analysis to identify opportunities for mainstreaming SFM/FLR and climate change considerations in relevant policies in order to increase resources available for SFM/FLR while reducing negative impacts of forests from other sectors; (ii) Review of past, current and planned interventions similar to the proposed project to identify lessons to inform project design.
inform project design	 Policy review Review and analyze existing policies and regulatory and institutional frameworks for relevant sectors, including land, forestry, infrastructure development, energy, agriculture and water management to identify complementarities, gaps and/or lacuna in promoting SFM and/or FLR and key entry points for the mainstreaming climate change considerations into these sectors to increase resources for SFM/FLR and adaptation; Assess barriers that might challenge the uptake of measures to mainstream considerations of climate change, adaptation, mitigation, SFM/FLR in the relevant policies and suggest project initiatives to address the challenges; Identify policy-based incentives for effective SFM/FLR to increase the role of forestry in economic development, livelihoods and incomes while simultaneously halting and/or reversing deforestation and forest degradation. Identify lessons to inform project design and identify synergies List all relevant past, current and planned projects relevant to SFM/FLR in the country and review them to identify lessons to inform project design, points for collaboration, synergies and complementarities. Assess the barriers that might challenge the collaborations and suggest project initiatives to address them.
	 A baseline analysis report outlining the institutional, policy, legal and regulatory framework shaping implementation of SFM/FLR and overall natural resources management in Mozambique and the Zambezi basin; and the gaps in these, as well as recommendations for policy and legal reform to facilitate the implementation of SFM and restoration/rehabilitation of degraded forest landscapes to enhance the role of forests in adaptation, mitigation and
	 sustainable economic development; A report outlining incentives and key strategies to be supported during implementation to promote restoration/rehabilitation of degraded forest landscapes to enhance the role of forests in adaptation, mitigation, livelihoods and sustainable economic development; A report outlining key lessons that should influence project design, explaining why and how, as well as a strategy for actualising collaboration and synergising
1.4 Position:	during project implementation. Role



agriculture	The overall objective of this value chain study is to generate recommendations on
based value	interventions necessary to enable the forest sector to expand its contribution to
chain	economic development, reverse ecosystem degradation, and improve the incomes and
analysis	livelihoods of forest-dependent rural communities. The assessment will focus on four
expert	inter-related aspects: (i) value chains for forest products; (ii) value chains for
	agricultural products; (iii) women engagement in both forest and agriculture based value
Organization,	chains; (iv) strategy for innovation and research in forest products aimed at identifying
preferably with a	opportunities for improving sector productivity and competitiveness. The report will be
team of ICs and	presented in a comprehensive manner avoiding duplications.
NCs	
	Forest and agricultural based value chains: The consultant shall:
	• Identify value chains for both (examples timber, charcoal, important non-
	timber forest products, soil carbon, grains, norticulture, etc.) and, for each value
	chain identified, establish:
	• The key primary chain actor, their key functions, relationships, key operational shallenges, and possible interventions
	A store' contribution to changes in prices along the value chain
	 Actors contribution to changes in prices along the value chain. Evaluate the social aspects as the key chain blocker(c) and enabler(s).
	 Evaluate the social aspects as the key thain blocker (s) and enabler (s). Chain supporter's /Support services and their role.
	 Challenges experienced in offering /accessing facilitative services
	 Possible notential risks/onnortunities
	 Cender and nower dynamics and advice on areas for improvement in
	maximizing benefits to Women and the youth
	manning scholas to tromon and the journ
	Markets: The consultant shall:
	• Identify specific, relevant, and reliable markets the entrepreneurs should target
	at primary, regional, national and international level markets;
	 Assess suitability, competitive and comparative advantages;
	• Assess the size of markets, the volume of sales, market
	integration/segmentation;
	Assess agriculture practices conformance to requirements and standards of
	markets.
	Government regulations and control mechanisms (in conjunction with the
	Delivery review): The consultant shall.
	 Fitablish markets structures and infrastructure and enabling environment (e.g.
	nolicies affecting market access).
	 Assess the level of support from local and national governments for the
	identified value chains as might be documented in policies and regulations for
	each level of government.
	• Assess the financing patterns in the value chains to identify the current
	financing partners, levels of financing of value chain activities, opportunities.
	and challenges;
	• Identify incentives related to value chains development for effective SFM/FLR
	to increase the role of forestry in economic development, livelihoods and
	incomes while simultaneously halting and/or reversing deforestation and forest
	degradation;
	• Provide structure for the design, implementation, risk management and
	evaluation of value chains development strategies.
	Un improving efficiency and competitiveness: Assess approaches, technologies,
	and other means to increase efficiency in the sawn timber value chains in different forest
	types in mozanibique
	Specific tasks
	• Map the value chain from the industrial roundwood raw material base. through
	harvesting/logging, processing, drying, to sale as sawn timber sourced from
	selected forests, including identifying the range of actors at the various levels in
	the value chain;

• Undertake efficiency studies on the various operations in the value chain including, harvesting/logging, log transport, sawmilling operations, sorting and



drying of sawn timber, marketing and trade in sawn timber detailing the product flows, productivity, technologies used and transaction costs at each step from logging to sale of sawn timber; Assess the industrial roundwood material availability and ways to make it meet demands for sawn timber on a sustainable basis; Identify the governance structures at each level of the sawn timber value chain, how they operate and how they can be made more efficient. Explore other determining factors and approaches (institutional, financial, policy, and others) that i) constrain efficiency and/or could be employed for increased efficiency at various levels of the sawn timber value chains; Based on the findings on the above issues (1 to 5), propose recommendations for improving the sawn timber value chain in ways that are environmentally, socially and gender inclusive. On development of the Forest Products Research Strategy for Mozambique: The purpose of the study is to develop a strategy for forest product research in the country, identifying areas where research is needed and capacity gaps to be addressed by the project to enhance the role of research in supporting forest contribution to industrialization, economic development and livelihoods while addressing forest degradation and deforestation sustainably. Some areas might be (this list needs to be further refined at the point of issuance of contracts for the assessment) addressing the use of timber and engineered timber products in the built environment; identifying and promoting the development of short- and long-term efficient biorefineries technology innovation opportunities to drive forestry sector competitiveness and productivity improvement in the emerging market sectors of bio-based chemicals, materials and bio-energy Identification, development and commercialization of products Human capacity building on efficient forest products development and utilization technologies. On assessing women engagement in forest products value chain: Ensure that the above assessments and reports place adequate focus on the role of women and youth in the value chains. Specifically, and in conjunction with the capacity and policy analysis as well as the gender study, the assessment will highlight: (i) the status and potential of women and youth engagement in forest products value chains; (ii) identify clear entry points for potential interventions to support women and youth engagement in forest and agriculture based value chains; (ii) identify capacity needs to enhance their participation in relevant value chains; (iv) recommend methods to empower women and the youth to enhance their effective participation and beneficiation from these value chains. **Deliverables** Values chain analysis report showing: 1) Key value chains (e.g., timber, charcoal, important non-timber forest products), describing how they are structured (actors, volume and value flows, type of agreements among actors, etc.); Identifying main opportunities for value chain development \triangleright Recommendations on tackling identified obstacles to development of relevant value chains Strategy for forest product research in the country, identifying areas where 1. research is needed and capacity gaps to be addressed by the project to enhance the role of research in supporting forest contribution to industrialization, economic development and livelihoods while addressing forest degradation and deforestation sustainably. 2. Strategy to increase efficiency in the sawn timber value chains in different forest types in Mozambique 3. A chapter on women and youth in value chains (showing opportunities, specific obstacles, capacity issues and recommendations specific to these groups to increase effective participation in value chains)



	Qualifications
	This assessment should be preferably undertaken by a company or civil society group focused on value chains with several in-house expertise on marketing, research, science and technologies, gender, institutional development and income generating activities, all related to forest dependent rural development. In addition, they should have:
	 At least 10 years' research/ consultancy experience in the agricultural, forestry, small holder farmers value chains:
	 Excellent knowledge of value chains, marketing systems and private sector development;
	 Excellent knowledge and understanding of the forestry sector in Mozambique; Strong analytical, research and presentation skills with excellent report writing skills
	Full command of and fluency in English; working knowledge of Portuguese is highly desirable
1.5 Position: Capacity Assessment experts – company or CSO with comparative advantage	Role The overall objective of the study is to conduct a capacity needs assessment for communities, community groups, technical institutions, relevant private sector and academia and design capacity building programs to enable the effective implementation of the project, achievement and sustaining of project results. Due to the enormity of the task (given the broad range of stakeholders and varied project initiatives needing capacity development), the task should preferably be undertaken by a company or CSO with comparative advantage and experience in capacity development.
and experience in capacity development	The definition of capacity adopted for this assignment is the one put forward by UNDP, which defines capacity development as the process through which individuals, organizations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time. This definition reflects the viewpoint that capacity resides within the following three levels:
	• The enabling environment describes the broader system within which individuals and organizations function and one that facilitates or hampers their existence and performance. This level of capacity is central to the understanding of capacity issues, as it determines the 'rules of the game' for interaction between and among organizations. Capacities at the level of the enabling environment include policies, legislation, power relations and social norms, all of which govern the mandates, priorities, modes of operation across different parts of society.
	 The organizational level of capacity comprises the internal policies, arrangements, procedures and frameworks that allow an organization to operate and deliver on its mandate, and that enables the coming together of individual capacities to work together and achieve goals. If these exist, are well-resourced and well-aligned, the capability of an organization to perform will be greater than that of the sum of its parts.
	 The individual level, at which capacity refers to the skins, experience and knowledge that are vested in people. Some of these are acquired through formal training and education, others through learning by doing and experience. The consultant is expected to follow UNDP Capacity Assessment Framework (<u>http://www.undp.org/content/undp/en/home/librarypage/capacity- building.htm</u>).
	 This would include the following three dimensions: Points of entry: these are the three levels mentioned above. Each of these levels can be the point of entry for a capacity assessment. The three levels interact, with each level influencing the other through complex co-dependency
	 relationships. Core issues: These are the capacity issues that are most commonly encountered across sectors and levels of capacity: 1) institutional arrangements; 2) leadership; 3) knowledge; and 4) accountability. Not every assessment needs to cover all four issues, and it can be amended based on its relevance and appropriateness to the project objectives.



	 Functional and technical capacities: These are necessary for creating and managing policies, legislations, strategies and programmes. The following functional capacities are key: 1) engage stakeholders; 2) assess a situation and define a vision and mandate; 3) formulate policies and strategies; 4) budget, manage and implement; and 5) evaluate. Various technical capacities may also need to be assessed, depending on the situation and; they may be added to the set of functional capacities as required. The Consultant is expected to undertake the capacity needs assessment by employing appropriate methods and review best practices under similar projects. The assessment will undertake the following:
	 > Identify relevant units of capacity assessment (community members, CSO, private sector, technical institutions at local, district, province or national levels) by subject (e.g. value chains, regenerative agriculture, income generation, extension service, processing sawn timber, etc.); > Assess capacity for each of the group, identifying capacity gaps and recommendations to improve capacity; > Design a costed capacity building strategies for the various groups on the various subjects, focusing on all the relevant levels and focal entry points as described by UNDP; > Identify capacity-based incentives for effective SFM/FLR to increase the role of forestry in economic development, livelihoods and incomes while simultaneously halting and/or reversing deforestation and forest degradation > Develop a strategy for the implementation of the capacity development programs during the project implementation, including indicators and baseline values for monitoring the capacity development program.
	Costed capacity building program with clear operationalization plan, including indicators for monitoring capacity development
	Skills and experience required
	 Advanced degrees in environmental sciences, economics, development studies, social sciences or related discipline; Minimum of ten years' experience in conducting individual, institutional and organisational capacity needs assessments and developing capacity building programs. At least ten years of experience working in organizational development and capacity building natural resources or forestry sector; Excellent writing and communication skills in English, working knowledge of Portuguese is an advantage; Strong interpersonal skills and the ability to communicate and work well with diverse people.
Activity2:Livelihoods, GenderandStakeholderEngagementspecialistYType: NCY	 Role The Livelihoods, Gender and Stakeholder Engagement Expert will provide technical expertise and guidance and lead the assessment/analysis of gender dimensions and stakeholder participation in sustainable forest and land management and the differentiated impacts of ecosystem degradation on men, women and youth and the implications for the environment and livelihoods of the local groups and communities in the project area. These assessments will use best practice, guided by IUCN and GCF Gender Analysis Templates. The results of this assessment will guide the project team to mainstream gender equality and women's and youth empowerment into project design and implementation, including monitoring. To facilitate the development of an inclusive and gender-transformative project, the expert will at a minimum: Lead the stakeholder identification (including identification of indigenous groups) and profiling process, by conducting an analysis of existing data demographic profiles of communities in the project sites and consultations and ensure that these are



	complete and comprehensive. This process should be informed by a review of the CN
	pre-screening report, and the existing IUCN guidance on Social and Environmental
	Standards and other best practice approaches to stakeholder engagement and gender
	mainstreaming;
	Lead and advise on the stakeholder analysis and consultations and ensure that they
	are complete and comprehensive;
	Prepare a stakeholder engagement plan;
	• Determine the number of men and women, disaggregated by age, in the project site
	and their roles, responsibilities and priorities in their access, use and utilisation of
	natural resources, including forests, and other non-timber forest products;
	• Conduct a participatory analysis of the unreferitiated impacts of failu, forest, water and accepted by again
	• Assess gender dynamics shaping adoption (or lack thereof) of SFM_FIR and forest.
	friendly agro-forestry practices, identifying enabling conditions that have been found
	to work:
	Based on the findings, prepare a gender action plan for incorporation into the Project
	Document to ensure that the project strategy and its implementation are monitored
	as appropriate in terms of gender-responsiveness;
	• Using the findings of the gender analysis exercise, propose gender-disaggregated
	indicators and targets for integration into the Project Results Framework;
	• Support action points, including risk assessments, from the IUCN Social and
	Environmental Screening Procedure (SESP) at the CN stage ("pre-screening") to
	ensure these are fully implemented during the PPF, and update that screening in an
	Dravida responses to the SESD on sections related to gender and women's
	• Flovide responses to the SESF on sections feated to gender and women's
	overall project strategy.
	Key deliverables for the expert include:
	• A profile of the stakeholders and right-holders in the proposed project areas, the
	community institutions (norms, rules and procedures) governing access to, control
	over and use of natural resources, and the mechanisms for sharing the benefits
	therefrom;
	• A gender analysis report outlining the key findings for use in formulating the gender strategy for the project:
	• A gender responsive project results framework, including sex-disaggregated
	indicators (also indicating the share of men and women direct beneficiaries).
	• Gender Action plan (outlining the process to be followed) for incorporation of gender
	aspects in the project;
	A stakeholder engagement plan;
	• A list of gender and livelihoods based incentives for effective SFM/FLR to increase
	the role of forestry in economic development, livelihoods and incomes while
	simultaneously natting and/or reversing deforestation and forest degradation.
	Qualifications:
	• Excellent knowledge and minimum 7 years of demonstrable experience in community
	development or project management;
	Master's degree in Development Studies/ Political Science/ Political Ecology/
	Sociology/Anthropology;
	• Training on gender issues/ gender studies and participatory development theories
	• Excellent understanding of the dynamics around gender and natural resource
	management;
	 Previous work on similar projects; Cood command of English is a requirement;
	GOOD COMMITATIO OF ELIGIISTI IS à l'équirement, Eluency in Portuguese is required
Activity 3: MEL a	ind Knowledge Management
rosition: M&E	I ne overall objective of the assignment is to design a monitoring and evaluation system for the project and to provide tools to effectively monitor project progress and exhicument
expert	clearly stimulating what needs to be measured, the most appropriate source of information
	that needs to be collected, how to collect the information and how often and how to store
	analyze data and use information.



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	 The consultant will therefore Lead the other consultants and stakeholders to formulate a set of SMART yet practical indicators to monitor the project results, and set the feasible targets on the indicators; Establish data collection and reporting forms for capturing quantitative and qualitative information; Design relevant surveys to collect baseline and/or updates on achievements on each indicator as appropriate, avoiding collecting redundant information; Identify sources of verification that the project can use. As much as possible, use existing data sources embedded in existing systems; Design simple means of registering information; Design simple ways and means to store such information and the pathways for dissemination of that information; Produce a manual that includes the above and guides project coordination in processing and evaluating the information.
	Output A costed M&E, learning and evaluation framework explaining requirements for its implementation (resources).
	 Requirements At least a Master's degree in a field relevant to the assignment, for example in development studies, Results Based Management related social science fields, or business administration; Proven experience in developing M&E systems for projects; Interpersonal and communication skills; Openness to change and ability to receive and integrate feedback; Demonstrated analytical and report writing skills including ability to establish rapport; A high level of proficiency in oral and written English; knowledge of Portuguese would be an advantage.
Knowledge Management expert National Consultant	The overall objective of the KM strategy will be to systematize learning. A KM strategy will be developed to improve the project's ability to generate, use and share knowledge to: (i) achieve high quality project performance and results; (ii) support policy engagement, scaling up and partnership building; (iii) build awareness of the project among stakeholders; (iv) raise visibility of results and impact. The consultant will facilitate the stakeholders to design the KM system and the tools required to operationalize it. S/he will undertake the following:
	 Specific Tasks: Conduct in an in-depth, analysis of the project results framework to identify areas for which knowledge worth sharing would be generated and develop a list of knowledge products to be produced by the project during implementation; Identify appropriate forums, events/platforms and channels for KM dissemination and a calendar for disseminating the information products; Develop appropriate methods and tools for disseminating each information product for different stakeholders; Develop an operational plan on how to engage the respective stakeholders in drawing and implementing action plans according to the respective recommendations; Integrate the monitoring and evaluating of the KM plan into the overall project M&E plan.
	Outputs A costed KM plan with clear and practical implementation plan
	 Requirements ➢ Advanced degree or equivalent post graduate degree relevant to knowledge management and/or organizational development; ➢ A solid understanding of knowledge management principles, practices, tools and products;



> At least five years of progressive experience in organizational learning/ development
knowledge management and/or monitoring avaluation and learning preferably in
knowledge management and/or monitoring, evaluation and learning, preferably in
forestry, agriculture or natural resources use projects;
> Demonstrated analytical and report writing skills including ability to establish
rapport;
> A high level of proficiency in oral and written English; knowledge of Portuguese
would be an advantage.

別添資料15キックオフ会議説明資料1



Ministério da Terra, Ambiente e Desenvolvimento Rural

Agência Japonesa de Cooperação Internacional



The project for Sustainable Forest Management and REDD+ (FLOMOZ)

Introduction of Integrated Provincial Forest Management Plan in Niassa Province

Takayuki NAMURA Technical Advisor on Local Forest Management Plan and Implementation

20 November 2019



Contents of the Presentation

0. Outline of JICA FLOMOZ project

1. Background of the Integrated Provincial Forest Management Plan (PPIGF)

2. Outline of the Integrated Provincial Forest Management Plan (PPIGF)

3. Institutional Arrangement, Process and Schedule for PPIGF formulation

4. Pilot Activity under PPIGF



Outline of the project for Sustainable Forest Management and REDD+ (FLOMOZ)



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Overall Goal	Sustainable forest management and REDD+ are promoted through the operationalization of the National Forest Monitoring System (NFMS) in Mozambique, and sustainable forest management including through REDD+ in Niassa is promoted
Project Purpose	The capacity of MITADER and Niassa Province is strengthened for implementing sustainable forest management and REDD+
	1. National Forest Monitoring System (NFMS) (/M&MRV System) is operational for REDD+ and sustainable forest management (SFM).
Outputs	2. Provincial planning process for sustainable forest management including REDD+ and its implementation exercise are promoted.
Outputs Project Period	2. Provincial planning process for sustainable forest management including REDD+ and its implementation exercise are promoted. March 2019 to March 2024 (5 Years)
Outputs Project Period Project Site	2. Provincial planning process for sustainable forest management including REDD+ and its implementation exercise are promoted.March 2019 to March 2024 (5 Years)National (Output1) Niassa Province (Output 2)

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1. BACKGROUND OF THE INTEGRATED PROVINCIAL FOREST MANAGEMENT PLAN (PPIGF)
1. Background of the Integrated Provincial Forest Management Plan (PPIGF)

Why we needs forest management plan?

- Forest is a valuable resource. Forest provide timber, fuel woods and non-timber forest products (wild plants, mushrooms, etc.), but also provide various habitat for flora and fauna, in addition to various environmental functions such as soil erosion prevention, water source protection, carbon dioxide absorption, etc.
- Niassa Province has high forest cover rate and forest carbon stock, but deforestation and degradation are ongoing issue.
- Once we lost it, it takes a long time and much efforts to restore forest resources and its environmental services. So it is necessary to manage forest resources in a long-term perspective for current and future generation.



1. Background of the Integrated Provincial Forest Management Plan (PPIGF)

Forest strategy, policy and law in Mozambique

- In the past, Mozambique government has taken much efforts to develop policy and strategy for sustainable forest management.
- To ensure systematic and effective implementation of forest management, the amended Forest Law, which is currently being reviewed and revised, proposes fourlevel forest management planning to be applied: national, provincial, district and field level.
- FLOMOZ supports to formulate the Integrated Provincial forest management plan (PPIGF) in Niassa Province to be a first model and for scaling up to nationwide.



Operational level

District level: Framework of forest management

Operational level: Response to specific conditions of the forest management

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I. Background of the Integrated Provincial Forest Management Plan (PPIGF)

Why select Niassa Province?

- High forest cover rate and forest carbon stock, but deforestation and degradation are on-going and necessary measures must be taken to address deforestation and degradation.
- Forestry related information including forest cover map in 2013 was prepared by DIRF and Japanese government. This information is a basis for forest management planning.



Deforestation in Niassa 2000-2016





2. OUTLINE OF THE INTEGRATED **PROVINCIAL FOREST MANAGEMENT PLAN** (PPIGF)

2. Outline of the Integrated Provincial Forest Management Plan (PPIGF)

<u>Vision</u>

Ensure the perpetuation and increase the currently existing national forest heritage and generation of benefits derived from environmental goods and services through reforestation, restoration, sustainable use and aggregation value of forest products, encouraging inclusive and participatory management, particularly of vulnerable groups, for economic, social and environmental benefit of present and future generations in Niassa Province

Objectives

- Ensure the perpetuation and increase the currently existing provincial forest heritage and generation of benefits derived from environmental goods and services
- Strengthen the socio-economic development and food security with a focus on community involvement;
- Enhancing resilience to climate change and natural disasters;
- To build capacity and integrate the principles of good governance in forest development;

Planning Period (TBD)

10 years (2020-2030)

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2. Outline of the Integrated Provincial Forest Management Plan (PPIGF)

Principles for PPIGF Planning Process

- Comply with applicable national and local policies and laws on sustainable forest management.
 - i.e. Agenda Estratégica Florestal de Moçambique 2019-2035 e Programa Nacional de Florestas
- Coordinate with national and local policies in other sectors.
 o i.e. Provincial land use planning, Provincial development plan
- Utilize existing data sets on forest and forest resources including forest cover map and national forest inventory data developed by DIRF
- Transparent and participatory process in the planning
- Consultation through stakeholders both government agency and local organizations



Outline of PRIGF 2020-2030 (TBD)

- 1. Introduction of Provincial Forest Management Plan
 - 1.1 Vision
 - 1.2 Objectives
 - 1.3 Process of Formulation
 - 1.4 Planning Period
- 2. Overview of Forest and Forest Management in Niassa: Status and Issues
 - 2.1 Current Forest Cover, Forest Volume and Forest Change
 - 2.2 Proximate drivers of deforestation and degradation and its underlying causes
 - 2.3 Provincial Land Use Planning and Current Forest Functional Categories
 - 2.4 Use and conservation of Forest and wildlife Recourses
 - 2.5 Tree and NTPF Planation
 - 2.6 Institutional Structure of Forest Management
- 3. Principles and Policies of Forest Management
 - 3.1 Principals and Policies of Conservation, Protection and Production Forest
 - 3.2 Location and Area of Conservation, Protection and Production Forest
 - 3.3 Estimation of Wood Volumes for Sustainable logging
 - 3.4 Concession Management
 - 3.5 Other Issues (TBD)

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2. Outline of the Integrated Provincial Forest Management Plan (PPIGF)

Outline of PRIGF 2020-2030 (TBD)

4. Activities on Forest Management

(Activities to achieve the following three objectives)

- Objective 1 Strengthening the socio-economic development and food security with a focus on community involvement
- Objective 2 Enhancing resilience to climate change and natural disasters
- Objective 3 To build capacity and integrate the principles of good governance in forestry development
- 5. Implementation plan
- 6. Operational and Financial Planning
 - 6.1 Institutional arrangements
 - 6.2 Estimated Budget
- 7. Monitoring and Evaluation





3. INSTITUTIONAL ARRANGEMENT, PROCESS AND SCHEDULE





3. Institutional Arrangement, Process and Schedule



Organization in Charge for PPIGF planning for Institutional Arrangement

	Roles and Responsibilities	Organization in Charge
Secretariat for PPIGF planning	 Organizing the review committee meeting and public consultation meetings Manage the progress and approval of PPIGF 	SPFFB/DPTADER DINAF (supported by FLOMOZ) (Max: 4 pax)
Technical Working Group (TWG) for Drafting PPIGF	 Drafting PPIGF Compile comments from review and consultation process and revise the draft PPIGF 	DINAF, DINAT SPFFB/DPTADER FLOMOZ (Max: 5 pax)
Review Committee	 Review, comment and feedback for draft PPIGF 	Representative of Private Sector (2-3 pax) CSO (2-3 pax) Academic (1-2 pax) Donor (2-3 pax) Government Agency



Potential Institution List for the Review Committee

	Organization
Central Government	DINAF, DINAT, DPC, Legal Office, DINOTER, FNDS
Provincial Government	DPTADER, SPFFB, SPGC, DPASA, DPTUR, DPEDH, DPOPHRH, DPREME, Niassa National Reserve,
District Government	SDAE, SDPI (Distric Service dor Planning & Infrastructure)
Academic/ Research Institute	IIAM,UCM,UEM,UNILURIO, UNIROVUMA, Instituto Agrário de Lichinga (IAL)
Private Sector CSO/NGO	MLT, Green Resources,ORAM, ITC, ESTAMOS, ROADS, UCA Operador de CF Operador de LS
Donor	WCS, FAO, WWF, JICA

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. Institutional Arrangement, Process and Schedule



	Steps	Schedule
1	Kick off meeting of Integrated Provincial Forest Management Plan (PPIGF)	Nov. 2019
2	Data collection, analysis and drafting the PPIGF	Nov. 2019 – Oct. 2020
3	Prepare 1 st draft PPIGF	Oct. 2020
4	Review Meeting for 1 st draft PPIGF by the Review Committee	Nov. 2020
5	Revise and develop 2nd draft PPIGF based on the comments and feedbacks from review meeting	
6	Review by Provincial Level	
7	Review by Concelho Techico, DINAF	
8	Review by Concelho Techico, MITADER	
9	Review by Concelho Consultivo, MITADER (if necessary)	
10	Prepare 3 rd draft PPIGF based on the comments and feedbacks from MITADER	
11	 Public Consultation for all stakeholders concerned Media (Radio, TV, newspaper) Website Consultation Workshop 	May. 2021
12	Prepare final draft PPIGF based on the comments and feedbacks from public consultation	
13	Submit final PPIGF for approval	Oct. 2021



3. Institutional Arrangement, Process and Schedule



	Organization in Charge				
Detailed Activities	DINAF	DEPTADER /SPFFB	FLOMOZ		
 Collect necessary information/data in the provincial level. (Provincial land use plan, sectoral development plan, concession and simple license, etc.) 	0	Ø	0		
 Collect necessary information/data in the central level. (Forest cover, NFI, DEM, etc.) 	Ø		0		
- Study for the identifying prioritized activities for sustainable forest management and/or tackling deforestation	0	Ø	0		
- Analyze the spatial data by GIS	O		0		
- Drafting PPIGF	O	O	0		
- Manage review and approval process in Provincial level	\bigcirc	O			
 Manage review and approval process in Central level 	O				

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4. PILOT ACTIVITY UNDER PPIGF





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Pilot Activity(ies) under PPIGF

- The Project plans to support pilot activity from priority activity of PPIGF.
- Objective: To experiment de susteinable forest management activity (ies), including those mesures for deforestation to confirm its feasibility
- Candidate schedule is as follows.

Year	Month	Tasks
	August	Selection of Pilot Activities
2020	October	Selection of Pilot Activities site
Untill December	Untill December	Preparation for implementation
2021-2023	-	Implementation of Pilot Activities for 3 years
2023	December	Summary for pilot activities
2024	February	Manual on pilot activities

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Thank you for your attention







別添資料16キックオフ会議説明資料2



Ministry of Land, Environment and Rural Development JAPAN International Cooperation Agency



Project for Sustainable Forest Management and REDD+

Current State of Forest in Niassa Province

Yoshihiko SATO Plano de Gestão Florestal Regional (2)/ Maneio Florestal 20 November 2019





- 2. The current state of Forest in Niassa
- 3. Deforestation and Forest Degradation in Niassa

1. Basic Information about Niassa Province



Niassa Province

Area	:	12,282,340 ha
Population(2017)	:	1,713,751 peoples

Niassa is located in the northwestern part of Mozambique and has an area of about 12,000,000 ha as the largest province in the country.



1. Basic Information about Niassa Province



> The population in Niassa concentrate in some districts

m	CI LI
Mecula	CL
Lage Sanga Mavago	LA
) Automan	CH
Marina L	IVI
Majure 7	
Licringe A	M
And Maus Npepe	M
Mandamba Metanca	Μ
Cuamba	Μ
Mecannera	Μ
	Μ
	Ν'
4 districts: 59.7%	NI
	SA
	– Ta

District	0/0
	70
LICHINGA	14.1%
CUAMBA	15.6%
LAGO	6.2%
CHIMBONILA	4.2%
MAJUNE	2.3%
MANDIMBA	12.4%
MARRUPA	4.5%
MAUA	4.0%
MAVAGO	1.7%
MECANHELAS	15.7%
MECULA	1.2%
METARICA	2.6%
MUEMBE	2.6%
N'GAUMA	5.6%
NIPEPE	2.6%
SANGA	4.4%
Total	100.0%
	(2017)

POPULAÇÃO POR	RELIGIÃO
RELIGIÃO	%
CATÓLICA	26.3%
ANGLICANA	4.3%
ISLÂMICA	59.0%
ZIONE/SIÃO	2.7%
EVANGÉLICA/ PENTECOSTAL	4.3%
SEM RELIGIÃO	0.7%
OUTRA	1.5%
DESCONHEC.	1.1%
Total	100.0%
	(2017)

2. The State of Forest in Niassa



> The forest area of Niassa accounts for 20% in Mozambique

Niassa province has a forest area of about 8,300,000 ha which is the largest forest area of 10 provinces in Mozambique. About 20% of the forest area in Niassa exist in the Niassa National Reserve.



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2. The state of Forest in Niassa



Niassa has the most forest area, the forest cover percentage of Niassa is second largest

Niassa is considered to have the rich forest resources

Torest area and Torest cover by province								
Province	Total area (ha)	Forest area (ha)	Forest cover (%)					
Niassa	12,282,340	8,374,775	68.2					
Cabo Delgado	7,784,884	5,733,656	73.0					
Nampula	7,900,832	2,654,524	33.6					
Zambezia	10,347,516	4,774,387	46.1					
Tete	10,065,985	5,712,737	56.8					
Manica	6,227,101	3,499,283	56.2					
Sofala	6,775,186	3,139,972	46.3					
Inhambane	6,877,453	3,530,468	51.3					
Gaza	7,533,304	4,081,173	53.8					
Maputo	2,360,501	493,321	20.9					
Maputo City	-	-	-					

Forest area and Forest cover by province

JICA (2018) Atral do Mapa de Referencia de resursos florestais em mocambique 2013

2. The State of Forest in Niassa



Niassa is considered to have the rich forest resources

			-	• •		
Province	CO ₂ e _(B) [Mg/ha]	CO ₂ e _(A) [Mg/ha]	CO ₂ e _(T) [Mg/ha]	CO ₂ e _(Bt) [Tg]	CO ₂ e _(At) [Tg]	CO ₂ e _(Tt) [Tg]
Niassa	46.69	123.08	169.77	368	972	1,340
Cabo	36.07	100.87	136.95	136	379	515
Nampula	49.14	131.85	180.99	59	157	216
Zambézia	88.40	257.94	346.34	405	1,181	1,585
Tete	31.13	91.42	122.56	119	350	469
Manica	39.49	110.28	149.77	70	197	267
Sofala	57.29	187.41	244.70	126	413	539
Inhambane	37.10	118.44	155.54	109	348	458
Gaza	19.47	56.78	76.24	60	176	236
Maputo	21.06	56.13	77.20	9	24	33

Carbon dioxide equivalent by province

Where CO_2e is carbon dioxide equivalent and subscripts A, B and T indicate CO_2e above, below ground and total (A + B). The subscript t indicates the total equivalent carbon dioxide in the sense in all forest area of the province

(2019, MITADEL)

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2. The State of Forest in Niassa



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Each districts include concession areas or Niassa National Reserve area



The location of concession areas and NNR in Niassa





Number of operators under concession regime, single license, their situation by province at 2018

Exploitation Regime	Forestry Concession				Single license				Total
Situation	In the process	Stopped	Operating	Sub-total	In the process	Stopped	Operating	Sub-total	iotai
Niassa	1	7	9	17	0	7	7	14	31
Cabo Delgado	1	15	38	54	0	25	29	54	108
Nampula	0	6	12	18	0	25	44	69	87
Zambezia	2	19	38	59	0	16	60	76	135
Tete	0	2	18	20	0	205	135	340	360
Manica	0	1	11	12	0	9	73	82	94
Sofala	0	12	17	29	0	19	35	54	83
Inhambane	2	4	9	15	2	8	44	54	69
Gaza	0	0	1	1	0	15	20	35	36
Total	7	65	153	225	2	329	447	778	1,003

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3. Deforestation and forest degradation in Niassa



- > Deforestation occurs across Mozambique.
- In Niassa, Deforestation concentrate in some areas.



Forest Cover Loss 2000-2018 Hansen Global Forest Change (https://earthenginepartners.appspot.com/science-2013-global-forest

3. Deforestation and forest degradation in Niassa



➢ In Niassa, Deforestation concentrate in some areas.



Hansen Global Forest Change (https://earthenginepartners.appspot.com/science-2013-global-forest)

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3. Deforestation and Forest Degradation in Niassa





3. Deforestation and Forest Degradation in Niassa

Deforestation has increased in Niassa, especially Lichinga.



Fluctuation of Deforestation Area by each districts in Niassa

(2013, Hansen, M. C, et. al))



3. Deforestation and forest degradation in Niassa

Emissions from each system of driver were estimated by combining forest cover change data (Hansen et al. (2013) corrected with a CENTACARTA map of forest cover (1997) with spatially explicit estimates of aboveground biomass across Mozambique (Saatchi et al. 2011)

System of driver

- S1. Commercial Agriculture
 S2. Subsistence and small scale agriculture
 S3. Wood products (Timber/logging and paper pulp)
 S4. Woodfuel/charcoal
 S5. Urban expansion and infrastructure
 S6. Mining
- S7. Cattle raising



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3. Deforestation and forest degradation in Niassa



- > 2.Small-scale agriculture had the greatest impact across all regions in Mozambique
- > The rate of 3.Wood products rate of Niassa is higher than other provinces
- No significant differences were observed among each district in Niassa

Province	1.Commercial Agriculture	2.Subsistence and small scale agriculture	3.Wood products (Timber/loggi ng and paper pulp)	4.Woodfuel/ charcoal	5.Urban expansion and infrastructure	6.Mining	7.Cattle raising
Niassa	5.1%	59.4%	16.9%	7.8%	7.3%	3.0%	0.5%
Cabo Delgado	1.6%	76.1%	8.0%	5.6%	5.4%	0.8%	2.5%
Nampula	1.1%	79.5%	2.7%	7.1%	7.4%	1.0%	1.3%
Zambezia	13.0%	67.0%	8.3%	4.3%	3.7%	1.5%	2.1%
Tete	3.8%	60.5%	10.0%	8.8%	10.1%	1.3%	5.5%
Manica	4.5%	62.9%	8.3%	6.2%	11.6%	2.1%	4.5%
Sofala	7.2%	48.0%	8.6%	9.0%	19.0%	2.4%	5.7%
Inhambane	0.7%	64.1%	8.9%	4.8%	16.6%	0.7%	4.2%
Gaza	2.0%	70.5%	6.0%	9.1%	6.2%	1.3%	5.0%
Maputo	2.9%	38.2%	1.4%	1.4%	50.2%	0.6%	5.3%
Average	4.2%	62.6%	7.9%	6.4%	13.8%	1.5%	3.7%
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Thank you for your attention





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Discussion time

9:55 – 10:15 :Q & A

- Question, clarification and suggestion for PPIGF
- Question, clarification and suggestion for the presentation on introduction of forest in Niassa Province

10:15 – 10:35 :Coffee Break

- 10:35 12:25 :Discussion
- What is the priority issue to be addressed in the PPIGF.
- Or, What is the priority issue for your organization in terms of forest and forest management.

別添資料17キックオフ会議説明議事録

Notes on the launch meeting of the Project for Sustainable Forest Management and REDD+ (PPIGF)

The launch meeting of PPIGF took place 20 November 2019 at Monte Belo hotel, Lichinga city, Niassa province, Mozambique coorganized by JICA and the National direction of Forest (DINAF). It was chaired by Mr. Xavier Sailors Sakambuera, National Director of Forest, accompanied by Mr. Izidine Opressa, Provincial Director of Land, Environment and Human development (DIPTADER) in the presence of Mr. Kazuhisa Kato, team leader of the project for sustainable forest management and REDD+. The meeting was attended by 76 people from Central Government, Provincial Government, District Government, Academia, NGOs, Private sector, and Donors. The list of the participants is in Appendix 1.

Opening of meeting

The meeting started at 8:28 with the entry of Mr. Xavier Sakambwera the Director of DINAF, accompanied by the Provincial director of Land, Environment and Human development. Mr. Sakambwera welcomed the participants and approved the agenda.

8:35: The Provincial Director welcomed all the participants and thanked the fact that Niassa province was chosen for the implementation of the project and showed the provincial's openness to host the project.

8:35: Mr. Claudio from DINAF presented the objectives of the meeting.

8:42: The National Director opened the meeting highlighting the importance of the project as a hope for controlling deforestation. He presented some data on forest cover and the importance of forests in the life of communities, asked participants to be engaged for the success of the project, and thanked JICA for the support.

Presentation of the project

Presentation of the project was made by the Japanese experts. Mr. Takayuki NAMURA, Technical Advisor on Local Forest Management Plan and Implementation gave an Introduction of Integrated Provincial Forest Management Plan in Niassa Province then, Mr. Yoshihiko SATO, Expert for Regional Forest Management plan and forest management presented the Current State of Forest in Niassa Province.

Debate

After the presentations followed the debate where participants presented their suggestions and contributions regarding the project.

	Comments and suggestions of the participants
Name/Institution	Comments/ Suggestions
Dario Pedro Antonio- SDAE Metarica	I am not against the tobacco company. In Metarica, tobacco is one of the main sources of income but drying of Virginia variety using native species is causing many damages to forests and there is no replacement of harvested trees.
	To dry one hectare of Virginia tobacco it is necessary between 20 to 25 steres ¹ of firewood.
	The experience indicates that Virginia tobacco has caused much deforestation in Metarica, and I believe that in five years without replacement the forest will disappear.
Nandinho Manuel-	My concern is about the replacement of harvested trees.
SDAE Nipepe	Nipepe district has 4 concessionaires (logging companies) but only one company (Global Park company) replaced the harvested area. Climate change in Niassa is visible, in the past Lichinga was very cold but nowadays the situation has changed.
Jose Manteiga- Florestas do Niassa (Plantation	In 2014 companies stopped their activities but deforestation continued.
Company)	Integrated plan: I am concerned about the sample size used to study the farmers since there is so much cultural diversity, and farming practices differ with culture.
	Around Lichinga city, some farmers also produce charcoal.
	Logging companies/concessionaire are more interested on their own business but are not expertise on plantations. Concessionaires may choose to hire private companies or individuals who can plant in harvested areas.

	Concessionaires should control fire on their area and manage the sprouts.
Baldeo Araquechande- Niassa National Reserve	Niassa Reserve cover 1/3 of Niassa province, and it has a heritage to be protected. Because of that it is important to be considered in this project.
	To stop deforestation, we had meetings with tobacco company and prohibited them to use native forests for firewood.
	I am concerned about the figures presented by Mr. Sato indicating that most of the deforested area was due to familiar agriculture. Local people are converting almost 60% of the forest for their own uses or needs, they remove trees that they consider as not important to replace with tobacco plantations. My idea is to recover the 60% deforested with fruit trees (Orange, Mango, etc). Recover the degraded area with fruit tree may contribute to carbon absorption at same time provide some incomes to mitigate the effects on the environment and promote development of the communities.
	There is enormous deforestation on the corridor Marrupa-Mecula.
Marcos Wiriamo- UCA Union of Niassa farmers and associations	Mr. Sato's presentation: The familiar sector is the main driver of deforestation then I suggest that farmers should be involved in the planning process. Environmental education to the farmers is important so that they can understand the importance of forest and forest protection. Planning should discuss the incentives to the farmers on how to
Nilsersel - Marsefa	stimulate their participation in the conservation.
WWF	Lichinga has lost its forest. Lichinga is the main reserve of water. Do you have Image of Lichinga in 70s?
	Cabo Delgado has higher forest cover but it has lower absorption rate?
	Statistical data was obtained by satellite. Do you have data from exploited resources? It was mentioned that agriculture caused 5% of deforestation, what does it represents in terms of volume?
	In Metangula-Lago District we conducted a forest assessment which showed that firewood production is responsible for destruction of natural regeneration. Agriculture causes large areas of deforestation but after 4 years the trees regenerate again. It is important to quantify the amount of wood harvested for these activities.
Leonardo Abilio- ORAM	I agree that agriculture is the main driver of deforestation but charcoal production is also important. Are there data about charcoal production? Deforestation graph (from the presentation) showed that Lichinga
	registered higher deforestation rate but it would be important to highlight the information about other Districts.

	Do plantation companies replace the deforested areas? I suggest that forestry companies should pay a deforestation fee to the government which would be used by Silviculture department to recover the deforested areas.
	If we want to talk about deforestation and find a way to solve this issue, we should involve the local people or communities who are responsible for charcoal production, timber production, etc.
Virgilio Penesse- REPADES-JAC	I am interested in seeing Niassa producing database of all charcoal producers so that they can create associations to help minimize deforestation losses by addressing information about replacement of the trees. From the associations could be possible to address forest policies and environmental education programs.
Oreste Zezela-ANE (Admin Nacional de estradas)	Our company (National Road Administration), has integrated plan. I want to know if the plan includes improvement of road conditions because the loggers are damage the roads.
	We are working with other projects and institutions that included improvement of roads in their plans for instance.
	I think that one year for the implementation of point 2 (Data collection, analysis and drafting the PPIGF) and point 3 (Prepare 1 st draft PPIGF) is too long. I suggest a concertation meeting with the stakeholders within this period
William Prado- Green Resources-	Information about natural forest should be separated from plantation. Natural forests when sustainably harvested no need to replant.
company)	With the fires, we cannot ask for planting trees within the forest because there is no chance for plants to survive.
	I would like to know the methodology used to calculate the carbon absorption. We should know how much carbon natural forests absorb and release with fire.
	Plan the forest for 5 years is short time. Forests take time to grow, and should have a medium- and long-term plan.
	The project should support Lurio University to investigate species that grow by seeds and sprouting. Are there studies on it?
	The rain season is short and all organic matter is burned.
	How much is deforested by logging companies?
	Almost 300 people invade the plantations to collect firewood and we have to guarantee protection against the invaders.

	At this moment, population who lives around the forests are facing shortage of food and are buying maize for higher price at the market.
	Considering that average charcoal consumption per month is 0.5 sacks, in the future the situation can be terrible. Alternatives must be found therefore, should have short, medium- and long-term plan. There are natural forests without commercial species and we have to find other alternatives than natural forests.
	A concessionaire should know how many trees are harvested, how many remains, and the situation of natural regeneration.
Mr. Celestino Tomas- Department of	Presentation 2: Population of Niassa- numbers differ from what is available on the internet.
Tourism-Niassa	Is there any study about the main causes of deforestation in Lichinga?
	In the past there were many Pinus trees in Lichinga but there were cut down.
	The PPIGF should incorporate areas adjacent to concessions.
	Companies plant Pinus for commercial purposes but it would be good to use the plantations for tourism.
Mr. Julio Ambrosio Masquete –	Universities can participate on data updating and pilot studies.
Universidade Rovuma	What do competent institutions think to correct the situation? (In response, Mr. Xavier Sakambuera requested researches and solutions from the Universities)
Mr. Celso Simão DINAF	Suggestions for the first presentation: Estimate provincial data using provincial sample.
	Comment: The result of carbon refers only to natural forests
	Graphic 2- Evolution of deforestation in Niassa can be showed using local estimates.

¹ Stere is a cubic meter of stacked firewood

Comments	and answers by presenters/panelists
Name	Comments/answers
Mr. Takayuki Namura- FLOMOZ	You (participants) know better about Niassa. During the elaboration of the plan we will contact the institutions asking for opinions to improve it.
	About roads: We registered the suggestions and we will analyze it together with DINAF and MITADER.
	Elaboration period: It was said to be long but the schedule is 2 years because we don't' know how long the program takes.
	Duration of the plan (10 years): It was commented that it is short, I fully agree with you but I considered 10 years according to forest law.
	A 5-year project cannot follow the growth of the forest but we intended to enable the Mozambican government to monitor forest management. Foreigners cannot stay in Mozambique forever, so Mozambicans have to follow up.
Mr. Yoshihiko Sato- FLOMOZ	Slide about satellite images: My presentation was based on documents and statistical data, I did not produce any data.
	I could not find information about the situation in the 70's.
	These data (maps) are not very accurate, just serves to get an initial idea.
	We'll collect more information from the stakeholders to improve the information.
	Data about deforestation and forest degradation in Niassa: The document does not show the volume, it represents the percentage. There are data that show the emission for each province.
	The data are from 2 different researches, and are available to be accessed.
Mr. Claudio Afonso- DINAF	Comments: Logging is prohibited from January to March.

	There is a need to plan enrichment activities for native
	species because forest takes long time to grow.
	We need help from Universities and investigation
	institutions to find the appropriate or "flag" species that
	can be used for reforestation
	can be used for reforestation.
	National inventory: Provincial data are useful to enrich
	this management plan.
	Pilot activities should be suggested by all participants.
Mr. Kazuhisa Kato-FLOMOZ	We will plan based on your opinions.
	Most important is that this is the first plan at provincial
	level and it can be used as a reference for other
	nrovinces
	Wa'll develop a plan for 10 years later you can work out
	we in develop a plan for to years, later you can work out
	another 10-year plan successively. Although it is 10
	years plan, you can set strategies for the next 50 years.
	The plan should not only be on paper but implemented.
	Forest protection should be promoted everyday by
	Mozambicans.
	Japan doesn't intend to work only with Japanese people.
	It is a Mozambican plan for Mozambican people, the
	Japanese just want to give their support.
Mr. Izidine Opressa-Director	There were good contributions and suggestions that can
of DIPTADER Niassa	he used to improve the document
of DIT TADER Massa	be used to improve the document.
	Our desire is to have a provincial inventory and I am
	Our desire is to have a provincial inventory and I am
	asking a support from our JICA partners.
	I would like to thank the Ministry for choosing our
	province to implement this project.
	I am also asking for collaboration from the stakeholders
	during the consultations.

Final remarks by Mr. Xavier Sailors Sakambuera-DINAF

The project has a limited budget of approximately 4 million USD for 5 years. It may not be enough but with your effort we can achieve our goals.

According to the law logging is carried out from 1st April to 31st December.

National inventory is conducted every 10 years. In the last 10 years Mozambique lost 10 million ha of commercial forests.

Situation of deforestation is not good and government has taken some measures such as:

- Revision of forestry law by prohibiting exportation of raw timbers;
- Ban on the exploitation of endangered species (Eg. Swartzia madagascariensis known as Iron wood);
- Introduction of Nkula tree on the precious species;
- Strengthening mobile surveillance (Eg. "Operação tronco" which helped to identify many illegalities, and some wood were seized and used to make school desks);
- Creation of Quality Analyze Agency.

I would like to reiterate NGOs who advocate for communities to help organize management committees.

NGOs should help to find better ways.

Forest law will be revised next year and will be included some ideas and contributions from this meeting.

別添資料18レビュー会議説明資料1



Ministério da Terra e Ambiente Agência Japonesa de Cooperação Internacional



INTEGRATED PROVINCIAL FOREST MANAGEMENT PLAN NIASSA PROVINCE

Session 1: Overview of Forest and Forest Management in Niassa - Status and Issues -

October 2022

Sustainable Forest Management Project and REDD+ (FLOMOZ)

Background of PPIGF

Mozambique government has taken much efforts to develop policy and strategy at National level for sustainable forest management. (Amendment of Forestry and Wildlife Law, Forest Policy and Implementation Strategy, National Forest Program 2018-2035, etc.)

In the context of decentralization policy, the Province play a critical role in promoting the National Forestry Program (NFP). A province-based planning system is proposed to ensure systematic and effective implementation of forest management activities under NFP.

JICA/FLOMOZ supports to formulate the PPIGF in Niassa Province to be the first model of PPIGF and expect for scaling up to nationwide in the future.

What is PPIGF?

The Integrated Provincial Forest Management Plan (PPIGF) provides medium- and long-term guidelines for comprehensive forest management throughout the province by integrating the individual planning elements of forest management, including forest conservation, plantation, firewood and charcoal, concession management, community benefit sharing, mitigation and adaptation.

As a basic plan for provincial forest management, the PPIGF is expected to play a coordination role for efficient allocation of limited budgets and for obtaining government budgets and external funding, as well as to encourage stakeholders to coordinate existing and future initiatives on forest management.

Principles for PPIGF Planning Process

- Comply with applicable national and local policies and laws on sustainable forest management.
- Coordinate with national and local policies in other sectors.
- Utilize existing data sets on forest and forest resources including forest cover map and national forest inventory data developed by DINAF
- Transparent and participatory process in the planning
- Consultation through stakeholders both government and non government agencies at national and local level.

Field Consultation and Interviews



Why Niassa Province?

 There are unique and critical forest landscapes that represents the country (Miombo Forest landscape in Niassa Special Reserve, Lake Niassa)

High forest cover rate and forest carbon stock, but deforestation and degradation are on-going and necessary measures must be taken to address deforestation and degradation.





PPIGF Planning Process and Schedule

A final draft will be prepared through technical review by the relevant agencies.

	Steps	Schedule
1	Kick off meeting of Integrated Provincial Forest Management Plan (PPIGF)	Nov. 2019
2	Data collection, analysis and drafting the PPIGF	Nov. 2019 – Mar. 2022
3	Prepare 1 st draft PPIGF (English and Portuguese)	Mar Jul. 2022
4	Distribution to Concerned Agencies at Central and Provincial level for review	JulAug. 2022
5	Review Meeting at Central and Provincial level	October 2022
6	Presentation to Provincial State Secretariat and Provincial Governor	
7	Review by Conselho Técnico, DINAF	
8	Review by Conselho Técnico, MTA	
9	Review by Conselho Consultivo, MTA	
10	Prepare final draft PPIGF	
11	Submit final PPIGF for approval	Dec. 2022

Contents of PPIGF

Chapter 1: Overview of Forest and Forest Management in Niassa: Status and Issues

 Forest Cover and Forest Change, Deforestation and Degradation Drivers and Natural Deserters, Problem Analysis on thematic issues in Conservation and Productive Forest Management

Chapter 2: Forest Zoning and Management

 Conservation, Protection and Productive Forest Zoning, Estimation of Allowable Annual Cut for Sustainable Wood Harvesting

Chapter 3: Provincial Forest Management Plan

 $\,\circ\,$ Vision, Strategic Objectives, Theory of Changes

Chapter 4: Activities on Forest Management

Chapter 5: Operational and Financial Plan

Chapter 6: Monitoring and Evaluation

Chapter 1: Overview of Forest and Forest Management in Niassa

1.1 Recent Forest Cover, Forest Volume and Forest Change

The province has 8,374,775 hectare of forests, accounting for 68.2% of the total land of province, of which 99.8% is natural forest and 0.2% is forest plantation (As of 2013 Forest Cover Map Niassa).

Forest area is decreasing in the recent years. According to the FREL report (2018), 384,437ha of forest, which covers 3.0% of the total land area has been loss during 2003-2013 in Niassa Province. Average annual loss become 34,949 ha, accounting for 0.28% of total land area, and mean annual emission of CO2 is 5,158,212tCO2e per year.

History of Deforestation Change in Niassa Province 2003-2013





1.2 Deforestation, Forest Degradation and Natural Disersters

Lichinga shows the highest area of deforestation, followed by Muembe, N'gauma, Mandimba, Sanga and Marrupa Districts.





1.2 Deforestation, Forest Degradation and Natural Disersters

The deforestation hotspots and drivers of deforestation were identified in the 16 districts of Niassa Province.

The main drivers of deforestation in Niassa province are

- Small scale agriculture expansion
- Uncontrolled fuelwood extraction and charcoal production
- Forest fire







Deforestation Hotspots in Niassa Province

1.2 Deforestation, Forest Degradation and Natural Disersters

Driver of Deforestation 1: Expansion of Agricultural Land

Niassa Strategic Plan 2018-2029 set a vision and goals to strengthen agricultural production through <u>expansion of cropping area</u> and improving productivity by using appropriate technologies and strategic marketing for food security and livelihoods improvement.

Small scale agricultural activities for subsistence are identified as a main driver of deforestation. <u>Maize</u> is the most abundant crop that has grown extensively in the province.

Cash crop production is also promoted in Niassa. <u>Tobacco</u> is one of the main cash crops in Niassa which has approximately 25 000 hectare of annual production from 2015 to 2018.

Improving agricultural production and expanding farmland is important policy for rural economy in Mozambique. However, unclear land use zoning and DUAT allocation for agricultural use may lead uncontrolled expansion of agricultural area leading to deforestation.

1.2 Deforestation, Forest Degradation and Natural Disersters

Driver of Forest Degradation 1: Uncontrolled wood extraction for fuelwood and charcoal production

The fuelwood and charcoal are the main source of domestic energy for almost the entire urban and rural population in Niassa. The use of fossil fuels and electricity as alternative energy are not used because costs of these energies are high.

It could be estimated that 655 497.2 tons of biomass are lost annually due to the use of charcoal and firewood, which is equivalent to <u>10 531</u>.8 hectares of Miombo forest.

Niassa has a growing population, increasing by an average rate of 4.1% per annum since 1980. As it is estimated that the population of Niassa will continue to increase, there will be an impact on deforestation in the future unless the consumption of fuelwood and charcoal is reduced or alternative means of energy such as electricity are introduced.

Another feature of the use of fuelwood in Niassa is to increase tobacco production leads to fuelwood consumption for curing tobacco leaf. Assuming that the volume of forest volume is 75.26 m3 per hectare (2019 DINAF), approximately 6 610 ha of forests is estimated to be decreased annually for drying tobacco. This is also significant impact of deforestation and forest degradation in Niassa. However MLT company have made efforts to minimize deforestation caused by tobacco drying.
1.2 Deforestation, Forest Degradation and Natural Disersters

Driver of Forest Degradation 2: Forest Fire

The causes of forest fires are mostly related to livelihoods and traditional cultures, such as agricultural land clearing/cleaning, hunting, honey harvesting.

According to MODIS Fire data, in Niassa Province,

2 244 fire hotspots were observed in 2020, which is 20% of the country. Mecula, Marrupa, Sanga, Mavago and Majune districts were listed as the highest incidence in the last five years.



1.2 Deforestation, Forest Degradation and Natural Disersters

Underlying Causes of Deforestation and Forest Degradation

Drivers	Underlying Causes
Expansion of Agricultural Land	Limited management capacity Ineffective land management, Unclear land allocation and DUAT management, Increased market demand of agricultural product Weak coordination mechanism among different sectors. Limited Extension services in rural development Population growth Poverty, Cultural Behavior
Uncontrolled wood extraction for fuelwood and charcoal production	Increased demand for fuelwood Weak law enforcement Weak coordination mechanism among sectors Ineffective land management Population growth, Poverty Cultural Behavior
Forest Fire	Cultural Behavior, Weak law enforcement Limited management capacity Deficient and ineffective forest management Increased market demand of agricultural product, Weak coordination mechanism among sectors

1.2 Deforestation, Forest Degradation and Natural Disersters

Natural Deserters caused by Deforestation and Degradation

Region of Occurance	Districts	Events on Natural Disersters
ZONE A	Cuamba, Mecanhelas, Lago, Mandimba, Metarica, Nipepe	Flood, Heavy rainfall, Strong winds, Irregular rainfall and drought in northern Lake Niassa
ZONE B	Sanga, Muembe, Lichinga, Majune, Ngauma, Mavago, Marrupa, Mecula and Maua	Strong winds, Heavy rains, Drought, Irregular rainfall In the area comprising the Lichinga plateau region there is an earthquake.

Some districts (Sanga, Mandimba, Cuamba, Mecanhelas, Metarica, Lago, Muembe and Marrupa) in Niassa have elaborated Local Climate Change Adaptation Plans (PLAs), which describe their vulnerability to climate change and local capacity in response to PEDDs (District Strategic Development Plans) and PESODs (District Economic and Social Plans and Budgets), as of 2021. In summary, the adaptation measures described in these PLAs include the following activities ;

- Ensuring the resilience of Agriculture; Introducing draught tolerant species in cropping, Agroforestry, livestock and fishery.
- Ensure the Construction of Social Infrastructure Resilient to Climate Change; Dam construction and water supply system,
- · Creation of nurseries and planting of seedlings for community reforestation and in degraded areas
- Reducing the vulnerability of people to the Vector-borne diseases associated with climate change (Public Health Sector).

1.3 Provincial Land Use Planning and Current Forest Zones

Niassa Province formulated Plano Estratégico do Niassa 2018-2029 in order to accelerate economic and social development in the province. The strategy suggested that "Agriculture and Agribusiness" "Tourism and Conservation" and "Mineral Resources" were priority sectors to be promoted in the long-term perspective.

However, The Strategic Plan did not provide an integrated spatial land use plan including conservation area and potential area for forest plantation and restoration.

As for Protected Forests, Niassa has the Niassa Special Reserve (NSR) in northern area. In addition, 27 areas including Área de Conservação Comunitária, Coutada Oficial and Fazenda de Bravio were designated and allocated for public and private entities for its wildlife management, which is accounting for 2,763,600 hector in Niassa Province.



Niassa National Reserve and Conservation Areas in Niassa Province

1.3 Provincial Land Use Planning and Current Forest Zones

In Niassa, Productive Forest and Multi-purpose forest areas has not defined. However, Niassa has defined simple licenses and forest concessions areas for forest exploitation purpose in Natural forests. Areas for forest plantation purpose are also defined.

However it can be observed that some forest concession areas were overlapped each other. the unclear forest management area makes forest inspection work difficult.

In addition, activities on agriculture and mining has been planned and operated in the forest area. It is not realistic to exclude all those activity from forest area, but it will necessary to take a consideration on how to accommodate the other land use and development activitiess in the forest management.



Niassa National Reserve and Conservation Areas in Niassa Province

1.3 Provincial Land Use Planning and Current Forest Zones

Main rivers and its watersheds that are located in Niassa province are Lúrio, Messalo, Rovuma and Lago Niassa

Forestry sector can consider introducing the concept of watershed forest management, assessing important watershed areas in terms of water and land management and taking necessary measures such as forest landscape restoration and climate resilient agriculture.



1.4 Conservation Forest Management

(1) Niassa Special Reserve

Niassa Special Reserve (NSR) is largest protected area in Mozambique (42,486 km2), with a central area (37,948 km2) that includes a buffer zone (4,538 km2). NRS has evolved as a conservation area, not only safeguards critical fauna, but also ensures the overall conservation of rich biodiversity and ecosystem services.

Approximately 60,000 people live inside the NSR area including its buffer zone, with 29,000 people located within the NSR, and approximately 31,000 in the buffer zone. Communities are also found in over 40 smaller scattered villages belonging to the six other districts. The vast majority of NSR residents are highly dependent on the use of natural resources for their livelihoods, resulting in significant impacts to the conservation area.



Niassa National Reserve and Buffer Zone

1.4 Conservation Forest Management

(1) Niassa Special Reserve

Threats have increased dramatically, including deforestation of miombo areas, poaching of wildlife, and mining etc, thus pressuring NSR's ecosystems.

According to the (draft) NSR management plan, challenges for NSR management were summarized as follows.

- 1) Lack of sustainable business model
- >2) Weak Law Enforcement
- ≻3) Unreliable data collection and analysis
- >4) Lack of Community Conservation efforts
- ≻5) Absence of high quality CBNRM programme



Niassa National Reserve and Buffer Zone

1.4 Conservation Forest Management

(2) Fazenda do Bravio, Coutada Oficial and Area de Conservacao Comunitaria

Niassa Province allocated 27 conservation areas including Fazenda do Bravio, Coutada Oficial and Community Conservation Area in Majune, Marrupa, Metarica, Maua, Sanga, and Lago. Area de Conservacao Comunitaria Chipanje Chetu is the largest conservation concession area in Niassa.

Issues are; 1) Unauthorized hunting and logging 2) weak law enforcement due to the lack of human, financial resources and equipment, 3) Lack of coordination with concessionaires. Some concession holder do not provide regular reports to the SDAE, making it impossible to update the actual situation.



Conservation Areas in Niassa

1.4 Conservation Forest Management

(3) Key Biodiversity Areas (KBAs)

Key Biodiversity Areas (KBAs) are sites contributing significantly to the global persistence of biodiversity, both in terrestrial, freshwater, marine and underground systems.

In Niassa Province, Niassa Special Reserve and Njesi Plateau was identified as KBA. Niassa Special Reserve KBA is formally protested as Special Reserve and Buffer Zone, however, Njesi KBA is only partially covered by community conservation Area.

These KBAs are crucial to guide the preparation of forest managment plans. Their inclusion helps to minimize the impact of infrastructure and development projects.



Conservation Areas in Niassa

1.5 Productive Forest Management

(1) Forest Concession and Simple License Management

■ In Niassa, 20 forest concessions and simple licenses are being operated or approved (as of October 2021). The approved areas are 559,600 hectares which is 3.8 % of the total area of Niassa Province and 5.6 % of the natural forest area of Niassa. Of the approved area, 530,000 hectares are for forest concessions and 29,600 hectares for simple licenses.

Operator and Volume of forest concession has increased but number of operator in simple license has decreased from 2017.



Forest Concession and Simple License in Niassa

25

1.5 Productive Forest Management

(1) Forest Concession and Simple License Management

The Provincial forestry and wildlife sector and National Agency for Environmental Quality Control (AQUA) took an efforts to control timber harvesting operations. As the result in 2020, 38 violation cases were found against the laws; Transport of forest products without a transportation permit, Unlicensed forest exploitation.

<u>Issues</u>

- >Insufficient human resource, means of transportation and budget for proper inspection and supervision
- Less information on forest concession available at District level. Lack of cooperation and information exchange between SPA and SDAE.
- >Waek inspection and supervision work at logging sites and lack of awareness raising activities for logging companies to comply with laws and regulations.
- GIS data of concession areas shows partial overlapping of areas in some parts, indicating that different concession permits are issued in the same location. This is due to insufficient information being provided in the application of concession and a lack of capacity to review and verify the location of concessions.
- Budget for reforestation after timber harvesting are not allocated to the province. Concession operators pay a reforestation fee equivalent to 15% of the logging fee when obtaining an annual logging permit but not reallocated to the province.

1.5 Productive Forest Management

(2) Benefit sharing to the community from forest concessions

Government officials have sufficient technical capacity for the establishment of CGRNs. In 2020, 4,390,149.42MT had been channeled to 51 communities in Chimbunila, Muembe, Marrupa, Maua, Nipepe, Metarica, Cuamba, Mavago, and Mecula, which is consist of 2,723,282 MT to 43 communities from forest concession, and 1,666,867.42 MT to 8 communities from wildlife exploitation in conservation concessions.

Issues

- ≻It is not clear how the funds allocated to communities have been used for due to insufficient monitoring.
- Difficulties in CGRN set up: Most of residents of the communities does not have the certificate of residence or any personal identification information, which is a requirement for membership of CGRNs. Another reason for the difficulty is the accessibility to the bank and open a bank account in remote areas
- Fair and equal benefit sharing to entire community is also challenging. Personal and exclusive use for their own benefits by elders and leaders have been observed in some cases and the contents of activities by using benefits were unclear.
- Some SDAE did not have sufficient information of forest concession and CGRN in their district. It is also required to set up information sharing and coordination mechanism among the related institutions at Provincial, District and community level.

1.5 Productive Forest Management

(3) Fuel Wood and Charcoal production

- Increase the demand of fuelwood has a significant impact on the degradation of forest resource. Government of Mozambique has issued the decisions to control fuelwood and charcoal production.
 - A licensing system similar to that for timber harvesting (Simple license) has been introduced for producers of fuelwood and charcoal
 - ≻The SPA issues transfer permission (guias de trânsito) for transportation of forest products.

To mitigate the impact by curing Tabaco, MLT have provided fuel wood and seedling for fuel wood plantation. Introduction of a shadow-dried tobacco variety (Burley) which doesn't require fuelwood is another measure to reduce deforestation.

Issues

- Uncontrolled logging for charcoal production and for drying tobacco leaf
- >Inefficient charcoal production and wasteful in fuelwood use;
- >Weak registration system for production and transportation of fuel wood leading to low tax collection;
- > Weak law enforcement with limited inspection capacity.

1.6 Tree and NTFP plantation

The National Reforestation Strategy 2010-2030: Forest restoration target is 1 million ha by 2030. Niassa province is one of the most appropriate provinces with a high or moderately high biophysical potential area for tree plantation.

In 2020 Niassa Province had 19 759 ha of commercial forest plantation of Pinus and Eucalyptus species promoted by Florestas de Niassa, Green Resources, New forest and ISOTOMANE.

Community based forest plantation: In 2020 Plantation Companies provided 2 344 000 seedlings for community and individual households, which covers 1 266 ha.

Community Engagement Programme: providing job opportunity, small-scale infrastructure, awareness raising on tree plantation.

Districts	Total Planted Area (ha)	GF	FN	ISO	NF	Species	
Lichinga	3,866	3,791		75.3		Pinus, Eucalyptus	
Chimbunila	8,721	3,819	4,902			Pinus, Eucalyptus	
Muembe	1,905	38	617		1250	Pinus, Eucalyptus	
Sanga	3,012	3,012				Pinus, Eucalyptus	
Lago	2,255	2,255				Pinus, Eucalyptus	
Total	19,759	12,915	5,519	75	1,250		

1.6 Tree and NTFP plantation

Issues raised by forest plantation companies

- Weak coordination and consultation at land acquirement process, resulting to duplication of DUAT and land use conflict over plantation area between local communities and plantation operators.
- >Weak law enforcement in the monitoring for illegal logging, forest fire, invasion of Plantation areas from local farmers.
- Lack of understanding of taxation rules applying for plantation company
- >Lack of plantation experiment station to test the suitable tree species and improve the capacity for production technique
- > Government faces lack of human resources and budget for promoting tree plantation.





1.7 Forest Fire Management

According to MODIS Fire data, in Niassa Province, 2,244 fire hotspots were observed in 2020, accounting for 20% of the country.

National action plan for the prevention and control of wildfires 2020-2024 set three pillars.

- Strengthen the intervention capacity of local authorities
- > Develop participatory programs for fire prevention and control
- Promote the use of appropriate technologies for fire mitigation and control through integrated systems of land use and other natural resources

In Niassa were promoted radio programs on forest fire prevention and placed warning **boards** for aware raising campaign to the local community; and the creation of natural resource management committees (CGRN) for fire prevention.

Issues: Lack of Human resource and budget for forest fire prevention



Forest Fire 2020 in Niassa

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1.8 Wood factory/industry Management

In 2020, 50.8 m³ of planks and 179.7 m3 of boards were processed as sawn wood. The species with the largest processed volume is Umbila with 139.5 m³, representing 60.5% of the total volume.

The part of wood products is transported by truck to Nampula province where it is exported from Nacala Port. In 2020, 76.9 m3 of sawn wood from Umbila were exported, of which 26.3 m3 in boards and 50.6 m3 in planks.

<u>Issues</u>

- Carpenters and small-scale sawmills is not officially registered
- >Timber from illegal logging are used for processing.
- >SPA and SDAE don't have updated database for registration of small operators as they (operators) doesn't submit their reports to the authorities.
- >Under these circumstances, it makes difficult to address how much volume of wood products were produced and exported and to inspect the legality of the timber for the processing at each factories.
- Need to encourage the carpentry and sawmill businesses to register for certification. It is also important to raise awareness and promote the Forest Law among local business operators.

別添資料19レビュー会議説明資料2



Ministério da Terra e Ambiente Agência Japonesa de Cooperação Internacional



INTEGRATED PROVINCIAL FOREST MANAGEMENT PLAN NIASSA PROVINCE

Session 2: Principles and Policies, Activities, Operational and Financial Plan, Monitoring and Evaluation

October 2022

Project of Sustainable Forest Management and REDD+ (FLOMOZ)



Chapter 2: Forest Zoning and Management

2.1 Principles and Policies of Conservation, Protection and Productive Forest

- Forest Zoning is important to effectively and efficiently promote conservation, protection and sustainable use of forest resources of Niassa Province.
- Forest Zone in Mozambique
 - Conservation forests
 - Conservation Forest Area
 - Protection Forest Area
 - Productive Forests
 - > Multiple use Forests

For forest zoning, appropriate criteria with available GIS data was selected in Niassa. (e.g. Island, Mangrove, coastline, Highway is not applicable in Niassa)

Conservat	ion Forests
CF	Conservation Forest Area
CF01	Conservation area established by laws (National parks, Forest Reserves)
CF02	Game Reserves (Coutadas Official. Community Hunting Zone, Fazenda do bravio)
CF03	Forest in Islands
CF04	Key Biodiversity Area
PF	Protection Forest Area
PF01	Mangroves
PF02	5km buffer zones of conservation areas
PF03	2km perimeter from national border in direction to the center of country
PF04	100m perimeter from the sea to continental area
PF05	250 m perimeter along the dams and reservoirs
PF06	Buffer zones of 100 m along rivers and lakes,
PF07	Buffer zones of 50 m along the Highways,
PF08	Buffer zones of 30 m along the primary roads.
PF09	Buffer zones of 15 m along the secondary and tertiary roads,
PF10	50 m buffer zones along the railways,
PF11	High potential of erosion, (Slopes more than 45 Decree)
PF12	Wet areas (Ramsar)
PF13	Areas with altitude \geq 1300 m,
Productive	e Forests
PD01	Forest Area outside Conservation and Protection Forest
Multiple L	Jse Forests
MU01	Non-Forest Area outside Conservation and Protection Forest

2.2 Conservation, Protection and Productive Forest Zone

- The forests in the Conservation and Protection Forest Area account for approximately 55% of the total forests in Niassa, and how to protect the Conservation and Protection Forest Area is a key policy and activity in the forest management in Niassa.
- It will also be important to manage the logging concession in Productive forest area, which have approximately 45% natural forest remaining, and how to control the sustainable harvesting for timber and charcoal production.



Conservation/Protection/Productive Forest in Niassa

2.3 Estimation of Allowable Annual Cut for Sustainable Wood Harvesting



(1) Estimation of the allowable annual cut from natural forest

2.3 Estimation of Allowable Annual Cut for Sustainable Wood Harvesting

(2) Estimation of the allowable annual cut from Tree Plantation

Assumptions:

- Main Plantation Species in Niassa: Eucalyptus (Eucalyptus grandis, Eucalyptus urophyla) and Pinus (Pinus patu
- Estimated area for plantation in Niassa: 19 580 ha.
- 50 % Pinus and 50% Eucalyptus.

IPCC guidelines:

- annual growth of *Eucalyptus grandis*: **15**-50 m³/ha/year
- annual growth of *Pinus patula*: 8-40m³/ha/year

Allowable Annual Cut Volume

- Eucalyptus plantations: 146 850 m³/year (9 790ha*15m³/ha/year)
- Pinus plantations: 78 320 m³/year (9 790ha*8m³/ha/year)

The current tree plantation in Niassa can provide approximately **225 000 m³ of wood materials per year**.

2.3 Estimation of Allowable Annual Cut for Sustainable Wood Harvesting

Recommendations

- The allowable annual cut volume of commercial species in natural forests is 224,359 m3 per year in Niassa
- -> logging concessions and simple licenses should be issued in productive forests

-> the amount of annual logging permits for logging concessions should not exceed the annual harvesting capacity for timber products.

- Monitoring and inspection of logging operation is also important activities to ensure the control of the logging volumes
- Estimated amount of woody biomass for energy use is approximately 1 290 092 m3/year. This amount exceed the AAC (1 152 000 m3) for energy use, leading to forest degradation.
- Furthermore, the demands for energy use will be increase due to the population increase and increasing industries requiring the use of fuelwood as their energy source in the future.
- Necessary actions should be taken to increase the supply through reforestation and afforestation, as well as control the logging from natural forest so that it does not exceed the standard volume of woody biomass indicated by the AAC

Chapter 3: Provincial Forest Management Plan

Design of Provincial Forest Management Plan (1)

To ensure consistency between national and local forest management policies and activities, **the National Forest Program**, promulgated in 2019, is defined as the top-level national forest management plan.

The "Vision" and "Strategic Objective" are designed to be the same as those of the NFP, so that the direction of the forest management plan is consistent with the national plan.

The activities in the PPIGF were also selected from the list of activities in the NFP that are relevant to forest management in the Niassa Province. (Refer to the Chapter 4 Activities on Forest Management)

Chapter 3: Vision and Strategic Objective

Vision

To ensure the economic, social and environmental benefits from forest goods and services through participatory management for current and future generations in Niassa Provinces

Strategic Objective

OBECTIVE 1 - Strengthen the socio-economic development and food security with a focus on community involvement

OBECTIVE 2 - Enhancing resilience to climate change and natural disasters

OBJECTIVE 3 - To build capacity and integrate the principles of good governance in forest development

Planning Period

10 years (2023-2032)

Chapter 3: Theory of Change



A theory of change is a method that explains how a given intervention, or set of interventions, is expected to lead to specific development change, drawing on a causal analysis based on available evidence. (UNDAF COMPANION GUIDANCE: THEORY OF CHANGE :2017)

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Chapter 4: Activities on Forest Management

Objective 1 - Strengthening the socio-economic development and food security with community involvement

Forests have an important role for provincial economy and food security especially for local communities dependent on resources. This objective proposes the integration of food security in the strategic area of economic development partners.

1.1 The communities at the center of economic development

This approach considers the need to foster the empowerment of local communities and effective participation of its members and bodies representation in decision-making to ensure the use of best practices at the local level, appreciation of local knowledge, and incorporation in forest management objectives the needs of the rural population dependent on these resources.

Activities

- Establishment of Community Based Organization for natural resource management
- Promote best practice of Community based Natural Resource Management
- Revenue management and benefit sharing to the community

Objective 1 - Strengthening the socio-economic development and food security with community involvement

1.2. Integrated development of sustainable value chains of forest products (timber and non-timber)

The integrated sustainable value chains considered sustainable supply of raw materials and adjustment of the legal and institutional framework favoring the sustainable forest management in its many forest products including the value chains of native forests and forest plantations for wood and energy. It also considers integrated business models that the state, private sector, small producers and community members bring positive and cross-cutting impact of economic, environmental and social development.

Activities

- Strengthen Wildlife management and Conservation Model
- Licensing System and Concession Management
- Registration of wood industry and incentive for processing and value addition
- >Creation of a favorable environment for the development of forest plantations
- Sustainable use of fuel wood and production of charcoal

Objective 2 - Enhancing resilience to climate change and natural disasters

This objective highlights the role and contribution of forests to resilience to extreme weather events and natural disasters that the country is plagued periodically.

2.1 Integrating forests in territorial planning and building synergies forest/wildlife/agriculture/water and energy

The integrated approach of rural development and forest management into the land management zoning and policies to ensure the the area based management for conservation, protection, and Productive forests, and forest plantations area, especially the most vulnerable districts in development corridors and as well as in the main river basins of the country.

2.2 Highlight the mitigation and adaptation to climate change

Identification of critical area for conservation and protection forest area including biodiversity conservation, wildlife corridor, and environmental services and the mapping of priority ecosystem services and their valuation for conservation, protection and plantation.

2.3 Increase resilience to climate change and natural disasters

The policy arrangement of offset mechanism and forest monitoring and implement activities including awareness raising campaign, forest restoration in degraded lands, and agroforestry for building resilience to disasters.



This objective recognizes the importance of building adequate capacity to meet the challenges of the sector and the need for coordination and integration of the principles of good governance for sustainable forest management.

3.1 Improve forest monitoring for decision-making

Forest monitoring to produce forest resource information with scientifically high quality and credible data and to contribute the decision-making including evaluation of performance, achievements and impacts of relevant forest policies and actions to be taken.

Strengthening monitoring capacities and encouraging the involvement of local communities in forest monitoring and supervision at the local level are also considered.

3.2 Reformulate and adjust the forest governance

Institutionalize mechanisms for participation and collaboration, accountability, transparency, fund raising and building synergies for integrated and sustainable forest development.

Objective 3 - To build capacity and integrate the principles of good governance in forestry development

3.3 Training and forest research

Weak technical capacity is major obstacles to promote sustainable forest management. The approach includes the improvement of technical skills and knowledge of forest management activities, and Awareness raining campaigns of forest and environment to the forestry officers and local producers. Forest research and application the results in practice **should also be** promoted to improve the sector's performance, emphasizing the need for coordinated actions long-term research for knowledge of sustainable forest management and use.

Chapter 5: Operational and Financial Plan

5.1. Institutional and implementation arrangements

Provincial level: SPA plays a crucial role in the planning, implementing, monitoring and evaluation of PPIGF.

National level: DINAF/MTA will be responsible for supporting PPIGFs related to policy analyses, policy revisions and integration into provincial planning, while also providing necessary capacity building to provincial level line agencies. ANAC /MTA mandated to manage Niassa Special Reserve together with SPA. Fiscals are responsible for forest inspection in the implementation of the PPIGF.

District Level: **SDAE** is the responsible organization with the primary implementation at field level, overseen and supported by **SPA**. This kind of integrated plan require the coordination with other sectors in the planning and implementation.

Capacity levels, both technical and financial, are known limitations of government institutions and capacity building and funding support is a core element of the PPIGF to ensure effectiveness of the identified activities. Shortage of vehicles and equipment for field investigation is also obstacle for effective to ensure sound forest management. Thus, external financial and technical support will be required for capacity building, which is expected to be filled by development partners and private sectors.

Design of Provincial Forest Management Plan (2)

The Operational budgets for each of the PPIGF activities were calculated by referring to the budgets listed for each of the NFP activities.

As approximately 19.9% of the forests were located in Niassa Province, the budget calculation was based on the assumption that approximately 19.9% of the NFP's budget would be allocated.

5.2. Indicative Budget

The total cost of implementing the PPIG over a period of 10 years (2021-2030) is \$82 million which equals MT 5.23 billion. Of this, **\$54.78 million (MT 3.50 billion) will be dedicated to the Socio-Economic Development and Food Security (Objective 1)**, \$22.57 million (MT 1.44 billion) to the Enhancing Resilience to Climate Change and Natural Disasters (**Objective 2**), and \$4.65 million (MT 0.29 billion) to the Capacity Building and Good Governance (**Objective 3**).

PPIGF Strategic	Indica	ative Budget (U	SD)	Indicative Budget (MT)			
Objectives	2021 - 2025	2026 - 2030	Total	2021 - 2025	2026 - 2030	Total	
Objective 1 : Socio- Economic Development and Food Security	38,996,500	15,781,900	54,778,400	2,485,637,000	1,005,939,000	3,491,576,000	
Objective 2: Enhancing Resilience to Climate Change and Natural Disasters	11,378,900	11,190,100	22,569,000	725,292,000	713,257,000	1,438,549,000	
Objective 3: Capacity Building and Good Governance	3,257,100	1,392,200	4,649,300	207,607,000	88,738,000	296,345,000	
Total	53,632,500	28,364,200	81,996,700	3,418,536,000	1,807,934,000	5,226,470,000	

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5.3. Funding Source

Limited provincial funding is considered a bottle neck for PPIGF implementation, and additional external support including private investment and donor will be required to support the implementation of the PPIGF

Project Name	Organization	Duration	Estimate Budget (USD)
National and Provincial Budget	Public	2021-2030	N/A
Concession fees for forest concession and simple license	Public	2021-2030	N/A
Northern Mozambique Rural Resilience Project (MozNorte)	World Bank	2021-2026	N/A
Sustainable Rural Economy Program (SREP or MozRural)	World Bank	2021-2026	N/A
Environmental Security and Resilience in Northern Mozambique (ECOSMART-2)	WCS/USAID	2021-2026	N/A
Other Donors		N/A	N/A
Private investment for tree plantation	Private	2021-2030	N/A
Investment for social and environmental services by Private Company (ex. MLT)	Private	2021-2030	N/A
Total			N/A

Chapter 6: Monitoring and Evaluation

The SPA plays a crucial role in the planning, monitoring and evaluation of provincial development plans.

The design of the Monitoring and Evaluation system will be based on the list of forest management activities outlined in Tables in Chapter 4 which already provide initial targets for each activity.

Muito obrigado !



別添資料 20 レビュー会議コメントリスト

Comments list on the PPIGF presentation, Maputo (October 03, 2022)

	NAME	INST.		COMMENT SUMMARY MAPUTO	CRITE RION	MEASURE
M1	lsilda Nha ntumbo	Consultant	Question: Problem: Opinion:	Intrasectoral approach on deforestation Lack of alignment of approach on deforestation/ degradation with other actors. Involve the Agricultural sector (Extensionist), sectors such as planning and territorial planning.		Answer already given by FLOMOZ: There were some constraints in involving other stakeholders in the preparation of the PPIGF. There is possibility for the inclusion of other instruments approved under other projects (Ex: SIF can help in the resolution of overlapping); the PPIGF was based on the forest cover map and other work by DINAE
M2	Saw	WWF	Opinion:	Niassa is one of the largest mosaics of land use and ecosystems. This is not being well capitalized due to their different microclimates. Excellent initiative that should be the beginning of a more integrated plan.		
M3	Saw	WWF	Opinion:	Ideas for community involvement should be made business-like to encourage participation. It must protect the private sector. PPIGF cannot be another document without implementation		

	NAME	INST.		COMMENT SUMMARY	CRITE	MEASURE
				ΜΑΡΟΙΟ	RION	
M4	Saw	WWF	Opinion	PPIGF should be included in the Province's plan and		Answer already given by FLOMOZ:
				programs.		Lack of cross-sector communication is
				The exchange of information between institutions should		indeed a problem and needs to be
				be improved.		addressed.
M5	Saw	WWF	Opinion	Deforestation: more than planting, it is necessary to train		
				the communities in Sustainable Management of Native		
				Forests.		
M6	Macuacua	DINAF	Opinion:	Identify problems and suggest solutions:		
				Overlapping DUATs,		
				Bring concrete, quantitative examples (e.g. seedling		
				production, planting, and growth;		
				Mineral Resources at REN, advise how resource		
				extraction should be carried out.		
				Suggest what is needed to stop the process (restoration,		
				etc)		
M7	Custodio	DINAF	Opinion:	Chapter 1 is very long and there is some repetition.		
				Why does the District of Cuamba not appear in the list of		
				Districts with the highest deforestation and use of		
				charcoal and firewood?		
				Why is exotic wood production and processing not well		
				reflected?		
M8	Julian	DINAF	Opinion	a) The problem of nomadism or constant movement of		Answer already given by FLOMOZ:
				rural population was not mentioned.		The situation of nomadism is not
						clearly reflected, however, it is
						mentioned as a cultural habit of the

	NAME	INST.		COMMENT SUMMARY	CRITE	MEASURE
		_		ΜΑΡυτο	RION	
				b) Refer to actions already carried out by DINAF such as		communities and was considered as a
				the establishment of Forest Management Units;		major cause.
				c)Align with territorial planning policies.		
M9	Dir. Claudio	DINAF	Opinion	Improve the calendar to indicate when the document will		Answer already given by FLOMOZ:
				be approved. The stages of approval should be clear;		The calendar will be reviewed and improved:
				Logging does not indicate that it is causing deforestation,		The exploitation of firewood
				but it does cause degradation;		contributes to deforestation.
				The issue of logging is not indicated as a cause of forest		
				degradation		
M10	Fatima Kanji	DINAF	Opinion	Registration of community-based organizations (CBOs):		Answer already given by FLOMOZ:
				include facilitating the acquisition of ID cards for		We take note and it will be taken into
				community members.		consideration
M11	Isilda	Consultant	Opinion	Species information is missing; include appendix with		Answer already given by FLOMOZ:
	Nhantumbo			information about the species and which are the main		The information about the species is
				ones;		contained in the document and
						separated by order of importance
				Analyze opportunities for each set of activities		
				(where it will be done, who will do it) so that		
				interventions are made in priority areas.		
				Budget: the criterion for estimating the budget should be		
				based on information from the Province, not the PNF;		

		COMMENT SUMMARY	CRITE	MEASURE
	INST.	ΜΑΡυτο	RION	MEASONE
		Emphasize the importance of the Producers' organizations.		
		The indication of participatory monitoring to capitalize on the human resources of the communities is missing.		

		INICT		COMMENT SUMMARY	CRITE	MEACUDE
	NAIVIE	INST.		LICHINGA	RION	IVIEASURE
L1	Alberto	IIAM	Question:	Concession		
	Mussana		Problem:	Invasion of concession area.		
			Opinion:	Support operators who do not know how to use GPS in		
				order to confirm the boundaries of the areas.		
L2	Alberto	IIAM	Question:	Zoning		
	Mussana		Problem:	Lack of concrete plan for agricultural practice.		
			Opinion:	SDAEs must zone in order to identify areas for agriculture.		
L3	José	ISOTO	Question:	Causes of Deforestation		
	Manteiga	MANE	Problem:	Debates for long years only about causes (agriculture,		
				honey harvesting, coal production) with complicated		
				practical applicability.		
			Opinion:	The biggest cause of deforestation is poverty.		
				Invest in the producers.		
				Encourage conservation agriculture. Promote community		
				reforestation.		
				_Directing funds for community training		
				_Train farmers about conservation agriculture.		
				Create associations to manage the honey harvest.		
				_Agriculture sector and forestry sector work in		
				coordination.		
L4	Júlio Afonso	Mecula	Question:	Lack of actual implementation of documents and plans.		
		SDAE	Opinion:	Effectively implement the PPIGF for various development		
				areas.		
L5	Júlio Afonso	Mecula	Question:	Cause of deforestation.		
		SDAE	Opinion:	Write into the PPIGF the concessions as cause.		

List of comments on the PPIGF presentation, Lichinga (October 07, 2022)

	NAME	INICT		COMMENT SUMMARY	CRITE	MEASURE
	INAIVIE	11151.		LICHINGA	RION	WEASORE
				Concessionaires do not respect environmental or social		
				issues.		
L6	Mbuma	WWF	Question:	Riverine forest, springs.		
	Marrufo		Problem:	Not in the PPIGF		
			Opinion:	Add actions for riparian forest management to facilitate		
				goal setting, monitoring, and measurement of results.		
L7	Mbuma	WWF	Question:	Honey collection.		
	Marrufo		Problem:	There is a lack of concrete proposals for developing the		
				value chain to help reduce wildfires.		
				There are honey production activities by individuals and		
			Opinion:	institutions that work in isolation.		
				PPIGF should include this activity to develop the		
				beekeeping value chain		
L8	Natalia	Director	Question:	20%		
	Farahane	SDAE	Problem:	Lack of tangible results from the 20%.		
-		Ngauma	Opinion:	Deployment of infrastructure with the benefits.		
L9	Natalia	Director	Question:	Coal extraction without a license.		
	Farahane	SDAE	Problem:	Charcoal burners must go to the province to obtain a		
		Ngauma		license, because the district does not have the		
			Opinion:	competence for licensing.		
				Decentralization so that the license within the community		
-				can be issued at the District level		
L 10	Natalia	Dir ^a	Question:	Tobacco		
	Farahane	SDAE	Problem:	Virginia variety creates deforestation.		
		Ngauma	Opinion:	MLT should include reforestation of native species in its		
				reforestation programs.		

		INCT		COMMENT SUMMARY	CRITE	MEASUDE
	NAIVIE	11151.		LICHINGA	RION	WEASURE
L 11	Natalia	Dir ^a	Question:	Wood production.		
	Farahane	SDAE	Problem:	SDAEs with no knowledge of the loggers' activities.		
		Ngauma		The loggers are not accountable to the District.		
			Opinion:	There must be coordination between the District and the		
				Province.		
L 12	Natalia	Dir ^a	Question:	MLT Firewood.		
	Farahane	SDAE	Problem:	The firewood that MLT supplies is expensive and causes		
		Ngauma		the producers to resort to native forest.		
L 13	Edgar	MLT	Explanation:	MLT does reforestation allied with sustainability.		
	Muthambe			Signed contracts with forestry companies for the supply		
				of tobacco curing firewood.		
				It will not promote Virginia tobacco production in places		
				with poor truck access to avoid deforestation.		
				Unsustainable tobacco has no world market.		
				MLT is open to give more information about its activities		
				to FLOMOZ		
L 14	Vitorino	Green	Question:	Green Resources is experimenting with charcoal		
	Mateus	Resourc		production using Eucalyptus waste. And is going to do a		
		es		feasibility study to acquire a license.		
			Opinion:	It needs government support to have a market.		
L 15	Carlos	Forestry	Question:	Deforestation for tobacco.		
	Messias	Operator	Opinion:	MLT should provide seedlings of native species.		
L16	José	Niassa	Question:	Zoning.		
	Manteiga	Forests	Opinion:	For the success of the PPIGF, you should refer to the		
				document regarding the Malonda Foundation.		
L17	José	ISOTO	Question:	Distribution of native seedlings by MLT.		
	Manteiga	MANE	Opinion:			

	ΝΔΜΕ		INST		COMMENT SUMMARY	CRITE	MEASURE
			11051.		LICHINGA	RION	WEASONE
					With good regeneration management the native Forest		
					can recompose itself.		
					The other stakeholders including the government should		
					use the regeneration Management that is technique is		
					easy.		
L18	Nilton	de	SDAE	Question:	Agriculture.		
	Rosário		Ngauma	Problem:	Lack of technology in agriculture.		
				Opinion:	Implementation of agroforestry systems.		
L19	Nilton	de	SDAE	Question:	SDAE		
	Rosário		Ngauma	Problem:	Lack of coordination among SDAE technicians.		
					The SDAE guides the expansion of cultivated areas at the		
					same time as it guides to reduce deforestation.		
L20	Nilton	de	SDAE	Question:	Firewood and Charcoal.		
	Rosário		Ngauma	Problem:	"manuals and pdfs", are not applicable.		
				Opinion:	The government should create at the provincial level a		
					mechanism responsible for the restoration of degraded		
					ecosystems. This mechanism should work and go to the		
					SDAE.		
L21	Nilton	de	SDAE	Question:	Fees.		
	Rosário		Ngauma	Problem:	Injustice in the application of fees to greenery sellers		
					versus coal sellers.		
				Opinion:	Coal fees should be directed to the restoration		
					institutions/organization.		
L22	Nilton	de	SDAE	Question:	MLT firewood price.		
	Rosário		Ngauma	Problem:	MLT should reduce the cost of the firewood it supplies.		
				Opinion:	The producers buy little firewood from MLT for sampling,		
					in fact they use firewood from native species		

	NAME	INICT		COMMENT SUMMARY	CRITE	MEASURE
	INAIVIE	11151.		LICHINGA	RION	MEASORE
L23	Vitalina	Catholic	Question:	Cultural aspect		
	Temporary	Universit	Problem:	Cultural aspects of the local community (areas of cultural		
		y (UCM)		importance, sacred sites, etc.) are missing from the PPIGF.		
L24	Alberto	IIAM	Question:	Indicators.		
	Mussana		Problem:	Missing Indicators about community change		
			Opinion:	How is agriculture practiced?		
				Should work with SDAEs to identify coal production site.		
				_How to replace coal that is a source of income?		
				_PPIGF must look at the social condition. Both agriculture		
				and coal are the result of poverty		
				It is not enough to raise awareness, you have to find		
				alternative livelihoods for communities.		
				How to work with the District to change the communities'		
				behavior?		
L25	Mbumba	WWF	Question:	Map of forest areas.		
	Marrufo		Opinion:	The Lake District has an area that can be included on the		
				Conservation Area Map.		
L26	Mbumba	WWF	Question:	Writing		
	Marrufo		Problem:	Niassa Special Reserve: REN or NSR?		
			Opinion:	In the PPIGF, abbreviations should be standardized.		
L27	Mbumba	WWF	Question:	Drivers		
	Marrufo		Problem:	Other important causes of deforestation (brick curing and		
				the bakeries) remain to be identified.		
			Opinion:	Objectives will not be solved only by intervention in		
				Tobacco curing and household consumption of woody		
				fuel without intervention in the production of bricks, piles,		
				bakeries.		

		INICT		COMMENT SUMMARY	CRITE	MEASUDE
	INAIVIE	11131.		LICHINGA	RION	WEASORE
				_Universities should study the consumption of firewood		
				for bricks and bakeries.		
				Encourage the use of efficient furnaces.		
L28	Mbumba	WWF	Question:	Community Forests		
	Marrufo		Problem:	He participated in the public consultation of the New		
				Forestry Law, but does not remember if this aspect was		
			Opinion:	discussed.		
				How to maintain good results from restoration programs		
				in communities where degradation once occurred?		
L29	Dario Pedro	SDAE	Question:	Causes		
	António	Metarica	Problem:	The planning for causes must be from the bottom to the		
				TOP and not from the top to the bottom		
			Opinion:	In Metarica there is an aviary that was implemented, but		
				the aviary is no longer operating because the government		
				was not involved in its implementation.		
L30	Newton do	SDAE	Question:	Logging records		
	Rosário	Ngauma	Problem:	There are carpentry shops in every district, but not all		
				districts have operators. The wood comes illegally.		
			Opinion:	In 2019 SDAEs were passing document for exploration at		
				local level. But the Districts were prevented from issuing		
				any authorization at the local level. A certain volume was		
				to be authorized depending on the potential of the District		
				to feed the carpenter shops.		
L31	Newton do	SDAE	Question:	Implementation of the PPIGF		
	Rosário	Ngauma	Opinion:	The SPA leads the implementation, but the involvement		
				of the SDAEs' technicians in the planning of the activities		
				should be considered.		

		INICT		COMMENT SUMMARY	CRITE	MEASURE
	INAIVIE	11151.		LICHINGA	RION	MEASORE
L32	José	Niassa	Question:	Zoning		
	Manteiga	Forest	Opinion:	Lumber must be zoned.		
L33	José	Niassa	Question:	Awareness		
	Manteiga	Forest	Opinion:	The loggers are not part of the deforestation because they		
				look for commercial species with larger diameters.		
				The communities must be sensitized.		
L34	Armando	SDAE	Question:	Coal		Answer already given:
	Alberto	Mandim	Opinion:	People use coal because it is necessary.		Major causes of deforestation are
		ba		Banning communities from using coal is not realistic.		related to subsistence
						The vision of the PPIGF is not to ban or
						make the community tight, but to
						identify where it should be protected,
						to have an idea of the minimum region
						to be protected.
L35	Armando	SDAE	Question:	20%		Answer already given:
	Alberto	Mandim	Problem:	Awareness-raising should be continued.		The total 20% figures are low because
		ba		It is difficult for the 20% to reach the community because		the province has few logging licenses.
				of excessive bureaucracy.		The process of creating the committees
						costs almost 50,000 MT. Therefore,
						when the 20% value is very low, the
						value accumulates for a few years until
1.20	A	CDAF				It is sufficient to direct the community.
L39	Armando	SDAE	Question:	Ketorestation Fee		
	Alberto	iviandim	Opinion:	The money for reforestation should also be distributed to		
140	lasí	60	Quanting			
L40	Jose		Question:	Reforestation		
	IManteiga	ANE	Problem			

	ΝΛΜΕ	INIST		COMMENT SUMMARY	CRITE	MEASURE
		11451.		LICHINGA	RION	WEASONE
				The PPIGF does not indicate who should do the		
				reforestation or how much should be reforested each		
				year.		
L41	Nandinho	SDAE	Question:	Reforestation with exotic species		
	Manuel	Nipepe	Opinion:	The very people who contribute to deforestation must do		
	Massangano	Director		the replenishing/reforesting.		
				Loggers should have the obligation to replace 5 times each		
				tree cut down, preferably native species.		
				It is possible to reforest with native species by collecting		
				seeds		
L42	Nandinho	SDAE	Question:	20%		
	Manuel	Nipepe	Problem:	SDAE of Nipepe does not receive the revenue harvested		
	Massangano	Director		from the farm. SDAE does not receive benefit from the		
			Opinion:	farm.		
				The upper level should disclose how much money is billed		
				at the provincial level. Then the SDAEs would have no		
				difficulty in overseeing it.		
L43	Natalia	Director	Question:	Committees		
	Farahane	Ngauma	Opinion:	Committees must be trained		
				Benefit sharing needed for communities to defend native		
				and exotic plants		
L44	Natalia	Director	Question:	Exotic Species		
	Farahane	Ngauma	Opinion:	The value chain (wood processing) should benefit the		
				communities more.		
L45	Natalia	Director	Question:	Training		
	Farahane	Ngauma	Opinion:	More funding and training should be provided at the		
				provincial and district level		

		INICT		COMMENT SUMMARY	CRITE	MEASURE
	NAIVIE	11151.		LICHINGA	RION	IVIEASORE
				Exchange experience with Malawi where there is no		
				uncontrolled burning.		
L46	Raju	SDAE	Opinion:	There must be awareness for the community and for us		
	Momad	Marrupa		decision-makers		
		Director				
L47	Raju	SDAE	Question:	Inspection		
	Momad	Marrupa	Opinion:	Surveillance does not cover all other activities that cause		
		Director		deforestation. The SDAE must participate in enforcement.		
L48	Raju	SDAE	Question:	Committee		
	Momad	Marrupa	Problem:	Committees appear when there is a possibility of the 20%.		
		Director				
L49	Raju	SDAE	Question:	PPIGF is very long term. Activities must start now.		Answer already given:
	Momad	Marrupa	Problem:			The plan always has to be long term
		Director				because the cycle of the trees is long (at
						least 10 years).
L50	Raju	SDAE	Question:	The seedlings distributed by MLT were often not planted,		
	Momad	Marrupa		but when they introduced live dryers the community		
		Director		began to cooperate.		
			Opinion:	It is necessary to change the producer's consciousness.		
L51	Raju	SDAE	Question:	Land Abandonment		
	Momad	Marrupa	Problem:	The population abandons the land for various reasons		
		Director		(leadership conflicts, search for better productive areas).		
			Opinion:	Important to raise awareness.		
L52	Raju	SDAE	Question:	Operator Accountability.		
	Momad	Marrupa	Problem:	In rainy weather (planting period) the operator is not in		
		Director		the field.		
	ΝΛΜΕ	INICT		COMMENT SUMMARY	CRITE	MEASURE
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	INAIVIL	11131.		LICHINGA	RION	WLASOKL
L53	Amisse	SDAE	Question:	Law		
	Aristides	Sanga	Problem:	The laws do not apply to the reality of the community: the		
		Director		inspectors are aware that the community members clear		
				forest for their needs.		
			Opinion:	Laws must be appropriate for the local community.		
L54	Amisse	SDAE	Question:	Agriculture.		
	Aristides	Sanga	Problem:	Lack of effort to look for alternatives to improve		
		Director		agricultural production.		
			Opinion:	The idea that agriculture is the basis of development must		
				be reversed.		
L55	Amisse	SDAE	Problem:	Processing plants are needed to generate alternative		Answer already given:
	Aristides	Sanga		income. Many communities are running to the forests to		Major causes of deforestation are
		Director		supply their needs.		related to subsistence use
						The vision of the PPIGF is not to ban or
						make the community tight, but to
						identify where it should be protected,
						to have an idea of the minimum region
						to be protected.
L 56	Ema Saide	Director	Problem:	Shortage of personnel at SDAE.		
		SDAE	Opinion:	Place 1 Forestry technician in the SDAE to safeguard the		
		Lichinga		forest in regeneration of the Administrative Post of		
				Meponda de Lichinga		
L 57	Mbumba	WWF	Question:	Committees		
	Marrufo		Opinion:	In Sofala province they form savings groups in the		
				committees to ensure that the committees meet		
				frequently. In these savings meetings they set aside 30		

	NAME	INST.		COMMENT SUMMARY LICHINGA	CRITE RION	MEASURE
				minutes to discuss aspects of Natural Resource management. SDAEs can perhaps create such a savings initiative		
L 58	Joaquim Macuacua	DINAF	Explanation	The PPIGF is aligned with the other documents already produced. There is a document produced in 2018 where one can find details of all the causes of deforestation. No one will be discriminated against Niassa will be the exception for zoning areas above 1300 meters. PPIGF will not respond to aspects of the Forestry Law. JICA is helping us draw up the plan, but the mobilization of the funds is up to the institution in charge.		

別添資料 21 ニアッサ州森林管理計画の要約



モザンビーク国土地環境省 (独)国際協力機構



モザンビーク国

持続可能な森林管理・REDD+プロジェクト

技術協力成果品

ニアッサ州森林管理計画 (PPIGF)

和文要約



2024年4月

アジア航測株式会社

国際航業株式会社

要 約

1. 州森林管理計画の背景と必要性

モザンビーク政府は、持続可能な森林管理に向けて、国家レベルで法律の整備や戦略・政策の策 定に取り組んできた。地方分権化の一環として、国家森林プログラム(National Forest Program)を 体系的かつ効果的に実施するためには、州レベルでの森林管理計画の策定と森林管理能力を強化 が必要である。また日本政府はこれまで、技術協力や無償資金協力を通じて森林情報の整備を支 援し、森林被覆図の作成や国家森林インベントリの実施に取り組んできた。これらの森林資源の 基盤情報を活用し、科学的な情報に基づく州森林管理計画(PPIGF)を策定する必要がある。

2. ニアッサ州森林管理計画の概要

PPIGF は、保護区における森林保全、植林、薪や木炭の採取と生産、伐採コンセッションの管理 と運営、コミュニティの利益配分、気候変動の緩和と適応など、個々の森林管理活動の要素を統 合し、州が中長期的に取り組むための包括的な森林管理の方針を示している。PPIGF の内容は以 下の通りである。

第1章 ニアッサ州の森林と森林管理の概要

- ニアッサ州の森林面積は8,374,775 ヘクタールで、州の総面積の68.2%を占め、そのうち99.8% が天然林、0.2%が植林地である。
- ▶ 近年、森林面積は縮小傾向にある。FRELの報告書(2018年)によると、2003年から2013年の間に、ニアッサ州の年間平均損失面積は34,949へクタール(総面積の0.28%に相当)、年間 平均 CO2 排出量は516万 tCO2eになる。
- ニアッサ州の森林減少の主な要因は、第1に小規模農地の拡大、続いて、薪炭生産のための 無秩序な伐採、そして森林火災が挙げられる。

【森林減少ホットスポット(2001-2019)】





▶ ニアッサ州における森林管理のテーマと課題

<u>保全林管理</u>:(1)ニアッサ特別保護区、(2)保護区(保全コンセッション、コミュニティ保全地区、 等)管理(3)主要な生物多様性重要地域(KBAs)。

<u>生産林管理</u>:(1) 森林伐採コンセッションとシンプルライセンス、(2) 伐採から得られる地域社会 への利益の分配、(3) 薪炭生産

その他:植林と NTFP、森林火災管理、 森林管理体制の構築

開発パートナーや植林企業、タバコ企業と協力しながら、上記のテーマにかかる施策を実施している。 ー方、主要課題として以下の点が挙げられる。

- ▶ 限られた森林管理キャパシティ(人材、予算、機材、技術など)
- ▶ 非効率な土地管理(不明瞭な保護区境界、土地利用権 DUAT の位置情報の精度が低い、コン セッションエリアの重複、鉱山開発区と保護区の重複、)
- ▶ 脆弱なセクター間調整メカニズム(土地利用の調整機能の不備)
- 伐採コンセッション、コミュニティ森林管理ネットワーク、木材産業、等に関する統計情報 を収集・管理する体制やシステムが不十分。
- ▶ 市場における需要の拡大(商品作物や薪炭材の需要による森林の開拓・伐採)
- ▶ 脆弱な農林業普及サービス
- ▶ 社会文化的要因(人口増加、貧困、伝統的な狩猟や農業技術)

第2章:ゾーニングと森林管理

<u>森林機能類型ゾーニング</u>:森林野生動物法及び関連法規を参照し、また森林被覆図のデータを元 に、ニアッサ州の森林を以下のようにゾーニングした。

【保全林】

- ▶保全林(6,049,700 ヘクタール)
- ▶保護林(191,500 ヘクタール)

【生産林】(3,709,000 ヘクタール)

【多目的林】(2,312,800 ヘクタール)

ニアッサ州の保全林は、ニアッサ特別 保護林を中心に、州の森林全体の約 56%を占めており、保全林管理は州の 優先事項である。また生産林や多目的 林も、天然林の約44%を占めており、 このエリアの森林伐採を持続的に管理 することも併せて重要である。



ニアッサ州の生産林における伐採許容伐採量:ゾーニング結果とNFI データを元に推計

- ▶ 商業伐採用の年間許容伐採量:約22万立米/年
- ▶ エネルギー利用のための木質バイオマスの伐採許容量:約115万立米/年。

ニアッサ州全体の薪炭材の消費量を推計した結果、約 129 万立米/年が利用されていた。現時点 で薪炭材消費量が伐採許容量を上回っていること、さらに将来的な人口増加や経済成長に伴うエ ネルギー需要の増加が想定されることから、対策をしない場合はさらなる森林の劣化の進行が予 想される。森林再生や植林によって供給量を増やすとともに、木質バイオマスの年間伐採許容量 の基準量を超えて消費しないよう、天然林からの木材・薪炭林利用をコントロールする等、必要 な措置を講じる必要がある。

第3章ビジョン、目標、セオリー・オブ・チェンジ、計画期間

<u>ビジョン</u>:ニアッサ州において、現在および将来の世代のために、参加型管理を通じて、森林の 財・サービスの経済的・社会的・環境的利益を確保する。

戦略目標

目標1:コミュニティの参加に重点を置いた社会経済開発と食糧安全保障の強化

- 目標2:気候変動や自然災害に対する回復力の向上
- 目標3: 森林管理能力とグッドガバナンスの強化

計画期間:10年間(2023~2032年)

第4章 森林管理活動

(1) 地域社会の参画を重視した社会経済開発と食糧安全保障の強化

コミュニティを中心とした経済発展

- ▶ 天然資源管理のための住民組織の設立
- ▶ 自然資源管理のベストプラクティスの推進
- ▶ 収益管理とコミュニティ利益配分

持続可能な林産物バリューチェーンの開発

- ▶ 野生生物の管理と保護モデルの強化
- ▶ 伐採ライセンスおよびコンセッション管理システム
- 木材産業の登録と木材加工・付加価値化の奨励
- 植林に関する投資環境の整備
- ▶ 薪炭の持続可能な利用と木炭生産

(2) 気候変動や自然災害に対する回復力を高める

森林を地域計画に組み込み、森林/動物相/農業/水/エネルギーの相乗効果を構築

土地利用ゾーニングと農村開発と森林管理の統合的アプローチにより、特に経済回廊や主要 河川流域の最も脆弱な地域において、森林と植林地の保全、保護、生産性を高めるための土 地利用管理を強化する。

気候変動の緩和と適応の重視

生物多様性保全、動物相回廊、環境サービス、生態系サービスのマッピングと森林保全・保護のための重要地域の特定。保全・保護・植林の付加価値化。

気候変動や自然災害に対する回復力の向上

- 災害に対する補償メカニズム、森林モニタリングの実施、啓蒙普及キャンペーン、荒廃地の 森林回復、アグロフォレストリーシステムの導入、等。
- (3) グッドガバナンス原則の導入と能力強化

意思決定のための森林モニタリングの改善

科学的に信頼できる質の高いデータを用いて森林資源に関する情報を作成し、関連する森林 政策や対策の成果や影響に関する実績評価、意思決定に貢献する森林モニタリングの実施。 及びモニタリング能力の強化。

森林ガバナンスの改革と調整

総合的で持続可能な森林開発のための参加と協力、説明責任、透明性、資金調達、相乗効果 を発揮するためのメカニズムの制度化。

研修·研究

林業技術者や地元生産者を対象とした、森林管理活動に関する技術力や知識の向上や森林・ 環境に関する啓蒙普及キャンペーンの実施。長期的な研究とその成果の実践への応用の促進。

第5章 実施体制、予算計画

実施体制

- ▶ 国家レベル: MTA/DINAFは、PPIGFを統括的に管理し、政策分析とレビューを実施し、PPIGF 策定に必要な能力強化を支援する。MTA/ANACは、SPAと共同でニアッサ特別保護区の管理 を委任されている。森林監察官は、PPIGFの実施における巡視や監察を担当している。
- ▶ 州レベル: SPA は、PPIGF の計画立案、実施、監視、評価を実施する。また計画と実施において、他のセクターと協力する。
- ▶ 郡レベル: SDAEは、SPAの監督と支援を受けながら、現場での実施を担当する。また計画と 実施において、他のセクターと協力する。

<u>予算</u>

PPIGF(2023~2032年)の総実施費用は8,200万米ドル(52.3億MT)。

- ▶ 目標1 社会経済開発と食料安全保障(5,478 万米ドル、35億 MT)
- ▶ 目標2 気候変動と自然災害に対する回復力の強化(2257 万米ドル、14.4億 MT)

▶ 目標3 能力構築とグッドガバナンス(465 万米ドル、2.9 億 MT)

		予算(USD)			予算 (MT)	
戦略目標	2023 - 2027	2028 - 2032	Total	2023 - 2027	2028 - 2032	Total
目標 1	38,996,500	15,781,900	54,778,400	2,485,637,000	1,005,939,000	3,491,576,000
目標 2	11,378,900	11,190,100	22,569,000	725,292,000	713,257,000	1,438,549,000
目標 3	3,257,100	1,392,200	4,649,300	207,607,000	88,738,000	296,345,000
合計	53,632,500	28,364,200	81,996,700	3,418,536,000	1,807,934,000	5,226,470,000

第6章 モニタリングと評価

- > SPA は PPIGF のモニタリングと評価を実施する上で重要な役割を果たす。SPA は森林管理活動の実施に責任を持つ各機関と調整し、モニタリングと評価に必要なデータを収集する。 PPIGF の実施は州内のあらゆるレベルに分散しているため、モニタリングと報告には、コミュニティレベルから郡、州、国レベルに至るまで、多様な関係者が参加することになる。
- ▶ モニタリング・評価システムの設計は、森林管理活動のリストや指標に基づいて行われる。
- 第7章 州森林管理計画の策定にかかる教訓と提言
- ▶ ニアッサ州PPIGF計画策定時に基礎データの充実が必要(木材供給量や需要量の推計向けた 事業者による統計データの欠如、不確実なGISデータの修正、等)。改善策として統計情報の 定期報告とGISデータの修正を提案。
- 木材伐採許容量の推計に郡レベルのデータ更新が必要。森林インベントリの設計と実施を通じてデータの信頼性を高める必要あり。
- ▶ 森林機能区分ゾーニングの精度向上のために森林被覆図の更新とGISデータ修正が必要。機能区分の基準の適用についてもさらに慎重な検討が必要。
- ▶ 州のキャパシティを踏まえて、PPIGFの活動優先順位付けは必要。森林保全やコミュニティ 管理などの活動分野を優先。

別添資料 22 省令 26/2024:ニアッサ州森林管理計画



BOLETIM DA REPÚBLICA

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AVISO

A matéria a publicar no «Boletim da República» deve ser remetida em cópia devidamente autenticada, uma por cada assunto, donde conste, além das indicações necessárias para esse efeito, o averbamento seguinte, assinado e autenticado: **Para publicação no «Boletim da República».**

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Ministério da Terra e Ambiente:

Diploma Ministerial n.º 26/2024:

Aprova o Plano Provincial Integrado de Gestão de Florestas para a Província de Niassa.

MINISTÉRIO DA TERRA E AMBIENTE

Diploma Ministerial n.º 26/2024

de 30 de Abril

Tornando-se necessário garantir a gestão integrada e participativa do Património Florestal e a sua exploração sustentável, considerando a promoção de boas práticas, equidade social, envolvimento das comunidades locais no processo de tomada de decisão e acesso justo e equitativo aos benefícios gerados pelos recursos florestais, ao abrigo do disposto no artigo 119 do Regulamento da Lei de Florestas e Fauna Bravia, aprovado pelo Decreto n.º 12/2002, de 6 Junho, determino:

Artigo 1. É aprovado o Plano Provincial Integrado de Gestão de Florestas para a Província de Niassa, em anexo, que faz parte integrante do presente Diploma Ministerial.

Art. 2. O presente Plano Provincial Integrado de Gestão de Florestas é implementado sob gestão do Serviço Provincial do Ambiente de Niassa.

Art. 3. Compete a Direcção Nacional das Florestas estabelecer os mecanismos de monitoria e avaliação de curto e médio prazo do presente Plano Provincial Integrado de Gestão de Florestas de Niassa.

Art. 4. O presente Diploma Ministerial entra em vigor na data da sua publicação.

Aprovado pelo Ministério da Terra e Ambiente, aos 14 de Março de 2024. – A Ministra, *Ivete Joaquim Maibaze*.

Plano Provincial Integrado de Gestão Florestal 2023 – 2032, Província de Niassa

Capítulo 1 Visão Geral e Gestão da Floresta na Província do Niassa: Situação Actual

1.1 Cobertura, Volume e Mudança da Floresta

A Província de Niassa tem actualmente a maior cobertura florestal de Moçambique com 8.374.775 hectares de floresta, representando 68,2% do total de terras da província, das quais 99,8% são florestas naturais e 0,2% são plantações florestais.

No entanto, a área florestal vem diminuindo nos últimos anos, sendo que entre 2003-2013 houve perda de 384.437 hectares de floresta, que correspondem a 3,0% da área da província. A perda média anual foi de 34.949 ha, representando 0,28% da área, e a emissão média anual de 5.158.212tCO2e.

Os dados de perda florestal de 2001-2019 indicam que o foco de desmatamento é observado nas periferias de grandes cidades como Lichinga e Marrupa causada pela expansão agrícola e pela exploração excessiva de lenha e carvão. Além disso, Lichinga tem a maior área de desmatamento, seguida pelos distritos de Muembe, N'gauma, Mandimba, Sanga e Marrupa, que mostram uma tendência relativamente elevada nos últimos anos.

1.2 Desmatamento, Degradação Florestal e Desastres Naturais

(1) Causas de Desmatamento e Degradação Florestal

A principal causa de desmatamento na província do Niassa é a expansão da agricultura de pequena escala, seguida pela extracção descontrolada de lenha e carvão e pelas queimadas descontroladas.

Causa do Desmatamento: Expansão de terra agrícola

O governo identificou o sector agrícola como uma prioridade para o desenvolvimento no Niassa. O Plano Estratégico do Niassa 2018-2029 estabelece uma visão e objectivos para fortalecer a produção agrícola através da expansão das áreas de cultivo, melhorando a produtividade através do uso de tecnologias apropriadas, *marketing* estratégico para a segurança alimentar e melhorando os meios de subsistência envolvendo o sector privado, associações de produtores, governo distrital e organizações não-governamentais.

As actividades agrícolas de subsistência em pequena escala são identificadas como uma das principais causas do desmatamento. O milho é o produto agrícola mais abundante cuja produção tem crescido consideravelmente na província. Em 2018, a área total cultivada com milho na província era de 533.340 ha, em comparação com outras culturas, tais como: feijão (174.722 ha), mandioca (88.715 ha), arroz (26.469 ha).

A produção de culturas comerciais também é promovida no Niassa. O tabaco é uma das principais culturas comerciais no Niassa, que tem aproximadamente 25.000 hectares por ano. O cultivo do tabaco em Moçambique é praticado principalmente nas províncias de Tete e Niassa, que juntas representam 89% da área cultivada com esta cultura a nível nacional.

A melhoria da produção agrícola e expansao das terras agrícolas constitui um objectivo importante para a economia rural de Moçambique, contudo carece de zoneamento adequado, o que contribui para o aumento do desmatamento da área florestal.

Causa de Degradação Florestal: Exploraçao florestal para produção de lenha e carvão

A lenha e o carvão vegetal são as principais fontes de energia doméstica para quase toda a população urbana e rural do Niassa. Esses recursos são utilizados no dia a dia, principalmente para cozinhar. A lenha é a principal fonte de energia nas áreas rurais e o carvão vegetal nas áreas urbanas.

O consumo de lenha e carvão vegetal tem impacto na degradação dos recursos florestais. Segundo dados apurados, o consumo anual per capita é de 190,97 kg para carvão e 336,85 kg para lenha nas áreas urbanas de Lichinga e Cuamba. Nestas áreas, cerca de 51% da população utiliza carvão vegetal como combustível lenhoso e 41% utiliza principalmente lenha. Nos restantes distritos, aproximadamente 94% da população utiliza lenha e pouco menos de 4% utiliza carvão, e o consumo anual per capita é de 205,42 kg de carvão vegetal e 285,77 kg de lenha. Com base nas estatísticas populacionais por Distrito e na biomassa acima do solo na floresta semidecídua incluindo Miombo (62,24 toneladas/ha), pode-se estimar que 655.497,2 toneladas de biomassa são perdidas anualmente devido ao uso de carvão e lenha, representando 10.531,8 hectares de Floresta de Miombo.

Como se estima que a população do Niassa continuará a aumentar, haverá um impacto no desmatamento no futuro, a menos que o consumo de lenha e carvão seja reduzido ou sejam introduzidas alternativas energéticas, como a electricidade e o gás.

Outra causa do desmatamento devido ao uso de lenha no Niassa é a sua utilização para a cura do tabaco, uma vez que tem havido um aumento na produção desta cultura. A produção de tabaco é uma das principais culturas comerciais no Niassa, com uma produção anual de cerca de 25.000 toneladas de tabaco. A secagem de 1.000 kg de tabaco requer 19,9 m3 de lenha, portanto, a secagem de 25 milhões de kg de tabaco exigiria 497.500 m3 de lenha por ano. Assumindo uma cobertura florestal de 75,26 m3 por hectare, seriam necessários anualmente aproximadamente 6.610 hectares de floresta para a cura do tabaco. Isto também tem um impacto significativo no desmatamento e na degradação florestal no Niassa.

Causa de Degradação Florestal: Queimadas Descontroladas

Foram observados 1.073 focos de queimadas na província do Niassa em 2020. Os distritos de Mecula, Marrupa, Sanga, Mavago e Majune foram listados como tendo a maior incidência nos últimos cinco anos. As queimadas não são registadas apenas em florestas naturais, mas também em plantações florestais, o que se torna um obstáculo à promoção das indústrias de plantações florestais. As causas das queimadas estão principalmente relacionadas com os meios de subsistência e hábitos culturais, como a limpeza dos campos agrícolas, caça e colheita de mel.

(2) Causas Subjacentes do Desmatamento e da Degradação Florestal

Factores Demográfico e Social

Crescimento Populacional: A população total do Niassa é de 1.722.895 pessoas em 2017, correspondendo a 6,35% da população total de Moçambique. A densidade populacional da província é de 13,3 habitantes por km2, a mais baixa do país, e 74% da população vive em áreas rurais. O Niassa tem uma população crescente, aumentando a uma taxa média de 4,1% ao ano desde 1980. A agricultura de pequena escala continuará a ser uma actividade importante para garantir a segurança alimentar e a geração de rendimentos na província. As terras agrícolas irão expandir-se com o crescimento populacional, levando à invasão de culturas agrícolas em áreas florestais. A procura de lenha e carvão vegetal também está a aumentar, levando à sobreexploração de produtos florestais, resultando no desmatamento e na degradação florestal.

Hábitos culturais: As práticas agrícolas tradicionais de corte e queima têm sido historicamente praticadas na província do Niassa para subsistência. As práticas agrícolas tradicionais evoluíram de acordo com as condições culturais e ambientais locais. As práticas tradicionais utilizam frequentemente variedades de culturas de baixo rendimento e práticas de gestão menos adequadas, o que leva ao desmatamento. A deficiência de serviços de extensão agrícola constitui uma barreira importante para a adopção generalizada de práticas melhoradas. As causas das queimadas descontroladas estão principalmente associadas às práticas tradicionais, para limpeza dos campos agrícolas, caça e colheita de mel.

Factores Económicos

Pobreza: A pobreza foi identificada como uma das causas subjacentes ao desmatamento e à degradação florestal, uma vez que muitas pessoas que vivem em zonas rurais dependem directamente dos recursos florestais e da agricultura para manterem os seus meios de subsistência. A falta de actividades alternativas de subsistência foi identificada como um grande obstáculo, apesar dos esforços substanciais que têm sido feitos no desenvolvimento rural.

Aumento da procura de produtos agrícolas e florestais: Nos últimos anos, as actividades geradoras de rendimento aumentaram na província. A elevada procura de produtos como o tabaco, o algodão, a madeira e o carvão vegetal tem uma forte influência na expansao de áreas degradadas.

O plano estratégico provincial e os planos de desenvolvimento sectorial destacam a importância destes sectores para o desenvolvimento económico e a redução da pobreza. Embora os mercados continuem a impulsionar a produção de produtos essenciais, os impactos negativos destas actividades nas áreas florestais tornar-se-ão mais acentuados no futuro.

Factores Políticos e Institucionais

Os desafios para a gestão florestal na província do Niassa decorrem de vários factores institucionais. A fraca capacidade de gestão da terra para adquirir direitos fundiários contribui para o desmatamento. A aplicação da lei relacionada com a governação florestal e a gestão sustentável enfrenta desafios, aliadas à exploração madeireira ilegal e à expansão agrícola em áreas florestais. Os serviços de extensão deficientes nas zonas rurais dificultam a adopção de práticas agrícolas sustentáveis, colocando ainda mais pressão sobre as zonas florestais. Para enfrentar estes desafios, é necessário integrar melhor a gestão florestal nas políticas sectoriais, reforçar a aplicação da lei e melhorar os serviços de extensão agrícola para promover o desenvolvimento sustentável.

(3) Desastres Naturais causados por desmatamento e degradação florestal

Moçambique enfrenta riscos naturais como cheias, secas e ciclones devido às suas características geográficas e factores socioeconómicos. As secas podem ser causadas por factores naturais e humanos, incluindo a sobre-exploração da terra e dos recursos florestais impulsionada pela pobreza. A gestão florestal eficaz é crucial para a resiliência contra desastres naturais. O Programa de Acção Nacional de Adaptação (NAPA) descreve estratégias para aumentar a resiliência, incluindo a promoção de energias renováveis, agricultura de conservação, reflorestamento e gestão da erosão. Embora a Província do Niassa não tenha sido identificada como uma área de risco de cheias ou secas, os planos de adaptação locais incluem medidas como a introdução de variedades de culturas tolerantes, a construção de infra-estruturas resilientes e a redução da vulnerabilidade a doenças transmitidas por vectores.

1.3 Plano Provincial de Uso da Terra e Área Florestal Actual

(1) Planos provinciais e distritais de uso da terra

O Plano Estratégico da Província do Niassa 2018-2029 visa impulsionar o desenvolvimento económico e social, priorizando a agricultura, o turismo e os recursos minerais. Os objectivos incluem o reflorestamento de áreas para uso comercial, o aumento da produção de madeira, a promoção de actividades turísticas como a caça e o safari, e a conservação de ecossistemas através de práticas como a apicultura.

(2) Património Florestal na Provincia de Niassa

De acordo com a Lei de Florestas e Fauna Bravia (1999), Moçambique adopta as seguintes categorias florestais;

- a) Florestas de conservação Vegetação arbórea localizada em zonas de proteção e sujeita a regime especial de gestão;
- b) Florestas produtivas Vegetação arbórea com elevado potencial florestal, localizada fora das zonas de proteção.
- c) Florestas de uso múltiplo constituídas por árvores localizadas fora das zonas de proteção e com baixo potencial florestal

Quanto a (a) florestas de conservação, o Niassa tem a Reserva Especial do Niassa (REN) na zona norte, que é uma das maiores áreas protegidas mais selvagens de África (42.300 km2). A REN compreende 31% das terras protegidas de Moçambique e alberga as populações de vida selvagem mais significativas, incluindo as maiores populações de elefantes, leões, leopardos, mabecos, palancas, kudus, gnus e zebras. Além da REN, 27 áreas incluindo a Área de Conservação Comunitária, Coutada Oficial e Fazenda de Bravio foram designadas e atribuídas a entidades públicas e privadas para a gestão da vida selvagem e florestal, representando 2.763.600 hectares na província do Niassa.

Embora (b) Floresta Produtiva e (c) Florestas de Uso Múltiplo não tenham sido definidas, a Província do Niassa tem uma área de exploração madeireira que inclui concessões florestais e licenças simples, e uma Área de Plantação Florestal para gerir a exploração madeireira e as plantações florestais na província.

As actividades de sectores como a agricultura e a mineração ocorrem frequentemente dentro destas áreas florestais de conservação, juntamente com a atribuição de concessões florestais e a plantação. Não é realista excluir todas estas actividades da área de gestão florestal, mas será necessário considerar como acomodar os outros planos de uso e desenvolvimento da terra na gestão florestal.

(3) Bacias Hidrográficas e Gestão de Bacias Hidrográficas na Província do Niassa

De acordo com a Estratégia Nacional de Gestão dos Recursos Hídricos (2007), Moçambique tem 13 bacias hidrográficas principais nos rios Maputo, Umbeluzi, Incomati, Limpopo, Save, Buzi, Pungoé, Zambeze, Licungo, Ligonha, Lúrio, Messalo e Rovuma. Destes, os localizados na província do Niassa são: Lúrio, Messalo e Rovuma

Com base na estratégia nacional, a Direção Nacional de Águas desenvolveu um plano de gestão de bacia hidrográfica, centrandose na gestão da água numa área específica da bacia (por exemplo, plano estratégico para a bacia do rio Lúrio). As práticas de maneio florestal das bacias hidrográficas são importantes para controlar a regulação do fluxo da água e sua qualidade, bem como para prevenir desastres naturais, como deslizamentos de terra. Embora não tenham sido relatados grandes problemas de deslizamento de terras ou erosão do solo no Niassa, o sector florestal também deveria considerar a introdução do conceito de gestão florestal de bacias hidrográficas, avaliando áreas importantes de bacias hidrográficas em termos de água e terra e tomando as medidas necessárias, tais como a restauração da paisagem florestal, medidas agrícolas e resiliência climática.

1.4 Gestão de Área de Conservação

(1) Gestão da Reserva Especial do Niassa

A Província do Niassa possui áreas críticas de biodiversidade e recursos naturais abundantes, com um potencial significativo para o crescimento socioeconómico sustentável. No entanto, estes recursos esgotáveis enfrentam ameaças, comprometendo a capacidade da região de apoiar economias prósperas, o bemestar social e sistemas ecológicos cruciais. A Reserva Especial do Niassa (REN) desempenha um papel fundamental na abordagem destes desafios, sendo a maior área de conservação do país, cobrindo 42.486 km2, e representando uma das sete "Mega áreas protegidas" da África Subsaariana. A REN possui vedaçoes mínimas, facilitando os movimentos naturais dos animais e distinguindo-a como uma natureza selvagem única no mundo de hoje. Delimitado pelo Rio Rovuma, que também delineia a fronteira com a República da Tanzânia, o seu tamanho expansivo e habitats diversos tornam-no capaz de sustentar populações densas e significativas de elefantes e carnívoros com esforços adequados de protecção e restauração. Além disso, serve como terreno fértil para aves raras como o falcão taita, com menos de 50 locais de reprodução conhecidos em África e uma população global de menos de 500 casais, consolidando o estatuto do Niassa como um nicho ecológico globalmente significativo.

Apesar da sua importância ecológica, a REN enfrenta ameaças crescentes, tais como desmatamento, caça furtiva e mineração, colocando em perigo os seus ecossistemas. Os objetivos de conservação definidos no Decreto n.º 89/2017 de 29 de Dezembro, visam preservar espécies e habitats, proteger as populações ameaçadas e promover a educação pública. No entanto, a gestão da REN apresenta desafios complexos devido aos assentamentos humanos dentro e ao redor da reserva, com aproximadamente 60.000 pessoas que dependem dos seus recursos para a subsistência. Foram iniciados esforços para envolver as comunidades locais na gestão dos recursos naturais através de associações, mas enfrentam obstáculos como a falta de programas comunitários formalizados e a aplicação insuficiente da lei. O plano de maneio da REN identifica os principais desafios, incluindo a necessidade de modelos de financiamento sustentáveis, reforço da aplicação da lei, melhoria da recolha de dados, maior envolvimento da comunidade e formalização de estruturas de gestão comunitária para garantir a conservação a longo prazo e viabilidade socio-económica.

(2) Areas Conservação para Uso Sustentável

O governo moçambicano estabelece um sistema de licenciamento para regular a conservação e a caça, com base nas Leis de Floresta e Fauna Bravia e da Lei de Protecção, Conservação e Uso Sustentável da Diversidade Biológica. Em 2021, a Província do Niassa atribuiu 27 áreas de conservação, incluindo Fazendas do Bravio, Áreas de Caça Oficiais e Áreas de Conservação Comunitárias em Majune, Marrupa, Metarica, Maua, Sanga e Lago. Como estudo de caso na Área de Conservação Comunitária de Chipanje Chetu, que é a maior área de concessão de conservação no Niassa, foi assinado um contrato para a gestão do Programa Chipanje-Chetu entre o governo, empresas privadas e comunidades locais.

A caça furtiva, a exploração madeireira ilegal e a pesca ilegal com produtos químicos tóxicos ocorrem na área, exigindo a aplicação da lei e fiscalização. A coordenação com as concessionárias deve ser melhorada para reforçar a fiscalização e aplicação da lei.

(3) Áreas Chave de Biodiversidade

As Áreas Chave para a Biodiversidade (KBAs) são locais importantes para a conservação da biodiversidade global em vários ecossistemas. Elas auxiliam no planeamento espacial, na priorização da conservação e na informação de políticas ambientais. Foram identificadas e mapeadas 29 KBAs em Moçambique. Na Província do Niassa, a Reserva Especial do Niassa e o Planalto de Njesi são designados como KBAs, orientando os planos de gestão florestal e apoiando os esforços de conservação para minimizar o impacto dos projectos de infraestruturas e desenvolvimento e para apoiar a expansão estratégica da rede nacional de áreas de conservação.

1.5 Maneio de Floresta Produtiva

(1) Gestão de Concesssões Florestais e Licenças Simples

O governo moçambicano estabelece o sistema de licenciamento para regular a exploração de madeira na Lei de Florestas e Fauna Bravia. O estado concede concessões florestais de longo prazo.

O governo moçambicano regula a exploração da madeira através de um sistema de licenciamento estabelecido na Lei de Florestas e Fauna Bravia. São concedidas concessões florestais de longo prazo e licenças de curto prazo para a produção legal de madeira, com concessões para áreas superiores a 20.000 ha e licenças simples para operadores nacionais. Na Província do Niassa, em Outubro de 2021, 30 concessões florestais e licenças simples cobrem 560.000 hectares, o que representa 3,8% da área total da província do Niassa e 5,6% da área florestal natural do Niassa.

Os esforços de fiscalização são desafiados por restrições de recursos e questões de coordenação com as concessionárias. Apesar dos esforços das instituições de gestão florestal para controlar a exploração madeireira, os desafios persistem, incluindo infracções como a exploração madeireira não licenciada. A coordenação entre as instituições e a melhoria da partilha de informações são cruciais para uma fiscalização florestal eficaz. Enfrentar os desafios na gestão florestal requer a incorporação da fiscalização nos locais de exploração madeireira, a sensibilização para os regulamentos e a implementação de um sistema centralizado de gestão de dados espaciais. Além disso, são necessárias uma melhor gestão orçamental e sistemas de distribuição transparentes para as actividades de reflorestamento.

(2) Partilha de benefícios

O Estado moçambicano atribui 20% das taxas de exploração florestal e faunística às comunidades locais. As comunidades devem estabelecer Comités de Gestão de Recursos Naturais (CGRNs) e abrir contas bancárias para aceder a estes fundos. Em 2020, foram distribuídos mais de 4 milhões de MT a 51 comunidades, tendo sido realizadas acções de sensibilização e formação para apoiar os CGRN.

(3) Produção de Lenha e Carvão

A lenha e o carvão vegetal são as principais fontes de energia para cozinhar nas zonas urbanas e rurais da província do Niassa, devido à sua acessibilidade em comparação com os combustíveis fósseis e a electricidade. No entanto, a sua utilização extensiva leva ao desmatamento. Para regular a produção e o transporte, o governo implementou um sistema de licenciamento semelhante ao da exploração florestal. Os produtores de carvão vegetal devem obter licenças para exploração, com limite de 1.000 esteres por ano sob licença simples. O governo também emite guias de trânsito para transporte. Na indústria do tabaco, empresas como a Mozambique Leaf Tobacco Company (MLT) obtém lenha para a cura do tabaco e mudas de espécies de rápido crescimento. A MLT está em transição para uma variedade de tabaco seco ao sol para reduzir a dependência de lenha.

Os desafios incluem a exploração madeireira descontrolada, métodos de produção ineficientes, sistemas de registo fracos dos produtores de carvão vegetal e capacidade limitada de aplicação da lei e de monitorização, levando a práticas insustentáveis e ao desmatamento.

1.6 Plantações Florestais e Produtos Florestais Não Madeireiros

O sector das plantações florestais é prioritário para o desenvolvimento económico em Moçambique, com o objectivo de restaurar um milhão de hectares até 2030. A província do Niassa, com aproximadamente 250.000 hectares adequados para plantações florestais, é uma área focal. Empresas privadas como a Floresta do Niassa, New Forest, Green Resources e ISOTOMANE plantaram cerca de 19.759 hectares até 2020, principalmente com espécies de Pinus e Eucalyptus. Programas de envolvimento comunitário, incluindo distribuição de mudas e oportunidades de emprego, são comuns. Esquemas de certificação florestal foram adoptados para aumentar a credibilidade e atrair investidores internacionais. O governo também apoia programas de reflorestamento. Os produtos florestais não-madeireiros (PFNM) também estão a ser promovidos para o desenvolvimento comunitário.

Contudo, os desafios incluem conflitos de terra. Enfrentar estes desafios requer uma melhor divulgação da legislação, uma melhor aplicação da lei contra actividades ilegais e atribuição de recursos para actividades de plantação. Técnicas de produção eficientes e espécies de árvores adequadas também são cruciais para melhorar a capacidade de produção de madeira.

1.7 Gestão de Queimadas

A província do Niassa registou 1.073 focos de queimadas em 2020, constituindo 20% dos incidentes de queimadas nacionais. A tendência dos focos de queimadas de 2001 a 2021 apresentou flutuações sem uma tendência clara de aumento ou queda. Os distritos de Mecula, Marrupa, Sanga, Mavago e Majune tiveram a maior incidência em 2020. As queimadas descontroladas, impulsionadas pela agricultura de subsistência e práticas tradicionais como a caça e a produção de carvão vegetal, são uma grande preocupação. legislaçao moçambicana proíbe queimadas descontroladas e impõe sanções criminais. Um plano de acção para 2020-2024 visa melhorar a capacidade de intervenção local, desenvolver programas participativos de prevenção de queimadas e promover tecnologias apropriadas. No Niassa, foram iniciadas campanhas de sensibilização e programas de rádio.

1.8 Gestão da indústria florestal

Numerosas carpintarias e serrações funcionam no Niassa, produzindo principalmente tábuas de espécies nativas como a Umbila. Uma parcela significativa destes produtos é transportada para a província de Nampula para exportação através do porto de Nacala. São necessárias medidas urgentes para promover a utilização legal da madeira, incentivar o registo entre os operadores e aumentar a sensibilização para a legislação florestal. O reforço dos sistemas de fiscalização e da partilha de informações entre as instituições relevantes é crucial para garantir aexploração legal da madeira.

Capítulo 2 Zoneamento Florestal e Maneio Florestal

2.1 Princípios e Políticas de Florestas de Conservação, Proteção e Produtiva

• Para promover de forma eficaz e eficiente a conservação, protecção e uso sustentável dos recursos florestais da Província do Niassa, o zoneamento florestal é importante de acordo com o objectivo da gestão florestal. A Lei de Florestas e Fauna Bravia classificou as florestas em florestas de conservação, florestas produtivas e florestas de uso múltiplo de acordo com a seguinte definição:

- Florestas de conservação: Área florestal localizada na zona de protecção com regime especial de gestão;
- Florestas produtivas: Área florestal com alto potencial madeireiro localizada fora das áreas de conservação; a floresta pode ser aprovada para concessão florestal ou licença simples.
- Florestas de uso múltiplo: Áreas florestais com baixo potencial madeireiro localizadas fora das áreas de conservação. Florestas com valor inferior às florestas produtivas são utilizadas para as necessidades de subsistência das comunidades.

2.2 Zoneamento Florestal: Área Florestal de Conservação, Protecção e Produtiva no Niassa

As áreas de Floresta de Conservação, Floresta de Proteção e Floresta Produtiva são de 6.050.000 ha, 190.000 ha e 3.71.000 ha, respectivamente. As florestas na Área Florestal de Conservação e Protecção representam aproximadamente 56% do total de florestas na Província do Niassa. Será também importante gerir as concessões florestais, que contêm aproximadamente 44% da floresta natural remanescente.

2.3 Estimativa de Corte Annual Admissível para Exploração Sustentável

O volume do corte anual permitido nas florestas produtivas na província do Niassa é estimado com base no zoneamento florestal e nos dados do inventário florestal nacional (IFN)

- Volume de corte anual permitido para extração comercial: aproximadamente 220 mil metros cúbicos/ ano
- Volume de Corte Anual Admissível para uso de energia: aproximadamente 1.150.000 metros cúbicos/ano

O consumo total estimado de lenha e carvão vegetal para a Província do Niassa foi de cerca de 1.290.000 metros cúbicos/ ano. É necessário tomar medidas para aumentar a oferta através da regeneração florestal e da reflorestamento e controlar a exploração de madeira e lenha provenientes de florestas naturais para evitar exceder o volume anual permitido de colheita de biomassa lenhosa.

Capítulo 3 Plano Provincial de Gestão Florestal 3.1 Visão

Garantir os benefícios económicos, sociais e ambientais dos bens e serviços florestais através da gestão participativa para as gerações actuais e futuras na Província do Niassa.

3.2 Objectivos estratégicos

Existem três objetivos estratégicos e listas de Actividades que contribuem para a gestão florestal sustentável e para enfrentar os desafios do sector:

Objectivo 1 - Reforçar o desenvolvimento socioeconómico e a segurança alimentar com foco no envolvimento comunitário

O uso sustentável das florestas é uma das muitas actividades no contexto rural. As florestas desempenham um papel importante para a economia provincial e para a segurança alimentar, especialmente para as comunidades locais dependentes de recursos. O PPIGF propõe integrar a segurança alimentar na área estratégica dos parceiros de desenvolvimento económico.

1-1 Comunidades no centro do desenvolvimento económico

- Criação de uma Organização Comunitária para a gestão dos recursos naturais
- Promover as melhores práticas na gestão comunitária de recursos naturais
- Gestão de receitas e partilha de benefícios comunitários

<u>1-2 Desenvolvimento integrado de cadeias de valor</u> <u>sustentáveis para produtos florestais (madeireiros e não</u> <u>madeireiros)</u>

- Fortalecimento do Modelo de Gestão e Conservação da Fauna Bravia
- Sistema de Gestão de Licenciamentos e Concessões
- Cadastro da indústria madeireira e incentivos ao processamento e agregação de valor
- Criar um ambiente favorável para o desenvolvimento de plantações florestais
- Uso sustentável de madeira, lenha e produção de carvão vegetal

Objectivo 2 - Aumentar a resiliência às mudanças climáticas e aos desastres naturais

Este objectivo baseia-se na posição de vulnerabilidade de Moçambique às mudanças climáticas e destaca o papel e a contribuição das florestas para a construção de uma economia verde, contribuindo para a resiliência a eventos climáticos extremos e desastres naturais que o país sofre periodicamente.

<u>2-1 Integrar as florestas no planeamento territorial e</u> <u>construir sinergias florestais, faunísticas, agrícolas, hídricas</u> <u>e energéticas</u>

Esta abordagem enfatiza uma visão integrada do desenvolvimento rural e da gestão florestal no planeamento e políticas do uso da terra para garantir a gestão baseada na área para as florestas de conservação, protecção e produtivas e, áreas de plantação florestal, especialmente nos distritos mais vulneráveis, nos corredores de desenvolvimento e também nas principais bacias hidrográficas do país.

2-2 Enfatizar a mitigação e adaptação às mudanças climáticas

Esta abordagem inclui a identificação de áreas críticas para a conservação e protecção de áreas florestais, incluindo a conservação da biodiversidade, corredores de fauna bravia e serviços ambientais e mapeamento de serviços ecossistémicos prioritários e a sua valorização para conservação, protecção e plantação.

2-3 Aumentar a resiliência às mudanças climáticas e aos desastres naturais

Com base no zoneamento e no mapeamento, esta abordagem inclui o arranjo político do mecanismo de compensação e monitoria florestal e a implementação de Actividades, incluindo campanhas de sensibilização, restauração florestal em terras degradadas e sistemas agroflorestais para construir resiliência a desastres.

Objectivo 3 - Desenvolver capacidades e integrar os princípios da boa governação no desenvolvimento florestal

Este objectivo reconhece a importância da criação de capacidades adequadas para enfrentar os desafios do sector e a necessidade de coordenação e integração dos princípios da boa governação para a gestão florestal sustentável. Sua implementação é baseada nas seguintes abordagens:

3-1 Melhorar o controle florestal para a tomada de decisões

Esta abordagem envolve a necessidade de monitoria das florestas para produzir informações cientificamente sólidas e credíveis sobre os recursos florestais e para contribuir para a tomada de decisões, incluindo a avaliação do desempenho, das resultados e dos impactos das políticas florestais relevantes e das acções a serem tomadas. O reforço das capacidades de monitoria e o incentivo ao envolvimento das comunidades locais na monitoria e fiscalização florestal a nível local também são considerados.

3-2 Reformular e ajustar a governação florestal

Os recursos florestais, os seus produtos e serviços abrangem múltiplos sectores e a governação florestal vai além de todas as partes interessadas, incluindo a população local, o sector privado, a sociedade civil e o Estado. Esta abordagem visa institucionalizar mecanismos de participação e colaboração, responsabilização, transparência, captação de recursos e construção de sinergias para o desenvolvimento florestal integrado e sustentável.

3-3 Treinamento e pesquisa florestal

A abordagem inclui a melhoria das competências técnicas e do conhecimento das actividades de gestão florestal e campanhas de sensibilização entre os responsáveis florestais e ambientais sobre a floresta e os produtores locais. A investigação florestal e a aplicação dos resultados na prática são também promovidas para melhorar o desempenho do sector, enfatizando a necessidade de acções de investigação coordenadas e de longo prazo para o conhecimento da gestão e utilização sustentável das florestas.

3.3 Período de planeamento

10 anos (2023-2032)

3.4 Teoria da Mudança

A teoria da mudança do PPIGF é apresentada na figura abaixo, ilustrando o progresso das actividades para ganhos, resultados e impactos.

30 DE ABRIL DE 2024

VISÃO	Assegurar os beneficios económicos, sociais e ambientais provenientes de bens e serviços florestais através da gestão participativa para as gerações actuais e futuras na provincia do Niassa						
Impacto do PPIGF	Fortalecimento das capacidades das comunidades para se engajarem no maneio florestal e resilientes ao clima		Melhoria do maneio sustentável, proteção, e reabilitação de ecossistemas florestais		Fo gov implem manei	Fortalecimento da governação florestal e implementação dos planos de maneio florestal sustentavel	
Resultados do PPIGF	Objectivo 1 - Fortalecimento do desenvolvimento sócio- económico e segurança alimentar com foco no envolvimento das comunidades		Objectivo 2 - Aprimorar a resiliência às mudanças climáticas e desastres naturais		Object da cap dos é deser	Objectivo 3 - Fortalecimento da capacidade e integração dos princípios de boa governanção no desenvolvimento florestal	
	1.1: Atividades de Desenvolvimento baseadas nas comunidades		2.1: Integrar o Maneio Florestal no plano de uso da terra e construção de sinergias		3.1: Monitoria Florestal		
Actividades			2.2: Medidas de Mitigação e adptação às mudanças		3.2: Reformular e ajustar a governação florestal		
	1.2: Desenvolvimento cadeias de valor dos pro florestais	o de odutos	2.3: Aprimorar a resiliência às mudanças climáticas e desastres naturais		3.3: Treinamento e Pesquisa		
Barreiras e riscos	Fraco envolvimento das comunidades locais	Capa subo pa flores mitiga o à	cidade técnica desenvolvida ra o maneio rtal sustentável e ação/adaptaçã is mudanças	Falta de mec operacio: capacidade gestão flor	anismo nal e para a restal	Fraca capacidade do governo para desenhar e coordenar ações efetivas.	
Desastres Naturais	Impacto nos meios de		Baixa produção de culturas		Degradação de Solos		
causados pelo clima	Cheias		Secas Ch		huvas Irregulares		
	Desflorestamento e Degradação Florestal						
Problemas	Expansão de áreas Agricolas		Extração desordenada de lenha		Incêndios Florestais		

Principais Causas	Actividades de Mitigação
Expansão da terra agrícola	 Maneio Florestal Comunitário (Actividade 1.1.2) Organização comunitária (Actividade 1.1.1) e repartição de benefícios (concessões florestais) (Actividade 1.1.3) Zoneamento florestal, identificação de áreas prioritárias para conservação (Actividade 2.2.1 e Actividade 2.2.3) Sensibilização para a conservação e protecção das florestas (Actividade 2.3.6) Promoção de uma agricultura amiga do ambiente (sistemas agroflorestais, etc.) (Actividade 2.3.3) Monitoramento (Actividade 2.3.5)
Exploraçao florestal para produção de lenha e carvão	 Cadastro de produtores de carvão vegetal, promoção de plantações florestais para produção de lenha, pesquisa e divulgação de melhores tecnologias para produção de carvão vegetal, introdução de fogões melhorados, criação de cooperativas de produtores de carvão vegetal, estudo dos usuários de energia de biomassa para promover o uso sustentável e energias alternativas, estudo de compensação ao sector florestal e de sensibilização para o uso de plantações florestais (Actividade 1.2.4) Zoneamento florestal, identificação de áreas prioritárias para conservação (Actividade 2.2.1 e Actividade 2.2.3)
Queimadas	 Maneio Florestal Comunitário (Actividade 1.1.2) Monitoria de queimadas descontroladas (Actividade 2.3.5) Sensibilização para a conservação e protecção das florestas (Actividade 2.3.6)

3.5 Actividades para Mitigar o Desmatamento e a Degradação Florestal

Capítulo 4 Actividades de Gestão Florestal

Objectivo 1 - Reforçar o desenvolvimento socioeconómico e a segurança alimentar com enfoque

no envolvimento da comunidade

1.1. AS DESENVO	COMUNIDADES EM PRIMEIRO LUGAR E NO CENTRO DO DLVIMENTO ECONÓMICO				
1.1.1 Reforço das Organizações Comunitárias de Base (OCBs) e comunidades					
1.1.1.1	Criar, manter e actualizar o registo de OCBs e comunidades em áreas florestais				
1.1.1.2	Apoiar a criação de organismos locais de representação				
1.1.1.3	Promover o estabelecimento de um fundo comunitário derivado de receitas provenientes de benefícios da gestão florestal e de pagamentos por serviços ambientais				
1.1.2 Prom	loção de áreas de gestão comunitária e empoderamento da comunidade				
1.1.2.1	Promover a gestão florestal comunitária (plantação em pequena escala para lenha, e regeneração natural, controlo de queimadas, apicultura, desenvolvimento de meios de subsistência, fiscalização florestal comunitária, etc.) boas práticas, capacitação das comunidades locais e reforço das líderanças locais				
1.1.3 Prom	oção de parcerias e partilha de benefícios				
1.1.3.1	Rever, simplificar, definir e divulgar mecanismos legais e administrativos dos benefícios da exploração florestal e faunística e outros benefícios para a sua canalização transparente para as comunidades locais				
1.1.3.2	Rever, refinar e aprovar o mecanismo de consulta e a sua incorporação no quadro legal				
1.1.3.3	Formular orientações processuais para a negociação, estabelecimento e formalização de parcerias com as comunidades, e tradução para a língua local				
1.1.3.4	Estabelecer e implementar um mecanismo de acompanhamento e avaliação periódica das parcerias				
1.2 DESE (MADEIR	NVOLVIMENTO DAS CADEIAS DE VALOR DOS PRODUTOS FLORESTAIS A, ENERGIA E PRODUTOS FLORESTAIS NÃO LENHOSOS)				
1.2.1 Boas	práticas de gestão florestal sustentável				
1.2.1.1	Promover a gestão integrada e integral dos recursos florestais (madeireiros e não madeireiros) nas unidades de gestão florestal				
1.2.1.2	Delinear a demarcação participativa das Unidades de Gestão Florestal (UGF)				
1.2.1.3	Promover as boas práticas de gestão e exploração florestal				
1.2.1.4	Estabelecer um guiao de gestão da fauna bravia em áreas fora das áreas de conservação				
1.2.1.5	Desenvolver e divulgar modelos para a conservação da água, do solo e protecção de bacias, riachos e cursos de água				

1.2.1.6	Rever e modernizar o sistema de licenciamento, acesso, utilização e uso dos recursos florestais naturais
1.2.2 Proce	essamento e adição de valor
1.2.2.1	Estabelecer, manter e actualizar os registos das empresas de transformação de madeira
1.2.2.2	Estabelecer um pacote de incentivos e um ambiente favorável ao investimento na indústria de transformação da madeira e dos produtos não-madeireiros
1.2.3 Apo desenvolvi	o ao estabelecimento de plantações e criação de um ambiente favorável ao mento das plantações florestais
1.2.3.1	Aprovar o mapa de uso do solo, indicando áreas potenciais para plantações florestais, a nível provincial e distrital, e estudos estratégicos sobre avaliação do impacto ambiental para facilitar o investimento em plantações florestais
1.2.3.2	Participar na preparação e revisão dos planos estratégicos de desenvolvimento distrital, de acordo com o potencial local de plantações florestais
1.2.3.3	Rever, melhorar, simplificar e implementar procedimentos de acesso à terra para plantações florestais
1.2.3.4	Propor e instituir mecanismos para a atribuição, utilização e monitorização de taxas de exploração para reflorestamento e regeneração natural;
1.2.3.5	Desenvolver e implementar um sistema de registo e monitoria do estabelecimento de plantações florestais
1.2.3.6	Preparar e aprovar mecanismos e estratégia de envolvimento comunitário e parcerias em plantações florestais para aumentar o rendimento familiar
1.2.3.7	Preparar e divulgar um roteiro para investidores em plantações florestais
1.2.3.8	Promover o estabelecimento de plantações com espécies de crescimento rápido para apoiar a indústria florestal
1.2.3.9	Apoiar a criação de uma rede de viveiros distritais, privados e comunitários e sistemas de recolha, processamento e tratamento de sementes
1.2.4 Quad políticas no	ro jurídico para a produção sustentável de combustíveis lenhosos e integração de o sector da energia
1.2.4.1	Estabelecer uma base de dados dos produtores/indústrias consumidoras de carvão vegetal existentes e das associações de transporte de carvão vegetal
1.2.4.2	Desenvolver uma proposta de canalização e aplicação do fundo de reflorestamento para encorajar a reflorestamento para fins energéticos
1.2.4.3	Incentivar / subsidiar o estabelecimento de plantações florestais comerciais privadas e sistemas agroflorestais, e rede de produtores comunitários e familiares em média e grande escala para fins energéticos
1.2.4.4	Desenvolver investigação sobre combustíveis lenhosos e divulgar técnicas melhoradas para a produção e utilização de carvão vegetal
1.2.4.5	Desenvolver e divulgar conhecimentos em tecnologias de produção de carvão vegetal

1.2.4.6	Estudo e promoçao da utilização de fogão de cozinha mais eficiente (lenha e carvão vegetal)
1.2.4.7	Promover a criação de fóruns provinciais e associações de operadores e produtores de carvão vegetal
1.2.4.8	Promover a coordenação e cooperação entre o sector florestal e o sector da energia da biomassa para gerar um fornecimento energético baseado na exploração sustentável de recursos e fontes alternativas;
1.2.4.9	Criar incentivos e compensações/offsets derivados de outras fontes de energia para apoiar o sector florestal
1.2.4.10	Promover a sensibilização para o impacto da utilização de carvão vegetal proveniente de florestas nativas e campanhas de sensibilização para o carvão vegetal "plantado" e o consumo sustentável
1.2.5 Aum (PFNM)	entar o conhecimento e a valorização dos Produtos Florestais Nao Madeireiros
1.2.5.1	Melhorar e apoiar as cadeias de valor existentes de PFNMs (incluindo apicultura) e identificar novas oportunidades de negócio e inovações

Objectivo 2 - Aumentar a resiliência às mudanças climáticas e às catástrofes naturais

2.1 INTE CONSTRU	EGRAR AS FLORESTAS NO PLANEAMENTO TERRITORIAL E NA JÇÃO DE SINERGIAS					
2.1.1	Estabelecer áreas de conservação florestal nos distritos					
2.2 DEST CLIMÁTIO	ACAR AS MEDIDAS DE MITIGAÇÃO E ADAPTAÇÃO ÀS ALTERAÇÕES CAS					
2.2.1	Estabelecer áreas de conservação florestal nos distritos					
2.2.2	Desenvolver uma proposta para a conservação e restauraçao de corredores de fauna e áreas de nidificação.					
2.2.3	Identificar serviços ambientais prioritários a nível provincial (carbono, água e solos).					
2.2.4	Avaliação de potenciais para a restauração de paisagens florestais					
2.3 AUME NATURAI	2.3 AUMENTAR A RESILIÊNCIA ÀS ALTERAÇÕES CLIMÁTICAS E ÀS CATÁSTROFES NATURAIS					
2.3.1	Estabelecer um mecanismo de compensação derivado das actividades económicas para a restauração do capital natural da floresta					
2.3.2	Promover e encorajar o sector privado a conservar a biodiversidade e recuperar áreas degradadas, particularmente em concessões florestais					
2.3.3	Promover a agricultura de conservação, incluindo sistemas agroflorestais usando espécies de uso múltiplo					
2.3.4	Encorajar plantações florestais de conservação e regeneração natural					

Objectivo 3 - Criar capacidade e integrar os princípios da boa governação no desenvolvimento florestal

3.1 MELHORIA DO CONTROLO FLORESTAL PARA TOMADA E DECISÕES 3.1.1 Monitoria Florestal Reforçar os inventários florestais provinciais com reforço da capacidade e 3.1.1.1 fornecimento de equipamento especializado; 3.1.2 Fiscalização florestal Assegurar a implementação efectiva da fiscalização florestal que garanta incentivos 3.1.2.1 a todos os intervenientes Descentralizar a fiscalização florestal e fornecer recursos humanos, materiais e 3.1.2.2 tecnológicos adequados Criar e facilitar o funcionamento de um órgão de coordenação interinstitucional na 3.1.2.3 fiscalização florestal central, provincial, distrital e comunitária Introduzir o sistema de rastreamento da madeira para verificar a origem dos 3.1.2.4 produtos e a cadeia de custódia Capacitar actores e utilizadores para as alterações introduzidas pelo sistema de 3.1.2.5 localização de madeira Modernizar a gestão florestal através da utilização das Tecnologias de Informação 3.1.2.6 e Comunicação nos processos administrativos do sector florestal 3.1.2.7 Reforçar o acesso à Internet 3.1.2.8 Estabelecer mecanismos de reclamação e resolução de conflitos no sector florestal 3.2 REFORMULAR E AJUSTAR A GOVERNAÇÃO FLORESTAL 3.2.1 Revisão do quadro institucional 3.2.1.1 Rever os desafios institucionais do sector florestal a nível provincial e distrital 3.2.1.2 Rever o quadro institucional ligado ao desenvolvimento das plantações florestais numa única janela para dinamizar a plantação 3.2.1.3 Garantir a alocação de receitas para desenvolvimento institucional e demais alocações 3.2.1.4 Institucionalizar o fórum florestal provincial e as reuniões anuais do sector florestal 3.2.1.5 Participar nos comités de gestão das bacias hidrográficas e promover a participação de todas as partes interessadas

3.2.3 Boa g	governação e transparência				
3.2.3.1	Criação de um sistema de auditoria para a gestão dos fundos atribuídos				
3.2.3.2	Incorporação de sistemas de auto-avaliação e monitorização independente da governação (transparência, responsabilização, participação na tomada de decisões, entre outros) no quadro jurídico do sector e regular o acesso à informação sobre florestas				
3.2.3.3	Conduzir uma avaliação periódica da governação florestal				
3.2.4 Imag	em, advocacia e rede				
3.2.4.1	Divulgar relatórios, informações, resultados alcançados e legislaçao				
3.3 FORM	AÇÃO E INVESTIGAÇÃO FLORESTAL				
3.3.1 Exter	nsão florestal e reforço da capacidade florestal e ambiental				
3.3.1.1	Avaliar as necessidades e lacunas do actual sistema de desenvolvimento de capacidades com o sector privado, sociedade civil e instituições estatais, para a preparação de programas de formação				
3.3.1.2	Institucionalizar a formação no local de trabalho para melhor acesso ao pessoal sem formação formal.				
3.3.1.3	Preparar uma proposta de aconselhamento técnico às comunidades locais e operadores, incluindo a viabilidade económica do mesmo programa de formação/extensão florestal				
3.3.1.4	Levantamento das necessidades de reforço das capacidades das associações de produtores				
3.3.1.5	Promover o intercâmbio de experiências e formação em PFNM incluindo apicultura				
3.3.1.6	Desenvolver manuais e material de apoio para formação (preparação social, gestão florestal, gestão empresarial, gestão de conflitos e questões transversais)				
3.3.1.7	Fornecer programa de formação a nível local, sensibilização para as questões ambientais e florestais e aconselhamento técnico				
3.3.1.8	Fornecer formação e incentivos para a adopção de uma agricultura sustentável e adaptação às alterações climáticas				
3.3.1.9	Fornecer cursos de formação de actualização para técnicos florestais				
3.3.1.10	Preparar e aprovar a estratégia de mobilização de fundos para o financiamento da investigação florestal				
3.3.1.11	Apoiar a formação de jovens na área das florestas através de bolsas de estudo				
3.3.2 Inves	3.3.2 Investigação Florestal				
3.3.2.1	Rede nacional de sítios (observatórios e parcelas permanentes) para observação, monitoria e pesquisa de longo prazo de fenómenos ecológicos e sociais				
3.3.2.2	Investigar e desenvolver espécies e proveniencias florestais para responder à procura de combustíveis de madeira e restauração florestal				
3.3.2.3	promover a investigação aplicada e extensão em plantações horestais, dando prioridade à escolha de espécies e proveniências, produção de plântulas, técnicas de estabelecimento, tratamento e protecção de plantações.				
3.3.2.4	Divulgação dos resultados da investigação e aplicação dos resultados				

Capítulo 5 Plano Operacional e Financeiro

5.1 Arranjos Institucionais e de Implementação

Nível Central: O MTA/DINAF supervisiona o PPIGF, incluindo a análise e revisão de políticas, e auxilia na capacitação necessária para o planeamento e operação do PPIGF; O MTA/ANAC está mandatado para gerir a Reserva Especial do Niassa em colaboração com a Zona de Protecção Especial; O MTA/AQUA e as suas agências operacionais são responsáveis pelas fiscalização e inspecções na implementação do PPIGF.

Nível provincial: O SPA desempenha um papel crucial no planeamento, implementação, monitorização e avaliação do PPIGF. O Governador da Província e o Secretário de Estado a nível da Província lideram o processo de coordenação entre os intervenientes do sector, e a SPA desempenha um papel de coordenação entre o sector florestal e o sector do uso da terra. Outras instituições a nível provincial, incluindo os departamentos de agricultura, indústria e infra-estruturas, também participam no processo de planeamento através de reuniões de revisão e consulta.

Nível distrital: Os SDAEs são responsáveis pela implementação no terreno, com supervisão e apoio dos SPAs. A prestação de contas sobre o progresso e os impactos da implementação do PPIGF é da responsabilidade do SPA e do MTA/DINAF.

5.2 Orçamento Indicativo

O custo total da implementação do PPIG durante um período de 10 anos (2023-2032) é de 82 milhões de dólares, o que equivale a 5.23 bilhões de meticais. Deste valor, 54,78 milhões de dólares (3.5 bilhões de meticais) serão dedicados ao Desenvolvimento Socioeconómico e Segurança Alimentar (Objectivo 1), 22,57 milhões de dólares (1.44 bilhões de meticais) ao Fortalecimento da Resiliência às Alterações Climáticas e aos Desastres Naturais (Objectivo 2), e 4,65 milhões de dólares (290 milhões de meticais) para Capacitação e Boa Governação (Objectivo 3).

5.3 Fonte de Financiamento

O orçamento provincial é limitado constituindo um obstáculo à implementação do PPIGF, sendo necessário apoio externo adicional, incluindo investimento privado e doadores, para apoiar a implementação do PPIGF.

Capítulo 6 Monitoria e Avaliação

O SPA desempenha um papel crucial na implementação, monitoria e avaliação do PPIGF. O SPA terá a responsabilidade de coordenar com os outros interveninetes a implementação de actividades de gestão florestal para recolher os dados necessários para monitoria e avaliação.

A concepção do sistema de monitoria e avaliação basea-se na lista de actividades de gestão florestal descritas no Capítulo 4.

Capítulo 7 Lições apreendidas e Recomendações no Planeamento da Gestão Florestal Provincial

Dados estatísticos e de GIS para o planeamento do PPIGF:

- A falta de dados estatísticos, particularmente sobre a área de plantação, volume de madeira, vendas e volume de exportação, dificultou a estimativa da oferta e procura de madeira para o PPIGF.
- São necessárias melhorias na recolha de informação estatística, reforçando a recolha de relatórios regulares aos operadores florestais.
- Necessidade de actualização dos dados do inventário florestal a nível distrital com vista a melhorar a estimativa do Corte Anual Admissível (CAA) para madeira e combustível lenhoso.

Zoneamento Florestal Baseado na Florestal:

- O zoneamento florestal na província do Niassa baseia-se em mapas de cobertura florestal desactualizados.
- São necessárias actualizações regulares dos mapas de cobertura florestal para um planeamento preciso da gestão florestal.
- As inconsistências nos dados GIS, especialmente em relação a rios, estradas e caminhos-de-ferro, precisam de ser resolvidas para um zoneamento eficaz.
- A aplicabilidade dos critérios de zoneamento deve ser cuidadosamente considerada, pois alguns critérios podem entrar em conflito com os usos existentes da terra.

Consistência com os Planos Florestais Nacionais:

- O PPIGF está alinhado com o Programa Nacional de Florestas 2019-2035, mas carece de um método padronizado de estimativa orçamental. Mais estudos são necessários para desenvolver uma norma de custos para estimativa orçamental.
- Deve ser estabelecido um mecanismo nacional para monitorar o cumprimento das metas do PPIGF em todas as províncias.

Priorização das Actividades do PPIGF:

- Dado os limitados recursos humanos e financeiros, as actividades prioritárias devem ser definidas tendo em conta as restrições sectoriais.

別添資料23州森林管理計画策定ガイドラインの要約



モザンビーク国土地環境省 (独)国際協力機構



モザンビーク国

持続可能な森林管理・REDD+プロジェクト

技術協力成果品

ニアッサ州森林管理計画(PPIGF)策定ガイドライン 和文要約



2024年4月

アジア航測株式会社

国際航業株式会社

1 ニアッサ州森林管理計画と州森林管理計画策定ガイドライン

モザンビーク政府は持続可能な森林管理に向けて、国レベルで法律の整備や戦略・政策の策定に 取り組んできた。国レベルにおける持続可能な森林管理の指針を示した国家森林プログラム (National Forest Program)を体系的かつ効果的に実施するためには、州レベルでの森林管理計画 の策定と森林管理能力の強化が必要である。モザンビーク国持続的な森林管理・REDD+プロジェ クトでは、ニアッサ州を対象に州森林管理計画(PPIGF)を策定した。また、今後、モザンビーク 国内他州での PPIGF 策定を推進することを目的に、州森林管理計画策定ガイドライン(以下、本 ガイドライン)を策定した。

2 州森林管理計画策定ガイドラインの概要

本ガイドラインは、ニアッサ州 PPIGF 策定におけるプロセスや実際に取り込んだ手法を参照して、 今後、各州で州森林経理計画を策定するための手順を Part1-3 に示した。州森林管理計画策定ガ イドラインの概要は以下のとおりである。

Part1. イントロダクション

PPIGF 策定の背景

モザンビーク国で PPIGF 策定が求められる背景として、深刻な森林減少・劣化の現状が挙げられる。約3,400万ha(森林率約42%)の森林において、毎年約26万7,000haの森林が消失しており、 平均森林減少率は0.79%と深刻である。森林減少劣化の主な要因として焼畑などの小規模農業、 薪や炭の生産、森林火災などが挙げられる。これらの要因に適切に対処しながら森林減少・劣化 を防ぐためには、森林ガバナンスを強化する必要がある。

州森林管理計画策定ガイドラインの目的

本ガイドラインの目的は、2019 年から 2024 年にかけて JICA が実施した持続可能な森林管理・ REDD+プロジェクトでのニアッサ PPIGF 策定の経験や教訓を踏まえ、モザンビーク国内における PPIGF 策定に必要な手続きやその流れ、その他 PPIGF 策定に関する情報を提供することで、他州 での PPIGF 策定を支援、推進することである。

本ガイドラインの利用対象者

本ガイドラインは、DINAF、SPA、その他モザンビークの PPIGF 策定に携わる関係機関が、関連 法律や規則に従って PPIGF を策定する際に、併せて参考資料として活用することを想定して作成 された。

Part.2 PPIGF 策定指針とプロセス

策定指針

PPIGF は森林法とその他の関係法令に準拠するとともに、各州の森林及び森林管理、森林保全や 山地災害の発生状況の実態に合わせて策定する必要がある。また、策定にあたっては最新の知見 や技術に基づき策定することが重要である。さらに PPIGF 策定にあたっては地域住民への周知や 関係者との協議を通した合意形成について配慮することが求められている。

PPIGF 策定プロセス

策定プロセスを6つステップに分けて整理し、それぞれの作業内容について記載した。

ステップ	内容
1	PPIGF 策定準備
2	既存の情報収集・分析、及び現地調査及び聞き取り調査に基づく情報収集・分析
3	森林インベントリ調査
4	PPIGF 案の策定 Preparation of the first PPIGF draft
5	PPIGF 案に基づく関係者協議、協議結果に基づく PPIGF 案の修正
6	政府機関による PPIGF 案の承認手続き

Part 3 州森林管理計画策定の方法論と記載内容

PPIGF は、対象州の森林の現状と課題を整理して、社会的・経済的発展と気候変動や自然災害に 対する強靭性に貢献するために、今後の森林と森林資源の中長期的な保全・管理方法を検討して、 作成するものである。PPIGF 各章の作成方法について、ニアッサ州 PPIGF 策定を事例に説明した。

第1章 州の森林と森林管理の概要

PPIGF 第1章では、対象州の森林の現状、森林・森林資源利用に関連する人口、産業、自然環境、 その他の要因をまとめ、森林減少や森林劣化の要因を分析する。主な調査分析手法として、ニア ッサ州 PPIGF 策定時に実施した(1)既存データの収集・調査方法、(2)現地踏査及び関係者インタビ ュー調査方法、(3)森林減少・劣化ホットスポット分析方法について説明した。

第2章:ゾーニングと森林管理

対象州における(1)森林のゾーニング方法と、(2)森林管理における年間伐採可能量の推計方法について説明した。(1)森林ゾーニングは、モザンビーク国における森林定義を規定した慣例法令と既存データを収集、整理するとともに、GISソフトを利用してデータ加工、図面を出力する。(2)年間伐採量の推計は、国家森林インベントリ調査結果などの既存森林資源量調査結果をもとに推計する方法を説明した。

第3章ビジョン、目標、セオリー・オブ・チェンジ、計画期間

PPIGF 第3章には、ビジョン、目標、計画期間を含む、州の森林管理の今後の方向性が記載される。これらの方向性は、より上位の森林管理戦略や計画に沿って設定する必要があり、本ガイドラインでは国家森林プログラムを上位計画として設定した。また、PPIGF に基づく森林管理の効果については、セオリー・オブ・チェンジを用いて説明したニアッサ州 PPIGF の実例が記載された。

第4章 森林管理活動

PPIGF 第4章では、第1章で言及された州の森林・森林管理における課題を解決するための森林 活動が記述される。本ガイドラインでは森林活動を選定する際の基準が、各州の状況(自然・社 会経済環境の考慮等)、上位計画との整合性などの観点から説明された。

第5章 実施体制、予算計画

PPIGF 第5章では、PPIGFの実施体制、概算予算、資金源が述べられる。ガイドラインには、それぞれの計画策定における一般的な留意点が述べられるとともに、ニアッサ州 PPIGFの策定時において実際に採用された計画策定の手法を実例として記載した。

第6章 モニタリングと評価

PPIGF におけるモニタリングと評価のプロセスは、PPIGF 第4章に記載された指標に基づき、森 林管理活動の進捗と達成度を監視するために実施される。ガイドラインでは、SPA が PPIGF のモ ニタリングと評価にいて果たす役割の重要性、具体的なモニタリング方法(実施時期や実施間隔 を含む)や責任機関が各活動の開始後に検討される点が説明された。

別添資料24再委託先による報告書(第2期)









MANAGEMENT OF FOREST FIRE AND COMMUNITY AWARENESS OF FIRE MANAGEMENT IN NIASSA

under

THE PROJECT FOR SUSTAINABLE FOREST MANAGEMENT AND REDD+ IN MOZAMBIQUE

FINAL REPORT



THE JOINT VENTURE OF EDUARDO MONDLANE UNIVERSITY AND LURIO UNIVERSITY

Maputo, November 2022

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List of abbreviations

- DBH Diameter at Breast Height
- DINAF National Directorate of Forests
- UEM-FAEF Eduardo Mondlane University Faculty of Agronomy and Forest Engineering
- UL-FCA Lurio University Faculty of Agricultural Science
- FLOMOZ the Project for Sustainable Forest Management and REDD+ in Mozambique
- JICA Japan International Cooperation Agency
- MICOA Ministry for Environmental Coordination
- MITADER Ministry of Land, Environment and Rural Development
- MODIS Moderate Resolution Imaging Spectroradiometer
- MRV Monitoring, Report and Verification
- MTA Ministry of Land and Environment
- NFMS National Forest Monitoring System
- NTFP Non-timber Forest Products

REDD+ - Reducing Emissions from Deforestation and forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries

- SDAE District Services for Economic Activities
- SFM Sustainable Forest Management
- SPA Provincial Services for Environment
- UEM Eduardo Mondlane University
- UL University Lúrio (UniLurio)

Summary

Considering the fact that forest fire management can contribute to sustainable use of forest resources, the current pilot activity "The Early Controlled Burning and Community Awareness of Forest Fire Management" (hereinafter referred to as "the Work") under the Project for Sustainable Forest Management and REDD+ in Mozambique (hereinafter referred to as "FLOMOZ") was carried out from May to November 2022. With this aim in view, the Work was based on the understanding of the importance of community-based fire management and development of the local and provincial forest management plan for local institution's capacity strengthening as well as community awareness to ensure forest use sustainability.

Under this work, forest fire management through early controlled burning and community awareness was conducted and assessed. Three phases comprised the Work, namely i) the preparation phase, in which internal meetings as well as meetings were held with local communities for discussions, training and necessary arrangements and agreements made on awareness raise about fire use prevention and control, and training ii) the phase of forest fire management in the management area, fire activity area definition, setting fire breaks, forest inventory, fuel load measurements and analysis, controlled burning and monitoring followed at the end by one block late subject to late burning for comparisons; and iii) assessment of late fires incidence and effect on vegetation and eventually on fauna, seminar to be held for trainers (DINAF, SPA and SDAE staff) and discussion and appraisal of sustainability of early controlled burning as a management tool.

For the accomplishment of these objectives, field surveys, observations, ecosystem parameters and forest variable measurements were undertaken in the Revia Comercial community area and surrounding miombo vegetation, Majune District, in 20 hectares of forest subjected to early controlled burning community as well as on in one hectare subject to late natural burning for fire impact assessments, comparisons and analyses. Parameters of tree density, biomass, species diversity and tree diametric classes did not differ between burnt and unburnt strata. Controlled burning differentially affected fuel load on the management blocks providing evidence of its relevance as a management tool for consumable plant materials availability. However, longer periods of time for analysis is essential for more hard evidence and conclusive statement.

The seminar held for trainers revealed that good practices and experiences from Revia Comercial community should be disseminated and shared with other communities including other Districts. Therefore, the Work results could be replicated in other sites. The sustainability of controlled burning activity as a tool for forest fire management can be consolidated by adding alternative income generation activities such as honey production in one hand and on the other hand, beekeeping might contribute in forest fire prevention effort as well as promotion of conservation agriculture. Such strategy ends up reducing itinerary agriculture and seeking new crop production areas, mainly open by slash and burn practices, which are not sustainable.

Team Composition

Contractor: The Joint Venture of Eduardo Mondlane University and Lurio University through the Faculty of Agronomy and Forest Engineering - CEAGRE of the Eduardo Mondlane University and the Faculty of Agricultural Sciences of Lurio University (hereinafter referred to as "the JV").

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Introduction

About 48% of the landmass of Mozambique, which represents approximately 38 million hectares, is covered by forests, but deforestation is advancing in the country, approximately 220,000 hectares (around 0.79% reduction rate) of forests are lost every year (MITADER, 2018). The main reasons for this deforestation include charcoal production, mining development, excessive use of shifting cultivation, and illegal logging, while the root cause can be considered to be, partially, the high dependency of rural residents on forest resources.

In Niassa Province, the prevailing ecosystem is miombo woodlands, the largest forest ecosystem in Southern Africa valued for its social, ecological and economical role. As such, the region offers an opportunity for promoting biodiversity on one hand and livelihood improvement for surrounding communities, highly dependent on forest resources (both timber and non-timber). This fact may put additional pressure on natural resources by unsustainable resource use and inappropriate management practices. Forest resources have direct contribution to local surrounding communities' livelihood.

Niassa is home to the Niassa Special Reserve where much research on fire management has been carried out by researchers from both Eduardo Mondlane University and Lurio University through FAEF and FCA, respectively. These institutions have formally established partnership consubstantiated on a Memorandum of Understanding involving the two units regarding research, training and consultancy work.

Early controlled burning with integration of community participation and local authorities forest management plans comprise a useful strategy in miombo ecosystems, in particular in Niassa Province.

Being fires a common event in miombo forests and playing an important role in the miombo ecosystem ecology, several authors (Chidumayo et al 1996) have proved that seeds of some plant species germinate better after being subjected to fires. Fire is a frequent and important element in miombo forests acting as an ecological factor and also as a management tool. For example, some species only germinate after the fire has passed. The greatest impact of fire occurs in the dry season when the combustible material is dry. In her studies, Ribeiro (2017) stated that the fire season in Miombo starts in April and ends in October/November.

More than 90% of uncontrolled fires in the country result from human activities, involving diverse causes such as subsistence agriculture involving inadequate slash and burn practices, hunting and charcoal production (MICOA 2008). These activities may lead to deforestation and forest degradation.

According to Cangela et al (2017), Niassa Province is one of those showing considerable fire frequency. Ribeiro et al (2019, 2021) has demonstrated that in parts of Niassa SR, fire regime patterns and severity appear to be affected by fire frequency and intensity. Among negative impacts of uncontrolled forest fires concerning national and international entities the release of greenhouse gasses has been documented.

With that in view, Early controlled burning, known to be one of the most effective strategies to reduce the negative impacts of uncontrolled forest fires and its achieving better results when local communities are involved will be implemented. Participation of local communities ensures that local knowledge and good practices are brought onboard, essential for forest management sustainability.

The Work objectives, purpose, goals and outputs

As described in the ToR's, the overall goals of FLOMOZ are i) Sustainable Forest management and REDD+ promoted through the operationalization of the National Forest Monitoring System in Mozambique, and ii) Sustainable forest management including through REDD+ in Niassa.

The Project purpose comprises strengthening of the capacity of MTA and Niassa Province for implementing sustainable forest management and REDD+. The main goals of the Work are:

- Reduce the amount of Combustible Material
- Empower local communities in improvement of their knowledge through preventing and fighting uncontrolled fires
- Raise awareness among local communities about importance of preventing and fighting uncontrolled fires and
- Evaluate the effectiveness of Early Controlled Burning and Community Awareness of Forest Fire Management to consider further extension in other forest areas

Materials, equipment and logistic support was ensured by FLOMOZ.

Plan and results of the work schedule

The performed activities and associated results during the course of the Work are confronted with the planned activities and schedule in the following Table 1. In general, all the activities programmed for the implementation of the Work was executed at 100%, except for the monitoring campaign by the SPA and SDAE, which were executed at 50%. Adverse factors beyond the control of the JV, forced to readjust the execution schedule of some activities (ex: cold burning), however it was carried out, not having compromised the remaining activities foreseen in the Work.

Table 1 Work schedule and implementation results

Phase	Activity		Monthly Chronogram (2022)							Results of execution
			May	June	Jul	Aug	Sep	Oct	Nov	
	1.1 Meetings with the	Plan								
	communities / Arrangements and Agreements	Imp	UL							Report submitted in May
		Plan								
1. Preparation	1.2 Community awareness in prevention and fight of forest fires	Imp	UEM and UL, FLOMOZ, SPA, SDAE, Majune Administrator , Local leaders, community and others.							Reported submitted in June
		Plan								
	1.3 Selection of the workforce in the community	Imp	UEM and UL, community members							Report submitted in July
		Plan								
	1.4 Training for community members	Imp	UEM, UL, community members	UEM, UL, community members						Report submitted in July
		Plan								

Phase	Activity		Monthly Chronogram (2022)							Results of execution
			May	June	Jul	Aug	Sep	Oct	Nov	
	2.1 Definition of the forest area to be managed and Establishment of firebreaks	Imp	UEM, UL, Community members	UEM, UL, Community members						Report submitted in July
		Plan								
2. Forest fire management itself within	2.2 Opening firebreaks	Imp		UEM, UL, Community members	UEM, UL, Community members					Report submitted in August
	2.3 Forest inventory and Analysis of combustible material including a reconnaissance	Plan								
		Imp				Activity: Data analyses and report by UEM and UL				Report submitted in Novembe r
the Porest		Plan								
	2.4 Analysis of meteorological variables (relative humidity, temperature and wind speed)	Imp		Protocol and report: UL and UEM Participants: UEM, UL	Protocol and report: UL and UEM Participants: UEM, UL	Activity: Data analyses and report by UEM, UL				Report submitted in August
		Plan								
	2.5 Early Controlled burning	Imp			UEM, UL, Community members	UEM, UL, Community members				Report in Novembe r

Phase	Activity		Monthly Chronogram (2022)							Results of execution
			May	June	Jul	Aug	Sep	Oct	Nov	
		Plan								
	2.6 Monitoring the Work with the staffs from SPA and SDAE of target district	Imp		Report: SPA, SDAE, UL Participants: SPA, SDAE, UL	Report: SPA, SDAE, UL Participants : SPA, SDAE, UL	Report: SPA, SDAE, UL Participants : SPA, SDAE, UL				Report submissi on Novembe r
	2.7 Late burning (One block for comparison purposes)	Plan								Report in Novembe r
		Imp							Report: UEM, UL Participants: SPA, SDAE, UL	
		Plan								
3. Overall activity	3.1 Monitoring the evolution of late fires and its effect on vegetation	Imp			Report: UEM, UL Participants : UEM, UL	Report: UEM, UL Participants : UEM, UL			Report: UEM, UL Participants: UEM, UL	Report every month
		Plan								
	3.2 Seminar for trainers (DINAF, SPA and SDAE staffs, etc.)	Imp							Report: UEM, UL Participants: DINAF, SPA,	Report in Novembe r

Phase	Activity	Monthly Chronogram (2022)								Results of execution
			May	June	Jul	Aug	Sep	Oct	Nov	
									SDAE, UEM, UL	
	Plan									
	3.3 Orientation for sustainability of the early controlled burning	Imp							Participants: UEM, UL, SPA, SDAE, DINAF	Discussio n in 15 Novembe r, report submitte d in Novembe r

All activities were performed although the dates had to be adjusted due to administrative slow processes at times, in particular at the beginning.

Methodology, Results and Discussion

> Phase I: Preparation of the work

1. Meetings with the Communities / Arrangements and Agreements

a. Methodology

Before the implementation of field activities, the entire controlled burning program will be presented to community members, mainly local leaders and the natural resources management committee, with the presence of government authorities. The presentation will focus on the program's objectives, purpose and scope of implementation so that communities are familiarized and a commitment to its implementation is established.

b. Results and discussions

At the onset of the Work, in May 2022, several meetings were held with different stakeholders. With local communities the kick-off meetings were conducted to discuss and perform the necessary arrangements and agreements about the training/awareness on fire management. On May 27th a meeting took place in Majune, involving representatives of the Niassa Environment Province Services (SPA) and Lurio focal point for preliminary discussion on the Work activities implementation. Another meeting was held with participation of the Head of Majune District Economic Services (SDAE) aiming to further harmonize the Work relevant information and to conduct the initial Work area recognition/selection, as well as introductions to local authorities namely Revia Comercial Locality Chief and respective traditional authorities (see report in Appendix 2).

The Work launching activity took place on June 13th, in which, Niassa Province Environment Services Director, Majune District Administrator, Majune Head of the District Environment Services, Majune Permanent Secretary, FLOMOZ, UEM and Lurio representatives were present as well as Revia Comercial community members and respective local traditional authorities. The report on the Work launching and list of participants is in Appendix 3.

Furthermore, was discussed with the selected community members, the contracting terms and payment procedures, definition of the forest area, acquaintance with the forest area, initial area delimitation, blocks settings, observations and description of main ecosystem characteristics and vegetation type recognition, logistic arrangements, methodological approach sharing, training and sensitization activities including brochures and other materials, firebreak opening, forest inventory aspects, fuel load assessment, meteorological conditions, early controlled burning, activities monitoring, were carried out.



Figure 1 The Work Launch at Majune District

2. Community Awareness in Prevention and Fight of Forest Fires

a. Methodology

Between June 26th and 29th (26th was travel day) awareness and training on fire management techniques and controlled burning to Revia Comercial community members was implemented (see Appendix 5). Guidelines for fire management and controlled burning techniques were produced (Appendix 6) as well as fire related materials for discussion during the training (Appendix 7).

A total of 41 members of the local community were trained, of which about 16 were women and the remainder were men. The learning process involved both a theoretical and a practical component. The practical component of the training took place in the natural forest, which is 1 km south of the training site. The training was extended to all available families, with emphasis on the members who were part of the firebreak opening process.

To improve interaction, participants were divided into three (3) heterogeneous groups, where training topics were discussed before being consolidated. The methodology used allowed all members to participate in the discussions and ensured personalized assistance during the three days of training.

b. Results and discussions

On the first day of awareness and training, aspects related to the causes of forest fires, the characterization of fires, the nature of the combustible material that favors fires and the atmospheric conditions that condition the occurrence and propagation of fires were discussed. After periods of group discussions (Figure 2), the following findings were reached:

- The main causes of fires in the community are: (1) **Hunting**: the hunting technique used by wild animals advocates the deliberate fire posture. This practice is one of the main causes of forest fires in the Revia Comercial community; (2) **Children's play**: the children have been cooking food (*massange* local name), next to the forests. Accidentally, that fire has gotten out of control and causing fires;
- Canopy and surface fires are more common in the Revia Comercial community. The crown fire starts when the fire reaches tall grass, which passes to the crowns and in places with nearby trees;

- There is a species whose leaves have burned when fires occur in the swamp. Locally the species is called Etici or Nakayakay (*Protea angolensis*);
- The fire that occurs between the months of September and October, crosses roads and rivers, because of the strong wind.



Figure 2 A. General discussion between all groups. B. Discussion group 1. C. Discussion group 2 and D. Discussion group 3.

On the second day of awareness and training, aspects related to fire management were discussed, with emphasis on the role of fire as a tool for forest fire mitigation, main techniques used in fire control and prevention, and limitations in fire control. After periods of group discussions, the following findings were reached:

• From the point of view of the Revia Comercial community, fire is important because it helps to regenerate the pasture, especially wild animals; helps to clean fields; scares away dangerous animals such as snakes; and clears the forest and helps in gathering firewood.

In this theme, the trainers emphasized the importance of fire for breaking dormancy of some forest species important to the community.

In turn, some fire management techniques used by communities were raised:

• Cleaning around the agricultural fields and dwellings, before carrying out the burning in the intended place and avoiding fires from the forests, respectively;

- If the forest fire causes damage to properties, such as a motorcycle, for example, sand is used to smother the flames;
- In case of fires that occur in forests and cultivated fields, water and fresh branches are used to put out the flames;

Main limitation in controlling fires in communities:

• **Tall grass:** when the grass is tall, the flames are very intense and it becomes difficult to put out the flames. In fact, in these situations the fire drops have crossed barriers such as roads and rivers.

The last day was dedicated to discussing the effects of uncontrolled fires on flora, fauna, soil, ecosystem and social services. However, issues related to the values and importance of forests for the community were discussed beforehand, highlighting the following: the forest provides wild fruits (Macunapa, Massuco and Ntululu); construction material such as stakes and rope; wood for the production of various goods and instruments, such as chairs, tables, hoe handles and pestles; combustible material (firewood); mushrooms and honey.

After group discussion, communities described the negative effects caused by uncontrolled fires perpetrated, mostly by poachers, which lead to forest fires:

- **Vegetation**: forest fires affect the supply of wood for various purposes, in addition to reducing substrate for the development of spores and the emergence of mushrooms;
- **Fauna**: decrease the supply of meat. Fires drive animals away from the community. On the other hand, the distancing of animals from communities can affect pest control in crop fields, especially rodents;
- Soil: fires increase the susceptibility to erosion, by exposing the soil to natural weathering. Underground fires eliminate microfauna, reducing the capacity for nutrient cycling and soil aeration;
- **Ecosystem Service** : decreased precipitation; forest fires also affect production and supply of important non-timber forest products;
- **Human Life**: loss and abandonment of their homes; burning of material goods (motorbikes, furniture, changing rooms, among others); in more serious cases, fires end up causing the loss of human lives.

3. Selection of the workforce in the community

a. Methodology

In this case, the workforce refers to the people who will work in the opening of firebreaks and support during the controlled burning. Will be chosen 12 members per the community of natural resources management committee recommended by local leadership. Gender and cultural sensitivity will be taken into account in the selection.

b. Results and discussions

The local workforce selection process was carried out on the 14th of June, in order to identify which people within the community will directly assist in the activities scheduled during the Work execution period. The workforce was selected through a rotating process of community members. Therefore, the technical team proposed organizing community members into households that ranged from 1 to 9 members per household (Figure 3). Depending on their size, each head of household selected 1 to 3 members of their household to be part of the activities in the second phase of the Work, totaling 21

members of which only one woman was selected, who later requested her removal from the group. of selected members. This fact bring the attention of the technical team, which intends to prioritize women in the next activities, but for cultural reasons, women end up giving up their places to the men of the family (husband or brother).



Figure 3 Annotation of the names of the members of each household

The selection method adopted aimed to safeguard the active involvement of community members in the decision-making processes, as well as to avoid biased choices by the community leadership. Additionally, it was explained that the Work will acquire 12 protective and safety equipment at work, which will be assigned to 12 members previously appointed by the local leadership.

4. Training for community members

a. Methodology

The training will be for members who will be directly involved in the controlled burning. It will be based on the contents about the use of personal protective equipment, techniques for carrying out the controlled burning, methods of fighting and monitoring the fire during the burning.

b. Results and discussions

To consolidate the contents covered in the first two days which was described in III.2 Community Awareness in Prevention and Fight of Forest Fires, a practical class was held to simulate the opening of firebreaks in the forest where the study will be carried out (Figure 4). Next to the community, a firebreak with a width and length of 5 m was opened. The exercise allowed visualizing the nature of firebreaks that would be opened in the study area.



Figure 4 Practical class in the field

In a way of consolidation, translating to the words of the community itself, they said "fire is dangerous, but also good, however, we have to know how to use it".

> Phase II: Forest Fire Management

1. Definition of the forest area to be managed and established of firebreaks

a. Methodology

The determination of the location for the establishment of the management blocks was carried out by the JV, using GIS techniques, by mapping the canopy cover density and the area burned in the last 3 years. Also, a consultation was carried out with the leaders of the locality to better understand the behavior of fire in the region,

The mapping of the canopy cover density was done using satellite images from the Landsat 8 sensor, 30 m spatial resolution, from July to October 2021, given the lack of images with low cloud percentage (image form June and July for 2022 had more than 30% of cloud cover) for the same period of the year 2022. The information was used to generate 4 canopy cover density classes: high, medium, low canopy cover density and exposed soil (usually roads).

Burned areas mapping was done using MODIS sensor (MCD64A1, 500 m resolution), over 3 years (2020, 2021 and 2022). For this analysis, polygons were generated for the areas that burned at least once, in the period under analysis. These analyzes allowed the JV to allocate the management blocks in all canopy cover classes, but also considering the gradient of burned and unburned areas, and the representativeness of the different classes within the study area.

b. Results and Discussion

Participatory mapping

Community leader, members of the working group and others who were not directly involved in the activities were present at the participatory mapping. Unfortunately, no women were present at the meeting, because, even after they were communicated, they were unavailable due to other tasks they were performing. During the mapping, all community members had the same opportunity to interact and indicate the limits of the communities, the areas with the highest incidence of fires within the community, among other resources. Fishing areas, agricultural practice areas, housing areas, construction material harvesting areas (grass, bamboo and stakes), wood species harvesting areas, medicinal plants harvesting areas and fruit harvesting areas were mapped. Wild animal areas were also mapped (supposedly used for hunting, despite the population informing that they do not practice hunting).



Figure 5 Participatory mapping with community members

After mapping the canopy cover density and areas burned over the last 3 years in the Revia Comercial community, the blocks were allocated into two different groups: 20 management blocks and 10 reference/control blocks, all of 1ha, covering all canopy cover densities. The management blocks were the blocks subject to controlled burning, and the reference blocks were the blocks that were not burned, having been left for natural burning. In the managed area, 7 blocks were allocated in areas where fire occurred annually in the last 3 years, and 13 blocks in the area where fire did not occur in the last 3

years. In the unmanaged area, only 2 blocks were allocated in areas burned periodically in the last 3 years, with the remaining 8 in the area where fire has not occurred in the last 3 years. Figure 6, illustrates the arrangement of blocks in the Revia Comercial community.



Blocks Arrangment

Figure 6 Blocks arrangement in study area

Given the situation found in the field, aware of the didactic and demonstrative component that is intended to be carried out with the local authorities and the community, the JV decided to add two (2) new management blocks further south, as these comprise areas with a high density of grass, evenly distributed (100% ground cover) and with an approximate height of 1 to 3 meters. In this area, firebreaks were opened, an inventory of tree species, natural regeneration, canopy cover density and grass and herbaceous biomass were carried out. Controlled burning was carried out in only one block, and the second remained intact for demonstrative and didactic purposes, to be done in November.



Figure 7 Blocks arrangement

2. Opening firebreaks

a. Methodology

The opening of firebreaks was carried out based on the mapping produced by the JV, where all the paths that the firebreaks should pass were demarcated block-by-block. This activity was carried out by members of the community, after the awareness campaign on matters of prevention and firefighting. In total, around 21 community members, representing different families, were involved in order to carry out the activity and reconcile the theoretical aspects they had during the training. Duly uniformed and strictly complying with the aspects of safety and hygiene at work, the members of the community were assigned 100 m x 5 m each, as a work target, and they received another portion of work, who, after inspection by the JV, showed to have successfully completed previous task.

The JV monitored the firebreak clearing process from the beginning, in order to ensure that it was being executed in accordance with the recommendations and in accordance with what was established in the geographic information systems.

b. Results and Discussion

Firebreaks of 5m width appeared appropriate since providing evidence that they could stop uncontrolled fire spread to the managed blocks. Firebreak width is determined according to vegetation characteristics such as average tree height and combustible material load height as well as topographic conditions. In Revia Comercial inclination in average did not reach the threshold (Soares and Batista 2007) for fire propagation rate of up to 1.





Figure 8 a) Internal firebreak. b) External firebreak and c) Work task team assigned to open firebreaks

3. Forest inventory and analysis of combustible material

a. Methodology

Forest inventory was conducted in blocks of approximately 1ha (125 x 80 m) aiming to determine the structure and composition of the vegetation. In total, 28 blocks with medium and low canopy cover density were established, where 20 were settled in the management area (in the area subject to controlled burning) and 8 blocks of the same size for comparison purposes (in the area not subject to controlled burning). Two other blocks with high canopy cover density were set and were not burned for comparison purposes too.

In all 30 medium and low canopy cover density blocks, including the two high canopy cover density blocks, the species identification and measurement of diameter at breast height (DBH) \geq 5 cm, total tree height, were performed. Regeneration density of plants with diameter <5 cm were recorded in four 1 m2 subplots, for each one of 1ha blocks. The canopy cover density for each block was also recorded. This inventory was conducted between July and August, before the controlled burning.



Figure 9 Collection of dendrometric data within the blocks

To determine the structure and composition of the vegetation, blocks were established in two strata (Burned area and Unburned). Means comparison of the 2 strata were performed using T-test for normal distributed data.

Tree biomass estimation, was based on an allometric equation calibrated for the miombo of the Niassa region (Macia, 2016).

TDW = 0.71*DBH2.347 (Equation 1)

Where TDW is total dry weight; DBH is diameter at breast height

For the survey of the biomass of the herbaceous material, the indirect method was applied, which consisted in the use of the Disc pasture meter to avoid the physical removal of the herbaceous material, on the other hand, making the sampling less costly and time consuming. Grass measurements were taken before and after the burning over the entire block.

For this purpose, in each block, fifty measurements were taken on each diagonal (Figure 10a). Equidistant points were applied to measure the height of grasses and herbs on the Disc pasture meter. The resulted 100 points measured were assumed as the average herbaceous and grass height in the block. Subsequently, the grass measured height were converted in biomass by applying local calibrated equation (Soto, 2020).

Y = 0.006281X + 0.138156 (Equation 2)

Where: Y corresponds to the accumulated mass of fuel (Kg) and X is the height of the disk



Figure 10 a) Illustrative diagram showing the diagonals where 50 measurements of the herbaceous vegetation and grasses were done in the block and b) measurement of grass and herbaceous vegetation height.

The classification of flammable combustible material was carried out in all blocks, through visual observation, using as criteria the arrangement of the combustible material, distribution and horizontal and vertical continuity. Table 2 below illustrates the criteria used for the classification and quantification of the available flammable combustible material.

Type/Category of combustible	Arrangement of	Distribution and continuity of
material	combustible material	combustible material
Dangerous (alive, <7mm in diameter)	Continuous	Horizontal
Semi-hazardous (alive, between 7mm to 10cm in diameter)	compressed	Vertical
live or green	connected	
dead material		

Table 2 Criteria to quantify and classifying combustible material type and category

b. Results and Discussion

The diametric class distributions showed an inversed J-shaped trend for burned and unburned strata, as expected for native forests, Figure 11. The highest number of stems in all strata was concentrated between first two DBH classes and the number of stems with larger diameters reduced drastically in subsequent diametric classes.



Figure 11 Tree diametric classes for burned (A) and unburned area (B) in managed blocks

Although a trend towards a greater number of trees under unburned strata, tree densities for adult and regeneration shows that there is no significant difference between the two strata, burned and unburned areas inside the managed blocks, as shown in Figure 12.



Figure 12 Tree density for mature trees (A) and regeneration (B) for the two strata in the managed blocks.

The tree biomass values tended to be high in unburned areas. However, no significant differences were observed between both strata in the managed blocks, as showed in Figure 6.



Figure 13 Tree biomass in the burned and unburned stratum

The biomass of the fuel material and estimated carbon emissions for each stratum are very low, as shown in Table 3.

	Before b	urning	After			
Stratum	Total biomass (Mg/ha)	Total carbon (Mg/ha)	Total biomass (Mg/ha)	Total carbon (Mg/ha)	Emitted carbon (ton)	
Burned	0.10	0.05	0.08	0.04	0.01	
Unburned	0.25	0.13	0.22	0.11	0.02	

Table 3	Biomass and	l total ca	rbon bef	fore and	after	burning	in each	stratum

To assess species diversity, rarefaction curves were used for regeneration and adult individuals in both strata. Despite a trend toward a greater number of stems in unburned strata, the tree species diversity showed similar values between burned and unburned areas, both for regeneration and for adult individuals (Figure 14). The Shannon diversity index ranged from 3.2 for burned areas and 3.3 for non-burned areas. For regeneration, the index ranged from 3.4 to 3.6 for Burned and Unburned area respectively. For the miombo woodlands, these values are clear indication of the stability of species diversity and richness (Hofiço and Fleig, 2015).



Figure 14 Tree species diversity for adult (A) and regeneration (B) in the burned and umburned areas, inside managed blocks.

Forest area reconnaissance was executed aiming to observe and get acquainted with forest condition for better planning. From the observations it was possible to learn that the area forest was open, perhaps a result of high fire incidence in most of the 20 ha for the Work. An adjacent area outside the Work area was close to a river branch and supposedly with higher humid microclimate, less fire incidence and higher canopy cover. For this reason, the selected management blocks area seemed to have been a better target of fire control activities. No evidence was found that vegetation parameters namely tree species diversity, density, biomass, are correlated with fire frequency (Figures 12-14). This is explained by the fact that the period of time considered for fire frequency (3 years) was relatively short and not allowing the capture of a meaningful association. Fire frequency did not exceed the miombo ecosystem fire return interval, determined as around 3 in average (Chidumayo, 2013).

For the early burning, 18 blocks were planned to be burned, with the remaining 2 blocks initially left for the demonstration of the effect of the late burning. In the 18 blocks selected for the early controlled

burning, the combustible material was classified as to its type as semi-hazardous and alive-green, since the arrangement was not connected or compacted. The distribution and continuity of the combustible material was, horizontal and discontinuous. These characteristics were present in almost all blocks, which combined with meteorological conditions, caused the fire to evolve in bands or aggregates, covering about 40 to 60% in the blocks located further south of the management area (ex. 13 to 20) and below 30% in the blocks located further north of the management blocks.

Fire is a reaction that results from the appropriate combination of flammable material, oxygen and heat. Being flammable material one of the fire triangle components, the strategy of reducing this component aiming at fire control is widely used. Results provide such evidence since low combustible material load did not reach the minimum required for adequate fire spread. Trollope (1998) observed that in tropical savannah, fire hardly spreads where fuel load is less than one ton/ha.

4. Analyses of meteorological variables (relative humidity, temperature and wind speed) and early controlled burning

a. Methodology

Before carrying out the controlled fires in the sampling blocks, meteorological data were measured in order to predict fire behavior and decide on the feasibility or not of carrying out the burning. This measurement was carried out with the aid of an anemometer (kestrel), where variables such as relative humidity (%), maximum temperature (°C) and wind speed (m/s) were measured to verify compliance according to Table 4 below, in order to predict fire behavior.

Fire behavior	Wind speed (m/s)	Temperature (°C)	Air humidity (%)
Soft	0-11	<18-28	>70
Moderate	11-15	29-31	50-70
Severe	>14	>31	<50

Table 4 Categorization of the weather status and consequences on fire behavior:



Figure 15 Registration about blocks condition and the meteorological variables before burning execution.

b. Results and Discussion

Before burning, meteorological parameters were measured to ensure that the fire was not dangerous and could be controlled as desired. However, it was found during the first attempt to carry out controlled burning, that the observed parameters were far below the optimum for us to have fire propagation, with an average of 1 m/s of wind speed, 27°C of temperature of the air and a relative humidity of approximately 50%. Table 5 illustrates the parameters collected during the week in which the fire was intended.

Parameters	Monday	Tuesday	Wednesday	Thursday	Friday
	(25.07.22)	(26.07.22)	(27.07.22)	(28.07.22)	(29.07.22)
Wind Speed (m/s)	0.5 – 1.5	0.5 – 1.5	0.0 - 1.0	0.5 – 1.0	0.0 – 1.1
Temp (°C)	26.5	27.1	25.4	28.0	27.5
Air Humidity (%)	50.9	60.2	48.5	58.4	53.4

Table 5 Meteorological parameter measured before implementation of controlled fire

In all planned days for the burning activity, weather conditions proved to be unfavorable to allow the occurrence of combustion and its propagation. Although the combustible material has low connectivity and still contains moisture in its structure, wind speed was one of the crucial factors that prevented the fire spreading (wind speed below 0.5 m/s).



Figure 16 Attempt of implementing controlled cold burning inside the blocks

Regarding the meteorological conditions, studies such as Soares and Batista (2007) indicate that meteorological elements and decisive in fire behavior, and wind speed and air relative humidity being some of the most important and that controlled burning has better results when wind speed ranges from a minimum of 5m/s, up to 15 m/s. In this study, during the first attempts of controlled burning, the low rate of success in fire spread for the entire blocks, one of the main factors for this was a wind speed of less than 0.5m/s in average (Table 5).

5. Early controlled fire burning

a. Methodology

The burning will be done alternately on different days in the blocks until the entire area is burned. Definition of technical aspects of burning (type of burning, strategy, prediction of fire behavior, etc.) requires a prior study of the forest, amount of fuel material and meteorological conditions at the time the burning is planned. A preliminary assessment of the Forest was carried out however, a survey of the fuel material and meteorological conditions remains to be carried out. After collecting this information, we can describe in detail how the burning will be done.

b. Results and Discussion

The early controlled burning was carried out between 27th August and 3rd September by the JV in coordination with SPA Niassa and SDAE Majune, with the active participation of the workforce selected in the location of Revia Comercial. Its execution was carried out in stages, in order to cover the entire area proposed for burning (18 blocks out of 20 managed). Thus, before the execution of the controlled fires, a photographic record was done in each management block, and the meteorological variables were measured to ensure that the fire would be safe and under control. Unlike July, in August the winds were slightly stronger, with gusts reaching 3 m/s, when compared to the conditions in July where the maximum wind speed recorded was 0.5 m/s. The average temperature during the period was 28 degrees, equal to that observed during the month of July in the same area. Exceptionally, the relative humidity was lower in August (mean 20%), when compared to July (mean 55%, Table 5); and this may have been because the winds were slightly stronger, which may have contributed to the removal of moisture from the air.



Figure 17-1 Blocks of management before and after burning



Figure 17-2 Blocks of management before and after burning



Figure 17-3 Blocks of management before and after burning



Figure 17-4 Blocks of management before and after burning

Weather constraints associated with low combustible material load affected fire behavior preventing complete fire spread since average combustible material load was in average less than 0.3 ton/ha (table 3), and average wind speed up to 0.3 m/s (table 5) but according to Trollope (1998) and Soares and Batista (2007) state that such figures must reach at least 1 ton/ha and 5m/s.

6. Monitoring the Activity with the staffs from SPA and SDAE of target district

a. Methodology

The monitoring work with UL, SPA and SDAE officials from the target district (Majune) was carried out once with all institutions present, and twice by Unilurio. The first monitoring, which had the presence of 2 members of the UL, 2 members of the SPA and 2 members of the SDAE, was held in July, where the work chosen by the JV was presented. All plots inside and outside the management area were visited and the subsequent steps were explained.

b. Results and Discussion

The monitoring team congratulated the research team for the work accomplished in a short period of time, and witnessed the collaboration between the JV and the local community. Suggestions were made to improve and ensure the active and continued participation of community members, as well as the subsequent steps regarding the cold burns and the training seminar.

7. Late burning

a. Methodology

To remains one block in the forest for comparison purpose in Revia Comercial community. The remaining block will be shown in the seminar (in Activity 4.3.3.). The biomass and so on will be compared with Controlled burning blocks and remaining block (in Activity 4.2.3).

b. Results and Discussion

During the late burning for demonstration purposes in November 16th, fire did not spread 100% on available combustible material. This was due to the high air relative humidity which measured more than 80% as precipitation occurred in the morning and wind speed was in average 3m/s. Fire flames length did not surpass the height of an adult human being. Such findings indicate moderate fire intensity up to 2,000.00 kilojoules/m/s as proposed by Trollope (1998).

> Phase III: Enclosed Activities

1. Monitoring the evolution of late fires and the effect of fire on vegetation

a. Methodology

It will consist of monitoring the behavior of vegetation, evolution and determining the impact of late fires within the areas where the controlled fires will have been carried out. In addition, a comparative analysis of the vegetation between the area subjected to forest fire management and the remaining forest area will also be carried out. This Monitoring also has the purpose of collecting practical evidence of the advantages of the early controlled burning, which will later be documented and shared.

The monitoring item as below should be reported in the monthly report, and Fixed-point observation image should be attached.

- Number and area of forest fire burning in the area subjected to forest fire management and the remaining forest area in the target community.
- Fire severity (biomass loss, vegetation regeneration)

b. Results and Discussion

For monitoring purposes, all blocks in the management blocks were identified with a single number, and photographed in the North direction, in order to allow the JV to monitor the process of vegetation recovery during their visit.



Figure 18 Block number 13 before implementation of cold burning

2. Seminar for trainers

Introductory note

Within the scope of FLOMOZ, on the 15th and 16th of November, a training seminar and dissemination of the results of activities carried out in the locality of Revia Comercial, in the district of Majune, in Niassa province. The event was attended at the highest level by the Director of Provincial Environmental Services (SPA) and a representative of JICA. Also present were the Directors of the District Services for Economic Activities (SDAE) from 16 districts of Niassa province, representatives of the Revia Comercial community, the National Directorate of Forestry (DINAF), UEM and UniLúrio, according to the attendance list in Appendix 10.

a. Methodology

The dissemination seminar took place in the conference room of the Hotel Girassol Monte-Belo, in Lichinga, and the controlled burning demonstration training, in the community of Revia Comercial, district of Majune. The first day of activities was reserved for the dissemination of the results of the Work's implementation, chaired by representatives of Eduardo Mondlane and Lúrio Universities, and preceded by the presentation of two lectures by DINAF speakers (Appendix 17). In the end, four groups were created, where seven fundamental issues were discussed about uncontrolled fires and measures for the sustainability of actions linked to the fight against uncontrolled fires and forest fires in Niassa province (see summary in Appendix 16).

The second day was dedicated to training and demonstrating how to carry out controlled burning in the community of Revia Comercial – where the Work is being implemented.

b. Results and Discussion

(1) Aspects presented and discussed at the Seminar

Representatives of the National Directorate of Forests: Maps of hot spots and fires from October to November 2022 were presented at which it was observed that Majune is the 4th district with the highest rate of fires at the level of Niassa province. Given the above, the main challenges for the perpetuation of forests, the practice of shifting agriculture, firewood collection, forest exploitation and burning stand out. These practices have threatened the survival of younger individuals. On the other hand, over-exploitation of the same classes of woody species by loggers and charcoal producers has contributed to the deforestation and degradation of natural forests in Niassa province and the country in general.

The Work Research Team: The Work implementation teams emphasize bilateral knowledge when training communities about fires. After the Work's intervention, the community mobilized to fight the fire near the communities, as seen the week before the Seminar took place, when an uncontrolled fire broke out in part of the Revia community. Due to the success of the Work, the process of creating a Community Firefighting Committee is in sight; Results of the analyses show that there was no significant difference in the density of individuals per hectare in the burned and unburned areas. However, the species diversity of adult individuals was greater in areas where fire is not frequent, indicating that most of the young individuals found in places with frequent fire do not reach adulthood. Thus, it is important to carry out controlled burning in order to reduce the load of woody combustible material and avoid catastrophic damage to biodiversity, economic and social assets.

Intervention by the Commercial Revia Community Leader: The community leader let it be known that the Work was well-received by the community and recognized that during the implementation of the Work, they learned a lot about fire and using it for the benefit of the community. Going forward, he

emphasized coordination between community members and the technical team in the implementation of activities.

Interventions by participants: Recognizing the importance of the activities developed through the results presented, the guests present proposed that the Work be replicated in other districts. Uncontrolled fires are a concern in the Majune district, which is why strategies used by the community of Revia Comercial to fight fires and ensure the Work's sustainability should be explored. The use of alternative energies is proposed as a way to reduce one of the main causes of fires, as well as the pressure on native forests for charcoal production. Uncontrolled fires affect the ecosystem as a whole, which is why it is also important to understand the impact of fires on the ecological component.

Group discussions: The questions presented were discussed and the summary is presented, in the form of proposals for each question contained in the guiding questions guide (see answers in Appendix 6).

Controlled burn training and demonstration aspects

The main aspects presented in the field were:

Presentation of activities: Brief presentation of the activities carried out in the field to the Administrator of the District of Majune and the other participants.

Demonstration of controlled burning: Before burning, the main atmospheric parameters were obtained (wind speed, temperature and relative humidity), which influence the behavior of the fire. The technical team and some members of the community explained that by opening firebreaks and carrying out cold burning, damage to forests is reduced, the amount of fuel is reduced and there is greater control of the process, because the combustible material is not completely dry. Then, the community members under the guidance of the technical team. However, the block did not burn completely, because it had rained the day before and the combustible material was partially wet.

Explanation of the data collection process: The technical team, along with some members of the communities, conducted a forest inventory, in which height was measured, DBH greater than 5 cm, local names of tree and shrub plants were obtained adults. For regeneration, subplots were established, in which the number of individuals was identified and counted. In obtaining data on biomass, the pasture measuring disc was used, in which Grass height data were obtained in 100 points, 50 points and each diagonal of the 1ha block.

Intervention of the participants: The main concern raised by the participants was related to the continuity of activities after the end of the Work. Subsequently, the community showed that it was capable of carrying out activities to prevent and combat fires. Finally, the participants proposed that the Revia Comercial community share the experience with other communities in the region.

Meeting with the community and fraternization: The Administrator of the District of Majune thanked the community for receiving the Work and exhorted it to continue, as the fires cause a lot of damage to the forests, as well as to the residential areas, resulting in the loss of houses, burns and human lives. The end of the visit was marked by a lunch prepared and served by the community of Revia Comercial.

(2) Results: main notes of seminary discussions

(a) Niassa is one of the provinces with more burning and forest fires in the country. In order of decreasing importance, itinerant and migratory agriculture, charcoal production and hunting in conservation areas have been the main causes of burning.

- (b) Forest fires do not only affect trees, but the ecosystem as a whole. For example, fires contribute to decrease of wild animals' population, including important pollinators as bee, carbon stocked by the trees, increases desertification and losing socio-economic services such as medicinal plants, wood, and honey.
- (c) Forest fires decrease flora populations and in critical cases can lead to species extinction. There are currently few or almost no reforestation program with native species in the country. Given that the burnings have been frequent in Niassa province, reforestation should be rethought to mitigate the effects of biodiversity loss.
- (d) Heat focus are registered when temperatures are above 47°C. However, heat focus cannot be considered fires/burning, but an important indicator of the potential for fires at the focus site. If there is a heat focus, abundant dry biomass and improper use of fire, catastrophic negative impacts may occur when burning starts.
- (e) The areas of forest concessions are not periodically updated, with SDAE's and communities. The updating of the limits of the concession will allow the community's complaint, if the concessionaires began to explore in a place that has not been assigned to it and will improve SDAE's supervision.
- (f) The new forest law is being updated and harmonized with the National Penal Code, and encompasses more serious aspects related to the misuse of fire.
- (g) Previous training about consequences of uncontrolled burning, importance and fire management techniques, allowed the JV to learn from the community:
 - use of branches, in the absence of mufflers to put out fire;
 - consolidation of the 5 -meter width set for the acers that were established in the Work.
- (h) It is important to think about the sustainability of the current Work, special if we consider that the material used by the Work to train community members is conventional. Thus, other issues arise:
 - is material sufficient and accessible to apply the practices learned throughout the community?
 - how to encourage the community to continue the good practices of fire management?
 - what alternative to communities, since the production of charcoal- indirect causes of forest fires, aimed the livelihood of the local community?

(3) Main notes of group discussion

- (a) All districts of the Niassa province make communities sensitization of uncontrolled burning. However, only a few through NGO and Natural Resource Management Committees (NRMC) created by NGOs, used to adopt fire management practices such as opening of acers around crop fields and homes.
- (b) The field SDAE staff and NGOs have promoted lectures and sustainable agricultural practices and contributing to the prevention of uncontrolled burning such as:
 - conservation agriculture- that advocates non-burning in the opening of machambas and grass kick and culture remains;
 - opening of block machambas.
- (c) There are no fire management plans developed by the SDAE's of the Niassa province. For the case of Mecula district, the Niassa Special Reserve has made cold burnings for the natural pasture management and mitigating the effects of uncontrolled burning. For the other districts, routine

sensitization activities are developed, within the scope of open governance carried out by the districts administrators.

- (d) Several actions are considered for the fire management in the Niassa districts:
 - training SDAE's and CGRN inspectors, and financing fire management equipment to response uncontrolled burning;
 - create specialized community inspectors in fire management and forest fire control;
 - systematic monitoring of burning focus;
 - zoning to define the type of land use;
 - create charcoal producers' association;
 - encourage through subsidies, for communities that best handle fire, as it is found in some forest plantations of exotic species;
 - for conservation areas, to offer sports hunting trophy meat to community.
- (e) Through sensitizations and practices of cold burning, for the case of Mecula, it was recorded:
 - reduction of migratory agriculture in some districts;
 - rehabilitation/construction of social infrastructure (water holes, school and casa mãe-espera), as a result of compensation by forest companies, for the good management of fire within the companies' plantations;
 - increased fauna and decreased loss of material and human goods.
- (f) The main limitations faced to implement sensitization actions on uncontrolled burning stand out:
 - practice of migratory agriculture;
 - socio-cultural aspects;
 - generalized food insecurity;
 - lack of material and human means for surveillance and response to intervene in case of forest fire or fire posture.
- (g) To overcome the limitations and contribute to the sustainability of the Work, it is proposed:
 - guarantee constant necessary equipment for fire management and control team;
 - associate project activities with others that bring social and economic benefits to communities;
 - to promote conservation agriculture practice and crop rotation to improve soil quality;
 - ensure the effective engagement of communities;
 - firm partnerships and promote environmental education and exchange experiences with model communities in fire management;
 - design projects according to the local community context;
 - to perspective fit the hunters into the forms of fire management and control.

3. Orientation for sustainability of the early controlled burning

a. Methodology

All activities in the Work will be carried out with care to ensure that residents can continue their voluntary efforts to combat forest fires. The contractor will pass on knowledge and technology to the communities. The contractor will examine methods and funds that the communities can continue to take measures against forest fires, and will have consultation meetings with the community.

The inclusion of traditional leaders in all activities is an important factor in ensuring the success, as they are more widely accepted and exert a great influence in mobilizing people. In addition, the SDAE within the scope of their outreach activities must disclose this practice. In order for this practice to reach other communities, it is necessary to disseminate the experience in other communities by SPA and SDAE technicians in all Districts.

It is important to note that the activities are designed for piloting purposes. With successful implementation, they are expected to be extended further to other forest areas with similar conditions. Collaboration with the World Bank's NORTHERN MOZAMBIQUE RURAL RESILIENCE PROJECT (MozNorte) and SUSTAINABLE RURAL ECONOMY PROGRAM (SREP), and other external resources should be explored during the implementation of the activities as well as through this seminar.

Contribution of JICA and FLOMOZ should be adequately acknowledged in the occasions of dissemination, such as seminars, workshops and publications.

b. Results and Discussion

This activity was implemented as the group discussion in the seminar. The result and discussion was described in III.2.b(3) Main notes of group discussion.

Lessons learned

During the training with community members, it was observed that local community at Revia Comercial are aware of some negative effects of fire on forest resources availability as demonstrated during the resources mapping exercise and training sensitization in which they explained how they have fought fires using locally available tools and materials including the use of tree branches to eliminate flames.

For definition of the forest area to be managed and establishment of firebreaks its important to involve the community because we can benefit from their knowledge of resources availability and condition based also on resources historical profile and condition. In the other hand, to opening of firebreaks, the blocks sized 1ha were used during this Work with firebreaks 5m wide. Determination of firebreaks grid should attempt to reflect more blocks broad enough to allow forest continuity in reality. Regarding the firebreaks width, this is to be determined based on field conditions such as vegetation characteristics in particular combustible material vertical and horizontal continuity, distribution as well as load, canopy cover and tree density topography. In addition, other factors have to be taken into account including site topography. Firebreaks proved to be a very useful strategy in stopping uncontrolled forest fires as seen at the surroundings of the site for training purposes outside management blocks in which it was demonstrated that a uncontrolled natural fire did not spread to the managed blocks due to the existing firebreak.

Concerning the inventory, the Forest national Inventory methodological approach methodology was not applied as planned due to the scale of the Work area which did not allow the use of recommended blocks size and distances between blocks. A longer period of time to assess fire impacts through the correlation analysis of fire incidence such as fire return interval and vegetation parameters is required.

In terms of combustible material biomass, when selecting areas to undertake fire management and control through controlled burning it is important to assess combustible material load. Such consideration is relevant based on the fact that high combustible material load may result in uncontrolled fires of high intensity.

Concerning the biodiversity, observations were made as planned, on management blocks species diversity focusing on the vegetation component although looking also at eventual fauna. The management blocks area of up to 20 hectares may have not been in a spatial scale big enough to adequate data gathering. Some signs of wild goat and at least one snake. A wider area might have provided more adequate space for such assessments. Monitoring is also important so that assessments should be done also in different seasons and longer period of time.

Meteorological data are essential when considering controlled burning. During this Work course of activities, it was observed that initial attempts to conduct early controlled burning in July did not succeed as expected being one of the main factors the fact that grasses and herbs at the time, had still relative high humidity content. These findings imply that this year showed unusual weather pattern, affecting the Work activities. Early controlled burning activity should be planned in advance to allow application of an alternative plan such as later burning but still in time to carry out other activities.

Regarding monitoring activities with staffs from SPA and SDAE, a visit was conducted at the beginning of the Work implementation in May. Other visits were done as well by the Work staff in particular Lurio members as deemed necessary for the accomplishment of the Work aims. However, for future monitoring activities, a monitoring plan should be agreed and established among the involved participating institutions staff so that all of them are able to take part whenever required.

In terms of monitoring evolution of late fires and the effect of fires on vegetation, this can be accomplished through assessment of fire incidence via analysis of MODIS information. The correlation

analysis between fire frequency and tree vegetation parameters might provide evidence of fire impacts on vegetation structure namely tree canopy cover and combustible material load.

The seminar for trainers revealed that the experience witnessed and good practices among Revia Comercial community should be disseminated and shared with other communities including from other Districts.

The success of Revia Comercial community acceptance of taking part in the Work activities might have been enhanced by the incentives offered by the Work such as personal protection equipment and field allowances. The sustainability of controlled burning activity as a tool for forest fire management can be consolidated by adding alternative income generation activities such as honey production in one hand and on the other hand, beekeeping might contribute in forest fire prevention effort as well as promotion of conservation agriculture. Such strategy ends up reducing itinerary agriculture and seeking new crop production areas, mainly open by slash and burn practices, which are not sustainable.

For sustainability of controlled burning activities in forest management at Revia Comercial forest area, given the fact that local communities do not possess sophisticated equipment, a suggestion is made to deeper understanding of how to ensure that communities use the surrounding forests in a sustainable way based on their real capacity. This would allow to determine what strategy to apply to guarantee sustainability considering local community's habits, cultural aspects. In addition, a strategy should be identified and applied in order to disseminate good practices to other communities around the country aiming the continuation of the good practices in places that did not benefit from the Work interventions. Actions to guarantee sustainability of fire management through controlled burning are proposed such as conservation agriculture, native species planting in surrounding forest areas, promotion of beekeeping. Such practices might result in nomadism and itinerary agriculture reduction, the main drivers in the search for new agricultural fields for crop production.
Conclusion

Parameters of tree density, biomass, species diversity and tree diametric classes did not differ between burnt and unburnt strata. Controlled burning differentially affected fuel load on the management blocks providing evidence of its relevance as a management tool for combustible plant materials availability. However, longer periods of time for analysis is essential for more hard evidence and conclusive statement.

Findings in the Work point the relevance of controlled burn as a fire management tool with participation of local communities.

Good practices and local knowledge sharing in fire control is an important strategy for information dissemination among communities involving different Districts and places.

The Work can be replicated in other sites but site selection needs to be relevant in terms of fire control need which can be perceived from fire incidence and available combustible material load as strategy to prevent high intense fires.

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Appendix

- Appendix 1 Team composition
- Appendix 2 Trip report to Majune
- Appendix 3 Project Launch Report
- Appendix 4 Technical report of activities plan
- Appendix 5 Proposal of program training in Revia Comercial
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Team Composition

Name	Institution
Natasha Ribeiro	UEM - FAEF
Romana Bandeira	UEM – FAEF
Jone Fernando	UEM – FAEF
Victorino Buramuge	UEM – FAEF
Paulo Guilherme	UniLurio - FAC
Alfredo Duvane	UniLurio – FAC
Filipe Cancao	UniLurio – FAC
Amina Amade	UniLurio – FAC
Semo Mogeia	UniLurio – FAC
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Relatório da Viagem ao Distrito de Majune

No dia 26 de Maio do ano em curso, chegou na FCA, o representante da empresa financiadora do projecto (a **Companhia Asia Air Survey (AAS)**), o **Sr. Kato Kazuhisa**, acompanhado do **Eng.**° **Taquidir, MSc.**, representante da Direcção Nacional de Florestas (DINAF), vindos de Maputo, onde foram assinar o contracto com o Senhor Director da Faculdade de Ciências Agrárias (FCA) da Universidade Lúrio, o **Prof. Doutor Paulo Guilherme**, relativo ao financiamento do projecto intitulado **"Management Of Forest Fire And Community Awareness Of Fire Management In Niassa Under The Project For Sustainable Forest Management And Redd+ In Mozambique" – JICA, o qual a FCA e a Faculdade de Agronomia e Engenharia Florestal (FAEF) da Universidade Eduardo Mondlane (UEM), irão implementar de forma conjunta do Comité de Gestão/Comunidade de Revia Comercial no distrito de Majune.**

Após a assinatura do contrato, o Sr. Kato Kazuhisa e o Eng.º Taquidir, dirigiram-se à Lichinga, onde a posterior tivemos um encontro de consertação para a viagem ao Distrito de Majune, que teve lugar no dia 27 de Maio do corrente ano, com o representante dos Serviços Provinciais do Ambiente do Niassa (SPA-Niassa), o Sr. Sidónio e o Eng.º Alfredo Santos Duvane, MSc, ponto focal do projecto da UniLúrio-FCA para a implementação do projecto.

Em Majune, houve um encontro com o Director dos Serviços Distritais das Actividades Económicas (SDAE) daquele distrito, o **Eng.º Rui Pacule** de forma a actualizar informações sobre o projecto, assim como fazer o reconhecimento da área de implementação do mesmo e a apresentação nas autoridades locais (Chefe da localidade de Revia e os respectivos régulos da zona). De seguida nos foi atribuído um fiscal que nos levou até as autoridades locais, e a posterior nos foi dado um guia que nos dirigiu até a respectiva área para o reconhecimento, onde fizemos o respectivo trabalho da parte que foi possível acedermos, tendo se tirado a conclusão de que a área é ideal para a implementação.

Por fim, voltamos ao SDAE para dar relatório ao director distrital dos Serviços Distritais das Actividades Económicas, a cerca do que encontramos na área e algumas considerações a volta do mesmo, tendo o director, se mostrado satisfeito com o projecto que poderá agregar valor a comunidade daquele ponto do distrito, pois além do fogo ser um problema quando mal manuseado gerando incêndios florestais, que podem ser incontroláveis, causando danos catastróficos a flora e a fauna, assim como a própria população, também pode ser usado como um factor importante de produção na abertura e limpeza das machambas, quando bem manuseado.

Sem mais, deu-se por terminada a visita e, regressou-se a Lichinga.

Unango, aos 31 de Maio de 2022

Alfredo Santos Duvane

(Ponto focal do projecto na UniLúrio-FCA)

Appendix 3. Project launching report



RELATÓRIO DE ACTIVIDADES

1. Lançamento do Projecto FLOMOZ

1.1. Lançamento Oficial de Projecto

O Governo de Moçambique, através do Ministério da Terra e Ambiente, em parceria com Agencia de Cooperação Internacional Japonesa (JICA), lançou no presente mês do ano em curso, o Projecto FLOMOZ (Maneio Sustentável de Florestas em Moçambique e REDD+) na província de Niassa, no distrito de Majune, localidade de Revia Central. O evento foi realizado no dia 13 de Junho e contou com a presença do Administrador do Distrito e a sua comitiva: líderes comunitários, Director dos Serviços Distritais das Actividades Económicas (SDAE), Comandante Distrital, Director dos Serviços Provinciais do Ambiente (SPA), Representante da JICA e Representantes da UEM, UniLúrio, bem como por membros da comunidade, de acordo com a lista de presença em anexo.

O Director dos Serviços Provinciais do Ambiente efectuou o Lançamento Oficial do Projecto FLOMOZ, tendo frisado que actualmente o mundo e Moçambique em particular, vem sentindo os efeitos das mudanças climáticas (cheias, ciclone e ventos fortes), que prejudicam a produção agrícola bem como a biodiversidade florística e faunística. Para tal o Governo em parceria com ONGs e outros países vêm implementando vários projectos para a conservação do ambiente e gestão sustentável dos recursos naturais. O Diretor do SPA reafirmou que o Projecto FLOMOZ é do Governo de Moçambique, financiado pela JICA e que incentiva o envolvimento da comunidade, com vista a contribuir para a conservação da cobertura florestal, gestão sustentável e monitoria dos recursos florestais. Para este efeito, o distrito de Majune foi selecionado por albergar uma significativa extensão de cobertura florestal e constituir um dos cinco (5) distritos com mais registos de queimadas descontroladas ao nível da Província do Niassa.

1.2. Concertação do corpo técnico

Após o lançamento do Projecto, houve um encontro da equipe técnica onde estiveram presentes a Prof. Romana Bandeira, os Eng's. Alfredo Duvane, Filipe Canção, Luís Pereira, Amina Amade e Jone Fernando Jr., com vista a alinhar o plano de trabalho, tendo-se acordado os seguintes pontos:

- 14 de Junho: Reunião com membros da comunidade para explicar de forma detalhada os objectivos do projecto e o plano de actividade, bem como efectuar a selecção de mão-de-obra, e inclusão de membros de quase todos os agregados familiares. Para isso, foi necessário propor o aumento da mão-de-obra, dos 12 indivíduos previstos pelo projecto para 21 indivíduos, mediante o ajuste do valor da jorna de trabalho. A actividade foi realizada pela equipe técnica em coordenação com as lideranças locais;
- 15 de Junho: Visita exploratória a área de estudo, com o objectivo de percorrer o perímetro da área a selecionar (efetuar a marcação dos pontos primários), bem como para descrever a vegetação. Esta actividade esteve sub responsabilidade de toda equipe técnica, Eng's. Luís Pereira, Amina Amade, Alfredo Duvane, Jone Fernando Jr. e Filipe Canção, com o auxílio do régulo e nove membros da comunidade
- 17 de Junho: Apresentação do draft do treinamento e sensibilização em queimadas descontroladas equipe da UniLúrio, baseando-se no Manual da FAO;
- 27 de Junho 04 de Julho: Treinamento e sensibilização em queimadas descontroladas e marcação de pontos para abertura dos aceiros externos (perímetro da área);
- 11-13 de Julho: Inventário florestal e análise de material lenhoso para abertura de aceiros internos (criação de blocos internos);
- 16-21 de Julho: Data proposta para abertura de aceiros internos e 24-30 de Julho: Inicio das queimadas frias.

No encontro de concertação da equipe técnica, recomendou-se que:

- O Ponto Focal da UniLúrio, Eng. Duvane deve arrolar as necessidades de material para as fases subsequentes do projecto, com vista a submeter ao DAF no dia 14 de Junho para iniciar o processo de *procurment* o mais cedo possível, para a posterior aquisição;
- O lanche a ser fornecido na fase de treinamento e sensibilização deve ser reforçado (Proposta: 1/4 de frango, batata frita, arroz, refresco, água), priorizando os prestadores de serviços locais;

 Os pontos focais da UniLúrio e UEM, devem escrever aos representantes da JICA, explicando a necessidade de se efectuar o reajuste dos custos de combustível devido a elevação dos preços dos mesmos;

2. Encontro com a comunidade e selecção de mão-de-obra local (14 de Junho) 2.1.Encontro de esclarecimento sobre o projecto com membros da comunidade

No segundo dia, fez-se o encontro com a comunidade, e teve início com a intervenção do régulo, o qual recapitulou que tinham sido realizadas três auscultações locais antes do lançamento do projecto. Nesse âmbito, a equipe técnica explicou detalhadamente os objectivos e a metodologia do projecto (figura 1), frisando que este não veio incentivar o abandono das suas fontes de subsistência habituais e muito menos acabar com os problemas financeiros da comunidade. Realçou-se que o projecto somente veio para acrescentar e melhorar a gestão dos recursos florestais na região.



Figura 1: Encontro de esclarecimento sobre o projecto com membros da comunidade

A equipe técnica esclareceu que diferentemente dos outros projectos, este em particular pauta por uma abordagem bilateral (mais do que trazer conhecimentos, pretende-se igualmente aprender com a comunidade), bem como a demostração práctica sobre estratégias de prevenção as queimadas.

2.2.Selecção de mão-de-obra local

A mão-de-obra foi seleccionada por meio de um processo rotativo dos membros da comunidade. Sendo assim, a equipe técnica propôs a organização dos membros da comunidade em agregados familiares que variou de 1 a 9 membros por agregado (figuras 2 e 3). Dependendo do tamanho dos mesmos, cada chefe de família selecionou 1 a 3 membros do seu agregado para fazer parte das actividades na segunda fase do projecto, totalizando 21 membros dos quais apenas uma mulher foi seleccionada, porém posteriormente a mesma pediu para ser retirada porque era a única num universo de 20 homens. Este facto, despertou a atenção da equipe técnica que pretende priorizar as mulheres nas próximas actividades.



Figuras 2: Anotação dos nomes dos membros de cada agregado familiar



Figuras 3: Processo de selecção de mão-de-obra pelo agregado familiar

O método de selecção adoptado teve como objectivo salvaguardar o envolvimento activo dos membros da comunidade nos processos de tomada de decisão, bem como evitar escolhas tendenciosas por parte da liderança da comunidade. Adicionalmente, explicou-se que o projecto irá adquirir 12 equipamentos de proteção e segurança no trabalho, e que serão atribuídos a 12 membros previamente indicados pela liderança local. Posteriormente, solicitou-se 9 voluntários dos membros seleccionados para um breve reconhecimento da área de estudo (figuras 4 e 5).



Figuras 4 e 5: Visita de reconhecimento da floresta

3. Visita exploratória a área de estudo (15 de Junho)

No terceiro dia, os 9 voluntários da comunidade na companhia da equipe técnica dirigiram--se a floresta da comunidade que constituirá a área de implementação do projecto onde percorreuse cerca de 2.5 Km floresta a dentro na direção Este, aproximadamente 1.8 Km na direção Sul e cerca de 3 Km na direção Oeste, perfazendo assim o perímetro da área de estudo, onde fezse a descrição da vegetação (floresta de miombo, caracterizada por árvores jovens e regeneração natural, apresentando algumas áreas de clareiras e zonas pantanosas) e marcaramse coordenadas geográficas para posterior seleção da área de interesse com auxílio de Sistemas de Informação Geográfica.

A redação do relatório Equipe técnica

ANEXO 1

Lista de Participantes

Nome	Instituição/ Posição
Governo P	rovincial e Distrital
Jornito Muemede	Director do SPA
Maida Levene	Técnica do SPA
Victor Levene	Administrador do Distrital de Majune
Rui Águas Mateus Pacule	Director do SDAE
Joana Selemane	Chefe do Posto Administrativo de Muaquia
Omar Saide Cambalane	Chefe da Localidade de Riate
	Comandante Distrital da Polícia
С	onsultores
Paulo Guilherme	UnilLúrio
Alfredo Santos Duvane	UnilLúrio
Filipe Zeca Canção	UnilLúrio
Amina Abudo Amade	UnilLúrio
Jone Fernando Jr	UEM
Romana Bandeira	UEM
Luís Pereira Domingos	FLOMOZ
Membro	s da Comunidade
Mateus Laisse	Líder da Comunidade
Mauricio Martire	Líder da Comundade
Oliveira Bernardo	
Alexandre Fernando	
Domingos Inácio	
Agostinho Júnior	
Celestino Constâncio	
Carlota Jackson	
Gimilardo Ernesto	
Evaristo Ernesto	
Janeiro Jackson	
Estelino Felisberto	
Filesia Fernando	
Iassine Moyo	
Rafique Jackson	
Alberto Armando	
Gerinimo Rofino	
Família Mateus Laisse	
Lopes Mahoa	
Lourenco Nicua	
Prisma Lopes	
Cristina Mateus	
Ozana Mateus	
Agostinho Amine	
Domingos Mauricio	
Pedrito Wilson	
Fabião Jamissone	

Wiski White	
Cardiano Cassimiro	
Mussa Wissilasse	
Jovenisto Valentim	
Jafar Witnes	
Alexandre Armando	
Arlindo Jaquissone	
Norte Joaquim	
Filipe Faustino	
Joaquim Labuquene	
Outros Membros da Comunidade	

Appendix 4. Plan of activities for the first phases of the project

Phase	Activity	June	Jul	Aug
		Proposal date: 13.06.22		
	1.1 Meetings with the communities / Arrangements and Agreements	Protocol and report: UL - Eng Amina		
		Participants: UL, UEM, SPA, SDAE		
		Proposal date: 14.06.22		
	1.3 Selection of the workforce in the community	Protocol and report: UL - Eng Amina		
		Participants: UL, UEM		
		Proposal date: 15-16.06.22		
	2.1 Definition of the forest area to be managed and Establishment of firebreaks	Protocol and report: UL - Eng Amina		
1. Preparation		Participants: UL, UEM		
	1.2 Community awareness in prevention and fight of forest fires	Proposel data: 27.06.22, 02.07.22		
		Proposal date: 27.00.22 - 02.07.22		
		Protocol and report: UI		
	1.4 Training for community members			
		Participants: UL and FAEF		
	First Report Submission	Responsibility: FAEF Proposed date: 08.07.22		
		Proposal date: 28.06.22 - 23.07.22		
2. Forest Fire	2.2 Opening firebreaks	Protocol and report: UL and FAEF		
		Participants: UL, FAEF, Communities menber		
Management Itself within the			Proposal date: 16.07.22 -	Activity: Data analyses and
Forest	2.3 Forest inventory and Analysis of combustible material including a reconnaissance		Protocol and report: UL and	report by UL
			FAEF	Proposal date: 08 08 22 -
			Participants: UL and FAEF	30.08.22

	2.4 Analysis of meteorological variables (relative humidity, temperature and wind speed)		Proposal date: 25.07.22 - 30.07.22 Protocol and report: UL and FAEF Participants: UL and FAEF	Activity: Data analyses and report by FAEF Proposal date: 08.08.22 - 30.08.22
	Open inter-firebreaks		Proposal date: 11.07.22 - 15.06.22 Protocol and report: UL and	
			FAEF Participants: UL and FAEF	
	2.5 Early Controlled burning		Proposal date: 25.07.22 - 30.07.22 Protocol and report: UL and FAEF Participants: UL and FAEF	Activity: Data analyses and report by FAEF and UL Proposal date: 08.08.22 - 30.08.22
			Proposal date: 28.07.22	Proposal date:
	2.6 Monitoring the Work with the staffs from SPA and SDAE of target districts		Report: SPA, SDAE, UniLurio	Report: SPA, SDAE
			Participants: All	Participants: All
	2.7 Late burning (One block for comparison purposes)			
	Second Report Submission		Responsibility: FAEF Proposed date: 12.08.22	
		Proposal date:	Proposal date:	Proposal date:
	3.1 Monitoring the evolution of late fires and its effect on vegetation	Report:	Report:	Report:
3. Overall activity	C C	Participants:	Participants:	Participants:
	3.2 Seminar for trainers (DINAF, SPA and SDAF staffs)			
	3.3 Orientation for sustainability of the early controlled burning			



Proposta do programa de actividades na comunidade de Revia, distrito de Majune entre os dias 26 de Junho – 04 de Julho de 2022.

da

Todos

Todos

Todos

Todos

Todos

Todos

Engº Merlindo

Eng^o Merlindo

e membros da

comunidade

Expositivo

e

Debate

pratico

Prático

Expositivo

e debate

Método a Dia Hora Tópicos Responsável usar Equipa técnica 26/06Viagem de Unango à Majune Introdução as queimadas 08h:00 - 08h:15 Engº Canção Expositivo (definição) Tipos de incêndios florestais e suas Debate 08h:25 - 09h:10 Engº Canção e causas membros da Material combustível comunidade 09h:20 - 10h:00 (caracterização tamanho, Debate cobertura, estado e arranjo) 27/06 10h:00 - 10h:20Todos Intervalo Engº Canção e Debate e Condições atmosféricas/ índices de 10h:20 - 11h:10 membros perigo de fogo Exposição comunidade

Fim do programa do dia

queimadas (introdução)

Abertura de aceiros

Fim do programa do dia

Aspectos técnicos de maneio de

Avaliação do material combustível

Material /equipamento, segurança

Almoço

Almoço

1- Programa do treinamento em queimadas

11h:10min

12h:00 - 13h:00

08h:00 - 08h:15h

08h:25 - 09h:00

09h:20 - 11H:00

11h:00 - 12h:00

12h:00 - 13h:00

12h:00

28/06

	08h:00 - 08h:15	Avaliação do impacto das queimadas (conceito de impacto)	Expositivo Engº Semo		
	08h:25 – 09h:15	Para a vegetação, fauna e solos	Debate e Eng ^o Semo e membros da comunidade		
29/06 09h:20 - 10h:20 Impactos ecossisten		Impactos sobre serviços do ecossistema e vidas humanas	Debate Eng ^o Semo e membros da comunidade		
	10h:20 -10h:40	Intervalo	Todos		
	10h:40 - 11h:30	Balanco da capacitação	Todos		
	11h:30	Fim do programa do dia	Todos		
	12h:00 - 13h:00	Almoço	Todos		
2-	2- Programa das actividades do campo				
29/06	08h:00 - 14h:00	Demarcação da área de estudo	Equipa técnica e alguns membros da comunidade		
30/06	08h:00 - 15h:00	Demarcação da área de estudo (parcelamento)	Todos		
01 /07	08h:00 - 15h:00	Demarcação da área de estudo (parcelamento)	Todos		
02/07	08h:00 – 15h:00	Demarcação da área de estudo (parcelamento) Abertura de aceiros	área de estudo Todos s		
	08h:00 - 14h:30	Abertura de aceiros	Todos		
03/07					
	16h:00 - 17h:30	Balanço das actividades realizadas	Equipa tecnica		

Sanga - Unango, Junho de 2022



DIRECTRIZES PARA O TREINAMENTO E SENSIBILIZAÇÃO SOBRE QUEIMADAS CONTROLADAS E GESTÃO DE INCÊNDIOS FLORESTAIS NA COMUNIDADE DE REVIA COMERCIAL, DISTRITO DE MAJUNE

Data: 27 a 29 de Junho de 2022 **Local:** Revia Comercial, Majune

Guião de treinamento, sensibilização e prática de campo sobre queimadas descontroladas

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Unango, Junho de 2022

CAPÍTULO 1 PRINCIPAIS CONCEITOS SOBRE INCÊNDIOS FLORESTAIS

O que são incêndios florestais e qual é a sua relação com queimadas descontroladas?

Incêndio florestal é a ocorrência do fogo em qualquer forma vegetativa sem controlo. As queimadas descontroladas podem originar em incêndios florestais. O incêndio florestal pode ter diversas causas, desde as naturais, incluindo as queimadas descontroladas causadas pelo homem, para a abertura de machambas, caça e descuido de pedaços de cigarro (figura 1). Essas ações podem ser de caráter criminoso, acidental ou inesperado.



Figura 1: Causas de ocorrências de incêndios Adaptado de (WWF 2001)

Quais são os diferentes tipos de incêndios florestais?

Os incêndios florestais são classificados em três tipos: incêndio de copa, incêndio de superfície e incêndio subterrâneo. Os *incêndios de copa* desenvolvem-se nas copas das árvores, propagando-se de forma rápida de uma copa a outra, devido à grande circulação do vento no topo (Figura 2A). É o tipo de incêndio florestal mais severo. *Incêndios de superfície* queimam a vegetação morta e rasteira, como as herbáceas, folhas, galhos, troncos, etc (Figura 2B). Estes incêndios não causam danos significativos em árvores de grande porte. *Incêndios subterrâneos* propagam-se de forma lenta debaixo da superfície do solo, alimentados por matéria orgânica seca, raízes e turfas (Figura 2C). É mais severo em relação ao incêndio de superfície.



Figura 2: Classificação dos incêndios florestais. A imagem "**A**"- a esquerda, demostra o comportamento de um incêndio de copa, "**B**" de superfície e "**C**", demostra um incêndio subterrâneo

Quais são os factores que condicionam a ocorrência de incêndios florestais?

ocorrência e frequência А dos incêndios, geralmente são afectados pelas condições do local (temperatura, precipitação, topografia, direcção e intensidade dos ventos predominantes) e material combustível (Figura 3). A temperatura é um parâmetro importantes, especialmente em regiões tropicais como Moçambique, Majune não é exceção. Nestes locais,

os incêndios podem ser compreendidos



Figura 3: Factores que contribuem para a ocorrência de incêndios

por frios e quentes. Incêndios frios ocorrem no início da época seca (entre Maio a Junho), quando o capim não está completamente seco. O incêndio frio é maioritariamente de superfície e causa menos impactos ao solo e a biodiversidade. Por sua vez, os incêndios quentes ocorrem nos meses de Agosto a Outubro, quando o capim está completamente seco. Os incêndios quentes tendem a ser uma combinação entre incêndios subterrâneos e de copa, o que o torna incêndio de grandes proporções e com impactos negativos severos. Contudo, podem ser efectuadas queimadas frias controladas, nas horas frias e com ventos fracos, nos meses considerados de queimadas quentes, como uma medida de gestão de fogos.

Por sua vez, o tipo e características do material combustível (tamanho, posição e arranjo) são outros importantes indicadores para estimar os parâmetros ligados a propagação do fogo (Tabela 1).

Categoria	Descrição	Arranjo	Distribuição
Perigoso	Material seco (galhos, folhas, líquen, musgos e	Continua	Horizontal
	gramíneas) com diâmetro inferior a 1cm		
Semi-perigoso	Material seco (galhos, folhas, líquens, musgos e	Compactada	Vertical
	gramíneas) com diâmetro superior a 1cm		
Verde	Material fresco (vegetação viva da floresta)		

Tabela 1: Critérios de classificação do material combustível

Quais são os danos causados pelas queimadas descontroladas?

Os incêndios florestais causados pelas queimadas descontroladas são considerados uma das principais causas de degradação das florestas. Para além de libertar o carbono estocado pelas árvores e destruir a madeira em pé (Figura 3A e 3B). Os incêndios florestais alteram o funcionamento do ecossistema como um todo, pois diminuem a resistência das árvores à ataque de fungos, aumenta a erosão, diminui a riqueza e abundância dos animais abaixo e acima do solo. Os incêndios florestais também afectam a oferta de produtos florestais não-madeireiros, como os cogumelos e frutos silvestres (Figura 4), para além de destruir locais sagrados das



comunidades. Alta intensidade de fogo nas florestas podem ser extrema ameaça para o próprio homem, ao destruir habitações, instâncias turísticas, veículos, equipamentos, machambas e, consequentemente afectar a renda das comunidades.



Figura 2: Danos causados pelas queimadas descontroladas. "**A**" e "**B**"- danos às árvores; "**C**", "**D**" e "**E**"- animais mortos durante o incêndio

CAPÍTULO 2 FOGO COMO UMA FERRAMENTA DE GESTÃO AMBIENTAL

Porque é importante fazer a gestão do fogo, se o fogo causa danos severos?

Nem todos os incêndios são maus e indesejados. O fogo é um mecanismo importante de gestão das florestas. Por exemplo, o fogo ajuda na regeneração de algumas espécies florestais importantes; ajudanos a eliminar algumas plantas indesejadas nas machambas, evitando a competição; e rejuvenesce o

capim para que seja mais nutritivo e palatável para os animais domésticos e selvagens. Para além destes, o fogo pode ser usado para controlar possíveis focos de queimadas descontroladas (Figura 5), a quando da preparação dos campos de cultivo.



Figura 5: Maneio intencional e controlado do fogo

Porque o fogo é uma importante ferramenta de gestão comunitária do meio ambiente?

Embora o fogo tenha evoluído com o próprio homem, o seu controlo continua a ser complexo, pois mesmo com equipamentos convencionais, uma vez iniciado, é extremamente difícil e até impossível controlar incêndios florestal em largas áreas (Figura 6).



Assim, a gestão de incêndios florestais pelas comunidades passa

Figura 6: Incêndio florestal descontrolado

primeiramente pela prevenção, através da abertura de aceiros e realização de **queimadas controladas**, por serem medidas que necessitam de poucos equipamentos, é barata e fácil de implementar. Porém, a gestão de incêndios florestais preconiza o conhecimento do comportamento do fogo, técnicas e factores da sua ocorrência. Compreende um conjunto de actividades cujo objectivo é reduzir ou anular a probabilidade de um incêndio começar e limitar a sua propagação, caso inicie.

CAPÍTULO 3 PRÁTICAS DE GESTÃO DO FOGO COMUNITÁRIO

Qual é a melhor estratégia para combater incêndios florestais?

A melhor estratégia para combater incêndios florestais é a prevenção, evitar que ele ocorra. Contudo, devem ser tomadas uma série de medidas, também para intervir caso o incêndio ocorra, observando:

- Prevenção das fontes de fogo;
- Educação e treinamento comunitário sobre a gestão do fogo;
- Cooperação entre a comunidade, utilizadores de terra e estruturas locais;
- Desenvolvimento de estratégias de gestão de fogo (incluindo abertura de aceiros, sistema de reporte de fogo, planos de maneio de fogo, etc.); e
- Aplicação da legislação (<u>ARTIGO 343</u> <u>Dano em machamba, seara, horta, plantação,</u> <u>viveiro ou sementeira</u>): "Aquele que destruir, em todo ou em parte, machamba, seara, horta, plantação, viveiro ou sementeira, pertencente a outrem, será punido com as penas do Artigo 338" (Lei 35/2014 - Aprova o 1 Código Penal - Quarta feira - 31 de Dezembro de 2014);

Como se comporta o fogo durante um incêndio?

Todos os fogos começam pequenos. Com tempo, vão se movendo em direção do vento prevalente e espalhando-se para as laterais. gerando "próprio" seu vento. "sugando" oxigénio para a área da queima. Existem cinco partes que caracterizam o fogo nos incêndios (Figura 7): (1) a cabeça- espalha-se mais rapidamente, na direcção do vento mais predominante; (2) dedosprojectam-se rapidamente para os



projectam-se rapidamente para os **Figura 7:** Partes que compões os incêndios lados da cabeça; (3) flancos- localizam-se por detrás da cabeça e são mais lentos; (4) retaguarda- são fogos deixados para trás, opostos a cabeça; e (5) pontos de fogo- são pequenas projecções de chamas, geralmente afrente da cabeça.

Quais são os métodos utilizados para prevenção e combate de incêndios florestais?

Existem três métodos comumente utilizados para o combate de incêndios, seja antes ou depois da sua ocorrência, designados por: aceiros/quebra fogos; batedor/abafador e queimada de retaguarda.



Figura 8: Abertura de aceiros

Aceiros/quebra-fogo: são faixas naturais (rios) ou artificiais (caminhos) encontradas ao longo das florestas. Podem ser usados tanto antes da ocorrência do incêndio, como na queimada de retaguarda, para diminuir a propagação do fogo. Esta técnica geralmente faz-se no início do período seco, quando a vegetação começa a secar e consiste na remoção completa da vegetação em faixas (Figura 8). A largura pode variar entre 2 e 5 m de largura em pequenas áreas e até 100 m em extensas áreas. Algumas medidas devem ser acauteladas ao planificar os aceiros:

 Local de estabelecimento do aceiro: pode ser determinado de acordo com a geografia do local, existência de rede de caminhos e direcção dos ventos prevalentes- na posição diagonal. Também pode ser determinado de acordo com o local de maior actividade antrópica. Uma estratégia bastante usada é a abertura de aceiros para dividir a área em blocos, para reduzir a área que pode ser queimada.

- Modo de fazer: os aceiros podem ser feitos através da remoção das bordas e depois queimados no meio. Normalmente esse processo é feito usando capinadeiras mecânicas (acopladas a tractores) ou com enxadas. Em pequenas porções de terra, o aceiro pode ser feito manualmente, porém, esta prática favorece a erosão.
- Manutenção dos aceiros: a manutenção é anual, depois das chuvas.
- **Responsabilidade da tarefa:** devem ser formadas equipes para garantir a execução e responsabilização da criação dos aceiros.

Batedor/abafador: consiste em bater as chamas com ramos frescos ou batedor, ou abafar as chamas com areia, para interromper a propagação das chamas. Os batedores devem sempre posicionar-se na área já queimada ou nos flancos (Figura 9), e nunca em frente (cabeça). Esta técnica exige a união e sincronização dos combatentes, pelo que devem estar unidos e posicionados em fila.



Figura 9: Formas de abafar as chamas durante um incêndio

Queimada de retaguarda: é técnica uma comumente utilizada após o início do incêndio, especialmente no período de incêndios quentes, entre Agosto a Outubro. A técnica consiste na criação de aceiros menores, antes do aceiro maior, como forma de minimizar os impactos de ventos fortes e biomassa seca abundante (figura 10).



Figura 10: Queimada de retaguarda. Caminhar ao redor do fogo para o próximo aceiro e queimar uma porção de capim, distante a 3 - 4 m do aceiro; executar o mesmo procedimento para quantos "mini-aceiros" forem necessários

Contudo os métodos de prevenção e combate de incêndios florestais apresentados neste guião não são absolutos ou universais, pelo que devem ser contextualizados para cada região e circunstância. **Quais são os utilizados em Majune?**

CAPÍTULO 4

PLANIFICAÇÃO E IMPLEMENTAÇÃO DE QUEIMADAS CONTROLADAS

O que saber antes de realizar uma queimada controlada?

A queima controlada consiste no uso do fogo de forma planeada para fins silviculturais e eliminação do material combustível (Figura 11). O material combustível merece especial atenção na prevenção de incêndios, porque é o único componente do triângulo do fogo que pode ser controlado. Porém, devem-se acautelar alguns aspectos antes de realizar a queima controlada:

- Estação do ano: o melhor período para realização de queimadas é o início da época seca, entre Maio a Julho, quando a vegetação apresenta alguma humidade.
- Hora do dia: a queima é maioritariamente feita de dia, período em que há maior dispersão de fumaça. Geralmente dá-se preferência à horas frias do dia.



Figura 11: Planificação de queimada

- Intervalo entre as queimas: as queimas devem ocorrer em intervalos em que as acumulações de combustível sejam críticas. A determinação destes intervalos é importante para evitar, por exemplo, a gradativa degeneração do solo.
- **Plano de queima**: elaboração de um plano escrito e detalhado para cada queima. Os principais pontos abordados em um plano de queima controlada são:
 - Descrição e localização da área a ser queimada: incluindo o tipo de vegetação, topografia, tipo e quantidade de combustível, tamanho da área a sere queimada, um mapa com aceiros, limites da área, estradas etc.;
 - Objetivos da queima: definir as razões da queima, discriminando a quantidade do combustível que será consumido e o efeito sobre as espécies arbóreas e de fauna;
 - Preparo da área: circunscrever a área a ser queimada com aceiros de no mínimo 3m de largura. Dividir a área com aceiros intermediários para maior controle da queima;
 - *Condições climáticas ideais*: para que a queima ocorra de forma segura, esta deve ser realizada em dias com temperaturas do ar entre 15° e 25°C, vento com velocidade entre 5 e 15km/h e direção constante, humidade relativa entre 50 e 60% e nunca quando o índice de perigo do fogo for alto ou muito alto;
 - *Técnica de queima*: o método de queima a ser usado depende da quantidade de combustível e da intensidade de fogo desejada;

- Vigilância, controle e rescaldo: a vigilância durante o transcorrer de uma queima controlada é imprescindível para que o fogo não fuja de controlo. Deve-se eliminar todos os vestígios de fogo remanescentes após o término da queima;
- Avaliação da queima: deve ser realizada após a queima registrando a data, hora da queima e comportamento do fogo, observados (velocidade de propagação, intensidade, altura de crestamento e quantidade de combustível consumido), bem como os registros das condições climáticas e os efeitos do fogo sobre o ambiente.
- Distribuir tarefas e mobilizar equipamento: é importante que todos os intervenientes estejam claros sobre o seu papel para evitar conflitos e mal-entendidos, sobretudo em locais de prática de caça. Geralmente a queimada controlada comunitária exige equipamentos simples e não especializados. Contudo, se a área for extensa, pode haver necessidade de usar veículo ou montar acampamentos.

Como determinar o índice de severidade de queimada?

Esta actividade é técnica e requer conhecimento especializado. Para o efeito, deve-se conhecer as variáveis meteorológicas que afectam o processo de queima, nomeadamente a humidade relativa do ar (%), temperatura máxima e velocidade de vento (m/s). Assim, podem-se seguir os seguintes passos:

- Nos blocos de 1 ha, delimitar parcelas de 20 m x 20 m para a recolha de material combustível principalmente a componente herbácea. Para levantamento herbáceo, dentro das parcelas de 20x20m estabelecem-se 5 sub-parcelas de 1x1m onde, quatro em cada extremo da parcela e a quinta irá se localizar no centro (Figura 12).
- Dentro das sub-parcelas de 1x1m, usando o disco medidor de pasto, mede-se a altura das gramíneas.
- Após o levantamento do material herbáceo, faz-se a queimada controlada, mas antes abrem-se aceiros com material combustível

uma largura de 5 m e medição das variáveis meteorológicas nomeadamente humidade relativa (%), temperatura máxima (F) e velocidade de vento (m/s).

Para estimar o índice de severidade de queimada, usam-se os critérios estabelecidos e apresentados nas tabelas 1, 2, 3 e 4.

ideia 2: Categorização da biomassa herbacea	
Categoria	Biomassa herbácea (Mg/ha)
Suave	0-1
Moderado	1.1-2.9
Alta	>3





Categoria	Velocidade do vento (m/s)	Temperatura (°C)	Humidade do ar (%)
Suave	0-11	<18-28	>70
Moderado	11-15	29-31	50-70
Severo	>14	>31	<50

 Tabela 3: Categorização do estado do tempo

Tabela 4: Categorização do índice de severidade de queimada

Biomassa Herhácea	Clima		
Diomussu Hei buccu	Suave	Moderado	Forte
Baixa			
Média			
Alta			

NOTA: A cor vermelha significa índice ALTO e cor verde significa índice BAIXO.

Como realizar uma queimada controlada

Na implementação do plano de queima controlada, cinco passos devem ocorrer:

Passo 1. *Informar ao vizinho*: O Artigo 388 da Lei 35/2014, pune danos causados à propriedade alheia devido a incêndios intencionais. Deve-se sempre informar a todos que podem ter interesse com a actividade da queimada controlada (Figura 13).

Passo 2. Testar a vegetação: Queimar pequena



porção para verifica se o capim está muito húmido. Figura 13: Comunicação

Se estiver húmido, esperar pelo menos uma semana e voltar a testar, no mesmo período. Contudo, podese também caminhar entre 3 a 5m mata dentro, pois esta vegetação das encostas pode estar mais húmida. Para garantir uma queima ideal deve-se: (1) garantir que a cobertura da vegetação seja parcialmente removida; (2) as chamas não devem queimar folhas encontradas acima de 1 m.

Passo 3. *Início da queimada*: Após a vegetação estar pronta, a equipe deve identificar o ponto de partida e: (1) pingar o lume em diferentes locais em torno da área (Figura 14); (2) deixar a vegetação queimar sem envidar qualquer acto para frear; (3) iniciar a queimada em locais mais altos, onde a vegetação tem estado mais seca em relação aos vales e depressões. (4) se a vegetação não queimar à primeira pinga do lume, deve-se tentar repetidamente ou voltar em outro período. (5) registar alguma informação básica, como (tempo, características do fogo e impactos sobre a vegetação e possível fauna).



Figura 14: Início da queima

Passo 4. *Queimar a área seleccionada*: quando se pretende queimar largas áreas, após a eliminação do material combustível em torno da área, realiza-se à queimada, iniciado do local de direcção do vento. Esse processo geralmente não leva mais de 10 dias. Com tempo, as chamas serão mais fracas e baixará de temperatura.

Passo 5. *Monitoria da queimada*: deve-se determinar a percentagem da área queimada; as características do fogo (fogo quente ou frio, altura das chamas, efeito sobre a vegetação, e a dificuldade da actividade); as características climáticas no acto da queima; o pessoal envolvido e como ficou a vegetação no final da época seca.

Quais equipamentos são necessários para realização de queimadas controladas?

Os equipamentos são simples e resumem-se em equipamentos de segurança individual e ferramentas de combate (figura 15).



Figura 15: EPI- equipamento de protecção individual; Equipamento para realização de queimadas à direita

O que fazer caso o incêndio tenha iniciado?

Ninguém deve se colocar em frente do fogo para combate-lo. E, não se deve combater o fogo sozinho. Um bom programa de monitoria do fogo não é apenas aquele que cria aceiros eficazes e mantêm baixa quantidade de combustível entre eles. Um bom programa de monitoria é também aquele que gera infração em tempo útil. A medida mais importante a ser tomada caso tenha-se iniciado um incendio, é recolher o máximo de informação possível sobre as características do local, comportamento do fogo, e reportar ao comité de combate aos incêndios na comunidade (Figura 16).



Figura 16: Reportar com exatidão o que vê ao comitê comunitário de combate a queimadas

Quais regras básicas de segurança devem ser consideradas no combate a incêndios?

Todo o pessoal combatente de incêndios, seja qual for sua hierarquia deverá ter em conta alguns aspectos fundamentais, cada vez que se incorpora ao trabalho na linha:

- Estar atento e observar em todo momento o que está se passando ao seu redor;
- Manter distância mínima 3 m, em terrenos acidentados ou com vegetação alta, e garantir contato visual com quem vai à frente ou atrás;
- Prestar atenção quando estão queimando tocos, raízes em solos com muita capa orgânica já que se podem formar poças de brasas;
- Atenção aos troncos ou rochas que rolam do incêndio;
- Caminhar a passo não excessivamente rápido para evitar fadigar-se antes do tempo.

Ao executar um programa de queimadas controladas, é importante lembrar:

- Desenvolver confiança ao realizar a queimada, pois inicialmente pode parecer uma actividade com efeitos drásticos;
- Informar ao vizinho sobre a pretensão de realizar queimada controlada;
- Manejar o fogo através de queimadas controladas na época fria é sempre menos desastroso que na época quente;
- Discutir o fogo como uma ferramenta de gestão ambiental;
- Não ignorar o potencial de perigo do fogo, especialmente quando manejado inadequadamente;
- Sempre que possível, evitar realizar queimadas depois do mês de Julho.

Sobre o guião:

Este guião sobre treinamento em queimadas controladas foi desenvolvido pela Faculdade de Ciências Agrárias (FCA) da Universidade Lúrio de Moçambique, com apoio da Faculdade de Agronomia e Engenharia Florestal da Universidade Eduardo Mondlane do mesmo país. O guião providencia informação relevante sobre os principais conceitos relacionados aos incêndios florestais, seus impactos e quais passos devem ser tomados para a gestão do fogo, através de queimadas controladas.

O guião foi desenvolvido para servir de base para os técnicos da FCA, no treinamento de comunidades do distrito de Majune, província do Niassa, em Moçambique, no âmbito de *The Early Controlled Burning and Community Awareness of Forest Fire Management*, do *The Project for Sustainable Forest Management and REDD+ in Mozambique*, financiado pela Asia Air Survey Company, Ltd em parceria com a JICA.

INTRODUÇÃO À QUEIMADAS

O que são incêndios florestais e qual é a sua relação com queimadas descontroladas?

Incêndio florestal é a ocorrência do fogo em qualquer forma vegetativa sem controlo. As queimadas descontroladas podem originar em incêndios florestais.

Quais são os diferentes tipos de incêndios florestais? Os incêndios florestais são classificados em três tipos: incêndio de copa, incêndio de superfície e incêndio subterrâneo.





CONDIÇÕES ATMOSFÉRICAS

Quais são os factores que condicionam a ocorrência de incêndios florestais?

A ocorrência e frequência dos incêndios, geralmente são afectados pelas condições do local (temperatura, precipitação, topografia, direcção e intensidade dos ventos predominantes) e material combustível.

Paisagem

Combustivel

MATERIAL COMBUSTÍVEL

O tipo e características do material combustível são indicadores importantes para estimar os parâmetros ligados a propagação do fogo.

Categoria	Descrição	Arranjo	Distribuição
Perigoso	Material seco	Continua	Horizontal
	(galhos, folhas,		
	líquen, musgos e		
	gramíneas) com		
	diâmetro inferior		
	a lcm		
Semi-perigoso	Material seco	Compactada	Vertical
	(galhos, folhas,		
	líquens, musgos e		
	gramíneas) com		
	diâmetro		
	superior a 1cm		
Verde	Material fresco		
	(vegetação viva		
	da floresta)		



MANEIO DE QUEIMADAS

Porque é importante fazer a gestão do fogo, se o fogo causa danos severos?

Nem todos os incêndios são maus e indesejados. Por exemplo, o fogo ajuda a:

- regeneração de algumas espécies florestais importantes;
- eliminar plantas indesejadas nas machambas;
- rejuvenesce o capim;
- por meio de queimadas controladas, o fogo pode ser usado para evitar incêndios.

O que fazer caso o incêndio tenha iniciado

Qual é a melhor estratégia para combater incêndios florestais?

A melhor estratégia para combater incêndios florestais é a prevenção, evitar que ele ocorra.



AVALIAÇÃO DO COMBUSTÍVEL

Como determinar o índice de severidade de queimada?

Primeiro deve-se conhecer as variáveis meteorológicas que afectam o processo de queima, nomeadamente a humidade relativa do ar (%), temperatura máxima e velocidade de vento (m/s). De seguida, colecta-se e avalia-se o material combustível para determinar o índice de severidade da queimada.

Biomassa Herbácea	Clima		
Diomassa neibacea	Suave	Moderado	Forte
Baixa			
Média			
Alta			



PREVENÇÃO E COMBATÉ DE INCÊNDIOS

Quais são os métodos utilizados para prevenção e combate de incêndios florestais?

Existem três métodos comumente utilizados para o combate de incêndios, seja antes ou depois da sua ocorrência, designados por: aceiros/quebra fogos; batedor/abafador e queimada de retaguarda.

MATERIAL EQUIPAMENTO DE IMPLEMENTAÇÃO E DE SEGURANÇA

Quais equipamentos são necessários para realização de queimadas controladas?

Os equipamentos são simples e resumem-se em equipamentos de segurança individual e ferramentas de combate.





IMPACTOS DE QUEIMADAS DESCONTROLADAS

Quais são os danos causados pelas queimadas descontroladas?

Os incêndios florestais causados pelas queimadas descontroladas são considerados uma das principais causas de degradação das florestas e das alterações climáticas.



EFEITO SOBRE A VEGETAÇÃO

Os incêndios florestais causados pelas queimadas descontroladas diminuem a quantidade de árvores viáveis para explorar e oferecer serviços; diminuem a resistência das árvores ao ataque de fungos e doenças; e libertam o carbono armazenado nos troncos.

EFEITO SOBRE A FAUNA

As florestas são "casas" de muitos animais. Os incêndios florestais acabam desabrigando os animais, para além de matar animais importantes para o controlo de pragas e doenças.





EFEITO SOBRE O SOLO

Os solos são vivos. Os organismos vivos no solo criam galerias e permitem a circulação do ar. A ausência destes torna o solo mais compactado, menos profundo. Os organismos vivos do solo também permitem a ciclagem de nuctrientes.

EFEITO SOBRE SERVIÇOS ECOSSISTÉMICOS

Para além de libertar o carbono estocado pelas árvores, as queimadas espoem o solo e aumentam a erosão e diminuem a quantidade de chuvas.





EFEITO SOBRE A VIDA HUMANA

As queimadas descontroladas podem também destruir habitações; bens materiais adquiridos; diminuir/extinguir a oferta de produtos florestais não madeireiros com cogumelos e frutos silvestres. Em casos mais graves, pode até matar o próprio homem.
Concept Note for the Trainers Seminar in November

Introduction

Ribeiro et al. (2013) noted that miombo woodlands in the Niassa have potential for carbon sequestration and stock in woody biomass. However, reports have provided evidence of association between fire incidence and vegetation structure, forest degradation and GHG emissions. For its wide use by human being as a land management tool, fire has been intensely applied with consequences on ecosystems composition and functioning (Probert et. al. 2019). Having miombo ecosystem evolved through fire dynamics, it is important to consider and implement controlled burning as management tool and ensure sustainable forest resources use.

The pilot project "The Early Controlled Burning and Community Awareness of Forest Fire Management under the Project for Sustainable Forest Management and Redd+ in Mozambique" being implemented since May 2022 in Revia Comercial, Majune District in Niassa, conducted several activities towards better understanding of fire effects in Niassa miombo ecosystem. Project activities included communities' awareness raise. Having reached the pilot project final phase, it is necessary to undertake an evaluation and dissemination of the project activities and assessment of early controlled burning potential in a sustainable manner in forest resource use after the project. With this in view, a training seminar targeting relevant local institution's staff as well as key community representatives using also evidences and data collected during the course of the project.

In terms of seminar structure and strategy, it is organized in two stages: i) presentations and discussions in plenary and ii) controlled burning demonstration in the field and fire effect observations

Seminar audience: Staff from DINAF, SPA, SDAE, key community leader Seminar contents

Seminar objectives:

- To create and maintain institutional and community technical capacity on:
- i) sustainable forest management with regard to the prevention and use of fires and

ii) evaluation and dissemination of the effectiveness and sustainability of the use of controlled burning as a management tool

Part I (Plenary meeting in a Lichinga Conference Room)

- Sharing relevant experiences on good fire management practices, debate
- DINAF intervention on the importance of fire management in the forest law framework revision
- Controlled burning methodology (how to set fire, control, ecosystem and fuel load considerations etc)
- Presentation of the data collected (from the Inventory and fuel load at the study site)
- Presentation on analysis of the historical profile of fires in the locality and effect on the lives of communities
- Community intervention on their experience with the fires; purposes and available forest resources, their use (how community use ensures sustainability and what can be improved
- Findings on the relationship between fire incidence and forest structure (including tree species diversity, regeneration (main indicators))
- Findings on possible interaction between fires and fuel load and weather conditions
- Discussion and recording of the main lessons learned: how to contribute to ensuring the sustainability of controlled burning in case of need, as a management tool, that is, how controlled burning can contribute to mitigating deforestation and forest degradation, how can the controlled burning approach (use of fire with a management tool) be sustainable and be used in the future by the community in a sustainable way, even in the absence of this pilot project (since as such, it is about of a pilot project and not just a study)
- documentation on community behavior change before and after the project (as a consequence of the project), it would be useful to integrate such contents and address during the seminar/training
- Debate on fire risk assessment

Part II (Demonstrations in the Forest, Revia Comercial)

- Visit to the place where the activities were carried out
- field findings on effects of controlled burning and natural burning (for future comparisons)
- fire simulation controls

Expected outputs:

- Relevant findings on fire incidence effect on vegetation structure, biodiversity, GHG presented and positive impacts/aspects presented (expressed in quantitative data)
- Relevance of cold and controlled burning in the miombo ecosystem demonstrated
- Strategy for sustainable early controlled burning use in the future by the community
- Controlled burning contribution on deforestation and forest degradation mitigation discussed
- Community behavior change before and after the project documented
- Effectiveness of the activities and plan extension strategy evaluated and disseminated

References

Probert, J.R., Parr1, C.L, Holdo, R.M., Anderson, M., Archibald, S., Mustaphi, C.J.C, Dobson, A.P., Donaldson, J.E., Hopcraft, G.C., Hempson, G.P., Morrison, T.A., Beale, C.M. 2019. Anthropogenic modifications to fire regimes in the wider Serengeti-Mara ecosystem. Global Change Biology. Wiley. DOI: 10.1111/gcb.14711

Ribeiro, N.S.; Matos, C.N.; Moura, I.R.; Washington-Allen, R.A; Ribeiro, A.I. 2013. Monitoring vegetation dynamics and carbon stock density in miombo woodlands. Carbon Balance and Management 2013, 8:11 http://www.cbmjournal.com/content/8/1/11

"MANEIO DE QUEIMADAS FLORESTAIS E CONSCIENTIZACAO DA COMUNIDADE NO MANEIO DO FOGO NO NIASSA"

Seminário de Treinamento

MonteBelo Hotel, Lichinga 15 - 16 Novembro 2022

Data	Hor á rio	Actividade/Apresentação	Responsabilidade	Notas
	08.00H - 08.30H	Chegada de Participantes	Secretariado	Registo
	08.30H - 08.40H	Apresentação do programa do encontro, objectivos e notas de boas- vindas	UEM&UniLurio	
	08.40H - 08.50H	Nota de Boas-vindas – Representante da JICA	JICA	
	08.50H - 09.00H	Nota de Boas-vindas e abertura do evento – SPA Niassa	Director do SPA	
15 Nov	09.00H - 09.15H	"Importância do maneio do fogo no quadro da revisão da lei de florestas - DINAF	DINAF	
NOV	09.15H - 10.15H	Interacção entre queimadas com a carga combustível e condições meteorológicas & Métodos de queima controlada (técnicas de acendimento, colocação do fogo, controlo, equipamento etc)	UniLurio	
	10.15H – 10.20H	Foto Protocolar	Secretariado	
	10.20H - 10.40	Intervalo	MC	
	10.40h – 11.00H	Analise do perfil histórico de queimadas na localidade e efeito no modo de vida	UEM / UniLurio	

	11.00H – 11.15H	das comunidades & Mudança de atitude na comunidade antes e depois do projecto (observações no decurso do projecto como consequência do mesmo) Apresentação dos resultados de inventário e da avaliação da carga combustível	UEM / UniLurio	
	11.15H – 11.30H	Interven çã o da comunidade sobre disponibilidade dos recursos florestais e seu uso & como a utilização dos recursos pela comunidade garante sustentabilidade dos recursos e o que pode ser melhorado neste sentido	Líder Comunitário	
	11.30H – 11.45H	Impactos tais como: relação entre incidência de queimadas e estrutura da floresta (diversidade de espécies arbóreas, regeneração e indicadores chave) & entre incidência de queimadas com carga combustível e emissões de gases de efeito de estufa	UEM / UniLurio	
	11.45H – 12.15H	Discuss ã o	Todos os Participantes	
	12.15H – 13.30H	Almo ç o	Todos os Partiicpantes	
15 Nov	13.30H - 14.45H	Discussão em grupo: Como garantir sustentabilidade da abordagem de queima controlada (uso do fogo como instrumento de maneio) e seu uso sustentável pela comunidade no futuro (após o termino e retirada do projecto piloto)	Todos os Partiicpantes	
	14.45H -15.15H	Apresentação da discussão pelos grupos		

15.15H – 15.30H	Notas Finais	Director do SPA	

"MANEIO DE QUEIMADAS FLORESTAIS E CONSCIENTIZACAO DA COMUNIDADE NO MANEIO DO FOGO NO NIASSA"

Seminário de Treinamento

MonteBelo Hotel, Lichinga 15 - 16 Novembro 2022

Data	Horário Actividade/Apresentação		Responsabilidade	Notas
	07.30H - 10.30H	Viagem a Revia Comercial	UEM / Unilurio	Saida do Hotel MonteBelo
	10.30H - 11.00H	Apresentação aos membros da comunidade	Unilurio	
	11.00H - 12.30H	Visita e explica çã o das actividades conduzidas nos blocos de maneio	UEM / Unilurio	
16 Nov	12.30H - 13.00H	Demonstração de queima controlada	UEM / Unilurio	
	13.00H - 13.30H	Perguntas e Respostas	Todos	
	13:30 - 14:30	Almoço	Todos	
	14.30H – 17.30H	Viagem a Lichinga		

Lista de Confirmação de Presenças - Niassa

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FLOMOZ REPORT ACTIVITIES



MONTHLY REPORT By UEM and UniLurio

Index

1. Introduction

The activities of the FLOMOZ project began in June, in the Province of Niassa, District of Majune, in Revia Central, and is being carried out by consultants from the Eduardo Mondlane University-Faculty of Agriculture and Forestry, and the University of Lurio – Faculty of Agricultural Sciences. This report describes the activities planned and carried out in the month of June (level of execution), and the activities proposed for the month of July. In June, all activities related to the preparation phase were carried out, in two different field campaigns, where for the first campaign were carried out activities related to (1) Official launch of the project at the local level (Fig1), (2) Meeting with the community to establish work agreements and means of collaboration, (3) Selection of community members who will be directly involved in the activities and (4) Visit to the study area to define the area to be managed. For the second campaign, activities related to (5) Awareness and training campaign in matters of preventing and fighting forest fires were carried out, and (6) Demarcation of blocks in the area to be managed and opening of firebreaks.



Fig.1. FLOMOZ Project Launch at Majune District

2. Results of the implementation of the work

2.1. Official Project Launch

2.1.1. Outline, Schedule and Period of Implementation

The Government of Mozambique, through the Ministry of Land and Environment, in partnership with the Japanese International Cooperation Agency (JICA), launched the FLOMOZ Project (Sustainable Forest Management in Mozambique and REDD+) in the province of Niassa, in the district of Majune, locality of Revia Central. The event was held on the 13th of June and was attended by the District Administrator and his entourage: community leaders, Director of the District Services for Economic Activities (SDAE),

District Commander, Director of the Provincial Services for the Environment (SPA), Representative of JICA and Representatives of UEM, UniLúrio, as well as by community members, (list of participants – annex 1).

The Director of the Provincial Services for the Environment launched the FLOMOZ Project, stressing that currently the world, and Mozambique in particular, is feeling the effects of climate change (floods, cyclones and strong winds), which harm agricultural production as well as the flora and fauna biodiversity. To this end, the Government, in partnership with NGOs and other countries, has been implementing several projects for the conservation of the environment and sustainable management of natural resources. The SPA Director reaffirmed that the FLOMOZ Project belongs to the Government of Mozambique, financed by JICA and that it encourages community involvement, with a view to contributing to the conservation of forest cover, sustainable management and monitoring of forest resources. For this purpose, the district of Majune was selected for having a significant extension of forest cover and constituting one of the five (5) districts with the most records of uncontrolled fires at the level of Niassa Province.



Fig. 2. JICA representant talking about the project

2.2. Meeting with the community to establish work agreements and means of collaboration,

2.2.1. Outline, Schedule and Period of Implementation

On the 14th of June, a meeting was held with the local community of Revia Comercial. This meeting began with the intervention of the régulo, who recapitulated that three local consultations had been carried out before the project was launched. In this context, the technical team explained in detail the objectives and methodology of the project (Fig. 3), stressing that it did not encourage the abandonment of their usual sources of livelihood, much less put an end to the community's financial problems. It was emphasized that the project only came to add and improve the management of forest resources in the region.



Fig. 3. Clarification meeting about the project with community members

The technical team explained that, unlike the other projects, this one in particular is guided by a bilateral approach (more than bringing knowledge, it is also intended to learn from the community), as well as practical demonstration of fire prevention strategies.

2.3. Selection of local labor

2.3.1. Outline, Schedule and Period of Implementation

The local workforce selection process was carried out on the 14th of June, in order to identify which people within the community will directly assist in the activities scheduled during the project execution period. The workforce was selected through a rotating process of community members. Therefore, the technical team proposed organizing community members into households that ranged from 1 to 9 members per household (Fig 4). Depending on their size, each head of household selected 1 to 3 members of their household to be part of the activities in the second phase of the project, totaling 21 members of which only one woman was selected, who later requested her removal from the group. of selected members. This fact bring the attention of the technical team, which intends to prioritize women in the next activities, but for cultural reasons, women end up giving up their places to the men of the family (husband or brother).



Fig. 4. Annotation of the names of the members of each household

The selection method adopted aimed to safeguard the active involvement of community members in the decision-making processes, as well as to avoid biased choices by the community leadership. Additionally, it was explained that the project will acquire 12 protective and safety equipment at work, which will be assigned to 12 members previously appointed by the local leadership. Subsequently, 9 volunteers from the selected members were requested for a brief reconnaissance of the study area (Fig 5).



Fig. 5. Forest reconnaissance visit

2.4. Exploratory visit to the study area

2.4.1. Outline, Schedule and Period of Implementation

On the 15th of June, 9 community volunteers in the company with the technical team went to the community forest that will constitute the project implementation area, where they walked about 2.5 km into the forest in the east direction, approximately 1.8 km towards the South and about 3 km towards the West, thus making up the perimeter of the study area (about 259 ha), where the description of the vegetation was made (miombo forest, characterized by young trees and natural regeneration, with some areas of clearings and marshy areas) and geographic coordinates were marked for later selection of the area of interest with the aid of Geographic Information Systems (GIS).

2.5. Awareness and training campaign on forest fire prevention and combat 2.5.1. Outline, Schedule and Period of Implementation

The awareness and training campaign in matters of prevention and combat of forest fire took place during the second field campaign, between the 27th and 29th of June in the Revia Comercial community. A total of 35 members of the local community were trained, of which about 8 were women and the remainder were men. The learning process involved both a theoretical and a practical component. The practical component of the training took place in the natural forest, which is 1 km south of the training site. The training was extended to all available families, with emphasis on the members who were part of the firebreak opening process.

To improve interaction, participants were divided into three (3) heterogeneous groups, where training topics were discussed before being consolidated. The methodology used allowed all members to participate in the discussions, and ensured personalized assistance during the three days of training (training program – annex 3).

a. First Day of Training – Forest Fires and Controlled Burns

On the first day of training (27/06/2022), 34 previously selected members of the community were present, including 8 women and 26 men (annex 2). Aspects related to the causes of forest fires, the characterization of fires, the nature of the combustible material that favors fires and the atmospheric conditions that condition the occurrence and propagation of fires were discussed. After periods of group discussions (Fig. 6), the following findings were reached:

The main causes of fires in the community are: (1) Hunting: the hunting technique used by wild animals advocates the deliberate fire posture. This practice is one of the main causes of forest fires in the Revia Comercial community; (2) Children's play: the children have been cooking food (*massange-* local name), next to the forests. Accidentally, that fire has gotten out of control and causing fires;

- Canopy and surface fires are more common in the Revia Comercial community. The crown fire starts when the fire reaches tall grass, which passes to the crowns and in places with nearby trees;
- There is a species whose leaves have burned when fires occur in the swamp. Locally the species is called Nakayakay or Etici;
- The fire that occurs between the months of September and October, crosses roads and rivers, because of the strong wind.



Fig 6. A. General discussion between all groups. B. Discussion group 1. C. Discussion group 2 and D. Discussion group 3.

b. Second Day - Importance of Fire Management

On the second day of training (06/28/2022), there was a greater turnout and participation of community members in the debates. There were 13 Women and 28 Men. Aspects related to fire management were discussed, with emphasis on the role of fire as a tool for forest fire mitigation, main techniques used in fire control and prevention, and limitations in fire control. After periods of group discussions, the following findings were reached:

• From the point of view of the Revia Comercial community, fire is important because it helps to regenerate the pasture, especially wild animals; helps to clean

fields; scares away dangerous animals such as snakes; and clears the forest and helps in gathering firewood;

In this theme, the trainers emphasized the importance of fire for breaking dormancy of some forest species important to the community.

In turn, some fire management techniques used by communities were raised:

- Cleaning around the agricultural fields and dwellings, before carrying out the burning in the intended place and avoiding fires from the forests, respectively;
- If the forest fire causes damage to properties, such as a motorcycle, for example, sand is used to smother the flames;
- In case of fires that occur in forests and cultivated fields, water and fresh branches are used to put out the flames;

Main limitation in controlling fires in communities:

• **Tall grass:** when the grass is tall, the flames are very intense and it becomes difficult to put out the flames. In fact, in these situations the fire drops have crossed barriers such as roads and rivers.

Field practice: To consolidate the contents covered in the first two days, a practical class was held to simulate the opening of firebreaks in the forest where the study will be carried out (Fig. 7). Next to the community, a firebreak with a width and length of 5 m was opened. The exercise allowed visualizing the nature of firebreaks that would be opened in the study area.



Fig. 7. Practical class in the field

In a way of consolidation, translating to the words of the community itself, they said "fire is dangerous, but also good, however, we have to know how to use it".

c. Third Day - Negative Effects of Forest Fires

Finally, on the last day of training (06/29/2022), 11 Women and 24 Men were present. The last day was dedicated to discussing the effects of uncontrolled fires on flora, fauna, soil, ecosystem and social services. However, issues related to the values and importance of forests for the community were discussed beforehand, highlighting the following: the forest provides wild fruits (Macunapa, Massuco and Ntululu); construction material such as stakes and rope; wood for the production of various goods and instruments, such as chairs, tables, hoe handles and pestles; combustible material (firewood); mushrooms and honey.

After group discussion, communities described the negative effects caused by uncontrolled fires perpetrated, mostly by poachers, which lead to forest fires:

- **Vegetation**: forest fires affect the supply of wood for various purposes, in addition to reducing substrate for the development of spores and the emergence of mushrooms;
- **Fauna**: decrease the supply of meat. Fires drive animals away from the community. On the other hand, the distancing of animals from communities can affect pest control in crop fields, especially rodents;
- **Soil**: fires increase the susceptibility to erosion, by exposing the soil to natural weathering. Underground fires eliminate microfauna, reducing the capacity for nutrient cycling and soil aeration;
- **Ecosystem Service** : decreased precipitation; forest fires also affect production and supply of important non-timber forest products;
- **Human Life**: loss and abandonment of their homes; burning of material goods (motorbikes, furniture, changing rooms, among others); in more serious cases, fires end up causing the loss of human lives.

According to the main issues discussed during the training, it is important to reflect on some issues (1) to study the importance value of the species that burn more or with peculiar characteristics, for example those found in the swamp, and (2) possibility of experimenting, considering the variable "width of the firebreak" and the "type of vegetation", given that the community emphasized that when the fire is very intense, mainly due to strong winds, it crosses roads and rivers.

2.6. Demarcation of blocks in the area to be managed and opening of firebreaks. **2.6.1.** Outline, Schedule and Period of Implementation

The location for the demarcation of the management blocks was identified using remote sensing techniques, using satellite images between the years 2020 to 2022. The canopy cover density was mapped using Landsat 8 images for the study area, resulting in 4 different canopy coverage classes: High, Medium and Low Canopy Cover density, as well as open areas. To map the burned areas, the product MCD64A1 from the Modis sensor was used, in order to identify the areas that burned between 2020 and 2022. as well as to include all canopy coverage classes within the study area. (See Annex 4).

The demarcation and opening of firebreaks were carried out between the 30th of June and the 3rd of July, where an area of about 860 m in length and 255 m in width was delimited in the north-south direction (Fig 8). These distances were placed assuming the width of the internal firebreaks in both directions, in order to guarantee a final usable area of 20 ha.



Fig. 8. Firebreak opened inside the forest

Nome	Instituição/ Posição
Governo P	Provincial e Distrital
Jornito Muemede	Director do SPA
Maida Levene	Técnica do SPA
Victor Levene	Administrador do Distrital de Majune
Rui Águas Mateus Pacule	Director do SDAE
Joana Selemane	Chefe do Posto Administrativo de Muaquia
Omar Saide Cambalane	Chefe da Localidade de Riate
	Comandante Distrital da Polícia
0	Consultores
Paulo Guilherme	UnilLúrio
Alfredo Santos Duvane	UnilLúrio
Filipe Zeca Canção	UnilLúrio
Amina Abudo Amade	UnilLúrio
Jone Fernando Jr	UEM
Romana Bandeira	UEM
Luís Pereira Domingos	FLOMOZ
Membro	os da Comunidade
Mateus Laisse	Líder da Comunidade
Mauricio Martire	Líder da Comundade
Oliveira Bernardo	
Alexandre Fernando	
Domingos Inácio	
Agostinho Júnior	
Celestino Constâncio	
Carlota Jackson	
Gimilardo Ernesto	
Evaristo Ernesto	
Janeiro Jackson	
Estelino Felisberto	
Filesia Fernando	
Iassine Moyo	
Rafique Jackson	
Alberto Armando	
Gerinimo Rofino	
Família Mateus Laisse	
Lopes Mahoa	
Lourenco Nicua	
Prisma Lopes	
Cristina Mateus	
Ozana Mateus	
Agostinho Amine	
Domingos Mauricio	
Pedrito Wilson	
Fabião Jamissone	
Wiski White	
Cardiano Cassimiro	
Mussa Wissilasse	
Jovenisto Valentim	
Jafar Witnes	
Alexandre Armando	

ANNEX 1 – List of Participant - Launch Program

Arlindo Jaquissone	
Norte Joaquim	
Filipe Faustino	
Joaquim Labuquene	
Outros Membros da Comunidade	

ANNEX 2 – List of Participant in Training Activities

ORD	Nome do participante	Datas e activi	Datas e actividades participadas				
		Treinamento	Treinamento				
		27/06/2022	28/06/2022	29/06/2022			
01	Mauricio Martene	Х	Х	Х	Х		
02	Terezinha Mateus		Х	Х			
03	Carlota Mussa	Х	Х	Х			
04	Graça Maurício	Х	Х	Х			
05	Rita Munhicala	Х	Х	Х			
06	Cristina Mateus	Х	Х	Х			
07	Essiana Laita		Х	Х			
08	Ermelinda Mateus	Х	Х	Х			
09	Verónica Rosário	Х	Х				
10	Nenita Casimiro	Х	Х				
11	Crisma Lopes	Х	Х				
12	Adelina Manuel	Х	Х	Х			
13	Iassine Moyo	Х	Х	Х	Х		
14	Lourenço Mahowa		Х	Х	Х		
15	Jafar Witinesse	Х	Х	Х	Х		
16	Oliveira Bernardo	Х	Х	Х	Х		
17	Mateus Laisse	Х	Х	Х	Х		
18	Wisque Waity	Х	Х	Х	Х		
19	Filipe Faustino	Х	Х	Х	Х		
20	Alfredo Eduardo	Х	Х	Х	Х		
21	Eusébio Manuel	Х	Х				
22	Mussa Wicilasse	Х	Х				
23	Martinho Estevão	Х	Х	Х	Х		
24	Lopes Mahowa	Х	Х	Х	Х		
25	Agostinho Amine	Х	Х	Х	Х		
26	Teófilo Alfredo	X	Х	Х	Х		
27	Jovenisto Valentim	Х	Х	Х	Х		
28	Mozinho Antoninho	Х	Х	Х	Х		
29	Pedrito Wilson	Х	Х	Х	Х		
30	Arlindo Jaquissone	X	Х	Х			
31	Renança Felisberto	Х	Х	Х	Х		
32	Rafique Jaquissone	Х	Х	Х	Х		
33	Alberto Armando	Х	Х				

34	Evaristo Ernesto	Х	Х	Х	Х
35	Esmeraldo Ernesto	Х	Х	Х	Х
36	Fabião Jamissone	Х	Х	Х	Х
37	Norte Joaquim	Х	Х	Х	
38	Veronica Pedro		Х	Х	
39	Luciana Manuel		Х	Х	
40	Manuel António	Х	Х	Х	
41	Issa Gulherme	Х	Х	Х	

ANNEX 3 – Training Program







FLOMOZ MONTHLY REPORT

JULY REPORT

Prepared by: UEM (FAEF) and UniLurio (FCA)

1. Introduction

In the month of July, the FLOMOZ project, through its consultants from the Eduardo Mondlane University - Faculty of Agriculture and Forestry, and the University of Lurio - Faculty of Agrarian Sciences, carried out several activities in the Majune district, central region of Niassa province. This report describes the activities planned and carried out in the month of July (level of execution), and the activities proposed for the current month of August. In the month of July, activities related to phase 2 (Fire Management) were carried out, namely: (1) office work to determine the location of management blocks establishment, (2) opening of general and internal firebreaks (breaking fire), (3) forest inventory and analysis of fuel combustible material, (4) assessment of meteorological variables, and (5) cold burning.

2. <u>Results of the implementation of the work</u>

2.1. Determination of the area for management blocks establishment

The determination of the location for the establishment of the management blocks was carried out by the team of consultants, using GIS techniques, by mapping the canopy cover density and the area burned in the last 3 years. Also, a consultation was carried out with the leaders of the locality to better understand the behavior of fire in the region,

The mapping of the canopy cover density was done using satellite images from the Landsat 8 sensor, 30 m spatial resolution, from July to October, 2021, given the lack of images with low cloud percentage (image form June and July for 2022 had more then 30% of cloud cover) for the same period of the year 2022. The information was used to generate 4 canopy cover density classes: high, medium, low canopy cover density and exposed soil (usually roads).

Burned areas mapping, was done using MODIS sensor (MCD64A1, 500 m resolution), over 3 years (2020 to 2022). For this analysis, polygons were generated for the areas that burned at least once, in the period under analysis.

These analyzes allowed the consultants to allocate the management blocks in all canopy cover classes, but also considering the gradient of burned and unburned areas, and the representativeness of the different classes within the study area.

Blocks Arrangment



Fig 1. Blocks arrangement in study area

2.2. Opening firebreaks

The opening of firebreaks was carried out based on the mapping produced by the team of consultants, where all the paths that the firebreaks should pass were demarcated block-by-block. This activity was carried out by the work team selected from the local community, after the awareness campaign on matters of prevention and firefighting. In total, around 21 community members, representing different families, were involved in order to carry out the activity and reconcile the theorical aspects they received during the training. Duly uniformed and strictly complying with the aspects of safety and hygiene at work, the members of the community were assigned 100 m x 5 m each, as a work target, and they received another portion of work, who, after inspection by the team of consultants, showed to have successfully completed previous task.

A.

В.



Fig 2. a) Internal firebreak. b) External firebreak and c) Worktask team assigned to open firebreaks

C

The team of consultants monitored the firebreak clearing process from the beginning, in order to ensure that it was being executed in accordance with the recommendations and in accordance with what was established in the geographic information systems.

2.3.Forest inventory, combustible fuel material, meteorological variables, canopy cover density and cold burning

Forest inventory was performed in plots of approximately 1 ha ($125 \times 80 \text{ m}$). The establishment of the plots for sampling was done in order to determine the structure and composition of the vegetation. In total, 20 plots of 125 m x 80 m were established in the management area (in the area subject to controlled burning) and 10 plots of the same size for comparison purposes (in the area not subject to controlled burning) See Fig 1.

In all plots, the identification and measurement of DBH ≥ 5 cm, total tree height and regeneration with diameter ≥ 5 cm were performed. The regeneration density of plants with diameter ≤ 5 cm was also identified and recorded, as well as the canopy cover density for each plot.



Fig 3. Collection of dendrometric data within the plots

For monitoring purposes, all plots in the management blocks were identified with a single number, and photographed in the North direction, in order to allow the consultant to monitor the process of vegetation recovery during their visit.



Fig 4. Plot number 13 before implementation of cold burning

For the survey of the biomass of the herbaceous material, the indirect method was applied, which consisted in the use of the Disc pasture meter to avoid the physical removal of the herbaceous material, on one hand and the other, making the sampling less costly and time consuming. Grass measurements were taken before the burning over the entire plot, and later will be evaluated in the same plots after burning.

For this purpose, in each plot, fifty measurements were taken on each diagonal (See diagram). Equidistant points were applied to measure the height of grasses and herbs on the Disc pasture meter. The resulted 100 points measured were assumed as the average herbaceous and grass height in the plot. Subsequently, the grass measured height will be converted in biomass by applying local calibrated equation.



Fig 5. a) Illustrative diagram showing the diagonals where 50 measurements of the herbaceous vegetation and grasses were done in the plot and b) measurement of grass and herbaceous vegetation height.

The classification of flammable combustible material was carried out in all plots, through visual observation, using as criteria the arrangement of the combustible material, distribution and horizontal and vertical continuity. Table 1 below illustrates the criteria used for the classification and quantification of the available flammable combustible material.

Type/Category of combustible	Arrangement of	Distribution and continuity of
material	combustible material	combustible material
Dangerous (alive, <7mm in	Continuous	Horizontal
diameter)		
Semi-hazardous (alive,	compressed	Vertical
between 7mm to 10cm in		
diameter)		
live or green	connected	
dead material		

Table 1. Criteria to quantify and classifying combustible material type and category

Likewise, data referring to the canopy cover density were measured within the sampling plots using spherical densitometer. To measure the canopy coverage density, 4 measurements of the percentage of canopy coverage were carried out in the 4 Cartesian directions (north, south, east, west), in the center of the plot, and the average of the readings within the plot represents the average of canopy cover density in the plot.



Fig 6. Measurement of canopy cover density in the center of the plot

Before carrying out the controlled fires in the sampling blocks, meteorological data were measured in order to predict fire behavior and decide on the feasibility or not of carrying out the burning. This measurement was carried out with the aid of an anemometer (kestrel), where variables such as relative humidity (%), maximum temperature (°C) and wind speed (m/s) were measured to verify compliance according to Table 2 below, in order to predict fire behavior.

Fire behavior	Wind speed (m/s)	Temperature (°C)	Air humidity (%)
Soft	0-11	<18-28	>70
Moderate	11-15	29-31	50-70
Severe	>14	>31	<50

Table 2. Categorization of the weather status and consequences on fire behavior:



Fig 7. Attempt of implementing controlled cold burning inside the plots

In all planned days for the burning activity, weather conditions proved to be unfavorable to allow the occurrence of combustion and its propagation. Although the combustible material has low connectivity and still contains moisture in its structure, wind speed was one of the crucial factors that prevented the fire spreading (wind speed below 0.5 m/s).

3. Implementation plan for next month activity

Due to meteorological conditions limitations, the team of consultants decided to monitor the meteorological variables in order to identify the convenient period to execute the cold burns. Thus, monitoring is scheduled for the third week of August. Depending on the weather conditions, the cold burns can be carried out in the last week of August.

On the other hand, the team of consultants will use the month of August to harmonize the collected field data, and later on to carry out data analysis, according to the reference term agreed at the beginning of the activities (See workplan attached).



FLOMOZ REPORT ACTIVITIES



AUGUST REPORT By UEM

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1. Introduction

The activities within the scope of the FLOMOZ project, in Niassa province, district of Majune, at Revia Comercial Community, during the month of August focused on the execution of early burning fire in the management blocks and on the analysis on the data from fieldwork inventory. This report describes how fieldwork was conducted and the main constraint found during the execution of the work. It is important to note that early fire management was part of the activities scheduled for July, which unfortunately did not happen due to the lack of ideal weather conditions for fire spread. This aspect among others, are discussed in this report, as they were verified by the team of consultants in the field, which, as small changes in the dry and rainy season recorded for the current year, may have influenced the optimal conditions for the execution of early burning, as well as the results obtained.

During this period the consultant team also carried out a participatory mapping with the members of the communities, in order to understand the population dynamics and the fire frequency, community area limits, as well as to understand how and where the resources used by communities in their daily lives are distributed.



Fig.1. Participatory mapping with community members
2. Results of the implementation of the work

2.1. Early fire burning in management plots

The early controlled burning was carried out between 27th August and 3rd September by the team of consultants (UEM and Unilurio) in coordination with SPA Niassa and SDAE Majune, with the active participation of the workforce selected in the location of Revia Comercial. Its execution was carried out in stages, in order to cover the entire area proposed for burning (18 blocks out of 20 managed). Thus, before the execution of the controlled fires, a photographic record was done in each management block, and the meteorological variables were measured to ensure that the fire would be safe and under control. Unlike July, in August the winds were slightly stronger, with gusts reaching 3 m/s, when compared to the conditions in July where the maximum wind speed recorded was 0.5 m/s. The average temperature during the period was 28 degrees, equal to that observed during the month of July in the same area. Exceptionally, the relative humidity was lower in August, when compared to July; and this may have been because the winds were slightly stronger, which may have contributed to the removal of moisture from the air.



Fig. 2. Registration about plots condition and the meteorological variables before burning execution.

a) Fuel Material and Burning Execution

In the 18 blocks selected for the early controlled burning, the combustible material was classified as to its type as semi-hazardous and alive-green, since the arrangement was not connected or compacted. The distribution and continuity of the combustible material was, horizontal and discontinuous. These characteristics were present in almost all plots, which combined with meteorological conditions, caused the fire to evolve in bands or aggregates, covering about 40 to 60% in the blocks located further south of the management area (ex. 13 to 20) and below 30% in the blocks located further north of the management blocks.





Fig. 3. Blocks of management before and after burning

b) Additional Blocks of Management

Given the situation found in the field, aware of the didactic and demonstrative component that is intended to be carried out with the local authorities and the community, the team of consultants decided to add two (2) new management blocks further south, as these comprise areas with a high density of grass, evenly distributed (100% ground cover) and with an approximate height of 1 to 3 meters. In this area, firebreaks were opened, an inventory of tree species, natural regeneration, canopy cover density and grass and herbaceous biomass were carried out. Controlled burning was carried out in only one plot, and the second remained intact for demonstrative and didactic purposes, to be done in November.



Blocks Arrangment

Fig 4. Blocks arrangement



Fig 5. New management block before and after burning execution

c) Participatory Mapping

Community leader, members of the working group and others who were not directly involved in the activities were present at the participatory mapping. Unfortunately, no women were present at the meeting, because, even after they were communicated, they were unavailable due to other tasks they were performing. During the mapping, all community members had the same opportunity to interact and indicate the limits of the communities, the areas with the highest incidence of fires within the community, among other resources. Fishing areas, agricultural practice areas, housing areas, construction material harvesting areas (grass, bamboo and stakes), wood species harvesting areas, medicinal plants harvesting areas and fruit harvesting areas were mapped. Wild animal areas were also mapped (supposedly used for hunting, despite the population informing that they do not practice hunting).



Fig. 6. Participatory mapping with community members

2.2. Data Analysis

At the moment, the field data are being analyzed in two different groups: the forest inventory data and the grass and herbaceous biomass data. Data from the forest inventory are being analyzed in terms of the structure and composition of the forest. Information on the behavior of individual tree and regeneration will be correlated with the areas of occurrence of fires, in order to understand the influence of fires on the structure and composition of tree species within the area. Data on the herbaceous grass component are being analyzed according to type, arrangement and distribution, in order to estimate the severity of burning in a given area. Correlation with canopy cover density parameters will be estimated to understand the relationship between the variables. Additionally, multitemporal analyzes are being performed to understand forest dynamics over time and correlate with tree and grass biomass parameters, as well as the frequency and severity of fire for Revia Comercial.

INTRODUÇÃO

This report summarizes the main activities carried out during the month of September as part of the FOLMOZ project. Consultants from Eduardo Mondlane University, Faculty of Agriculture and Forestry and the University of Lurio, Faculty of Agrarian Sciences were involved in the activities, at Majune district, Niassa province. In September, activities involved forest inventory data, quantifying grass biomass, and estimating carbon emissions. This report presents the results of a comparison of the parameters analyzed in areas subject to frequent fires occurrence and areas not subject to fire occurrence, across the management blocks, according to the gradient of fire occurrence.

MATERIALS AND METHODS

Structure and composition of vegetation

To determine the structure and composition of the vegetation, plots were established in two strata (Burned area and Unburned). In each stratum, 20 plots of 20 x 50 m were established, 7 in the Burned area and 13 in the Unburned area. In each plot, diameter at breast height (DBH, cm) and total tree height (m) were measured and species identified for all trees with DBH greater than 5 cm. The regenerating trees were also evaluated (DBH < 5 cm) in subplots of 5 m × 5 m. Means comparison for the strata were performed using t-test for normal distributed data. The vegetation parameter comparison were done fort the two strata namely, burned and unburned.

Tree biomass

Tree biomass estimation, were based on allometric equation calibrated for the miombo of the Niassa region (Macia, 2016). The estimated tree biomass were compared for burned and unburned area, using Equation 1.

 $PST = 0.71 * DBH^{2.347}$ (Equation 1)

Where: PST is the estimated tree biomass; DBH is the Diameter at breast height

Quantification of combustible material and estimation of emitted carbon

The combustible material in the two strata, namely burnt (subject to a 5-year burning frequency) and unburnt, is primarily composed of grasses and herbs, and is characterized primarily as semi-hazardous, with a discontinuous arrangement and a horizontal distribution. The biomass of the combustible material was estimated using the direct method, which requires the use of a pasture measuring disc.

Measurements were taken in both strata before and after controlled burning. 100 measurements were taken in each plot (50 on each diagonal of the plot). The measured grass height were converted to biomass by applying local calibrated equation (Equation 2). The average height of grass and herbaceous material measured was 5.2 cm.

Y = 0.006281X + 0.138156 (Equation 2)

Where: Y corresponds to the fuel mass of accumulated grass (Kg) and X is the height pasture measuring disc.

To determine CO2 emissions, was the equation developed by the IPCC (2006):

 $EBQ=Ai * Bi * Cf * Ggi * 10^{-3}$ (Equation 3).

Where: EBQ is the CO2 emitted (ton); Ai is the burned area (ha); Bi is the biomass before burning (T/ha); Cf is the combustion factor (proportion of combustible material burned -t/ha); Ggi is the emission factor – (IPCC, 2006).

Tree species diversity

Tree species diversity, were assessed using rarefaction curves for regeneration and adult individuals across in both strata namely, burned and unburned.

RESULTS

Tree density

The Figure 1 shows the tree density for regeneration and mature trees for burned and unburned area strata. Although a trend toward a greater number of stems under unburned strata, tree densities for adult and regeneration shows that there is no significant difference between the two strata, burned and unburned areas.



Figure 1. Tree density for regeneration and mature trees for the two strata

Although tree biomass values tend to be high in unburned areas, no significant differences were observed between burned and unburned area.



Figure 2. Tree biomass in the burned and unburned stratum

Tree Diversity

The results shows that despite a trend toward a greater number of stems in unburned strata, the tree species diversity showed similar values between burned and unburned areas, both for regeneration and for adult individuals. The Shannon diversity index ranged from 3.2 for burned areas and 3.3 for non-burned areas. For regeneration, the index ranged from 3.4 to 3.6 for Burned and Unburned area.



Figure 3. Tree species diversity for adult and regeneration in the burned and unburned areas.

Tree diametric class

The diametric class distributions showed an inversed J-shaped trend for burned and unburned strata, as expected for native forests. The highest number of stems in all strata was concentrated between first two DBH classes and the number of stems with larger diameters reduced drastically in subsequent diametric classes.



Figure 4. Tree diametric classes for Burned and unburned area

Although fire is a factor that affects the structure and composition of forests, overall the results clearly show that the occurrence of fire did not change the parameters analyzed both for regeneration and adult individuals. These findings suggest that the fires in the area have not been severe enough to cause changes in the vegetation, which is supported by the low load of combustible material present in the area. Low load of combustible material, cannot sustain the occurrence of severe fires that can imply a change in the structure and composition of the vegetation.

Combustible material

The results show that the fuel material biomass differs significantly between burned and unburned strata. The highest biomass values are found in unburned strata (Figure 1).



Figure 5. Biomass estimated in each stratum a) before and b) after burning

Biomass and carbon emitted values were very low due to lower availability of combustible material and limited fire propagation during burning. However, the results in Figure 1 clearly emphasize the significance of controlled burning in reducing fuel load.

	Before b	urning	After b	Emittad		
Stratum	Total biomass	Total carbon	Total biomass	Total carbon	corbon (ton)	
	(Mg/ha)	(Mg/ha)	(Mg/ha)	(Mg/ha)		
Burned	0.10	0.05	0.08	0.04	0.01	
Unburned	0.25	0.13	0.22	0.11	0.02	
Total	0.35	0.18	0.30	0.15	0.03	

Tabela 1. Biomass and total carbon before and after burning in each stratum

The biomass of the fuel material and estimated carbon emissions are very low, as shown in Table 1. Since the combustible material and meteorological variables are determinant in fire behavior, these were used to classify the severity of the burn. The estimated biomass values were used to categorize the severity of fires using the criteria shown in Table 2. Thus, using the biomass criterion, the fires are considered as soft. The meteorological variables measured in the field prior to the burn were also used to categorize the severity of the burn. (Table 3). The average values of the meteorological variables measured in the field before the controlled burning were:

Wind speed: varied from 0 to 1.5 m/s

Temperature: varied from 24.3 to 26.8°C Air humidity: varied from 50 to 70%

The meteorological variables measured in the field also indicate that the severity of the fires is soft. Thus, factors related to combustible material properties and meteorological variables unequivocally explain the limited propagation of fire during burning, resulting in a reduced amount of carbon emitted (0.03 Mg/ha).

Tabela 2. Criteria used to determine the fire severity index as a function of the biomass value

Category	Herbaceous biomass (Mg/ha)
Soft	0-1
Moderate	1.1-2.9
High	>3

Table 3. Determination of the fire severity index using meteorological criteria:

Comportamento do fogo	Velocidade do vento (m/s)	Temperatura (°C)	Humidade do ar (%)
Suave	0-11	<18-28	>70
Moderado	11-15	29-31	50-70
Severo	>14	>31	<50

Table 4. Determination of the fire severity index combining meteorological and herbaceous biomass criteria:

	Climate				
Herbaceous biomass	Sof	Moderate	Strong		
Low					
Mediun					
High					



FLOMOZ REPORT ACTIVITIES



OCTOBER REPORT

The activities within the scope of the FLOMOZ project, in Niassa province, district of Majune, at Revia Comercial Community, during the month of October focused on the preparation of the seminar for training of SDAE members. This report describes how preparation was conducted and the main constraint found during the preparation of the seminar.

1. Results of the implementation of the work

1.1. Preparation of the Seminar

The month of October consisted of organizing the training seminar and disseminating the results obtained so far with the implementation of the Flomoz Project by the team of consultants. A total of 2 meetings were held between the team of consultants (UEM and UL) and the team of proponents.

At the first meeting, the dates for holding the meeting were defined, having been agreed that it would take place between the 13th and 14th of November, having subsequently been postponed to the 15th and 16th of November, due to the launch of the agricultural campaign that took place in the nationwide on the 14th of November. It was defined by the team of consultants that the main participants would be members of the district services for economic activities (SDAE), SPA, WCS, DINAF, WWF, FAO, NSR and the person in charge of the Safari area in Majune.

Likewise, it was suggested that the logistics for the second day of the field, include a lunch that would be served in the community after the end of the field activities. It was agreed that the team of consultants would create logistical conditions for the supplies to be prepared at the community level.

It was agreed that invitation letters should be sent up to three weeks before the event, so that UEM could have enough time to ensure that logistical issues were taken care of in order for the meeting to run smoothly. For the event, the Montebelo hotel conference room was chosen, as it has adequate conditions for the implementation of the training. Attached is the list of participants who are expected to be present at the training, as well as the proposal for the event's program, which was refined and agreed upon by all project stakeholder

SEMINAY AND GROUP DISCUSSION NOTES

Main notes of seminary discussions

- 1. Niassa is one of the provinces with more burning and forest fires in the country. In order of decreasing importance, itinerant and migratory agriculture, charcoal production and hunting in conservation areas have been the main causes of burning.
- 2. Forest fires do not only affect trees, but the ecosystem as a whole. For example, fires contribute to decrease of wild animals' population, including important pollinators as bee, carbon stocked by the trees, increases desertification and losing socio-economic services such as medicinal plants, wood, and honey.
- 3. Forest fires decrease flora populations and in critical cases can lead to species extinction. There are currently few or almost no reforestation program with native species in the country. Given that the burnings have been frequent in Niassa province, reforestation should be rethought to mitigate the effects of biodiversity loss.
- 4. Heat focus are registered when temperatures are above 47°C. However, heat focus cannot be considered fires/burning, but an important indicator of the potential for fires at the focus site. If there is a heat focus, abundant dry biomass and improper use of fire, catastrophic negative impacts may occur when burning starts.
- 5. The areas of forest concessions are not periodically updated, with SDAE's and communities. The updating of the limits of the concession will allow the community's complaint, if the concessionaires began to explore in a place that has not been assigned to it and will improve SDAE's supervision.
- 6. The new forest law is being updated and harmonized with the National Penal Code, and encompasses more serious aspects related to the misuse of fire.
- 7. Previous training about consequences of uncontrolled burning, importance and fire management techniques, allowed the consultant to learn from the community:
 - use of branches, in the absence of mufflers to put out fire;
 - consolidation of the 5 -meter width set for the acers that were established in the Project.
- 8. It is important to think about the sustainability of the current Project, special if we consider that the material used by the Project to train community members is conventional. Thus, other issues arise:
 - is material sufficient and accessible to apply the practices learned throughout the community?
 - how to encourage the community to continue the good practices of fire management?
 - what alternative to communities, since the production of charcoal- indirect causes of forest fires, aimed the livelihood of the local community?

Main notes of group discussion

- All districts of the Niassa province make communities sensitization of uncontrolled burning. However, only a few through NGO and Natural Resource Management Committees (NRMC) created by NGOs, used to adopt fire management practices such as opening of acers around machambas and homes.
- 2. The field SDAE staff and NGOs have promoted lectures and sustainable agricultural practices and contributing to the prevention of uncontrolled burning such as:
 - conservation agriculture- that advocates non-burning in the opening of machambas and grass –kick and culture remains;
 - opening of block machambas.
- 3. There are no fire management plans developed by the SDAE's of the Niassa province. For the case of Mecula district, the Niassa Special Reserve has made cold burnings for the natural pasture management and mitigating the effects of uncontrolled burning. For the other districts, routine sensitization activities are developed, within the scope of open governance carried out by the districts administrators.
- 4. Several actions are considered for the fire management in the Niassa districts:
 - training SDAE's and CGRN inspectors, and financing fire management equipment to response uncontrolled burning;
 - create specialized community inspectors in fire management and forest fire control;
 - systematic monitoring of burning focus;
 - zoning to define the type of land use;
 - create charcoal producers' association;
 - encourage through subsidies, for communities that best handle fire, as it is found in some forest plantations of exotic species;
 - for conservation areas, to offer sports hunting trophy meat to community.
- 5. Through sensitizations and practices of cold burning, for the case of Mecula, it was recorded:
 - reduction of migratory agriculture in some districts;
 - rehabilitation/construction of social infrastructure (water holes, school and casa mãeespera), as a result of compensation by forest companies, for the good management of fire within the companies' plantations;
 - increased fauna and decreased loss of material and human goods.
- 6. The main limitations faced to implement sensitization actions on uncontrolled burning stand out:
 - practice of migratory agriculture;
 - socio-cultural aspects;
 - generalized food insecurity;
 - lack of material and human means for surveillance and response to intervene in case of forest fire or fire posture.
- 7. To overcome the limitations and contribute to the sustainability of the Project, it is proposed:

- guarantee constant necessary equipment for fire management and control team;
- associate project activities with others that bring social and economic benefits to communities;
- to promote conservation agriculture practice and crop rotation to improve soil quality;
- ensure the effective engagement of communities;
- firm partnerships and promote environmental education and exchange experiences with model communities in fire management;
- design projects according to the local community context;
- to perspective fit the hunters into the forms of fire management and control.

SUMMARY OF THE TRAINING SEMINAR REPORT

a. Introductory note

Within the scope of the FLOMOZ Project (Sustainable Management of Forests in Mozambique and REDD+), on the 15th and 16th of November, a training seminar and dissemination of the results of activities carried out in the locality of Revia Comercial, in the district of Majune, in Niassa province. The event was attended at the highest level by the Director of Provincial Environmental Services (SPA) and a representative of Asia Air Survel Compay Limited and JICA. Also present were the Directors of the District Services for Economic Activities (SDAE) from 15 districts of Niassa province, representatives of the Revia Comercial community, the National Directorate of Forestry (DINAF), UEM and UniLúrio, according to the attendance list. in Annex 1.

b. Methodology

The dissemination seminar took place in the conference room of the Hotel Girassol Monte-Belo, in Lichinga, and the controlled burning demonstration training, in the community of Revia Comercial, district of Majune. The first day of activities was reserved for the dissemination of the results of the Project's implementation, chaired by representatives of Eduardo Mondlane and Lúrio Universities, and preceded by the presentation of two lectures by DINAF speakers (Annex 2). In the end, four groups were created, where seven fundamental issues were discussed about uncontrolled fires and measures for the sustainability of actions linked to the fight against uncontrolled fires and forest fires in Niassa province (see summary in Annex 3).

The second day was dedicated to training and demonstrating how to carry out controlled burning in the community of Revia Comercial – where the Project is being implemented.

c. Presentations of the results of the FLOMOZ Project

i. Aspects presented and discussed at the Seminar

Representatives of the National Directorate of Forests: Maps of hot spots and fires from October to November 2022 were presented at the which it was observed that Majune is the 4th district with the highest rate of fires at the level of Niassa province. Given the above, the main challenges for the perpetuation of forests, the practice of shifting agriculture, firewood collection, forest exploitation and burning stand out. These practices have threatened the survival of younger individuals. On the other hand, over-exploitation of the same classes of

woody species by loggers and charcoal producers has contributed to the deforestation and degradation of natural forests in Niassa province and the country in general.

Project Research Team: Project implementation teams emphasize bilateral knowledge when training communities about fires . After the Project's intervention, the community mobilized to fight the fire near the communities, as seen the week before the Seminar took place, when an uncontrolled fire broke out in part of the Revia community. Due to the success of the project, the process of creating a Community Firefighting Committee is in sight ; Results of the analyzes show that there was no significant difference in the density of individuals per hectare in the burned and unburned areas . However, the species diversity of adult individuals found in places with frequent fire do not reach adulthood. Thus , it is important to carry out controlled burning in order to reduce the load of woody combustible material and avoid catastrophic damage to biodiversity, economic and social assets .

Intervention by the Commercial Revia Community Leader: The community leader let it be known that the Project was well-received by the community and recognized that during the implementation of the Project, they learned a lot about fire and using it for the benefit of the community . Going forward, he emphasized coordination between community members and the technical team in the implementation of activities .

Interventions by participants: Recognizing the importance of the activities developed through the results presented, the guests present proposed that the Project be replicated in other districts. Uncontrolled fires are a concern in the Majune district, which is why strategies used by the community of Revia Comercial to fight fires and ensure the Project's sustainability should be explored. The use of alternative energies is proposed as a way to reduce one of the main causes of fires, as well as the pressure on native forests for charcoal production. Uncontrolled fires affect the ecosystem as a whole, which is why it is also important to understand the impact of fires on the ecological component.

Group discussions

The questions presented were discussed and the summary is presented, in the form of proposals for each question contained in the guiding questions guide (see answers in Annex 4).

d. Controlled burn training and demonstration aspects

The main aspects presented in the field were:

Presentation of activities: Brief presentation of the activities carried out in the field to the Administrator of the District of Majune and the other participants .

Demonstration of controlled burning: Before burning, the main atmospheric parameters were obtained (wind speed, temperature and relative humidity), which influence the behavior of the fire **.** The technical team and some members of the community explained that by opening firebreaks and carrying out cold burning, damage to forests is reduced, the amount of fuel is reduced and there is greater control of the process, because the combustible material is not completely dry. **.** Then, the community presented the equipment used in fighting the fire and

finally the burning was carried out by community members under the guidance of the technical team . However, the plot did not burn completely, because it had rained the day before and the combustible material was partially wet .

Explanation of the data collection process: The technical team, along with some members of the communities, conducted a forest inventory, in which height was measured, DBH greater than 5 cm, local names of tree and shrub plants were obtained adults. For regeneration, subplots were established, in which the number of individuals was identified and counted. In obtaining data on biomass, the pasture measuring disc was used, in which Grass height data were obtained in 100 points, 50 points and each diagonal of the 1ha plot.

Intervention of the participants: The main concern raised by the participants was related to the continuity of activities after the end of the Project . Subsequently, the community showed that it was capable of carrying out activities to prevent and combat fires . Finally, the participants proposed that the Revia Comercial community share the experience with other communities in the region.

Meeting with the community and fraternization: The Administrator of the District of Majune thanked the community for receiving the Project and exhorted it to continue, as the fires cause a lot of damage to the forests, as well as to the residential areas, resulting in the loss of houses, barns and human lives. The end of the visit was marked by a lunch prepared and served by the community of Revia Comercial.

The wording of the report:

technical team

別添資料25再委託先による報告書(第3期)





THE EARLY CONTROLLED BURNING AND COMMUNITY AWARENESS OF FOREST FIRE MANAGEMENT IN NIASSA

Under

THE PROJECT FOR SUSTAINABLE FOREST MANAGEMENT AND REDD+ IN MOZAMBIQUE

FINAL REPORT



THE JOINT VENTURE OF EDUARDO MONDLANE UNIVERSITY AND LURIO UNIVERSITY

Maputo, March 2024

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List of abbreviations

COGECO – Natural Resources Management Committee

- DBH Diameter at Breast Height
- DINAF National Directorate of Forests
- UEM-FAEF Eduardo Mondlane University Faculty of Agronomy and Forest Engineering
- UL-FCA Lurio University Faculty of Agricultural Science
- FLOMOZ the Project for Sustainable Forest Management and REDD+ in Mozambique
- JICA Japan International Cooperation Agency
- MICOA Ministry for Environmental Coordination
- MITADER Ministry of Land, Environment and Rural Development
- MODIS Moderate Resolution Imaging Spectroradiometer
- MRV Monitoring, Report and Verification
- MTA Ministry of Land and Environment
- NFMS National Forest Monitoring System
- NTFP Non-timber Forest Products

REDD+ - Reducing Emissions from Deforestation and forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries

- SDAE District Services for Economic Activities
- SFM Sustainable Forest Management
- SPA Provincial Services for Environment
- UEM Eduardo Mondlane University
- UL-University Lurio

Summary

Based on the principle that sustainable forest management can benefit from using fire as management tool through early controlled burning, this pilot activity designated "The Work" standing for "The Early Controlled Burning and Community Awareness of Forest Fire Management" under the Project for Sustainable Forest Management and REDD+ in Mozambique (referred to as "FLOMOZ") was performed in the period January-November 2023. The Work was based on the understanding of the importance of community-based fire management and development of the local and provincial forest management plan for local institution's capacity strengthening as well as community awareness to ensure forest use sustainability.

Under this work, forest fire management through early controlled burning and community awareness was conducted and assessed. The Work comprised three phases, namely i) the preparation phase, involving internal meetings as well as meetings held with local communities for discussions, training and necessary arrangements and agreements made on awareness raise about fire use prevention and control ii) the phase of forest fire management in the management area, starting with fire activity area definition, setting fire breaks, forest inventory, fuel load measurements and analysis, controlled burning and monitoring prior to late burning in 1 ha block at the end for comparisons with managed areas in all Districts except in Marrupa where two 2 ha plots were left for late burning; and iii) assessment of late fires incidence and effect on vegetation and eventually on fauna, seminar to be held for trainers (DINAF, SPA and SDAE staff), discussions and appraisal of sustainability of early controlled burning as a management tool. In the second and third phases, fuel load biomass measurements mainly from herbaceous and grasses composing the combustible material before and after burning were taken to assess burning efficacy, coverage and GHG emissions in 16 ha of managed areas per site in the three selected Districts. The data was also used to compare variables measured in the areas inventoried before and after cold burning, as well as in the 1ha blocks subjected to late burning. Training to communities in the selected District areas as well as surrounding communities was carried out in which topics on mapping local resources vulnerable to uncontrolled fires, uncontrolled fire risk, drivers of uncontrolled fires, techniques for controlled burning, equipments and uncontrolled fire suppression methods were discussed, and finally, the controlled effects on fuel load on the management blocks and its relevance as a management tool for the availability of consumable plant materials.

In addition, a manual on fire management was developed in order to strengthen technical staff in the forest and environment sectors, communities and any relevant stakeholder understanding about fires and to boost good practices on integrated fire management dissemination. Three videos were developed by a company selected among three companies that entered the competition. The videos emphasized training of trainers for early burning and community awareness of fire management in Portuguese, a video targeting local people on early controlled burning and community awareness of forest fire management with versions in Makua and Portuguese and the third video aiming for publicity of the pilot activity to the other country government and the donor in English and Portuguese versions. A symposium on strategies design to mitigate the impacts of fire on climate change was organized by the Provincial Service for the Environment and the Japan International Cooperation Agency. A seminar, held at the end of the project implementation in Lichinga, was attended by 74 participants from the relevant stakeholders and local communities' representatives.

The results of the analysis of grass biomass unequivocally demonstrated the importance of early controlled burn. The controlled burning practice demonstrated a considerable reduction in combustible material in the three regions where the project was implemented. The Pahua community in the Maua district had the highest carbon emission (0.68 ton/ha), while the Luambala community in the Majune district had the lowest (0.45 ton/ha).

Inventory access shows that Marrupa district presented the highest species richness (s=65) and abundance of regeneration trees (n=1125), followed by Majune (s=63), and Marrupa (s=56), of the species identified so far. However, Maua (n=714) had a higher abundance of regeneration trees than Majune (n=575). Was found that the species *Brachystegiaboemii*, *B. spiciformis*and*Syzygiumchordatum* were the most important with IVI of 11.50%, 11.40% and 15.19% for the districts of Majune, Marrupa and Maua, respectively. In general, the species *Brachystegiasp., Burkeaafricana, Jubernadiagloiflora*and*Uapacakirkina* are the common representative species in the three districts inventoried. Regarding carbon estimates, the Pahua community was leading in biomass and carbon accumulation followed by Manhula.

We realized that the three communities have low to moderate fire frequency, but the richness and abundance of species shows variations among them. Maybe the presence of operators in these places are contributing to reducing the fires and the difference in the trees structure and compositions resulting from different levels of forest exploitation. Despite fires occurring in the region, the diameter distribution appears that there is a large stock of smaller trees in DAP that could replace larger trees that will be exploited for wood production, for example. Although there are other factors that may endanger the succession of the forests in the districts of Majune, Marrupa and Pahua.

TEAM COMPOSITION

Contractor: The Joint Venture of Eduardo Mondlane University and Lurio University through the Faculty of Agronomy and Forest Engineering - CEAGRE of the Eduardo Mondlane University and the Faculty of Agricultural Sciences of Lurio University (hereinafter referred to as "the JV"), team composition in appendix 16.

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1. INTRODUCTION

Approximately 38 million hectares of Mozambique land, which corresponds to 48% of total land, is covered by forests. However, a 0.79% deforestation rate has been reported, equivalent to 220,000 hectares of forest area loss every year (MITADER, 2018). Deforestation main drivers include shifting cultivation which often requires opening new agricultural fields, illegal logging, charcoal production and mining. Meanwhile, affected communities depend on forest resources for their livelihoods, by using timber and non-timber forest products.

Miombo woodlands comprise the main forest ecosystem in the Niassa Province, which also represents the largest forest ecosystem in Southern Africa. Miombo woodlands have social, ecological and economical roles. This feature represents opportunities for biodiversity promotion as well as improvement of surrounding communities' welfare.

Due to its role in society, pressure on natural resources has increased in recent years since unsustainable resource use and inappropriate management practices have been used.

Being home to the Niassa Special Reserve, Niassa has gained attention for research on fire management and related studies have been conducted involving researchers from Eduardo Mondlane University and Lurio University through FAEF and FCA, respectively. For this reason, these institutions formally established a partnership and a Memorandum of Understanding which envisages research, training and consultancy work.

Early controlled burning with integration of community participation and local authorities forest management plans was identified as a useful strategy for sustainable miombo management, in particular to Niassa Province. The miombo ecosystem evolved with fires and these comprise a common event in these forest ecosystems, with beneficial ecological impacts. However, fires may represent adverse effects particularly when these happen during dry season when the combustible material loses humidity content.

FAO (2006) observed that more than 90% of uncontrolled fires in the tropics result from human activities, which may result in deforestation and forest degradation.

Cangela et al (2017) reported that Niassa Province shows considerable fire frequency, Ribeiro et al (2019, 2021) demonstrated that in parts of Niassa Special Reserve, fire regime patterns and severity appear to be affected by fire frequency and intensity.

As a way to overcome the harmful effects of burning at inappropriate times, early controlled burning, known to be one of the most effective strategies to reduce the negative impacts of uncontrolled forest fires while achieving better results when local communities are involved, will be implemented. Participation of local communities is fundamental, and ensures that local knowledge and good practices are brought onboard, essential for forest management sustainability.

The project "Early Controlled Burning and Community Awareness for Forest Fire Management within the scope of the Sustainable Forest Management and REDD+ Project in Mozambique" has been implemented since May 2022, having started with the pilot project in the community of Revia Comercial, district of Majune, which culminated in the dissemination of project activities in November 2022.

In the current year, activities were developed in three districts selected on the basis of the presence of a safari or forestry operator to ensure continuous support and participation in sustainable resources utilization, namely: Majune, Marrupa and Maua, apart from Sanga where partial activities were set to be implemented.

1.1. The Work objectives, purpose, goals and outputs

As described in the ToR's, the overall goals of FLOMOZ are:

- i) Sustainable Forest management and REDD+ promoted through the operationalization of the National Forest Monitoring System in Mozambique, and
- ii) Sustainable forest management including through REDD+ in Niassa.

The Project purpose comprises strengthening of MTA and Niassa Province capacity for implementing sustainable forest management and REDD+ envisaging the following outputs:

- Information gathering to contribute to National Forest Monitoring System operationalization (NFMS) (M&MRV) for REDD+ and sustainable forest management (SFM)
- 2. Promotion of provincial planning process for sustainable forest management including REDD+ and its implementation.

1.2. The early controlled burning and community awareness of forest fire management ("The Work")

The early controlled burning and community awareness of forest fire management (referred as "The Work" comprises the field implementation of pilot activity based on Output 2 of the above mentioned project, namely:

To test and adjust the methodology carried out in 2022 in the Majune District, Revia Comercial Community during seven-month period, from May to November.

The Work bases its activity on the principle that in subsistence agriculture by small-scale farmers, fire is extensively used as a management tool to open new agricultural fields, leading to deforestation. Consequently, early controlled burning represents an alternative to reach farmers goals. Early controlled burning, conducted before the dry season peak, prevents accumulation of fuel load represented by combustible materials from grasses and dead wood on forest ground. High amounts of fuel load increase the danger of forest fires due to the development of intense and destructive fires in the event of wildfires, keeping, then, manageable and healthy forests. In Niassa, wildfires are frequent and difficult to fight due to socio-cultural aspects and low readiness. Change in attitude by increased awareness, people sensitization is key to sustainable use of forest resources and still ensure that community goals are attained.

THE WORK TARGET AREA

The four selected Districts for forest fire management activity through early controlled burning, local community awareness and community members selected were Marrupa, Maua, Majune and Sanga.

The selection of districts was based on:

In the presence of a safari or forestry operator to ensure ongoing support and participation in the sustainable use of resources; and frequency of fires at district level.

The Work pursues the following goals:

- Get to know the communities, their forestry and fire management practices and share good practices among them;
- Monitor activities to assess the impact of fire severity on communities;
- Understand and collect evidence of the delayed impact of wildfires on unmanaged areas;
- Train forestry operators who operate around the target community, as well as communities in the 4 previously selected districts;
- To understand and explain the importance of reducing the combustible material amount involving the communities;
- To aggregate value to local communities knowledge by improving their understanding on fires, preventing and fighting uncontrolled fires;
- To evaluate the effectiveness of the early controlled burning and community awareness of forest fire management to consider extension in other forest areas;
- To estimate the GHG emissions from uncontrolled fire and uncontrolled fire behavior in the communities.

2. PLAN AND RESULTS OF THE WORK SCHEDULE

For these activities, each community had different activities to be performed (table 1). The phases and The Work activities are shown in table 2, Performed activities and associated results during the course of the Work are confronted with the planned activities and schedule in the same table 1. All planned activities were implemented. Schedule of some activities, namely early controlled burning, and had to be adjusted due to environmental and meteorological conditions.

Table 1. The target communities per activity in selected Districts based on the changed/added

 contents to the activities

District	Full Scale activity	Monitoring and	Training for safari	Community awareness
		follow up activity	staff company and	for the other
			community	communities surrounding
			awareness to local	the target community of
			people	full scale activity
Sanga	-	-	the Lipillich wildness	the Maumbica 1, 2 and
				Lilumba communities
Majune	Luambala	ReviaComercial	William Prado	Micoco, Xipwipwi, and
				Luambala
Marrupa	Manhula	-	Hippo Safari (Forest	Iaranca, Mucuvango, and
			Concession)	Manhula
Maua	Pahua	-	-	Muloloua, Nikweniha, and
				Pahua

The full scale activity involved concession operators in Marrupa, Maua and Majune Districts.

Table 2. Phase and activity of The Work (Early controlled burning and community awareness of forest fire management) schedule and implementation results

		Plan/	Chronogram (2023)						Results of		
Phase	Activity	Activity	Imp.	New communities in Marrupa, Maua and Majune Districts	ReviaComercial in Majune District	Sanga District	Other surrounding communities in Marrupa, Maua and Majune Districts	Results	Indicators	Planned and Execution Dates	- execution
1. Preparati on	1.1 Definition of the forest areas to be managed	Plan	\checkmark				Reduced the impacts of fire on vegetation and fauna in the surrounding forest Improve and utilize community knowledge to prevent and fight uncontrolled forest fires	16 hectares of forest subjected to early controlled burning Lecture and group discussions	March-May 2023	16 hectares subjected to controlled burning defined May report	
		Imp.	UEM and UL, FLOMOZ, SPA, SDAE, Local leaders, community.						May report	Report submitted in August	
		Plan	\checkmark	\checkmark					May 2023		
	1.2 Meetings with the communities/arrange ments and agreements	Imp.		UEM and UL, FLOMOZ, SPA, SDAE, Majune Local leaders, community and others.					June report	Reported submitted in June	
Plan/ Chronogram (2023)						Results of					
--	--	------	--	--------------------------------------	----------------------------------	--	--	--	--------------------------------------	---	
Phase	Activity	mp.	New communities in Marrupa, Maua and Majune Districts	ReviaComercial in Majune District	Sanga District	Other surrounding communities in Marrupa, Maua and Majune Districts	Results	Indicators	Planned and Execution Dates	execution	
	1.3 Community awareness in prevention and fight of forest fires	Plan	\checkmark		\checkmark	\checkmark	Create and maintain technical and local capacities in the community, mainly to the management communities for the good management of forest fires	Capacity building/field training for community members and other key members	May- October 2023		
		Imp.	UEM and UL, community members		UL, community members	UEM and UL, community members			May- October 2023	Report submitted in July and October	
	1.4 Selection of the	Plan	\checkmark						May report		
	work force in the community Training	Imp.	UEM, UL, community members						May 2023	Report submitted in July	
			\checkmark	\checkmark	\checkmark				May 2023		
	1.5 Training for community members		UEM, UL, Community members	UEM, UL, Community members	UEM, UL, Community members				June report	May & June Report	
		Plan	\checkmark						June 2023		
2. Forest fire manage ment itself within the	2.1 Opening firebreaks	Imp.	UEM, UL, Community members						June	Report submitted in June	
	2.2 Analysis of	Plan	\checkmark						July 2023		
	combustible material including a reconnaissance	Imp.	UEM, UL, Community members						July- September 2023	Report submitted in October	
rorest	2.3 Analysis of meteorological	Plan							July-August 2023		

	Plan/ Line Chronogram (2023)							Results of		
Phase	Activity	Imp.	New communities in Marrupa, Maua and Majune Districts	ReviaComercial in Majune District	Sanga District	Other surrounding communities in Marrupa, Maua and Majune Districts	Results	Indicators	Planned and Execution Dates	execution
	variables (relative humidity, temperature and wind speed)	Imp.	Activity: Data analyses and report by UEM and UL						July-August 2023	Report submitted in through The Work period
		Plan	\checkmark						July-August 2023	
	2.4 Early Controlled burning	Imp.	Protocol and report: UL and UEM Participants: UEM, UL						Performed from 26-30 September. September report	Report submitted in September
	2.5 Monitoring the activity with the staffs from SPA and SDAE of target Districts	Plan	\checkmark						July- October 2023	
		Imp.	SPA, SDAE, UL Participants: SPA, SDAE, UL						July- October 2023	Reports submitted throughout The Work period
	2.6 Late burning	Plan	\checkmark						October 2023	
	(One block for comparison purposes)	Imp.	SPA, SDAE, UL, UEM, communities						October 2023	Report submission in October
3. Overall activity, Evaluati on and dissemin ation	3.1 Monitoring the evolution of late fires and the effect fire on	Plan	\checkmark	\checkmark					May- October 2023	
	vegetation. The biomass of the fuel material and carbon emissions for the two target areas estimated	Imp.	UEM, UL	UEM, UL					May- October	Report every month

		Plan/ Imp			0	Chronogram (2023)			_	Results of execution
Phase	Activity	mp.	New communities in Marrupa, Maua and Majune Districts	ReviaComercial in Majune District	Sanga District	Other surrounding communities in Marrupa, Maua and Majune Districts	Results	Indicators	Planned and Execution Dates	
	3.2 Seminar for trainers (DINAF, SPA and SDAE staffs, etc.)	Plan	V	\checkmark			Evaluate the effectiveness of the activities and plan extension strategy development of the manual for early controlled fire dissemination	Seminar for trainers (DINAF, SPA and SDAE staffs) Symposium in Niassa Manual for the dissemination of the early controlled fire activity (English and Portuguese versions)	October 2023	October 2023
		Imp.	DINAF, SPA, SDAE, UEM, UL	DINAF, SPA, SDAE, UEM, UL					October 2023	
		Plan	\checkmark	\checkmark					March-April 2023	
	3.3 Organization of the symposium in Niassa with SPA	Imp.	DINAF, SPA, SDAE, UEM, UL,	DINAF, SPA, SDAE, UEM, UL					Held on April 3rd.	January, February, March reports (Appendix 1, 2 & 3) and Symposium (Appendix 4) Reports
	3.4 Orientation for sustainability of the early controlled burning and		V	٨					Planned for June- November 2023	77100010

		Plan/		Chronogram (2023)						Results of
Phase	Activity	Imp.	New communities in Marrupa, Maua and Majune Districts	ReviaComercial in Majune District	Sanga District	Other surrounding communities in Marrupa, Maua and Majune Districts	Results	Indicators	Planned and Execution Dates	execution
	development of the manual for early controlled fire dissemination								Executed in June- November 2023	Deliverable submitted in October 2023
			\checkmark						Planned for June- November 2023	
	3.5 Development of video materials								Executed in June- November 2023	Final deliverables to be submitted in November 2023

All activities were performed although the dates had to be adjusted due to administrative slow processes at times, in particular the early controlled burning due to meteorological conditions.

3. METHODOLOGY, RESULTS AND DISCUSSION

PHASE I: PREPARATION OF THE WORK

3.1. Preparation Methods

The approach used throughout the activities regarding gender followed JICA terms and conditions guidelines. During the implementation of the activities, some concession operators were involved in the communities targeted by the activity, with the operators of Majune and Sanga standing out. For fire burning activity, sites and forests that did not burn in the past years were selected.

3.1.1 Definition of the forest area to be managed

The forest area subjected to early controlled burning was established by the project team from UEM and Lurio, FLOMOZ, and teams as well as surrounding community members, a total of 10 people were present in this process in each community: in Majune was carried out between the 15th and 16th of May; in Marrupa between the 17th and 19th of May and Maua between the 19th and 22th of May (table 3).

Based on the methodology proposed in the fire manual of Ribeiro and Darabant (2021). The area for the burning activity was planned to be 16 ha in size, limited by 5 meters wide firebreaks to isolate it from the remaining forest and communities (figure 1). Early controlled burning was applied to 15 ha per site. Fix observation points were marked for monitoring purposes. A plot sized 1ha per site not subjected to early controlled burning was used for demonstration of late forest fire conduction in full scale activity except in Marrupa where the area was 3 ha.

Date Venue Participants		Participants	Observation	
May	15-	Majune	FLOMOZ (Luis, Stela and Sato)	Maintained contact with the local community,
16^{th}			Lurio (Alfredo Duvane and Filipe	and it was through consensus with the
			Canção)	community that the best area for opening a
			UEM (Jone Fernando)	firebreak was identified.
			Members of communits	
May	17-	Marrupa	FLOMOZ (Luis, Stela and Sato)	Maintained contact with the local community,
19 th			Lurio (Alfredo Duvane and Filipe	and it was through consensus with the
			Canção)	community that the best area for opening a
			UEM (Jone Fernando)	firebreak was identified.
			Members of communits	
				However, due to the high rate of
				decommissioning to open areas for
				machamba, 2 areas were allocated for

Table 3. Outline of definition of the forest area to be managed

			opening firebreaks, totaling 16ha.		
May 20-	Maua	FLOMOZ (Luis, Stela and Sato)	Maintained contact with the local community,		
22		Lurio (Alfredo Duvane and Filipe	and it was through consensus with the		
		Canção)	community that the best area for opening a		
		UEM (Jone Fernando)	firebreak was identified.		
		Members of communits			





Figure 1. Forest management area for each community: a) Revia comercial; b) Luambala; c) Pahua; d) Manhula and e) Sanga.

3.1.2 Meetings with the Communities / Arrangements and Agreements

a) Methodology

Before the implementation of field activities, the entire controlled burning program will be presented to community members, mainly local leaders and the natural resources management committee, with the presence of government authorities. The presentation will focus on the program's objectives, purpose and scope of implementation so that communities are familiarized and a commitment to its implementation is established.

b) **Results and discussions**

In the month of June, activities related to phase 1- Preparation (meetings with the communities/arrangements and agreements; community awareness in prevention and fight of forest fires; selection of the workforce in the community training; training for community members) and phase 2 - Forest fire management itself within the Forest (opening firebreaks).

The launch of the project "The Early Controlled Burning and Community Awareness of Fire Management in Niassa under-The Project for Sustainable Forest Management and Redd+ in Mozambique" performed in the period 15-25 June, Figure 2.



Figure 2. Ceremony lunching at Manhula community, Marrupa district

On June 15th this year, the launch ceremony took place in the District of Marrupa - Manhula and around 60 participants took part in this event, where 26 participants were representatives

of the government of the 3 districts and technical staff from UEM and Lurio; around 20 participants were community leaders and the rest were members of community in general.

The launch ceremony was attended by the Honorable Director of the Provincial Service for the Environment (SPA), the Honorable Provincial Director of Territorial Development and Environment (DPDTA), the Honorable Administrators of the three aforementioned districts and the Honorable Directors of the District Services for Economic Activities (SDAE) and District Services for Planning and Infrastructures (SDPIs), local community leaders, representatives of FLOMOZ, two representatives of the team of consultants from Eduardo Mondlane University, seven representatives from the side from Lurio University and members of the local community.

3.1.3 Community Awareness in Prevention and Fight of Forest Fires

a) Methodology

The activity consisted of community learning processes including environmental education aiming at preventing indiscriminate use of fire to open new cropping fields as well as for hunting and other activities in forests and promoting alternative practices to achieve similar goods and income generation activities. National legislation was disseminated and impacts of uncontrolled fires presented and discussed including actions to control and fight wildfires. Socio-cultural community characteristics were taken into consideration such as community priorities, mother tongue, and literacy among others. In addition, pamphlets and posters were used as additional communicating and message dissemination tools. Community awareness was based on FAO (2006) which describes fire management code strategies for public awareness regarding fire prevention.

The activity was performed in every full scale activity area, namely in the Districts of Marrupa, Maua and Majune. In order to improve interaction, participants were divided into four and/or three heterogeneous groups, with the aim of allowing high participation and interactivity in the topics under discussion, as shown in figure 3. The consultants guided the group discussions, proposing relevant questions for reflection on: i) the impact of uncontrolled fires; ii) fire management and uncontrolled burning; iii) types of forest fires; iv) technical aspects of fire management, among others. At the end of the group discussions, all participants met again to consolidate the theme of the day.



Figure 3. Program training session: Luambala community (a); Pahua community (b).

In order to consolidate the thematic contents covered in the first two days (table 4), the participants were involved in the opening firebreaks activities close to each community, as part of practical class. The exercise allowed visualizing the nature of the firebreaks that would be opened in the study area by the members of the local community involved in the activity. It was highlighted that the definition of the size of the firebreak depends on the height of the combustible material present in the area.

Title	Contents
Forest fires and	Forest fires and controlled burns: types of forest fires and their causes, combustible
controlled burns:	material (characterization – size, coverage, condition and arrangement),
	atmospheric conditions/fire danger indices.
Fire management:	Fire management: fire management techniques fires, assessment of combustible
	material, material and equipment necessary for carrying out controlled fires.
Assessment of the	Assessment of the impact of fires: effects of uncontrolled fires on flora, fauna soil,
impact of fires:	ecosystem and social services. There was also talk about the importance of forests for the community.
	Demarcation, subdivision of the study area and opening of firebreaks

 Table 4. Consolidate the thematic contents

b) Results

The training debate sessions, figure 5, prioritized aspects related to the types and causes of forest fires, combustible material (characterization – size, coverage, state and arrangement), atmospheric conditions and fire danger indices, effects of uncontrolled burning on flora, fauna soil, ecosystem and social services and equipment needed to carry out controlled burns.

During the training sessions, an attendance list was circulated daily as a way of ensuring the reliability of the work performed. Table 4 below shows the relationship between the number of participants per day and per district.

District	Topic covered	Date	Number of
			participants
Majune	Forest fires and controlled burns:	16/06/2023	39
	Fire management:	17/06/2023	48
	Assessment of the impact of fires:	18/06/2023	47
Marrupa	Forest fires and controlled burns:	16/06/2023	49
	Fire management:	17/06/2023	49
	Assessment of the impact of fires:	18/06/2023	49
Maua	Forest fires and controlled burns:	23/06/2023	55
	Fire management:	24/06/2023	50
	Assessment of the impact of fires:	25/06/2023	50

Table 5. Number of participants per day and per district.

The main points found during the discussions are presented in Table 6:

Community	Introduction to fire	Fire management	Fire-related effect assessment
Luambala –	The main causes of wildfires are:	The main causes of wildfires are:	Impacts of uncontrolled fires considered
Majune	i) Children;	i) Children;	negative for the community:
	ii) Hunting;	ii) Hunting;	i) It impoverishes the soil, as it eliminates the
	iii) Cleaning of machambas;	iii) Cleaning of machambas;	organic matter and animals that live there;
	iv) Beekeepers; and	iv) Beekeepers; and	ii) It causes forest fires and the death of trees in
	v) Fishermen.	v) Fishermen.	general, in addition to the destruction of trees
	The high abundance of avifauna has	The high abundance of avifauna has	considered sacred to their cultural rites;
	conditioned the occurrence of fire points	conditioned the occurrence of fire points	iii) Pollution of river waters with ash;
	during fires in the region.	during fires in the region.	iv) Death of large and small animals, as not all
			manage to escape and those that manage to end
			up invading homes, contributing to the Man-
			Wildlife conflict;
			v) Destruction of houses, destruction of property
			and loss of human life;
			vi) Loss of agricultural products, loss of wood
			and decrease in the flow of tourists as they no
			longer have vegetation or animals.
			Positive effects of fire:
			i) It helps to regenerate some tree seeds in the
			forest; Helps rejuvenate grass for pasture;
			ii) Prevents forest fires through cold burning; It
			allows food to be cooked and bodies warmed up,
			so "we simply need to know how to use it".

Table 6. Summary of findings taken in group and joint debates in each of the communities visited

Community	Introduction to fire	Fire management	Fire-related effect assessment
Manhula –	The main causes of wildfires are:	Fire management techniques used by	Negative effects caused by uncontrolled
Marrupa	i) Hunting;	communities:	burning:
-	ii) Cleaning of machambas:	i) Cleaning around the machamba and	i) Forest fires affect the supply of wood for
	iii) Beekeeping;	dwellings, before carrying out the burning	different purposes;
	iv) Cigarette consumption.	in the intended location;	ii) They drive animals away from the
	Canopy and surface fires are most	ii) In the case of fires that occur in forests	community and also kill those that cannot
	common.	and fields, water, sand and tree branches	escape the flames;
		are used to extinguish them.	iii) Increase soil susceptibility to erosion;
		Main limitation in fire control is tall grass.	iv) Underground fires eliminate microfauna,
			reducing nutrient cycling capacity and soil
			aeration;
			v) Decreased precipitation; they contribute to the
			silting up of rivers and consequently influence
			cyclical floods;
			vi) Loss and abandonment of residences,
			burning of material goods (motorbikes,
			furniture, clothing, among others), and loss of
			human life.
			Fire is important because:
			1) Help to open machambas,
			11) Regenerates the pasture for the animals;
			111) Scares away dangerous animals;
			iv) Forest clearing; and
			v) Facilitates the search for firewood.
			The turing and ded the importance of first in
			The trainers added the importance of fire in
			breaking the dormancy of some important forest
			species for the community.

Community	Introduction to fire	Fire management	Fire-related effect assessment
Pahua –	Community members stated that fires are	Community members stated that fires are	Benefits of Fire:
Maua	frequent in that area and that the main	frequent in that area and that the main	i) Aid in the regeneration of pasture grass;
	causes are:	causes are:	ii) Cleaning of machambas; and
	i) Cleaning of areas for opening	i) Cleaning of areas for opening	iii) Chase away dangerous animals.
	machambas; Hunting;	machambas; Hunting;	In this community, it was emphasized that fire
	ii) Smokers (butts); and	ii) Smokers (butts); and	can also be used to break the dormancy of some
	iii) Honey harvest.	iii) Honey harvest.	seeds of important forest species for the
	Regarding the types of fires, surface and	Regarding the types of fires, surface and	community.
	canopy fires are the most frequent.	canopy fires are the most frequent.	
			Negative effects of fire:
			Community members present highlighted that
			fire destroys forests and fauna, causes erosion,
			destroys homes and property, in some cases
			even causing death.
Lilumba -	Community members stated that fires are	To prevent fires from occurring, they	Benefits of fire:
Sanga	frequent in that area and that the main	choose to:	i) Help in the regeneration of grass for pasture;
	causes are:	i) Clean the area around their homes;	ii) Manufacture of clay pots;
	i) Cleaning areas for opening machambas;	ii) When they go to clean the fields, they	iii) Coal production;
	Hunting;	first remove the grass from the surrounding	iv) Burning of blocks to make bricks;
	ii) Smokers; It is	area and then set the fire.	v) Banana ripening;
	iii) Honey harvesting.	In case of fires, they use bush branches to	vi) Cleaning of farms; It is
	Regarding the types of fires, surface and	put them out.	vii) Chase away dangerous animals.
	canopy fires are the most frequent.		Negative effects of fire:
			Community members present highlighted that
			fire destroys forests and fauna, causes erosion,
			destroys homes and property, in some cases
			causing deaths.

Both communities recognized that from the forest it's important to obtain wild fruits; construction material (stakes and rope); wood for the production of various goods furniture and tools (chairs, tables, hoe handles and pestles); combustible material (firewood and charcoal); foods such as honey and other non-timber forest products.

According to the debates in both communities, fire detection and gathering the most possible information about detected uncontrolled fires are crucial for an assertive communication to the Fire Management Committee. This, in turn, has the responsibility for members mobilization, moving to the uncontrolled fire occurring site, comprising, thus, the six steps in uncontrolled burning suppression.

Participatory mapping

a) Methodology

This activity was done with all community members (about 50 persons in each community) after the forest fire management awareness and before opening of fire break. The members of the community would say how their settlement was defined and the activities carried out (agriculture, fishing, hunting, charcoal production, beekeeping, cutting stakes for construction, logging), location of rivers and mountains, and where the forest fires are common. Then, a map was obtained according to the description given by the community members present.

b) Results

The mapping results from Luambala, for example, showed that fires occur in two regions, at north and south (Figure 4). However, the frequent fires used to come from south, thus, the block experiment was conclusively established at south, where the JV, SPAE, FLOMOZ and SDAE defined before.



Figure 4. Resume of participatory mapping of the Luambala community (a); Pahua community (b) and Manhula community.

The training activities were carried out in 2 phases: June (training target communities, details above) and October (training members of the management committee, surrounding communities and operators).

In the months of September and October between the 30th of September and the 14th of October, activities related to phase 2 were carried out: training of surrounding communities in Marrupa, Majune, Maua and Sanga (figure 5). The strategy applied for the training was the same, however, it included the presence of communities around the target community. Table

7 below shows the number of participants for each community. The activities lasted 2 days in Majune, Marrupa and Maua; however, in Sanga it lasted 3 days.

Day	District	Communities	Number of participants	Presence of Operator
11/10 - 14/10	Sanga	Maumbica 1, Maumbica 2, and Lilumba and members of COGECO (Community Management Committee)	50 / 50 / 50	
08/10 - 10/10	Majune	Micoco, Xipwipwi, and Luambala	30 / 25	No
05/10 - 07/10	Marrupa	Iaranca, Mucuvango, and Manhula	35 / 33	Hippo Safari (Forest Concession) was represented by Workers
01/10 - 04/10	Maua	Muloloua, Nikweniha, and Pahua	39 / 40	No

Table 7. Number of participants of training surrounding community	ities
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Figure 5. Group discussion session: Luambala community (a); Manhula community (b), Pahua community (c) and Maumbica (d)

3.1.4 Selection of the workforce in the community

The workforce in the community was selected by community leaders. The selection consisted of 12 members in total, where:

- They must be members who were involved in the community awareness in preventing and fighting forest fires;
- There must be at least one member representing each family (we consider people with the same surname to be family);
- The local governor must be one of the members, and
- The group must include at least 3 women.

3.1.5 Training for community members

a) Methodology

The training was aimed at members who were directly involved in controlled burning, that is, the 12 members chosen by the leaders, who in turn form the fire management committee.

The training was based on content on the use of personal protective equipment, techniques for carrying out controlled burning, methods of fighting and monitoring the fire during burning.

Two teams, A and B, worked on the training. This was done to increase the flexibility of training work. In the communities of Manhula and Luambala the training was carried out on June 19th; and in the Pahua community on June 26th.

b) Results

The members of the fire management committee were presented with the materials and equipment used to fight the fire, from the mask, gloves, helmet, glasses, muffler, hoe, etc.

It was also clarified how each of these instruments should be used and in what situation, based on the information explained in the manual.

Mention was made of the precautions that must be taken in the event of a fire in communities, how to proceed with reporting the fire in order to ensure that the community remains calm and safe.

Table 8 shows the overall presence of operator in the pilot activity.

Table 8. The presence of the operator in the pilot activity

District Training of the target Establish the Early Training for
--

	Community	firebreak	controlled	surrounding
			burning	communities
Sanga	Safari operator (Lipilichi Wildlife) represented by workers and committee Members	Not applied	Not applied	Safari operator (Lipilichi Wildlife) represented by workers and committee Members
Majune	Hippo Safari (Hunting Concession) was represented by Workers	No	No	No
Marrupa	No	No	No	No
Maua	No	No	No	No

PHASE II: FOREST FIRE MANAGEMENT

3.2. Forest Fire Management

3.2.1 Opening firebreaks with definition of the forest area to be managed

a) Methodology

The determination of the location for the establishment of the management blocks was carried out by the Joint Venture (JV) and provincial environmental services (SPA), using GIS techniques, by identifying areas with high occurrence of fire and with presence of Safari or Forest operator. Also, a consultation was carried out with the leaders of the locality to better understand the behavior of fire in the region. Finally, a participatory mapping approach was used.

b) Results

This activity was carried out by the work team selected from the community, after the fire prevention and fighting matters awareness. Twelve members of each community (training participants) representatives of different families were involved; in order to carry out the activity and reconcile the theoretical aspects they received during the training.

The JV monitored the firebreak clearing and demarcation process from the beginning, in order to ensure that it was being executed in accordance with the recommendations and in accordance with what was established in the geographic information systems.

The plots were fixed in previously defined blocks with 5m firebreaks in Luambala, and Pahua and 10m in Manhula, because the grass height in Manhula was high. For each location, blocks of 16 ha, 10 ha and 8 ha were previously established in the communities of Luambala,

Manhula and Pahua, respectively. But more blocks were established in Manhula and Pahua to achieve 16ha in each community (Figure 6). The opening of firebreaks was carried out based on the mapping produced by the JV, where all the paths that the firebreaks should pass were demarcated block-by-block. Duly uniformed and strictly complying with the aspects of safety and hygiene at work, the members of the community were assigned 100 m x 5 m each, as a work target, and another portion of work were given for who, after inspection by the JV, showed to have successfully completed the previous task.





Marrupa Block Management





Figure 6. Firebreaks and blocks managed in Majune (a), Marrupa (b, c) and Maua (d) community.

Management areas resume per district and community are presented in Table 8 and figure 6. In all communities were remained 1ha area for late burn and the main area for early burn. Table 8. Demarcated areas process and open firebreaks in each of the communities.

Communities	Implementation
Luambala - Majune	An area of 16 hectares was demarcated, divided into 4 blocks of 4 ha each, with two central firebreaks 5m wide in the shape of a cross and a side firebreak that surrounds the 16ha area. Finally, an area of 1 ha was demarcated in the Southwest
Manhula–Marrupa	Two areas were demarcated: 1st Area of 2 ha with the internal and external firebreaks of 10m wide. This is characterized by having greater coverage of the grass component, unlike the other area which has dominance of tree species. 2nd area of 14ha, and according to the characteristics of the vegetation, the open firebreaks were 5 m wide.
Pahua - Maua	An area of 16ha was demarcated In this community, given the characteristics of the local vegetation, both external and internal firebreaks were 5m wide.



A. Before opening firebreaks



B. Opening firebreaks



C. After opening firebreaks

Figure 7 Opening firebreaks in Luambala community

3.2.2 The confirmation of combustible material including a reconnaissance

Before carrying out controlled fires in the sample blocks, analyzes of the combustible material were carried out, regarding height, connectivity, state of the material (green or dry), density, and etc. This information was collected by observing the availability of the material in question. The table 9 below illustrates the data obtained during the observation.

Table 9.	Resume	of	meteorological	variables	measurement	before	early	burn	in	the	three
district											

		Parameters Combustible Material					
Districts- communities	Date of survey	Wind speed (m/s)	Temp. (°C)	Type /Category	Continuity	Distribution	Date of implementation
Majune - Luambala	26/09	6	29.2	Semi- dangerous	Continuous	Horizontal	26/09
Marrupa - Manhula	27/09	8	29.5	Semi- dangerous	Continuous	Horizontal	27/09
Maua - Pahua	28/09	6	29.8	Semi- dangerous	Continuous	Horizontal	28/09 - 29/09

The analysis of combustible material, including reconnaissance, was carried out using as a basis the observation of the grass (combustible material), regarding the continuity of the material, the horizontal arrangement, among other aspects.

Due to the non-connectivity of the combustible material, it was possible to verify some plots where there were practically many unburned spots, despite the continuity of the combustible material in terms of arrangement and horizontal in terms of distribution and continuity of combustible material.

3.2.3 Analysis of meteorological variables

Before carrying out the controlled fires in the sampling blocks, analyses of meteorological variables (relative humidity, temperature and wind speed) were carried out. Meteorological data were measured in order to predict fire behavior and decide on the feasibility or not of carrying out the burning. This measurement was carried out with an anemometer (kestrel), where variables such as relative humidity (%), maximum temperature (°C) and wind speed (m/s) were measured to verify compliance according to Table 10, in order to predict fire behavior.

Fire behavior	Wind speed (m/s)	Temperature (°C)	Air humidity (%)
Soft	0-11	<18-28	>70
Moderate	11-15	29-31	50-70
Severe	>14	>31	<50

Table 10. Categorization of the weather status and consequences on fire behavior

3.2.4 Forest inventory, biomass and tree carbon estimation

(1) Methodology Sampling

The forest inventory was carried out shortly afterwards, between 07/25 and 08/12/2023 in the 3 districts (Majune, Marrupa and Maua).

The methodology used to carry out the inventory was adapted from the Manual for the Installation and Monitoring of Permanent Sampling Plots in Mozambique in 2020. The methodology aimed to standardize the way in which mapping data is collected with the purpose of generating statistical data capable of allowing comparisons between different types of forest formations and/or regions in the country.

Initially, through the systematic sampling process, temporary rectangular plots were established with a north orientation and a size of 50 m x 20 m (Figure 7). In the first phase, 170 plots were established, distributed among 80 in the community of Luambala in Majune district, 50 in Manhula, in Marrupa district and 40 in Pahua, in Maua district.



Figure 8. Outline of sampling units for data collection.

The orange color represents 4 ha blocks; brown color represents firebreaks; green indicates the 50 m x 20 m plots and lilac represents the 5 m x 5 m subplots. The diagonal X-shaped dashed line in the green plot represents the height measurement of grass/biomass and herbaceous plants.

Combustible biomass measuring and tree inventory

In each plot, information on grass height/biomass and herbaceous plants was obtained using a biomass measuring disc. The measurement was made on approximately 54 points in two imaginary diagonal lines forming "X", with a distance of approximately 2 m between each point. The information collected at the points were used to estimate the amount of fuel from the grass and herbaceous stratum existing in each experimental block, and to estimate the carbon released after early burn activity.

The classification of flammable combustible material was carried out in all blocks, through visual observation, using as criteria the arrangement of the combustible material, distribution and horizontal and vertical continuity. Table 11 illustrates the criteria used for the classification and quantification of the available flammable combustible material.

Type/Category of combustible material	Arrangement of combustible material	Distribution and continuity of combustible material
Dangerous (alive, <7mm in	Continuous	Horizontal
diameter)		
Semi-hazardous (alive,	Compressed	Vertical
between 7mm to 10cm in		
diameter)		
live or green	Connected	
dead material		

Table 11 C	tonto to more atten a	J ala an <u>ifat</u> ia a a	and here which has not a f		-
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Determination of fire severity index was performed as described in Table 12.

Classification	Herbaceous biomass (Nig/ha)
Low	0.0-1.0
Moderate	1.1-2.9
High	≥ 3

Table 12. Classification of combustible material, mainly herbaceous

Simultaneously collecting data on the herbaceous stratum and grasses, the heights of all individuals with a diameter at breast height (DBH) greater than or equal to 5cm (DBH>5cm) were identified by local names and measured. In the 50x20m plots, 5x5m subplots were established in the lower left corner, where all young trees with DBH>5cm (non-established regeneration) were identified and counted, with the aim of understanding the recruitment capacity of new trees in the communities.

Within the scope of the FLOMOZ project, the JV team planned field activities in July and August months, such as: monitoring activities, inventory of grass, herbaceous and arboreal biomass, and early burn for all three districts.

Activities to extend new areas in the districts of Marrupa (6 ha) and Maua (8 ha) were also realized, including the demarcation of blocks and opening of firebreaks, as a way of standardizing the size of experiment blocks (16 ha) in all districts.

Three biomass and carbon estimation

With the DBH>5cm measurements extracted from trees, the total dry weight value was obtained using the allometric equation developed by Macia (2016), for miombo forests in Niassa:

$PST = 0.171* DBH^{2.347}$

The dry weights in kilograms obtained through the Equation 1 were converted to tons per hectare using the Equation 2:

$$BmArv = \frac{\sum (Pst)}{n*Ab} BmArv = \frac{\sum (Pst)}{n*Ab}$$

Equation (2)

Equation (1)

$\Sigma(Pst)\Sigma(Pst)$

Where: **BmArv**- Average biomass of trees per community (ton/ha); - Sum of total dry weight of trees per block (ton); **n** - total number of blocks per community; **Ap** - Block area (ha).

To determine the carbon stock, a biomass-to-carbon conversion factor was used, which may vary between authors. For the present study, the factor used by the IPCC of 0.5 was adopted, which considers that almost 50% of biomass is composed of carbon (IPCC 2006). The amount of carbon stored in the inventoried trees was determined by multiplying the average biomass by the factor 0.5, using Equation 3.

C= BmArv * 0.5

Equation (3)

Where: C - carbon stock per community (ton/ha) Bm - Average biomass of trees per community (ton/ha) 0.5 - Biomass to carbon conversion factor (Pearson et al, 2005).

(2) Results and Discussion

Floristic composition and structure

Around 9483 individuals with DBH \geq 5cm were inventoried, Majune (n = 3505), Marrupa (n = 2306) and Maua (n = 3672). The total number of individuals that were identified by species and/or genus was 9055, remaining 428. The level of execution of the species identification process is around 134 in Majune, 251 in Marrupa and 43 for Maua. There was a greater abundance of regenerating tree species in the district of Marrupa (n = 1125), followed by Maua (n = 714) and Majune (n = 575).

The Marrupa district presented the highest species richness (s = 65), followed by Majune (s = 63) and Marrupa (s = 56), of the species identified so far (Table 13).

Table 13. Summary of composition, horizontal structure, species diversity and basal área in the three districts.

District	Richness	Abundance	$G(m^2 ha^{-1})$	Η'	J
Majune	63	3505	22.823	3.160	0.763
Marrupa	65	2306	38.420	3.384	0.811
Maua	56	3672	54.183	3.008	0.741

Diametric structure

The diametric structure reflects the history or balance of forest formation, which is commonly used as a tool to understand forest succession and dynamics. The diametric distribution shows that the diameters of the trees in the three districts is presented as a negative exponential function, resembling the "inverted J" shape (Figure 8), meaning that the abundance of young trees (smaller diameter classes) will supply the forest in the adult phase.





Phytosociological characterization

The disturbances that forests have been suffering make the scientific community find tools capable of making qualitative diagnoses about the state of natural forests. Phytosociology studies phenomena related to life, the importance of plants, and how they are distributed within an area.

One of the phytosociological indicators of a forest community is the Importance Value Index (IVI), which varies from 0 to 300%, where the highest value indicates the degree of importance of the species in the population. However, to facilitate understanding, the IVI values for each district were divided by 3, in order to obtain a percentage of up to 100% instead of 300%. Was found that the species *Brachystegia boehmii*, *B. spiciformis* and *Syzygium cordatum* were the most important with IVI of 11.50%, 11.40% and 15.19% for the districts of Majune, Marrupa and Maua, respectively. The species *Brachystegia boehmii*, *B.*

spiciformi, Burkea africana, Julbernardia globiflora and *Uapaca kirkina* are the common representative species in the three districts inventoried (Tables 14, 15and 16).

	Majune				
Species	Abundance	Frequence	Dominance	IVI	
Brachystegia boehmii	15.72	3.53	15.24	11.50	
Julbernardia globiflora	11.33	3.53	7.32	7.39	
Syzygium cordatum	3.23	1.94	9.57	4.91	
Uapaca sansibarica	6.05	3.35	5.25	4.89	
Brachystegia spiciformis	5.93	3.53	5.01	4.82	
Pterocarpus angolensis	7.30	0.35	6.73	4.79	
Burkea africana	4.92	3.53	4.08	4.18	
Uapaca kirkiana	3.68	3.53	5.07	4.09	
Diplorhynchus condylocarpon	5.07	3.53	3.49	4.03	
Monotis engleri	4.21	3.35	3.72	3.76	
Others	32.54	69.84	34.51	45.63	
Total	100.00	100.00	100.00	100.00	

Table 14. Summary of the phytosociological characterization and IVI of the Majune district

Table 15. Summary of the phytosociological characterization and IVI of the Marrupa district

	Marrupa			
Species	Abundance	Frequence	Dominance	IVI
Brachystegia spiciformis	8.58	4.02	21.68	11.43
Julbernardia globiflora	10.75	4.02	10.33	8.37
Not-identified	10.88	4.02	7.46	7.46
Burkea Africana	7.07	4.02	6.97	6.02
Brachystegia boehmii	3.90	3.42	6.28	4.54
Uapaca kirkiana	4.12	2.41	6.21	4.25
Diplorhynchus condylocarpon	5.33	4.02	2.52	3.96
Pseudolachnostylis maprouneifolia	4.51	4.02	2.99	3.84
Erythrophleum africanum	3.73	2.62	2.69	3.01

Parinari curatellifolia	2.38	3.42	2.21	2.67
Others	38.75	63.98	30.67	44.47
Total	100.00	100.00	100.00	100.00

Table 16. Summary of the phytosociological characterization and IVI of the Maua district

	Maua			
Species	Abundance	Frequence	Dominance	IVI
Syzygium cordatum	22.60	3.75	19.22	15.19
Brachystegia boehmii	11.38	3.75	12.86	9.33
Uapaca kirkiana	5.69	3.56	13.48	7.58
Parinari curatellifolia	5.66	3.75	4.82	4.74
Burkea africana	4.49	3.75	5.72	4.65
Swartzia madagascariensis	4.36	3.75	4.19	4.10
Monotis engleri	3.40	3.56	4.06	3.67
Brachystegia spiciformis	4.33	3.00	3.59	3.64
Pseudolachnostylis maprouneifolia	3.40	3.75	2.76	3.30
Julbernardia globiflora	3.68	3.56	2.49	3.24
Others	30.99	63.86	26.80	40.55
Total	100.00	100.00	100.00	100.00

Floristic diversity and similarity

The diversity indices of Shannon Winner (H') and Pielou's Evenness were approximated for the populations of the three districts, however, a greater diversity of species and uniformity in distribution were recorded for the district of Marrupa (Table 13).

The rarefaction method allows us to compare the number of species between communities when the sample size (i.e., number of sampling units), the sampling effort (i.e., sampling time) or the numbers of individuals are not equal. Rarefaction calculates the expected number of species in each community based on a value in which all samples reach a standard size (Gotelli & Colwell, 2001).

Based on the rarefied species richness, at a 95% confidence level, the intra and extrapolated richness is different between the forests of the three districts, being greater for the Marrupa district, given that the confidence intervals - represented by the surplus in around the lines (Figure 9) does not overlap between curves (Chao et al. 2014).





To determine the similarity or dissimilarity between the forests of the three districts, the Morisita similarity index was used, computed and illustrated using the UPGAMA hierarchical method (grouping by unweighted arithmetic means). Where the greatest similarity (or smallest distance) identifies and groups communities with similar characteristics. A cophenetic correlation coefficient > 0.7 indicates a strong approximation between communities. Data collected in the inventory showed the creation of two groups with a cophenetic correlation coefficient of 0.66, one between Majune and Marrupa and the other in Maua (Figure 10).



Figure 11. Dendrogram of forest clusters in the districts of Majune, Marrupa and Maua

Biomass and carbon estimates

Resume of biomass estimates (PST) of the three communities are presented in Table 17. The results show that Pahua and Manhula had more biomass than Marrupa in all blocks inventoried, except in block 4 from Manhula.

According to DINAF (2018), analyzing the estimates per unit area for the entire forest area of each province (total estimates), the province of Niassa took second place after Zambezia, as a result of its vast forest area. The biomass values found in the project are smaller than those one estimated above ground in Niassa province (PST=71.42 t/ha). However, the finds can be explained by the place where the inventory was made- a place with tall grass and few trees, as ecologically, places with tall grass used to comport few trees.

Bloco/Comunidades	Luambala (Mg/ha)	Manhula (Mg/ha)	Pahua (Mg/ha)
1	19.083	55.60	53.51
2	13.49	23.71	37.82
3	12.66	36.97	40.28
4	17.33	4.16	30.74
Total	62.57	120.46	162.36

Table 17. Biomass stock by community and block

Regarding carbon estimates, it was expected to observe the similar tendency to biomass estimates, as carbone is strictly related to biomass weight. The Pahua community was leading in biomass accumulation followed by Manhula (Figure 11).



Figure 12. Biomass and carbon estimates per community

Fire frequency

The data collected in this project corroborates with DINAF data. The province has frequent fires, and the three districts that were chosen are among them (Figure 12). In the Majune district, fire tends to occur with high frequency in the eastern part, where the area selected for early controlled burn is located. In the Marrupa district, fire frequency tends to be high in the north and south; while for the Maua district, fire occurs with high frequency in areas of the East and West. Some areas in the central part also have a high frequency of fire.



Figure 13. Fire frequency for the location where were conducted the early controlled burned: i) Majune district; ii) Marrupa district; iii) Maua district

Relationship between structure, diversity and floristic similarity with the occurrence of fire outbreaks

In general, data on fire outbreaks since 2005, from DINAF (2023) reveal the existence of height fires occurrence index in the Marrupa and Majune districts. The occurrence of disturbances caused by the outbreak can change the structure and composition of species (Buramuge at al. 2023). These included a decrease in woody parameters and a replacement of typical Miombo species in Mozambique (*Julbernardiaglobiflora* and *Brachystegiaspp.*) by

subdominant species, such as *Combretum* spp., *Terminalia sericea*, and *Diplorhynchuscondylocarpon* (Moura et al., 2017).

In Miombo forest, the regeneration can be favored even in places deforested for the opening of cultivation fields, charcoal production or with moderate disturbance by fire, as the existence of open places allows the regeneration of species that are not very tolerant to shading (Syampungani et al .2020). However, fire management in these areas must be redoubled as this group of species rarely tolerates the passage of fires.

When analyzing the diameter distribution, it appears that there is a large stock of smaller trees in DBH that could replace larger trees that will be exploited for wood production. Although there are other factors that may endanger the succession of the forests in the districts of Majune, Marrupa and Maaúa. We realized that the three communities have low to moderate fire frequency (Figure 11), but the richness and abundance of species shows variations among them (Table 10). Maybe the presences of operators in these places are contributing to reducing the fires and the difference in the trees structure and compositions resulting from different levels of forest exploitation. Thus, it can be assumed that the natural support capacity of the forests in the three districts is assured, if we consider the diametric distribution of the species as an analysis parameter (Lamprecht 1990).

3.2.5 Early Controlled burning

a) Methodology

After the inventory, the early burn activity was carried out (see images in the Appendix 7), as the meteorological conditions were satisfied (Table 9 and 10). With the help of fire flyers, generally oriented in favor of the wind and considering that the combustible material was semi-green or with a moisture content that justifies a low to moderate fire intensity, fire was set in some blocks of demonstration area, especially in Manhula (except the 1ha area where hot burning will take place).

b) **Results**

After the survey, actual burning was carried out (see figure 13, 14, and 15), as the conditions were met for this, with the help of sparks (fire flyers), generally oriented in favor of the wind and considering that the combustible material was semi-green or with a moisture content that

justifies a low to moderate fire intensity, fire was set in almost the entire demonstration area (except the 1 ha area where late/hot burning will take place).



Figure 14. Images showing burning activity in Majune district – Luambala before and after burning



Figure 15. Images showing burning activity in Marrupa district – Manhula before and after burning


Figure 16. Images showing burning activity in Maua district – Pahua.

Table 18. Implementation	Schedule of Early	Controlled Burning
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Communities	1st	2 nd
Luambala	28 of July	26 of September
Manhula	5 of August	27 of September
Pahua		28 of September

Grass mass data collection after cold burning

After the area was burned in September, the combustible material was measured after cold burning, as shown in the figure 16 below.



Figure 17. Surveying combustible material after early burning in Marrupa (a), Majune (b) and Maua (c) Districts, respectively.

3.2.6 The biomass of the fuel material and estimated carbon emissions data before and after early burning respectively

a) Methodology

The biomass of the combustible material, was collected between July 25th and August 12th in the 3 districts, and this was estimated using the direct method, which requires the use of a pasture-measuring disc. The measured grass height was converted to biomass by applying a local calibrated equation (Equation 1).

Y = 0.006281X + 0.138156

To determine the carbon emissions, Equation (2) developed by the IPCC (2006) was used.

$Yf = Aj*MB*Cf*Ggi*10^{-3}$

Where: Yf is the amount of carbon emissions (ton), Aj is the Area burned in hectares per year (ha); MB is the biomass fuel before burn (T/ha); Cf is the combustion factor (proportion of combustible material burned -t/ha), Ggi is the emission factor

(Equation 5)

(Equation 4)

b) Results and Discussion

(1) Grass biomass estimation before and after early burn

Early controlled burning was initially carried out in two blocks in the districts of Majune (Luambala) and Marrupa (Manhula) and Maua (Pahua) due to weather conditions and inadequate fuel materials until August due to weather conditions, however in September it was possible to conduct burning in all areas planned for the 3 districts. The results show that the biomass of combustible material in the three communities differs significantly before and after burning, showing that control of burning is essential to reduce combustible material (Figure 17).



A. Represent biomass difference in B. ? Represent biomass difference in Luambala
 Manhula



C. Represent biomass difference in Pahua

Figure 18. Analysis of biomass weight before and after burn in three communities. A-represent biomass difference in Luambala; B- represent biomass difference in Manhula; and C- represent biomass difference in Pahua.

(2) Estimation of CO2 emissions after early burn

The results show significant differences in CO2 emissions in the two districts, Luambala and Pahua (Figure 18). However, the community of Pahua, Maua district, tends to have high levels of CO2 emitted. The Maua district is considered one of those with high levels of burning, which means that most of the grass biomass is consumed during the burning, which imposes the need to implement early burning.



Figure 18. Analysis of carbon emission in three communities. Pahua had high carbon emission than Manhula and Luambala, and differ statistically from Luambala; however, Manhunadoesnt show difference in carbon emissions from.

3.2.7 Monitoring the Work with the staffs from SPA SDPI, and SDAE of target district

a) Methodology

Within the scope of the FLOMOZ project, the monitoring work with Lurio, SDPI SPA and SDAE officials from the target districts namely Majune (community of Luambala), Marrupa (community of Manhula) and Maua (Pahua community), all in the Niassa Province to monitor progress of The Work was carried out by mentioned institutions.

Monitoring in the districts of Majune, Marrupa and Maua was carried out monthly by representatives from SPA, DIPTA, SDAE from Majune, Marrupa and Maua) and SDPI (Majune, Marrupa and Maua) from each District, led by Lurio staff was performed (table 18.Implementation schedule and summary of monitoring activity)

b) **Results and Discussion**

With the visits made to all demarcation areas, it was possible to:

- Observe the areas where early burning was possible in the months of July and August. The remaining areas were scheduled to be burned during the month of September.
- Make a positive assessment of the activities implemented to date, however, it was called, a priori, that early burning be carried out immediately, under penalty of the area being subjected only to hot burning (which was not planned).

Once the monitoring activity in the three districts was complete, the team committed to sharing recommendations for improving the work and the respective monitoring images duly written in a report.

The monitoring was able to assess the degree of combustible material amount reduction in the managed areas, local communities empowerment and knowledge improvement preventing and fighting uncontrolled fires as well as awareness raise among local communities about prevention and fighting of uncontrolled fires importance, and evaluation of Early Controlled Burning and Community Awareness effectiveness of forest fire management to consider further extension in other forest areas.

The monitoring team, after regular visits made the following recommendations:

a) Boost the involvement of women in carrying out activities, contacting community leaders whenever necessary to support the mobilization;

b) Assign or make available in the field of action all the necessary equipment before the start of activities so that they occur in a uniform manner;

c) Increase the monitoring time (with a minimum of 6 days), in order to allow collecting more information on the execution or carried out steps;

d) Advance payment of logistical support subsidies to technicians involved in monitoring.

Date	Target	district	Number of		Summary of monitoring activity
			participants		
25-28/07/2023	Majune,	Marrupa,	9 persons	(SPA1,	early burn activities, planned, completed in all districts to date;
	Maua		DPDTA1,	SDAE3,	late burning as it takes place in October (on reserved plots of 1ha);
			SDPI3)		Improved the involvement of women in carrying out activities in Marrupa;
					There are outbreaks of uncontrolled fires due to the presence of elephants (in
					Marrupa);
					Communities with a good perception of the benefits of controlled burning,
					although with some need for training on sustainable fire management;
					Equipment duly allocated in the 3 districts.
26-29/09/2023	Majune,	Marrupa,	9 persons	(SPA1,	All activities planned in the supervised phase were well established in the
	Maua		DPDTA1,	SDAE3,	ground;
			SDPI3)		Lack of involvement of SDAEs and/or SDPIs technicians in the execution of
					activities
					in all monitored districts.
26-29/10/2023	Majune,	Marrupa,	9 persons	(SPA1,	Waiting for monitoring report
	Maua		DPDTA1,	SDAE3,	
			SDPI3,)		

Table 19. Implementation schedule and summary of monitoring activity

3.2.8 Late burning

a) Methodology

The late burning was carried out between the 26th and 29th of October, where the 12 members of the management committee from each community took part in this activity, as well as 2 members of the Lurio technical team. Before starting the late burn, the meteorological variables (wind speed and direction, temperature, precipitation, relative humidity) of the location were surveyed, to observe the behavior and intensity of the fire.

b) Results

After the respective survey, the actual burning took place (figure 19), as the conditions were created for this, with the help of fire flyers, generally oriented downwind and considering that the combustible material was semi-green or with a moisture content that justifies a low to moderate fire intensity, fire was set in the remaining 1ha area (3ha area for Marrupa). During the process of carrying out the late burn, the fire management committee of each community was present accompanied by the material provided, specifically: backpack pumps containing water, fire dampers/fire battens, rakes, shovels, machetes.



PHASE III: OVERALL ACTIVITIES

3.3. Overall Activities

3.3.1 Monitoring the evolution of late fires and the effects of fire on vegetation

It consisted of monitoring the behavior of vegetation, evolution and determining the impact of late fires in areas where controlled fires occurred. Furthermore, a comparative analysis of vegetation was also carried out between the area subject to forest fire management and the remaining forest area. This Monitoring also aims to collect practical evidence of the advantages of controlled early burning, which will later be documented and shared.

3.3.2 Seminar for trainers

a) Introductory note

As a way of reporting on the results of the Project's activities, as well as discussing possible strategies for the sustainability of the actions, a Workshop was held on October 24th and October 25th, 2023, aimed at relevant personnel from various local institutions that work towards the management of forest resources in the province of Niassa, as well as the main representatives of the communities.

Workshop objectives:

i) Present the results of the Project activities and other studies aimed at conserving forests through fire management;

ii) Discuss and publicize the effectiveness of using controlled burning as a forest management tool;

iii) Present the controlled burning manual developed by the Project, to be used as a guide in other communities and districts in the country;

iv) Present the documentary video on the best practices for preventing and combating uncontrolled fires produced by the Project;

v) Discuss the best strategies to guarantee the sustainability of the activities carried out when implementing the pilot project;

vi) Create institutional and community technical capacity in sustainable forest management with regard to preventing and combating forest fires.

Workshop programme

In terms of the structure and strategy of the Workshop, it is organized into three phases as shown in appendix 13 (Workshop Programme) and appendix 14 (Concept note in and list of participants).

Venue and time

The Workshop took place in Bendiak Conference Centre, city of Lichinga, between 8:00 am and 3:30 pm on October 24th and in the community of Luambala, Majune district, between 5:00 am and 08:00 pm including travel on October 25th, 2023.

b) **Results**

The Seminar program had three parts namely, (i) Presentations and discussion in plenary; (ii) Group discussions; (iii) Practical demonstration of hot burning in Marrupa district. The Seminar was attended by the Representative and a technician from the National Directorate of Forests (DINAF), Director and technicians from the Provincial Environmental Services (SPA), Director and technicians from the Provincial Directorate of Territorial Development and Environment (DPDTA); Coordinator and representatives of JICA & FLOMOZ in Mozambique; Administrator of the Niassa National Reserve; technicians from the District Economic Activities Services (SDAE) and technicians from the District Planning and Infrastructure Services (SDPI) from all 16 Districts in the province of Niassa; Safari and forestry concession operators, forestry companies and community leaders from the communities of Maumbica (Sanga district), Luambala (Majune district), Manhula (Marupadistrict) and Pahua (Maua district); academies represented by Eduardo Mondlane University and Lurio University.

The discussion of the topics was moderated by the representative of the National Forestry Directorate, who made some comments related to the presentations made, emphasizing the problem of uncontrolled fires and the importance of responsible use of fire. He then invited participants for interventions. In this regard, the traditional leader of the ReviaComercialcommunity, District of Majune, shared his experience with the FLOMOZ Project, namely, the activities carried out by the project and how he has promoted awareness-raising activities among members of his community about the danger of fire.

Next, the community leader of the community of Ceruma, Maumbica, District of Sanga, reported his experience with the training carried out within the scope of the FLOMOZ project and, as a result, he has launched campaigns to raise awareness among communities about the danger of uncontrolled fires. The Lambala traditional leader, in Majune District, was also grateful for the opportunity given by the FLOMOZ Project to train community members on the management and sustainable use of fire.

The traditional leader of the Manhula community, Marrupa District, also thanked them for the opportunity they had in training on the use of fire. He addressed the problem of the invasion of elephants in the community, and the use of fires to scare them away, which often results in uncontrolled fires. Reacting, the Administrator of the Niassa Reserve said that there is basic work being carried out to mitigate the human-elephant conflict and that the immediate action was the allocation of inspectors from the Reserve and SDAE Marrupa for scaring actions, mentioning a communication line to report emergency cases.

Main notes of group discussion

i) Demonstration the current situation in Mozambique, in particular the province of Niassa regarding the fire incidence;

ii) Partners and communities are aware of the importance of fire management for forest management through carrying out appropriate prevention and combat activities;

iii) Introduced the controlled burning manual as a product of the Project, to be used as a guide to preventing and combating forest fires in other communities and districts in the country;

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iv) Understood the importance of the video produced by the project to encourage changes in community behavior regarding best practices to combat uncontrolled fires;

v) Proposals for strategies contextualized in local realities were found to ensure continuity in carrying out activities to mitigate and combat uncontrolled fires; It is

vi) Created institutional and community technical capacity for sustainable forest management through forest fire mitigation at the level of Niassa province.

Practical demonstration of late burn

The third part of the Seminar, therefore, on the second day, participants traveled to the community of Manhula, district of Marrupa, for a practical demonstration of hot burning (figure 20). Before burning, weather conditions were checked. The burning activity was led by one of the members of the Fire Management Committee. The burning demonstration activities ended with final considerations, which consisted of encouraging communities to apply the knowledge acquired.





Figure 20. Inthereheat of burning (i), spread of fire (ii), extinguishing active fires after the end of burning (iii).

3.3.3 Organization of the symposium

a) Methodology

Introductory note

The occurrence of uncontrolled fires in Niassa province is one of the major factors of environmental and climatic instability. In addition to damage to ecosystems in general, uncontrolled fires contribute to the degradation of Biological Diversity.

Although there is now a substantial increase in awareness in the country and in the province about the unregulated use of fire combined with the impact of uncontrolled fires that decimate undetermined areas of ecosystems, there is no deep and documented knowledge about this situation. Research on the causes, impact or consequences of uncontrolled fires, as well as forms of mitigation is scarce. Similarly, isolated and uncoordinated awareness-raising actions, in addition to duplication of efforts and resources, also contribute to disrupting the messages disseminated to the different actors. The uncontrolled fires today reach a level that is considered alarming in the province of Niassa, on which the entire country incurs environmental crime.

Objectives of the symposium

- To create synergies within the different actors of the environment and other institutions, including NGOs, private sector, and local authorities interested in the prevention and control of fires;
- To Contribute to the development and application of appropriate fire use practices that allow the sustainable management of Natural Resources and conservation of biodiversity in general;
- To Promote the replication of awareness and civic education campaigns, aimed at reducing the negative effects of uncontrolled fires in all districts;
- To Develop and implement a Provincial and local burn assessment, monitoring and mitigation system;
- To establish mechanisms that promotes the active participation of local authorities and communities in the Prevention, Control and fight against fires.

Venue and time

The symposium took place in Bendiak Conference Centre, city of Lichinga, between 8:00 am and 3:30 pm on April 3th, 2023.

b) **Results**

The event was attended by the Honorable Director of the Provincial Environmental Service, the host of the event, among other individuals, with emphasis on the Administrator of the Niassa Special Reserve, Administrators of all districts of the Province of Niassa, forestry companies, representatives of the Centro Zonal Noroeste of the Institute of Agricultural Research of Mozambique, Non-Governmental Organizations, and civil society, in addition to consultants from the FLOMOZ Project: The Project for Sustainable Forest Management and REDD+ in Mozambique, namely from the Faculty of Agronomy and Forestry Engineering of Eduardo Mondlane University and Faculty of Agricultural Sciences at Lurio University, who helped organize the event. In total we had 113 participants (list of participants in appendix 4).

The presentations began with the theme "Importance of fire management in the preservation of natural resources and the impact of the activities of the FLOMOZ Project on the life of the

community of Revia Comercial- Majune". The theme of the event was presented by consultants from the Faculty of Agronomy and Forestry Engineering at Eduardo Mondlane University and Faculty of Agrarian Sciences at Lurio University, represented by Engineers Victorino Buramuge and Alfredo Duvane, respectively. The speakers emphasized the methodological processes and results achieved in the pilot phase of the project in the aforementioned community.

Afterwards, a presentation was made on the "Situation of uncontrolled fires in Mozambique and the current stage in the province of Niassa", Engineer Cármen Baptista (Technician of the Ministry of Land and Environment) referred to the districts with the largest fires in the province of Niassa. Niassa, where the highlight was Mecula, Marrupa, Sanga and Majune.

Then the representatives of Safari companies and forestry companies in general and Green Resources Mozambique in particular, individually presented topics on "Objectives and methods of controlled burning (lighting techniques, placement of the fire, control and equipment used)".

The operators were unanimous in the techniques used and shared peculiar experiences in fire management within their concessions. For example, representatives from Green Resources Mozambique shared a management program based on communities and local leaders, which provides community benefits as a result of good forest management.

The symposium participants were unanimous that companies, the government or communities alone would not be able to manage the fire, so they should all pool human and financial resources to manage uncontrolled burns.

Following the event, the participants agreed that a specific regulation should be created for the use of fire and that no one should burn a certain area without authorization and knowledge of the neighbor of the same.

The meeting ended with the challenge of developing a directive instrument to guide the functioning of the Committee for the management of fires in the province of Niassa and the need to include "uncontrolled fires" in the agenda of all meetings at the provincial and district level.

3.3.4 Sustainability analysis of fire management

a) Methodology

Focus group interviews were carried out with residents from each of the 3 Districts selected for this study, in the local communities of each of the Districts, the multiple ways in which forest resources are used by local residents were inventoried, including where and for what purpose (figure 21). In-depth mapping interviews were also conducted to develop a broader scale map and characterization of forest resources and distribution within our study area. These maps were made with the aim of revealing the main hotspots and likely starting points for uncontrolled fires.



Figure 21. Meetings held in the communities of Luambala, Manhula, and Pahua in the districts of Majune, Marrupa and Maua respectively with the aim of inventorying the uses of forest resources and hotspots of uncontrolled fires.

In the focus groups, open questions were asked with no answer options, where all responses were collected and comments provided. Individual interviews were also carried out with community leaders, representatives of community committee teams, elders, young people and representatives of the district government, to assess the different ways of using fire and also identify alternative activities that can contribute to fire management using resources locations (figure 22). Details of Sustainability analysis of fire management, will be found at appendix 15



Figure 22: Interview with the governor of the Pahúa community (1), with the community's elders (2).

b) **Results**

Based on knowledge of the community area, the community population mapped the uses of the community areas and the main sources of uncontrolled fires (figure 23).

According to the map drawn, the area where the most burning is the bamboo exploitation area, followed by the forest and finally the machamba areas, this fire that breaks out has a tendency to spread and reach the community, the fires tend to increase and spread to new areas, swampy areas tend to burn less intensely than high areas, due to the humidity of the combustible material.



Figure 23. The figure represents the map produced by the community. The map represents the Forest, the machambas, the community and the area of the experimental plot of the present study, and the areas where the most burning is also indicated.

When asked about the reasons why fires occur in these areas, the answer was that these areas are areas with a lot of wild animals, they are areas of machambas and they are areas with a lot of bamboo, during the exploitation of these resources the community sets up camps and ends up leaving remains fires that cause uncontrolled burning, for this community uncontrolled fire tends to be more intense between the months of June and July and more severe in the months of October and November, in these peak seasons the community always has to paralyze its routine activities to dedicate themselves to putting out the fire, at the risk of losing their possessions.

For the continuity of fire management using other techniques that were not known by the community before the FLOMOZ project, it is necessary to extend the training of good fire management practices to the entire population of the community, as well as covering adjacent communities.

If there is a support window, it is recommended that the community of Luambala District of Majune inject resources aimed at improving the type of agriculture practiced in this community, moreover, in the case of an area crossed by the Luambala River, where the population practices a type of artisanal fishing based on practices that are the eminent causes of the emergence of uncontrolled fires, it is recommended that work to raise awareness of fire management directly aimed at fishermen and hunters.

3.3.5 Development of the Manual and Video Materials

a) Manual

(1) Methodology

The development of the Manual on Early Controlled Burning was based on the proposed target audience namely, SPA, SDAE staff as well as local communities dependent on forest resources.

The manual was developed based on literature review principles and practices on use of controlled burning as a management tool towards sustainable forest use and management.

(2) Results

The manual entitled "Manual for Fire Use and Management in Miombo Woodlands, Mozambique" main objectives are :to explain basic concepts on forest fires, to describe main features of integrated fire management and steps to elaborate a fire management plan, appendix 14.

b) **Production of videos**

(1) Methodology

During the month of July, the definition of the contents of the videos foreseen in the project was finalized, as well as their alignment. During this period, competitions were launched to select the company producing the videos, and the selection, after evaluating the quotes and portfolio of competing companies, fell to the company Maocha Filmes. The Maocha Films Company was selected following the evaluation of three competing companies as required in national administrative processes. With this in view, the company and Project team held meetings for clarifications and harmonization of videos contents, scripts alignment.

Several meetings were held between the UEM team and the selected company with the aim of establishing the accountability contract and clarifications on the terms of reference as well as any issues between the parties.

Three different video materials were developed as follows:

- Video material for training of trainers for early burning and community awareness of fire management in Portuguese
- 2) Video material for local people by movies of the early controlled burning and community awareness of forest fire management with versions in Makua and Portuguese
- 3) Video material for publicity of the pilot activity to the other country government and the donor in English and Portuguese versions.

Results

In August, recordings were made with a view to producing the videos in Marrupa involving key actors, namely communities, technicians and local authorities. Preliminary versions of the videos were shared in October.

The preliminary versions of the three videos were produced, available in the link

https://drive.google.com/drive/folders/1Ox6Mgv7HJEP8Fd0XXaFkb3EPx-ChszzW

4. LESSONS LEARNED

- It is urgent to monitor fire outbreaks at level of the three districts and take mitigation actions to manage fires given that fire may be replacing the composition of abundant species in Miombo, thus becoming a threat to the miombo itself, ecosystem widely and survival of local communities.
- All studies involving the mitigation of uncontrolled fires must be accompanied by a floristic inventory, as plants respond instantly to the effects of forest fires and can serve as important indicators for their appropriate management.
- Mozambique currently has approximately 45 million carbon credits available and is expected to be regulated in 2024. This is an opportunity for local communities and safari operators to generate additional revenue, both for the survival of communities and to contribute to sustainability. However, it is important to engage the community so that they can benefit from carbon credits.
- Importance of involving local communities in the activities starting from the definition of the forest area to be managed and firebreaks establishment.
- The implementation of adequate firebreaks is a key factor in ensuring that consciously lit fires cannot spread to unwanted locations.
- Most controlled burning was only carried out in September, because environmental/meteorological conditions were not appropriate during the month of August at the project sites in Niassa, which showed substantial differences in environment e climate conditions compared to other parts of the country even though the ecosystems under consideration had mostly similar characteristics. Thus, is the

importance to consider in similar projects that dates of regular calendar may not always match specific cycles in nature.

- In the community of Manhula, Marrupa district, it is recommended to create a community fire management committee, to ensure control of the main source of uncontrolled fires, which are fires to chase away elephants, it is recommended that this experience be replicated urgently in the surrounding communities, because they also practice fires to chase away Elephants.
- It was possible to observe during training the need to reflect on more strategies, alternatives to encourage and strengthen community participation in sustainable natural resources and adequate controlled burning use since some community members hoped to gain money or fire related equipment in exchange to get involved in the training sessions.

4.1. Constraints

- At the planned period for early controlled burning, it was not possible to fully carry out cold burning in all established blocks, mainly in the districts of Maua and Majune due to the meteorological condition observed in the allocated period and later the condition of the combustible material which still contained high levels of humidity.
- Of the planned activities, however, was that in September, early burning in all planned areas in all project districts, was performed which allowed the team to subsequently make estimates of biomass fuel for the entire area under study. The technical report on combustible material biomass survey and inventory before burning was then produced and will be complemented with combustible material biomass after burning, in order to assess burning efficacy and coverage.

A positive point was the extension of the area from 10 and 8 ha in the districts of Marrupa and Maua, respectively to 16 ha in each of them.

5. CONCLUSION

We realized that the three communities have low to moderate fire frequency, but the richness and abundance of species shows variations among them. Maybe the presence of operators in these places are contributing to reducing the fires and the difference in the trees structure and compositions resulting from different levels of forest exploitation. Despite fires occurring in the region, the diameter distribution appears that there is a large stock of smaller trees that could replace larger trees that will be exploited for wood production, for example. Although there are other factors that may endanger the succession of the forests in the districts of Majune, Marrupa and Pahua.

Members of the communities involved claim to have learned a lot about fire management, and the relevance of implementing controlled burning, and are now willing to continue the learning they received.

Members of the communities state that the implementation of good practices is the first positive attitude that, as a community, they can put into practice.

The Work was replicated from the Majune Pilot Project in 2022 to other Districts which could be beneficial if extended beyond selected communities, Districts and Provinces in the country. Majune, Mavago, Lago, Muembe, Chimbonila and Naguma are the prominent Districts in the Niassa Province in terms of fire risks and where there is need to launch a comprehensive awareness campaign among the communities in these districts by local leaders.

During the seminar, discussion groups converged on the need to raise awareness among local communities about the danger of uncontrolled fires, promotion of conservation agriculture, training of natural resources management committees in matters such as beekeeping, sustainable production of charcoal; law enforcement; dissemination of good practices on the use of fire. The groups also proposed trading carbon credits in conservation areas as a way of encouraging communities to conserve forests.

If there is a support window, it is recommended that the community of Luambala District of Majune inject resources aimed at improving the type of agriculture practiced in this community, moreover, in the case of an area crossed by the Luambala River.

There is a need to better expectations management regarding community members participation in sustainable fire and resources management.

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APPENDIX

- Appendix 1 January report
- Appendix 2 February report
- Appendix 3 March report
- Appendix 4 Symposium report
- Appendix 5 May & June reports
- Appendix 6 July-August reports
- Appendix 7 September report
- Appendix 8 October reports
- Appendix 9 Monitoring report
- Appendix 10 Monitoring report
- Appendix 11 Monitoring report
- Appendix 12 Workshop programme
- Appendix 13 Concept note and list of Participants of Workshop
- Appendix 14 Manual for Fire Use and Management in Miombo Woodlands, Mozambique
- Appendix 15 Sustainability analysis of fire management Report
- Appendix 16 Team composition

Appendix 1



1





Field Report for the month of January

FLOMOZ Pilot Project on Controlled Burning, entitled "Management of Forest Fire And Community Awareness Of Fire Management In Niassa Under The Project For Sustainable Forest Management And Redd+ In Mozambique" districts of Majune, Marrupa, Maúa and Sanga.

January 2023

JANUARY REPORT

The activities in January consisted essentially of preparing the terms of reference and budget for Forest Fire Management and Community Awareness for Fire Management in Niassa, within the scope of the Sustainable Forest Management Project and the Redd+ project in Mozambique, for the current year 2023. Eduardo Mondlane University (UEM) and Lúrio University prepared their budget separately. Monitoring activity in the Majune district was included in the planning of activities to extend the project. The activities also included the planning of the 1st Provincial Symposium on Forest Fires, held in the city of Lichinga, Niassa province.

The symposium focused on the Action Plan for the Prevention and Control of Forest Fires, which is part of the implementation of the Government's Five-Year Program (2020-2024) and the Economic and Social Plan (PES) of the Provincial Environment Service, 2022, and is based on Priority III: Strengthen the Sustainable Management of Natural Resources and the Environment, which defends the sustainable management and use of natural resources, as well as the preservation of the environment.

On January 30, 2023, UEM met with the Provincial Environmental Services (SPA) and UniLúrio to discuss the shared information, which included the terms of reference and responsibilities of each party for holding the symposium, as well as such as the event design, program and date of the symposium.

Contacts between the three institutions culminated in the proposal to create a fire management group at provincial level, led by UEM, and in the formulation of the terms of reference for the symposium discussion groups, led by UniLurio. From the meeting it was decided that the symposium should take place in the last week of March or the first week of April. Appendix 2







Field Report for the month of February

FLOMOZ Pilot Project on Controlled Burning, entitled "Management of Forest Fire And Community Awareness Of Fire Management In Niassa Under The Project For Sustainable Forest Management And Redd+ In Mozambique" districts of Majune, Marrupa, Maúa and Sanga.

February 2023

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FEBRUARY REPORT

February activities focused on preparing for the Provincial Symposium on Wildfires. The preparatory committee for the symposium, composed of Eduardo Mondlane University (UEM), Lúrio University (UniLurio) and Provincial Environmental Services (SPA), met on February 20th to address the following topics:

1. SPA shared a list of forestry companies working with forest fire management programs.

2. Confirmation of the presence of Her Excellency Secretary of State and Governor of the Province;

3. The SPA shared the current state of information requested from forestry companies regarding their experience in Fire management with a view to preparing their respective presentations;

4. Unilúrio and SPA were responsible for the process of preparing the visual proposal jointly;

5. UEM shared the draft of the program and the proposal of institutions that can hold the poster exhibition.

Regarding the duties and responsibilities of the symposium, the following points were agreed:

- ✓ The SPA will be responsible for official communication of the event, preparing invitation letters and sending them to all participants.
- ✓ The SPA must request all quotes for the products and services to be purchased (conference room, banners, t-shirts, caps, meals, etc.)
- ✓ The SPA must prepare a list of all participants whose expenses must be covered by FLOMOZ (Full name, Account number, NIB, Bank).
- ✓ The SPA must appoint the Master of Ceremony for the event, taking into account the protocol aspects.
- Unilúrio must communicate to potential poster presenters to request their presentation and guide them in preparing the posters.
- Unilúrio must design the visual material for banners, t-shirts and signs (Motto and Images) this must be done in partnership with SPA.
- ✓ UEM was responsible for preparing all administrative processes to ensure that payments are made in a timely manner.

On February 20th, the symposium preparation group met to check the status of the different tasks.

In the context of Forest Fire Management and Community Awareness Raising for Fire Management in Niassa, within the scope of the Sustainable Forest Management Project and the Redd+ project in Mozambique, on February 27, 2023, the UEM and Unilúrio team met meet with the FLOMOZ team to discuss the project's terms of reference, with regard to implementation locations. From this meeting it was decided that there would be two locations to identify, in the Marrupa district. These locations must have a safari or forestry operator, in order to guarantee the sustainability of the project. As for the final report, it was agreed that it would be prepared in English and Portuguese.

Appendix 3







Field Report for the month of March

FLOMOZ Pilot Project on Controlled Burning, entitled "Management of Forest Fire And Community Awareness Of Fire Management In Niassa Under The Project For Sustainable Forest Management And Redd+ In Mozambique" districts of Majune, Marrupa, Maúa and Sanga.

March 2023

MARCH REPORT

Throughout March, preparations for the forest fire symposium continued. The team from UEM, Unilúrio and SPA met on the 8th and 15th of March to synchronize the schedule, presentations and logistics for the event. Following this meeting:

- ✓ The SPA informed the group of the final date of the symposium, April 3rd in this specific case.
- ✓ SPA communicated the official motto of the symposium, approved at provincial government level: "Niassa, together in the management of uncontrolled fires".
- \checkmark The model for printing caps and t-shirts, as well as other materials, was defined
- ✓ The process of identifying and contracting food services and event location has been completed.
- ✓ At this meeting it was noted that the list of all participants and their bank details for payment of allowances was ready.
- ✓ The presence of Her Excellency the Secretary of State and the Provincial Governor at the symposium was confirmed,
- \checkmark The presentation of a cultural number confirmed

Regarding the Sustainable Forest Management and Redd+ Project in Mozambique, on March 30th, UEM and Unilúrio met to discuss the possibility of adding more locations for its implementation, as indicated by FLOMOZ. From the meeting it was clear that it was possible to achieve the objective, due to the fact that concrete actions had been identified and aligned with ongoing activities.
Appendix 4







Summary of the 1st Provincial Symposium on Uncontrolled Burning

FLOMOZ Pilot Project on Controlled Burning, entitled "Management of Forest Fire And Community Awareness Of Fire Management In Niassa Under The Project For Sustainable Forest Management And Redd+ In Mozambique" districts of Majune, Marrupa, Maúa and Sanga.

April 2023

Contextualization

The occurrence of uncontrolled fires in Niassa province is one of the major factors of environmental and climatic instability. In addition to damage to ecosystems in general, uncontrolled fires contribute to the degradation of Biological Diversity.

Although there is now a substantial increase in awareness in the country and in the province about the unregulated use of fire combined with the impact of uncontrolled fires that decimate undetermined areas of ecosystems, there is no deep and documented knowledge about this situation. Research on the causes, impact or consequences of uncontrolled fires, as well as forms of mitigation is scarce. Similarly, isolated and uncoordinated awareness-raising actions, in addition to duplication of efforts and resources, also contribute to disrupting the messages disseminated to the different actors. The uncontrolled fires today reach a level that is considered alarming in the province of Niassa, on which the entire country incurs environmental crime.

Objectives of the symposium

General objective

The overall objective is to establish a framework of General actions that will allow the development and implementation of local fire management programs at all sectoral levels in the province.

Specific objectives

- ✓ To Create synergies within the different actors of the environment and other institutions, including NGOs, private sector, local authorities interested in the prevention and control of fires;
- ✓ To Contribute to the development and application of appropriate fire use practices that allow the sustainable management of Natural Resources and conservation of biodiversity in general;
- ✓ To Promote the replication of awareness and civic education campaigns, aimed at reducing the negative effects of uncontrolled fires in all districts;
- ✓ To Develop and implement a Provincial and local burn assessment, monitoring and mitigation system;
- ✓ To Establish mechanisms that promote the active participation of local authorities and communities in the Prevention, Control and fight against fires;

Opening notes

On three days in the month of April in the year two thousand and twenty-three, the first Provincial Symposium on Uncontrolled Fires was held in the province of Niassa, with the motto "Niassa, together in the management of uncontrolled fires", where they were present 88 participants and 34 support team members.





The Symposium was organized by the Provincial Environment Service and Japan International Cooperation Agency and was attended at the highest level, with the presence of Her Excellency Secretary of State of the Province of Niassa, Linda Maria da Silva Portugal, Her Excellency Governor ElinaJudite da Rosa Victor Massengele, and two technicians from the Department of Forestry at the Ministry of Land and Environment.



Figure 2: His Excellency Secretary of the State of Niassa Province, Linda Maria da Silva Portugal (center), His

Excellency Governor ElinaJudite da Rosa Victor Massengele (right), and National Head of the Department of Forestry, Engineer CármenBaptista (left). **Source:**Duvane, 2023.

The event was also attended by the Honorable Director of the Provincial Environmental Service, the host of the event, among other individuals, with emphasis on the Administrator of the Niassa Special Reserve, Administrators of all districts of the Province of Niassa, forestry companies, representatives of the Centro Zonal Noroeste of the Institute of Agricultural Research of Mozambique, Non-Governmental Organizations, and civil society, in addition to consultants from the FLOMOZ Project: The Project for Sustainable Forest Management and REDD+ in Mozambique, namely from the Faculty of Agronomy and Forestry Engineering of Eduardo Mondlane University and Faculty of Agricultural Sciences at Lúrio University, who helped organize the event.

The Symposium began with the presentation of the program, followed by a moment of welcome poetry, with themes surrounding the potential of the province of Niassa in terms of flora and fauna and threats to biodiversity perpetrated by uncontrolled fires, in reference to the title of the symposium.

Afterwards, Her Excellency Governor of the province of Niassa began by greeting everyone present and emphasized the role of the Government in maintaining biodiversity, guaranteeing jobs and managing fire. Going forward, the leader highlighted the inclusion of the FLOMOZ Project in the Government's Five-Year Plan 2020-2024. Finally, the leader highlighted the provincial government's commitment to developing and implementing an integrated system for managing uncontrolled fires.

In turn, the Director of the Provincial Environmental Service of Niassa, after greeting the participants, informed them that Mozambique took on leadership of the group for the conservation of Miombo forests in 2022. At the end, the Director of the SPA mentioned that the symposium would serve to align the work plans that FLOMOZ and other actors have been developing within the scope of managing uncontrolled fires in the Province, mentioning the pilot experience of managing uncontrolled fires in the community of Revia Commercial, in the Majune district.

At the end of the speaker's interventions, the Secretary of State of the province of Niassa mentioned that in addition to the Government's Five-Year Plan 2020-2024, the theme of the symposium was included in the Economic and Social Plan 2020-2023. Thus, the Secretary emphasized the importance of the Symposium for designing strategies to mitigate the impacts of

fire on climate change. The leader recognized the importance of the various actors for fire management at the Province level, with emphasis on forestry companies, Safari operators and district leaders. Finally, the Secretary opened the "First Provincial Symposium on Wildfires", leaving the challenge that the event can contribute to encouraging those present to generate changes, especially at the district level.

Presentations

The presentations began with the theme "Importance of fire management in the preservation of natural resources and the impact of the activities of the FLOMOZ Project on the life of the community of ReviaComercial- Majune". The theme of the event was presented by consultants from the Faculty of Agronomy and Forestry Engineering at Eduardo Mondlane University and Faculty of Agrarian Sciences at Lúrio University, represented by Engineers VictorinoBuramugi and Alfredo Duvane, respectively. The speakers emphasized the methodological processes and results achieved in the pilot phase of the project in the aforementioned community.



Figure 3: Presentation by consultants from the Faculty of Agronomy and Forestry Engineering at Eduardo Mondlane University and Faculty of Agricultural Sciences at Lúrio University. Source:Duvane, 2023.

Following the morning panels, presentations were made by the representative of the Japan International Cooperation Agency, MrSakto, who described the profile of the FLOMOZ Project and forest fire management activities, which culminated in presenting possible financing windows to provide follow-up to the activities of the FLOMOZ Project, which ends in 2024. On the occasion, the MozNorte and MozRural windows were presented, both financed by the World Bank.



Figure 4: Presentation by the representative of the Japan International Cooperation Agency, MrSakto. Source:Duvane, 2023.

Afterwards, a presentation was made on the "Situation of uncontrolled fires in Mozambique and the current stage in the province of Niassa", Engineer CármenBaptista (Technician of the Ministry of Land and Environment) referred to the districts with the largest fires in the province of Niassa. Niassa, where the highlight was Mecula, Marrupa, Sanga and Majune.

Then the representative of Safari companies and forestry companies in general and Green Resources Mozambique in particular, individually presented topics on "Objectives and methods of controlled burning (lighting techniques, placement of the fire, control and equipment used)". The operators were unanimous in the techniques used and shared peculiar experiences in fire management within their concessions. For example, representatives from Green Resources Mozambique shared a management program based on communities and local leaders, which provides community benefits as a result of good forest management.

The interventions ended with the testimony of the Community Leader of ReviaComercial, who succinctly recounted his experience in implementing the pilot project FLOMOZ: *The Project for Sustainable Forest Management and REDD+ in Mozambique.*



Figure5: Testimony from the Leader of the Commercial Revia Community.Source:Duvane, 2023

Debates

In the first debate, which took place in the morning, the Honorable Administrators of the district of Mavago, Momade Abdul Cadre and Nipepe, SérgioAgostinho proposed that the districts under their supervision should also be included in the FLOMOZ Project, as they have high levels of fire. In turn, Safari manager, JúlioAbrão questioned the duration and sustainability of the project. The Manager highlighted the need to seek more financing. Further on, MrJúlio questioned the methodology used to detect fire outbreaks, given that in his opinion, the entire province has fire outbreaks, with the exception of the Lichinga district. Finally, Mr. Júlio congratulated the initiative, which he considered promising.

In her intervention, the Honorable Administrator of the district of Maúa informed that fire management at the district level is the responsibility of the District Planning and Infrastructure Service. Therefore, she proposed that the District Planning and Infrastructure Service be involved and work closely with the District Economic Activities Service.

Mr. Edmundo, from the Environment Department of the National Criminal Investigation Service, in Lichinga, proposed the development of a multisectoral project to combat uncontrolled fires using information and communication technology tools.

The Honorable Administrator of the Majune district, Victor Levene, was happy because the pilot project was implemented in his district, however he questioned the sustainability of the implementation of the activities, as it was not discussed. In response, MrSakto clarified that the project started late (in two thousand and twenty-two), due to the COVID-19 pandemic. However, he encouraged the search for financing to continue the activities, as the project belongs more to Mozambicans than to Japanese people. On the other hand, MrSakto mentioned that the SPA, for example, is a key actor in continuing the project's activities.

The representative of the Provincial Prosecutor's Office highlighted its role in biodiversity conservation, and suggested the involvement of the Public Ministry at district level to ensure that human rights and the law prevail in the fight against uncontrolled fires.

The Provincial Manager of the Civil Society Learning and Training Center, Salvador Rabissone, questioned the involvement of civil society organizations in carrying out project activities. Likewise, Mr. Salvador questioned the reasons for the existence of fires in districts with Safari and Forestry operators, such as Mecula, Sanga, Majune and Marrupa. In response, the representative of the Safari operators, in his talk, emphasized that unlike the United States of America, for example, where fires sometimes have natural causes such as lightning, in Mozambique, the fire is set intentionally or accidentally by various reasons.

In turn, the Honorable Administrator of the district of Mecula expressed concern about the fact that his district appears in the first position of having the most outbreaks of uncontrolled fires, given that there are several operators in the region. His intervention ended with a question about the separation of uncontrolled and prescribed burns in the fire outbreak data collection methodology, given that operators in the district carry out prescribed burns. In response to this concern, Engineer Cármen informed that the methodology used to detect fire outbreaks does not discriminate between uncontrolled and prescribed fires. Thus, she recognized that the values for fire outbreaks may be overestimated.

For her part, Her Excellency Provincial Governor appealed to everyone present for a greater commitment to managing uncontrolled fires because, in her opinion, the situation we are experiencing today, particularly cyclones, is a reflection of the effect of climate change. And he emphasized that it was necessary to work in a joint and coordinated way. To end the debate in the morning, Her Excellency Secretary of State questioned why the program did not cover all districts. Something that remained a point of reflection. After the intervention of Her Excellency the Secretary of State, the break took place.

In the afternoon, the debate began with an intervention by Engineer Alberto Mussana, from the Centro Zonal Noroeste of the Institute of Agricultural Research of Mozambique, who said that the fight against uncontrolled fires involves the application of legislation and environmental education. In reaction to this comment, Engineer Cármen informed that the creation of a Forest Information System and environmental clubs in the districts was underway.

The Honorable Administrator of the Sanga district, José Albino Yassin, emphasized that the involvement of communities in biodiversity conservation depends on the benefits they can achieve. For example, hunting rates have decreased in the district because communities see some benefit from safari operators. He also stressed that the benefits must be reflected in all communities to avoid "jealousy" on the part of those not covered. Finally, the Honorable Administrator of the district of Sanga proposed that the Seminars take place in communities and not in urban centers.

Engineer Luís Pereira, from Lúrio University argued that communities are aware of their actions in setting the fire, so there must be sanctions in accordance with the law. Engineer Pereira ended his intervention by asking about the success of the actions of the company Green Resources Mozambique with the communities.

In response to engineer Pereira's concern, the representative of Green Resources Mozambique clarified that the company created a Social Fund to compensate communities for forest management. For example, each community receives USD 5 per hectare annually for the management of forest resources. The amount is distributed in USD 1 for fire management, USD 2 for monitoring illegal activities and USD 2 for meeting targets. The company emphasized that it is not an award, but a fund created for the sustainable management of forests.

Discussion in groups

The third part of the symposium was reserved for group discussions. For this purpose, the participants were separated into three groups. Each group had a distinct theme from the others: (1) uncontrolled burning VS Agriculture and poaching; (2) uncontrolled burning VS Tourism; and (3) Fire Management as a strategy for maintaining ecosystem services.

The representative of the first group stressed that Natural Resource Management Committees should not only solve problems when financial resources are available, but should find local solutions. Subsequently, the second group argued that uncontrolled burning reduced biodiversity, affected the ecosystem of rare flora and fauna species, and consequently decreased the interest and flow of tourists. Finally, the third group emphasized that fire management contributes to reducing carbon dioxide emissions; favors ecosystem balance and helps control pests and diseases.

Closing notes

Before the closing of the event, engineer Jone presented the terms of reference for the selection of the members of the Committee for the management of the fires in the province of Niassa, which were unanimously approved. According to the proposed structure, the committee would be represented by the Secretariat of State and provincial government, and assisted by the provincial Environmental Services; Provincial Directorate of Territorial Development and Environment; Infrastructure Services and Provincial Directorate of Public Works; Social Affairs Services and Provincial Directorate of Education; Departments of economic activities and Provincial Directorate of Agriculture; Civil society; Forestry and Wildlife Management Companies; academic institutions; Attorney General's office at the Provincial level; Natural Resources Management police; and district administrators.

In relation to the selection of members of the Committee for burn Management in Niassa province, it was proposed that District Planning and infrastructure services be included as the committee's Sterring.

The symposium participants were unanimous that companies, the government or communities alone would not be able to manage the fire, so they should all pool human and financial resources to manage uncontrolled burns.

Following the event, the participants agreed that a specific regulation should be created for the use of fire and that no one should burn a certain area without authorization and knowledge of the neighbor of the same.

The meeting ended with the challenge of developing a directive instrument to guide the functioning of the Committee for the management of fires in the province of Niassa and the need to include "uncontrolled fires" in the agenda of all meetings at the provincial and district level.

List of participants



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Appendix 5







FLOMOZ MAY AND JUNE MONTHLY REPORT

FLOMOZ's Pilot Project on Controlled Burning,*intitled "Management of* Forest Fire And Community Awareness Of Fire Management In Niassa Under The Project For Sustainable Forest Management And Redd+ In Mozambique" in the Majune, Marrupa and Maúa districts

Prepared by: UEM (FAEF) and UniLurio (FCA)

1. Introdution

In the month of June, the FLOMOZ project, through its consultants from the Eduardo Mondlane University - Faculty of Agriculture and Forestry, and the Lúrio University - Faculty of Agrarian Sciences, carried out several activities in the communities of Manhula, Pahua e Luambala district of Marrupa, Maúa e Majune respectively, in the province from Niassa. This report describes the activities planned and carried out in the months of June (level of execution), and the activities proposed for the month of July and August. In the month of June, activities related to phase 1 (awareness campaign on matters of fire prevention and fighting), namely: (1)Launch of the project "The Early Controlled Burning And Community Awareness Of Fire Management In Niassa Under-The Project For Sustainable Forest Management And Redd+ In Mozambique", (2) training on forest fire management and controlled burning, (3) demarcation and subdivision of the study area and (4) opening of general and internal firebreaks (breaking fire). Meanwhile, preparations for the execution phase planned for June were undertaken during the previous weeks including the month of June. To this end, team meetings involving UniLúrio and UEM project staff were conducted using online platforms. The preparation phase during the month of May included also addressing all necessary logistics requirements as well as the procurement processes.

1.1. Activity plan to be developed in June

Period	Activities	Responsibility
15 – 25 jun	Launch of the project "The	UEM and Unilurio
	Early Controlled Burning And	
	Community Awareness Of Fire	
	Management In Niassa Under-	
	The Project For Sustainable	
	Forest Management And Redd+	
	In Mozambique"	
	Training on forest fire	
	management and controlled	
	burning, (3) demarcation and	
	subdivision of the study area and	
	Demarcation and subdivision of	
	the study area and	
	Opening of general and internal	
	firebreaks (breaking fire).	

Tabela 1: Dates of each training stage by district/location

District	Topic covered	Date
Majune	Forest fires and controlled burns: types of forest fires and their causes, combustible material (characterization – size, coverage, condition and arrangement), atmospheric conditions/fire danger indices.	16/06/2023
	Fire management: fire management techniques fires, assessment of combustible material, material, and equipment necessary for carrying out controlled fires.	17/06/2023
	Assessment of the impact of fires: effects of uncontrolled fires on flora, fauna, soil, ecosystem, and social services. There was also talk about the importance of forests for community. Demarcation, subdivision of the study area and opening of firebreaks	18/06/2023
Marrupa	Forest fires and controlled burns: types of forest fires and their causes, combustible material (characterization – size, coverage, condition, and arrangement), atmospheric conditions/fire danger indices.	16/06/2023
	Fire management: fire management techniques fires, assessment of combustible material, material and equipment necessary for carrying out controlled fires.	17/06/2023
	Assessment of the impact of fires: effects of uncontrolled fires on flora, fauna, soil, ecosystem, and social services. There was also talk about the importance of forests for community. Demarcation, subdivision of the study area and opening of firebreaks	18/06/2023
Maúa	Forest fires and controlled burns: types of forest fires and their causes, combustible material (characterization – size, coverage, condition and arrangement), atmospheric conditions/fire danger indices.	23/06/2023
	Fire management: fire management techniques fires, assessment of combustible material, material and equipment necessary for carrying out controlled fires.	24/06/2023
	Assessment of the impact of fires: effects of uncontrolled fires on flora, fauna soil, ecosystem and social services. There was also talk about the importance of forests for community. Demarcation, subdivision of the study area and opening of firebreaks	25/06/2023

the implementation of the work

2.1.Launch of the project

2.1.1. Outline, Schedule and Period of Implementation

On 15 June of this year, the launching ceremony for the start of activities of the FLOMOZ Project (Sustainable Forest Management in Mozambique and REDD+) took place in the province of Niassa for the year 2023, covering three districts namely, Majune, Marrupa and Maúa. The launching ceremony took place in the District of Marrupa, locality of Manhula and was attended by the Honorable Director of the Provincial Service for the Environment (SPA), the Honorable Provincial Director of Territorial Development and Environment (DPDTA), the Honorable Administrators of the three aforementioned districts and the Honorable Directors of the District Services for

Economic Activities (SDAE) and District Services for Planning and Infrastructures (SDPIs), local community leaders, representatives of FLOMOZ, two representatives of the team of consultants from Eduardo Mondlane University, seven representatives from the side from Lúrio University and members of the local community.

The Director of the Provincial Environment Service carried out the Official Launch of the FLOMOZ Project, highlighting the relevance of partnership between the Mozambican Government and the Japanese International Cooperation Agency (JICA), for the creation of the forest management plan in which itinerant agriculture and fires was identified as the main activities for deforestation and forests degradation. Afterwards, the member of the council representing the State in the province present at the ceremony called for the collaboration of communities and local community leaders in the implementation of activities for the prevention and control of fires, considering that they play the role of teachers for technicians around the measures that they have adopted in case of fires. This representative spoke in the following terms "In Manhula there is a forestry concession, so for the success of their activities, the community has to collaborate in thecontrol the fires so that there is an area to explore and in turn continue to benefit from the 20% and social benefit. The Marrupa district is among the districts with the highest rate of fires are caused by arson".





Figure 1. Ceremony lunching at Manhula community, Marrupa district

2.2. Training on forest fire management and controlled burns

2.2.1. Outline, Schedule and Period of Implementation

Two teams, A and B, worked on the training. This was done to increase the flexibility of the training work. The training program was carried out by Team A of consultants, between in the Manhula community, June 16th and 18th; Pahua community, between June 20th and 22th; and Luambala community, between the 17th and 19th, by Team B.

In each communities, 50 people previously selected by the local structures has participed. The participants should came from as many households as possible in order to cover the bulk of the community, if possible, each of the 50 participants should belong to a different aggregate.

In terms of gender representation, in Mahula community we had 68% men and 32% women; in Pahua we had 76% men and 24% women and finally in Luambala we had 66% men and 34% women (within this number of participants in Luambala, four were inspectors from Safari Operator William Prado).



Figure2. Programtraining session: Luambala community (a); Pahua community(b).

In order to improve interaction, participants were divided into fourand or threeheterogeneous groups, with the aim of allowing highparticipation and interactivity in the topics under discussion. The consultants guided the group discussions, proposing relevant questions for reflection on: i) the impact of uncontrolled fires; ii) fire management and uncontrolled burning; iii) types of forest fires; iv) technical aspects of fire management, among others. At the end of the group discussions, all participants met again to consolidate the theme of the day.

The training debate sessions, prioritized aspects related to the types and causes of forest fires, combustible material (characterization – size, coverage, state and arrangement), atmospheric conditions and fire danger indices, effects of uncontrolled burning on flora, fauna soil. , ecosystem and social services and equipment needed to carry out controlled burns. The main points found during the discussions were in the table below.

Tabela 2: Summary of findings taken in group and joint debates in each of the communities visited

Discussion	Communit	Mahula - Marrupa,	Pahua - Maúa	Luambala - Majune
topics	y			
Introduction to fire	2	The main causes of wildfires are: i) Hunting; Inappropriate use of fire: ii) Cleaning of farm; iii) Honey harvest; iv) Cigarette consumption. Regarding the types of fires, surface and canopy fires are the most frequent.	Community members stated that fires are frequent in that area and that the main causes are: i) Hunting; Inappropriate use of fire: ii) Cleaning of areas for opening farm; iii) Cigarette consumption; iv) Honey harvest. Regarding the types of fires, surface and canopy fires are the most frequent.	The main causes of wildfires are: i) Hunting; Inappropriate use of fire: ii) Children; iii) Cleaning of farm; iv) Honey harvest.; and v) Fishermen. When fires occur, the nests are easily transported by strong winds, creating fire spots.
Fire management		 Fire management techniques used by communities: i) Cleaning around the farm and dwellings, before carrying out the burning in the intended location; ii) In the case of fires that occur in forests and fields, water, sand and tree branches are used to extinguish them. Main limitation in fire control is tall grass. 	To avoid the occurrence of fires they choose to: i) Clean the area around their homes; and ii) When they go to clear the farm, they first remove the grass from the surrounding area and then they put the fire. In case of fires they use branches of bushes to put out	Fire management techniques used by communities: i) Water, sand and tree branches have been used to overcome them.
Fire-related effe	ect assessment	Negative effects caused by uncontrolled burning: i) Forest fires affect the supply of wood for	Benefits of Fire:i) Aid in the regeneration of pasture grass;ii) Cleaning of farm; and	Impacts of uncontrolled fires considered negative for the community: i) It impoverishes the soil, as it eliminates the organic

different purposes;	iii) Chase away	matter and animals that live
ii) Thou drive enimels	dangerous animals.	there;
away from the community	In this community, it was	ii) It causes forest fires and
away from the community	emphasized that fire can	the death of trees in
and also kill those that	also be used to break the	general in addition to the
cannot escape the frames;	dormancy of some souds	destruction of trees
iii) Increase soil	of important forest	considered secred to their
susceptibility to erosion;	species for the	cultural rites:
iv) Underground fires	community	cultural lites,
aliminata microfouna	community.	iii) Pollution of river waters
reducing nutrient cycling		with ash;
capacity and soil aeration:	Negative effects of fire:	iv) Death of large and small
capacity and son aeration,	Negative effects of file.	animals, as not all manage
v) Decreased	Community members	to escape and those that
precipitation; they	present highlighted that	manage to end up invading
contribute to the silting up	fire destroys forests and	homes contributing to the
of rivers and consequently	fauna, causes erosion,	Man-Wildlife conflict
influence cyclical floods;	destroys homes and	man whome connet,
vi) Loss and abandonment	property, in some cases	v) Destruction of houses,
of residences burning of	even causing death.	destruction of property and
material goods		loss of human life;
(motorbikes, furniture.		vi) Loss of agricultural
clothing, among others).		products, loss of wood and
and loss of human life.		decrease in the flow of
		tourists as they no longer
		have vegetation or animals.
Fire is important because:		
i) Help to open farm,		Positive effects of fire:
ii) Regenerates the		
pasture for the animals:		1) It helps to regenerate
r		some tree seeds in the
iii) Scares away		torest; Helps rejuvenate
dangerous animals;		grass for pasture;
iv) Forest clearing: and		ii) Prevents forest fires
,		through cold burning; It
v) Facilitates the search		allows food to be cooked
tor firewood.		and bodies warmed up, so
		"we simply need to know
		how to use it".
The trainers added the		
importance of fire in		
breaking the dormancy of		
some important forest		
species for the		
community.		

Both communities recognized that from the forest it's important to can obtain wild fruits; construction material (stakes and rope); wood for the production of various goods afurniture and

tools(chairs, tables, hoe handles and pestles); combustible material (firewood and charcoal); foods such as honey and other non-timber forest products.

According to the debate in communities, detecting and gathering as much information as possible about the sighted wildfire is fundamental to make an assertive communication to the Fire Management Committee. In turn, the community be responsible for mobilizing othermembers, traveling to the fire site, intervention planning and finally fighting the fire, thus completing the six stages involved in fire fighting.





Figure 3.Group discussion session: Luambala community (a); Mahula community (b) e Pahua community (c)

In order to consolidate the consolidate the thematic contentscovered in the first two days, the participants were envolved in the opening firebreaks activities close to the each community, as part of practical class. The exercise allowed visualizing the nature of the firebreaks that would be opened in the study area by the members of the local community involved in the activity. It was highlighted that the definition of the size of the firebreak depends on the height of the combustible material present in the area.

Participatory mapping

This activity was done collectively and not in groups like the other topics discussed. The members of the community would say how their settlement was defined and the activities carried out (agriculture, fishing, hunting, charcoal production, beekeeping, cutting stakes for construction, logging), location of rivers and mountains. Finally, a map was obtained according to the description given by the community members present.



Figure 4: Participatory mapping of the Luambala community (a); Paua community(b) and Mahula community(c)

2.3.Demarcation, subdivision of the study area and opening of firebreaks

2.3.1. Outline, Schedule and Period of Implementation

This activity was carried out by the work team selected from the community, after the awareness campaign on fire prevention and fighting matters. In total, about 12 members of each community (training participants) were involved, representatives of different families, in order to carry out the activity and reconcile the theoretical aspects they received during the training. Where cold firing was planned, a 1ha block was kept intact for hot firing.

The team of consultants monitored the demarcation process, subdivision of the study area and the opening of the firebreak from the beginning, in order to guarantee that it was being carried out according to the recommendations.

	Mahula - Marrupa	Pahua - Maua	Luambala - Majune
Demarcated area and firebreaks	Two areas were demarcated: First area of 2 ha and the internal and external firebreaks will be 10 m wide. This is characterized by having greater coverage of the grass component, unlike the other area that has the advantage of dominance of tree species. Second area of 8 ha, and according to the characteristics of the vegetation, the open firebreaks were 5 m wide.	An area of 8ha was demarcated In this community, given the characteristics of the local vegetation, both external and internal firebreaks were 5 m wide.	An area of 16 ha was demarcated, divided into 4 blocks of 4 ha each, with two central firebreaks 5 m wide in the shape of a cross and a side firebreak that surrounds the 16 ha area. Finally, an area of 1 ha was demarcated in the Southwest, an area of 16 ha, where hot burning will take place, while the remaining 15 ha will be used for cold burning, between the months of July and August.

Table 2. Demarcated areas and open fires in each of the communities

ATTACHMENT

1. List of project launch participants

#	Name	Institution
1	Jone Fernando Junior	Assistente de Investigacao FAEF
2	Amelia David Mugabe	Docente da UEM-FAEF
3	Felipe Cancao	Docente da Unilurio
4	Rui Aguas Pacule	
5	Felizardo Biriate	
6	Daniel Jonasse Mpuecha	
7	Luciana Nhatumbo	Docente da Unilurio
8	Jonas Massuque	Docente da Unilurio
9	Jornito Muemede	Director do SPA de Niassa
10	Raul Messo	Chefe de departamento de florestas
11	Gracinda Levene	Tecnica de reparticao de florestas
12	Jackson Nkuanda	SPA
13	Celestina Teofilo	Directora Provincial da Agricultura
14	Pedro Salimo	Chefe do departamento
15	Eusebio Rachide	DPA
16	Victorino Buramuge	Asssistente de Investigacao FAEF
17	Alfredo Duvane	Docente da Unilurio
18	Semo Mogeia	Docente da Unilurio
19	Rosalina Machado	Docente da Unilurio
20	Valerio Pedro	Docente da Unilurio
21	Victor Levene	Administradora de Majune
22	Ismael Zilale	ADC de Majune
23	Ernesto Rajabo	Administracao de Majune
24	Ilda Macome	Administradora de Maua
25	Carvalho Mauricio	ADC de Maua
26	Chabane Cassimo	Administração de Maua

#	Full Name	Training participation (June of 2023)		
		17th	18th	19th
1	Acácio Bartolomeu	Х	Х	Х
2	Adelina José	Х	Х	Х
3	Adelino Sidónio	-	Х	Х
4	Alberto Abasse Robe	-	Х	Х
5	Amélia Salimo	Х	Х	Х
6	António Malute	_	Х	Х
7	Armindo Moisés - Régulo	Х	X	X
8	Bernardo Joaquim	-	Х	Х
9	Candida Wilede	Х	Х	Х
10	Cecília Assima	Х	Х	Х
11	Cornélio Adriano	Х	Х	-
12	Daniel Issa	Х	Х	Х
13	Domingas Tiago	Х	Х	Х
14	Ernesto Gongo	Х	Х	Х
15	Estélio José	Х	Х	Х
16	Faustino Wisso	Х	Х	Х
17	Fino Amussa	Х	Х	Х
18	Furcan Floriano	Х	Х	Х
19	Gabriel Wiriamo	Х	Х	Х
20	Gita Julião	Х	Х	Х
21	Gonçalves Valeriano	Х	Х	Х
22	Horácio Sinajo	Х	Х	Х
23	Issa Wilede	Х	Х	Х
24	Jacinto Joaquim	Х	Х	Х
25	Joaquim João	Х	Х	Х
26	Joaquim Walasse	Х	Х	Х
27	Joaquina Daussene	Х	Х	Х
28	Linda Daniel	Х	Х	Х
29	Lopes Calisto	Х	X	Х
30	Lucas Vitorino		X	Х
31	Madalena Issa	Х	Х	Х
32	Magay Manuel	Х	Х	Х
33	Mambo Jarde	Х	Х	Х

2. List of training participants- Majune

34	Manuel Awalo Bamussi	Х	X	x
35	Miguel Widinessi	-	X	Х
36	Miro Belmiro	_	X	Х
37	Miséria Manuel	Х	X	Х
38	Mofina Armando	-	Х	Х
39	Natália Wilide	Х	Х	Х
40	Nox Rui	Х	Х	Х
41	Olívia Ângelo	Х	Х	Х
42	Rofino Chisequite	Х	Х	Х
43	Saimone Munquiua	Х	Х	Х
44	Sidónio	-	Х	Х
45	Tercia Felisberto	Х	Х	Х
46	Tina Moisés	Х	Х	Х
47	Valeriano Saimone	Х	Х	Х
48	Vitorino Buanachauni	Х	Х	Х

3. List of training participants – Marrupa

16/06/2023 11 bin de treunamento. Emmendade de Manihita 28. Enterfano Arrândio CV bilita de parkmen Respondencel= Jacon Alberto CV 30. Jacquier wirimone # Balliona eduardo c 1. Dolfina Adriano 2 Isabel Tenne c 31. Filomena Alanec 3 Elina Saide cur 32 Mauricio Vicente UV 4 Leonora Pilar 33. Belinta Jabiao er 5. Clemencia Felecianoc 6 ATija Benjamin 34 Manuel Chigure T Hockenara Alexandre c 36 - Daniel Abilio + Demilson mildonicu 37 Gillio 8. Eugênio Bolacha 9 Saime Canno / 10 Alver Rafael UV 37 Silva Sibeno white w 11. Junios Ali 38. Ancha Journe cr 12 Raimundo Alvaroc 39. Hamiltung Irrang Ch 13 Alberto Chiquira -40. Ermelinda work cry 14. Antonio Carlitor CV 15. Joanito Alves CV 41 Maria Helena Sulsmane e 16. Ismael Fernandes C 12. Eusébio Filipe VV 17. Vicente Simae 43. Adina Rachide 18 biamantino Feleciano U 44. Cotonna Alberto CV 19 Martinho António 20. Quentino Eduardo UV 45 Atardire Pati ao ZI. Argentino Marcelino CN 16. Boatriz Alberto * C 22 bionitio João cor 47. Lucrenção, Sedro CV 23. Eduardo Agostinho 200 48. Quetodio Samuel Com 24 Alves Francisco 23 Janiel Arlindo CN 49. Axtufno Roaquiva 16 Eduardo yoão T Northnaio Simao /
4. List of training participants - Maua

Treinamento - Patrus	27. Daniel Jakson ~
And a second	28. Remition warally
Liste de prevença	29 Nelson Amamor
1 John Abdala-Réguler	30. Leonardo Intónio/
2. bomingon Amimor	31. Alfredo José /
3. Mateus Abdalar	32. Samuel Leonardor
4. Alebica Franciscos	33. Talvez Adriano
6. Bento Tome /	34. Jelie Abudar
7 Fernando Xavier	35. Luis Pauler
8. Juvêncio Mauricio-	36. Veniato Estevão
9. Evansto Bernardo	37 - Carliton Jervahior
10. Erequiel Agestinho	38. Cecília Jeremias
11. Severino Afonho	39. Gaudêncio Hemilia
12. Cansão Herminico	Calific Sevence *
13. Sozinho Santo	10. Cartonic solering
14. Evaristo Matengula	12. Armando Matxipinar
15. Cardoso Henniques/	13. Lopez white
16. Jenito Tome	13. Juliota Cammo
17 Juvêncio Manuelv	14. Jaminaos Matola
18 Jacinto Samuel	is Lealinder Alfredo
19. Serafim Rafael	IT Chotine Francisco
20. Vicente nauricio	8 Estefania Abilio
21. Jabião Batistar	9. Judiel baringes V
27. Frequiel Ento	o Albertina Francisco
23 Tomex Armando	1. beolinda Adriano
24 Pouline Beaventura	2. Florentina Adriano
25 Calito Cipiano V.	13. Feligarde Jeremias
a Labor Jairoll	4. Leonor trancince
26. Loper States	- Romaking Jeremias

Appendix 6







FLOMOZ JULY AND AUGUST MONTHLY <u>REPORT</u>

FLOMOZ Pilot Project on Controlled Burning, entitled "Management of Forest Fire And Community Awareness Of Fire Management In Niassa Under The Project For Sustainable Forest Management And Redd+ In Mozambique" in the districts of Majune, Marrupa, Maúa and Sanga.

Prepared by UEM (FAEF) and UniLúrio (FCA

1. Introduction

Within the scope of the FLOMOZ project, through the constituent members of UEM (FAEF) and UniLúrio (FCA), planned monitoring activities, inventory of grass, herbaceous and arboreal biomass, and cold burning were launched. The activities were carried out between the months of July and August, in the districts of Majune (community of Luambala), Marrupa (community of Manhula) and Maúa (community of Pahua), all in the province of Niassa. Given the continuity of the activities of the field work teams, this report reports on the activities implemented during the aforementioned months.

In this report, activities to extend new areas in the districts of Marrupa and Maúa are also described, including the demarcation of blocks and opening of firebreaks, as a way of standardizing the size of experimental area blocks in all districts. The first days of July were dedicated to preparing the activities to be carried out in the field, namely monitoring visits, cold burning, and collecting biomass fuel data, including the logistics involved.

Period	Activity	Responsibility	Execution level
07/19/2023	Preparation meeting for field	UEM and Unilúrio (technical	Done
	activities	team)	
25.07.2023 -	Monitoring of activities	Professor Paulo Guilherme	Done
27.07.2023			
25.07.2023 -	Work in the field (inventory,	UEM and Unilúrio (technical	Done
12.08.2023	measurement therethat of	team)	
	flammable fuel)		
	Cold burning only in Majune	UEM and Unilúrio (technical	Made only in two installments
	and Marrupa	team)	in the Districts of Majune and
			Marrupa
July and	Continuation of the preparation	Contracted company under the	Ongoing
August	of the burning manual and	supervision of UEM and	
	videos	UniLurio	

Table 1: Plan of activities carried out in the months of July and August

2. Results of activities carried out

2.1. Activity monitoring

Monitoring in the districts of Majune, Marrupa and Maúa was carried out between the 25th and 27th of July 2023. Representatives from SPA (Sidónio Gastão), DIPTA (Pedro Salimo), SDAE (Rui Águas Pacule-Majune, Elidio Malou-Marrupa and Daniel Mpuecha-Maúa) and SDPI (Sérgio Moçambique-Majune, Avelino Milando-Marrupa and Felizardo Biriate-Maúa) from each District, led by Professor Paulo Guilherme (UniLúrio - FCA), Keita Shimahoka, Luís Pereira and Stela Timana (FLOMOZ) and members of the technical team (Jone Fernando, Alfredo Duvane, Filipe Canção and Rosalina Tamele). For the first day of activities, we worked in the Majune district where the following explanations were given in the field:

- 1. Training was given on topics related to the use of fire and uncontrolled burning, their impacts, benefits and losses, which lasted 3 days covering a target group of 50 members per community.
- 2. After this activity, the area selection phase took place and the field was established to demonstrate the activities. An area of 16 ha was opened, divided into 4 blocks of 4 ha each with two central firebreaks 5 meters wide in the shape of a cross and a lateral firebreak that surrounds the total area. An area of 1 ha was also demarcated for cold burning, which took place in September.
- 3. The constituent members of the monitoring team visited the entire area and made a positive assessment of the activities implemented to date.

The following day (26.07.2023), the same work was carried out in Marrupa district. It should be noted that the training given in the three districts was on the same dates for a period of 3 days. The demarcated areas were visited. For this district, two areas were opened in different locations but within the same community. For the first, an area of 8 ha was opened divided into two blocks of 4 ha each with two central firebreaks of 5 meters and a firebreak that surrounds the total area of 5 meters. The second area comprised 2 ha with a lateral firebreak (perimeter) of 10 meters. On the same day, the Maúa field was visited and monitored.

After monitoring activity, the team made a positive assessment for the three districts, and recommendations for improving the work were duly written in a report.



Figure 1:Monitoring activity in the districts of Majune (Luambala community) and Maua (Pahua community).

On August 2nd, an internal monitoring visit was carried out in the ReviaComercial community area with the participation of members of the community involved, UniLurio (Filipe Canção, Alfredo Duvane), UEM (Jone Fernando, RomanaBandeira) and FLOMOZ. During this visit it was found that the maintenance of firebreaks in some areas requires more effort, an aspect that was mentioned in the meeting held with community members immediately after the visit, where they reflected on the need for sustainability of the activity of protection and sustainable use of forest resources.

2.2. Forest Inventory

The methodology used to carry out the inventory was adapted from the Manual for the Installation and Monitoring of Permanent Sampling Plots in Mozambique of 2020. This aimed to standardize the way vegetation data is collected with the purpose of generating statistical data capable of allowing comparisons between different types of forest formations and/or regions of the country.

Initially, through the systematic sampling process, temporary rectangular plots were established with a north orientation and a size of 50 mx 20 m (Figure 2). In the first phase, 160 plots were established, distributed among 80 in the community of Luambala in the district of Majune, 50 in Manhula, district of Marrupa and 40 in Pahua, district of Maúa. The plots were fixed in previously defined blocks with 5 m firebreaks in Luambala and Pahua and 10 m in Manhula.

For each location, blocks of 16 ha, 10 ha and 8 ha were previously established in the communities of Luambala, Manhula and Pahua, respectively.



Figure 2:Outline of sampling units for data collection. The orange color represents 4 ha blocks; brown color represents firebreaks; green indicates the 50 m x 20 m plots and lilac represents the 5 m x 5 m subplots. The diagonal X-shaped dashed line in the green plot represents the height measurement of grass/biomass and herbaceous plants.

In each plot, information on grass height/biomass and herbaceous plants was obtained using a biomass measuring disc. The measurement was made on two imaginary diagonal lines forming an X, with a distance of approximately 2 m between each point (Figure 2). The information collected at the points mentioned will be used to estimate the amount of fuel from the grass and herbaceous stratum existing in each experimental block. Simultaneously collecting data on the herbaceous stratum and grasses, the heights of all individuals with a diameter at breast height (DBH) greater than or equal to 5 cm (DBH 5 cm) were identified by local names and measured. In the 50 x 20 m plots, subplots of 5 x 5 m were established in the lower left corner, where all young trees with DBH 5 cm (non-established regeneration) were identified and counted, with the aim of understanding the recruitment capacity of new trees in communities.

2.3. Cold burning

Before the actual burning, the meteorological variables (wind speed and direction, temperature, precipitation, relative humidity, heat index) of the location were always surveyed, to observe the behavior and intensity of the fire. After the respective survey, the burning itself was carried out, with the aid of fire-flyers, generally in favor of the wind, considering that the combustible material was semi-green or still had a moisture content that justifies a low to moderate intensity of the fire. And as measures to control the fire, the burning was always carried out with all members involved with different materials such as backpack pumps containing water, fire dampers/fire battens, rakes, shovels and machetes.

Due to unfavorable weather conditions and the fuel material, which had a higher moisture content, it was not possible to carry out cold burning in all of the planned areas. In these locations and occasions, the average wind speed generally varied between 0 and 5 m/s, unsuitable for the intended effects considering the recommendations described by Soares et al. (2008).



Figure 3:Cold burning carried out in the district of Marrupa in the community of Manhula.

3. Extension of the Marrupa and Maúa experiment blocks

Initially, due to financial limitations, for the districts of Marrupa and Maúa, the total open area had been 10 and 8 ha respectively. An additional 6 and 8 ha were opened to total an area of 16

ha in each of them, aligning with what has already been done in the Majune district. Thus, another 30 plots were established in Marrupa and 40 plots in Maúa, totaling 240 plots in the three districts, for biomass measurement.

4. Production of fire manual and videos

Fire manual

During the months of July and August, the production of the manual on fires continued, the initial version of which is expected to be completed and shared in September for consideration and input both internally and by FLOMOZ

5. Main findings/conclusions

Of the planned activities, a positive point was the extension of the area from 10 and 8 ha in the districts of Marrupa and Maúa, respectively to 16 ha in each of them.

However, it was not possible to fully carry out cold burning in all established blocks, mainly in the districts of Maúa and Majune due to the meteorological condition observed in the allocated period and later the condition of the combustible material which was still damp.

6. References

Soares, RV; Batista, AC; Nunes, JRS 2008. Forest Fire Prevention and Fighting Manual. AJIR Graphics. Curitiba, Parana. 55p.

Appendix 7







FLOMOZ SEPTEMBER MONTH REPORT

FLOMOZ Pilot Project "Management of Forest Fire And Community Awareness Of Fire Management In Niassa Under The Project For Sustainable Forest Management And Redd+ In Mozambique" in the Districts of Majune, Marrupa, Maúa and Sanga.

Prepared by UEM (FAEF) and UniLúrio (FCA)

1. INTRODUCTION

1.1. Background

Within the scope of the FLOMOZ project, UEM (FAEF) and UniLúrio (FCA) staff planned monitoring and early burning activities which were executed in the month of September in the districts of Majune (community of Luambala), Marrupa (community of Manhula) and Maúa (Pahua community), all in the Niassa Province. The first days of September were dedicated to preparing the activities to be carried out in the field, namely monitoring visits and early burning, including the logistics involved.

Period Activity		Responsibility	Execution level
19.09.2023	19.09.2023 Preparation meeting regarding field activities		Conducted
		(project team)	
26.09.2023 -	Monitoring last performed activities	Professor Paulo	Conducted
29.09.2023		Guilherme	
26.09.2023 -	Early burning with participation of fire	UEM and Unilúrio	Conducted
29.09.2023 management committee members (finalizing		(project team)	
	remaining blocks)		
1-30 September	1-30 September Compilation of the fire manual Project team		Ongoing
1-30 September	1-30 September Videos production Video company		Ongoing
1-30 September Preparation of October Seminar Project		Project team	Ongoing
1-30 September Elaboration of technical report on combustible		Project team	Ongoing
material biomass survey		-	

Table 1. Plan of activities conducted in the month of September

2. RESULTS

2.1. Monitoring

Monitoring in the districts of Majune, Marrupa and Maúa was carried out between the 26th and 29th of September 2023. Representatives from SPA (Gracinda Levene), DIPTA (Pedro Salimo), SDAE (Rui Águas Pacule - Majune, Elidio Maloa - Marrupa and Daniel Mpuecha - Maúa) and SDPI (Sérgio Mozambique - Majune, Avelino Milando - Marrupa and Felizardo Biriate - Maúa) from each District, led by Professor Paulo Guilherme and member of the technical team (Filipe Canção).

Table 2. Activities undertaken during monitoring

Date	Activity performed at monitoring
26 th September	Visit to the demonstration area in Luambala -Majune
27 th September	Visit to the demonstration area in Marrupa
28 th September	Visit to the demonstration area in Maúa

With the visits made to all demarcation areas, it was possible to:

• Observe the areas where early burning was possible in the months of July and August. The remaining areas were scheduled to be burned during the month of September.

• Make a positive assessment of the activities implemented to date, however, it was called, the priority, that early burning be carried out immediately, under penalty of the area being subjected only to hot burning (which was not planned).

Once the monitoring activity in the three districts was complete, the team committed to sharing recommendations for improving the work and the respective monitoring images duly written in a report to be submitted in the coming days.

2.2. Early burn

Before starting the early burning, the meteorological variables (wind speed and direction, temperature, precipitation, relative humidity) of the location were surveyed, to analyze fire behavior and intensity, and the following data were obtained:

	Parameters		Combustible Material			Date	
Districts- communities	Wind speed (m/s)	Temperature (°C)	Type/category	Continuity	Distribution	of the survey in 2023	Date of the implementation in 2023
Majune - Luambala	6	29.2	Semi-dangerous	Continuous	Horizontal	26/09	26/09
Marrupa - Manhula	8	29.5	Semi- dangerous	Continuous	Horizontal	27/09	27/09
Maua - Pahua	6	29.8	Semi- dangerous	Continuous	Horizontal	28/09	28/09 - 29/09

 Table 3. Meteorological variables measurement

After the survey, actual burning was carried out (see images in the annex 1), as the conditions were met for this, with the help of sparks (fireflyers), generally oriented in favor of the wind and considering that the combustible material was semi-green or with a moisture content that justifies a low to moderate fire intensity, fire was set in almost the entire demonstration area (except the 1 ha area where late/hot burning will take place).

During the process of carrying out the early burning, the fire management committee of each community was present, accompanied by the materials and tools provided, specifically: backpack pumps containing water, fire dampers/fire battens, rakes, shovels, machetes. Per community and burning site 12 members of the fire management community participated in the activity, list of participants attached as annex 2. The burned area was 15 ha per site per District.

2.3 Fire manual and video production

During the month of September, fire manual continued to be edited. The preliminary versions of the three videos were produced, available in the link https://drive.google.com/drive/folders/1Ox6Mgv7HJEP8Fd0XXaFkb3EPx-ChszzW

2.4 Other project activities

Preparations of the seminar have been implemented through project team meetings to coordinate necessary steps, producing of invitation letter drafts, as well as seminar concept note and tentative programme, list of seminar participants in annex 3.

The technical report on combustible material biomass survey and inventory before burning was produced and will be complemented with combustible material biomass after burning to be conducted in October in order to assess burning efficacy and coverage.

3. Main observations/Conclusions

Of the planned activities, a positive point was the early burning in all planned areas in all project districts, which will allow the team to subsequently make estimates of biomass fuel for the entire area under study.

ANNEX 1



Figure 1: Images showing burning activity in Majune district – Luambala



Figure 2: Images showing burning activity in Marrupa district – Manhula



Figure 3: Images showing burning activity in Maúa district – Pahua.

Annex 2. List of participants in the burning activity Maua District

Nome	
Aleluia Francisco Mucolo	
Jose Abdala Muhua	
Domingos Amimo Masse	
Mateus Abdala	
Sozinho Santos	
Bento Tome	
Alfredo Jose	
Florentina Adriano	
Amede Armindo de	
Cecilia Francisco	
Samuel Leonardo	
Deolinda Adriano	

Marrupa District

Nr	Nome	
	Manuel	pascoal
1	Chiquire	
2	Raimundo Alvar	ro
3	Artufino Moaqu	iwa
4	Alves Francisco	
5	Estefano Arman	do
6	Daniel Arlindo	
7	Bernardo Vicente	
8	Atardino Patricio	
9	Eduardo Joao Tuaibo	
10	Rosina Celestino Razao	
11	Iahaia Alberto Tuarbo	
12	Tavares Tuaibo	

Maune District

Nr	Nome
1	Daniel Issa
	Vitorino
2	Buanachuaule
3	Candida Wilede
4	Mofina Armando
5	Saimone Muquiwa
6	Armindo Moises
7	Miseria Manuel
8	Olivia Angelo
9	Adelina Jose
10	Cecilia Assima
11	Ancha Bartolomeu
12	Lucas Vitorino

Appendix 8







FLOMOZ OCTOBER MONTH REPORT

FLOMOZ Pilot Project on Controlled Burning, entitled "Management of Forest Fire And Community Awareness Of Fire Management In Niassa Under The Project For Sustainable Forest Management And Redd+ In Mozambique" in the districts of Majune, Marrupa, Maúa and Sanga.

Prepared by: UEM (FAEF) and Unilúrio (FCA)

1. Introduction

In October, the FLOMOZ project, through its technicians from the Eduardo Mondlane University -Faculty of Agronomy and Forestry Engineering, and the University of Lúrio - Faculty of Agricultural Sciences, carried out various activities in the communities of Manhula, Pahua, Luambala and Maumbica, in the districts of Marrupa, Maúa, Majune and Sanga respectively, in the province of Niassa. This report describes the activities planned and carried out in the mentioned month (execution level). Activities related to phase 2 (Management of forest fires within the forest) and phase 3 (General activities) took place, namely:

- Training in forest fire management and controlled burning in the surrounding communities of Luambala, Manhula and Pahua;
- ✓ Measurement of grass mass after cold firing;
- ✓ Training for rangers from the Lipilichi Wilderness safari company and raising awareness among communities residing within the boundaries of the Chipanje-Chetu community conservation area in Sanga district;
- ✓ Hot burning in the communities of Luambala Manhula and Pahua;
- ✓ Monitoring activities and
- ✓ Workshop held (DINAF, SPA, DPDTA, SDAE, SDPI, REN, private operators, UEM and UniLúrio).

Dates	Activities	Responsible person(s)
09/30 - 10/10 -	Training in the district of Maúa, Marrupa and Majune (Community/Management Committee of Pahua and surrounding communities) and survey of grass mass data after burning in Maua.	Technical team
11 - 14/10	Training in the Sanga district (Maumbica Community, Lipilichi Wilderness safari rangers).	
15-18/10	Survey of grass mass data after cold burning in Marrupa and Majune.	Technical team
24 -25/10	Workshop (DINAF, SPA, DPDTA, SDAE, SDPI, REN, private operators, UEM, UniLúrio)	Technical team
	Burning hot in the districts of Majune, Marrupa and Maua	Technical team
26 -29/10	Monitoring of activities (Majune, Marrupa, Maúa and Sanga)	UniLúrio, SPA, DPDTA, SDAE, SDPI

Tabela 3: Plan of activities developed

2. Results of work execution

2.1. Training in forest fire management and controlled burns

The training program was carried out between 09/30 and 10/14 in the communities of Manhula, Pahua, Luambala and Maumbica, in the districts of Marrupa, Maúa, Majune and Sanga respectively, where the following surrounding communities participated (table 2):

District	Community involved	Surrounding communities
Majune	Luambala	Members of the Luambala fire management committee;
		Xipwipwi Community;
		Micoco Community.
Marrupa	Manhula	Members of the Manhula fire management committee;
		Mukuvango Community;
		Yaranka Community.
Maua	Pahua	Pahua Fire Management Committee Members
		Nikweniha Community;
		Muloloha Community.
Sanga	Maumbica	Maumbica Headquarters;
		Lilumba 1;
		Lilumba 2.

For each district, 50 members of the communities involved were invited, previously selected by local structures, being: 12 members of the fire management committee and 19 members for each community, however it was not possible to reach this required number.

Additionally in Maumbica, the training also included members of the Community Management Committee (COGECO) integrated into the area being explored by Lipiliche Wildness. In addition to COGECO members, the Leader of each community involved and other members residing in these communities.



Figure 1. Maumbica community training and discussion session in Manhula

According to the debate in both communities, detecting and collecting as much information as possible about the uncontrolled fire seen is essential to make an accurate communication to the Fire Management Committee. In turn, this will be responsible for mobilizing its members, traveling to the fire site, planning intervention and finally fighting the fire, thus completing the six stages involved in fighting fires.

As a way of consolidating the content covered in the training, the communities were taken to visit the area where the firebreaks were opened. Meanwhile, in the community of Maumbica, a diagram was made as a way of showing how the firebreak has been opened.



Figure 2. Visit the demonstration area in Pahua.

2.2. Grass mass data collection after cold burning

Due to the non-connectivity of the combustible material (Figure 3), it was possible to verify some plots where there were practically many unburned spots, despite the continuity of the combustible material in terms of arrangement and horizontal in terms of distribution and continuity of combustible material.



Figure 3.Lack of connectivity of combustible material



Figure 4.Grass mass survey after cold burning in the districts of Marrupa (a), Majune (b) and Maúa (c) respectively.

2.3. Results presentation seminar

As a way of publicizing the results of the Project's activities carried out this year, and debating strategies for the sustainability of the actions, a Seminar was held between the 24th and 25th of October this year with the objectives:

- Present the results of the Pilot Project activities and other studies aimed at conserving forests through fire management;
- ✓ Discuss and publicize the effectiveness of using controlled burning as a forest management tool;
- Present the Controlled Burning Manual developed by the Project, to be used as a guide by communities and other actors
- Present the video on best practices for preventing and combating uncontrolled fires produced by the Project;
- Discuss the best strategies to guarantee the sustainability of the activities carried out when implementing the pilot project; It is
- Create institutional and community technical capacity in sustainable forest management with regard to preventing and combating forest fires.

The Seminar was attended by the Representative and technician from the National Directorate of Forestry (DINAF), Director and technicians from the Provincial Environmental Services (SPA), Director and technicians from the Provincial Directorate of Territorial Development and Environment (DPDTA); Coordinator and representatives of JICA Mozambique; Administrator of the Niassa Special Reserve (REN); technicians from the District Economic Activities Services (SDAE) and technicians from the District Planning and Infrastructure Services (SDPI) from all districts in the province of Niassa; Safari and forestry concession operators, forestry companies and community leaders from the communities of Maumbica (Sanga district), Luambala (Majune district), Manhula (Marupa district) and Pahua (Maúa district); academies represented by Eduardo Mondlane University and Lúrio University.



Figure 5.General appearance of the Seminar session room

2.3.1. Presentations and discussion in plenary

The Seminar began with brief welcome notes to participants, by the Provincial Directorof Territorial Development and Environment, following the Director of Provincial Services took the floor, noting that the implementation of the FLOMOZ pilot project in the province of Niassa, is integrated into the national policy and strategy of the government of Mozambique, with a view to ensuring integrated forest management and climate change mitigation REDD+ . He also made reference to the provincial integrated forest management plan, which is an instrument of capital importance that serves to evaluate and measure the elements that contribute to the degradation of forests in the Province of Niassa.When designing this instrument, it was found that uncontrolled fires constitute a factor in forest degradation, loss of biodiversity and human lives and compromise the province's economy.

He mentioned the 1st symposium on uncontrolled fires held this year, which was crucial in drawing guidelines for mitigating uncontrolled fires. He highlighted the importance of the Seminar, as being essential to transmit knowledge and experiences related to fire management techniques and management.

The Seminar program had three parts namely, (i) Presentations and plenary discussion; (ii) Group discussions; and (iii) Practical demonstration of hot burning in Marrupa district, in accordance with the attached shared program.

After the initial opening notes, thematic presentations followed: where UEM kicked off by addressing topics related to forest fires. During the presentation, issues related toglobal climate change; fire ecology; and preservation of the environment, through appropriate fire management. He discussed forest fires, their implications for climate change, different types of fire, conditions for their occurrence, and at the end left a question for reflection on subsequent actions that can be taken to preserve the environment.



Figure 6. Thematic presentation session

Later, the DINAF representative addressed a topic regarding spatial and temporal trends in the use of fire in Mozambique. In it, he focused on the problem of uncontrolled fires in the degradation of forests and the emission of carbon dioxide.

During the presentation he mentioned that miombo forests have a higher incidence of fires, followed by undifferentiated forests, and, at the level of Mozambique, the peak of fires normally occurs in September, however the change in this peak represents a major concern.

In 2005, the peak of fires occurred in August, while in 2010, 2015 and 2020 it was concentrated in September. However, in 2022 the peak of fires moved to October, as a consequence of climate change.

The province of Niassa is among those with the highest incidence of fires, with the districts of Mecula, Marrupa, Sanga, Majune and Mavago being the most prominent. In this province, the peak of fires moved to October, which is worrying, and the districts that contributed most to setting the

peak of fires for October were Majune, Mavago, Lago, Muembe, Chimbonila and Ngauma. Therefore, there is a need to launch a serious awareness campaign among the communities in these districts by local leaders.

Later, the DINAF representative referred to a platform for monitoring fires and deforestation. As follow-up actions, he spoke of the need to strengthen the intervention capacities of local communities; design of participatory programs to control and prevent uncontrolled fires; use of technologies to control and mitigate fires.

The proposal for a manual on good controlled burning practices was then presented by UEM, focusing mainly on its content. It was mentioned that the manual was still being prepared and it comprises three parts, the first part referring to basic concepts related to integrated fire management; the second part addresses elements of integrated fire management and the third part is related to prescribed burning techniques.

2.3.1.1. Discussion session

The discussion of the topics was moderated by the representative of the National Forestry Directorate, who made some comments related to the presentations made, emphasizing the problem of uncontrolled fires and the importance of the responsible use of fire.

He then invited the participants for interventions: in this regard, community leaders of the invited communities shared their experience with the FLOMOZ Project, namely, the activities carried out by the project and how they have promoted awareness-raising activities among members of their community about the danger of fire and , as a result, campaigns have been launched to raise awareness among communities about the danger of uncontrolled fires.

The community leaders of the Manhula community, Marrupa district, addressed the problem of the invasion of elephants in the community, and the use of fires to scare them away, which often results in uncontrolled fires.

Reacting to this intervention, the Administrator of the Niassa Special Reserve said that there is basic work being carried out to mitigate the human-elephant conflict and that the immediate action was the allocation of inspectors from the Reserve and SDAE Marrupa for scaring actions. . He spoke of a line of communication to report emergency cases.

The Prof. Romana, sought to find out about plans and programs for maintaining firebreaks in places where they had already been established. In reaction, the chief of Luambala, district of Majune assured that inspection and control work will be carried out in the areas. Meanwhile, she highlighted the role of the 12 members of the community fire management committee.

Reacting to DINAF's presentation, the director of SPA expressed concern about the fact that the district of Muembe this year was among those with the highest incidence of fires, and last year was one of the districts that burned the least, having been this was awarded at the 1st Provincial Symposium on uncontrolled fires that took place in April this year in the province. He encouraged technicians from the districts to activate the fire and deforestation monitoring platform on their cell phones to advise district governments on the fire situation.

The Provincial Directorof Territorial Development and Environment, congratulated community leaders on their shared experiences and suggested that training programs include plays and radio messages to facilitate their dissemination, given that radio is a medium easily accessible to communities.

The FLOMOZ representative encouraged the continuation of fire management efforts, as the occurrence of fires in the province constitutes a major challenge, he also encouraged that the Government of Mozambique should continue the initiative by mobilizing funds from other sources, considering that the FLOMOZ project it's finishing.

2.3.1.2. Group discussion

The second part of the Seminar program consisted of discussion in groups on topics related to proposals to encourage the use of alternative fire techniques, with regard to the feasibility of proposals for the commercialization of carbon credits as a form of incentive for communities that use techniques alternatives to the use of fire.

In relation to the proposals put forward, the three groups converged on the need to raise awareness among local communities about the danger of uncontrolled fires, promotion of conservation agriculture, training of Natural Resources Management Committees in matters such as beekeeping, sustainable production of charcoal; law enforcement; dissemination of good practices on the use of fire. The groups also proposed trading carbon credits in conservation areas as a way of encouraging communities to conserve forests.

2.4. Practical demonstration of hot firing

In the third part of the seminar, therefore the second day, participants traveled to the community of Manhula, Marrupa district, for a practical demonstration of hot burning.

The burning activities were carried out in an area close to the communities of 1ha. Before burning, weather conditions were observed. The burning activity was led by one of the members of the Burning Management Committee. The burning demonstration activities ended with final considerations, which consisted of encouraging communities to apply the knowledge acquired.



Figure 7.Participants to the Seminar, touring the area that will be subject to hot burning demonstration.



Figure 8.Inthereheat of burning (i), spread of fire (ii), extinguishing active fires after the end of burning (iii)

During the burning demonstration process, some questions were raised by SDAE and SDPI technicians:

- ✓ How can you identify whether there is an appropriate wind condition to carry out the burning, without using the instrument;
- \checkmark What is the ideal size of the firebreak to be established, among others.

These questions were answered by the Manhula fire management committee, explaining that we can take a piece of sand and release it slowly, so we can see the direction the wind is taking. Regarding the size of the firebreaks, 5m is recommended.

2.5. Hot burning and activity monitoring

Monitoring in the districts of Majune, Marrupa, Maúa and Sanga was carried out between the 26th and 29th of October. The monitoring team was represented by SPA (Eng. Raul Messo), DIPTA (Pedro Salimo), SDAE (Rui Águas Pacule - Majune, Elidio Maloa - Marrupa and Daniel Mpuecha - Maúa) and SDPI (Sérgio Moçambique - Majune, Avelino Milando - Marrupa and Felizardo Biriate -

Maúa) from each District, led by Professor Paulo Guilherme and member of the technical team (Filipe Canção).

2.5.1. Burns hot

Before starting the hot burning, the meteorological variables (wind speed and direction, temperature, precipitation, relative humidity) of the location were surveyed, to observe the behavior and intensity of the fire.

After the respective survey, the actual burning took place (see images), as the conditions were created for this, with the help of fireflyers, generally oriented downwind and considering that the combustible material was semi-green. or with a moisture content that justifies a low to moderate fire intensity, fire was set in the remaining 1ha area. During the process of carrying out the hot burning, the fire management committee of each community was present accompanied by the material provided, specifically: backpack pumps containing water, fire dampers/fire battens, rakes, shovels, machetes.



Figure 9. Burning hot Maúa

Appendix 9

Appendix 10
Appendix 11

Appendix 12

Workshop Programe

Workshop phase	Data	Horário	Contents	Activity	Responsibility	Observation
		(hrs/min)				
	24	08:00-	Arrival of participants and registration		Secretariat	Registration
	Oct	08:30				
		08:30-	Presentation of the Workshop program and objectives		MC	Manuela
		08:35				Sentinanca
		08:35-	Welcome note (policy level interventions)		DPDTA	Dra
		08:40				Celestina
						teófilo
		08:40-	Welcome notes and opening of the event		SPA	Dr. Jornito
		08:50				Muemede
		08:50-9:00	Opening remarks		FLOMOZ	Dr. Kato
						Kazuhisa
Part I		09:00-	Theme 1: Forest Fires	Presentation	UEM	Jone
Meeting in Plenary		09:15	1) Global climate changes;			Fernando
at the Conference			2) Fire ecology;			
Room in Lichinga			3) Preservation of the environment			
Koom in Lichniga		09:15-	Theme 2: Spatial and temporal trends in the use of fire	Presentation	DINAF	Obasanjo
		09:30	in Mozambique			Dembele
			1) Presentation of hot spots from 2019 to 2022;			
			2) Results of hot spots monitoring.			
		09:30-	Theme 3: Presentation of data on activities carried out	Presentation	Unilurio	Alfredo
		09:45	at the study sites			Duvane
		09:45-	1) Action strategy to ensure a reduction in the rate of	Discussion	Project Staff	Paulo
		10:30	uncontrolled fires;		5	Guilherme
			2) Discussion on controlled burning;			
		10:30-	Photo protocolar			
		10:35				

		10:35-	Coffee break			
		11:00	Theme 4: Effects of uncontrolled fire on the forest and	Presentation	Unilurio	Semo
		11:20	communities	riesentation	Children	Mogeia
		11:20- 11:40	Community intervention (considerations about the impact of the project on the community; changes in community behavior before and after the project)		Community Leaders	Regulo Revia Comercial
						Regulo de Marrupa
		11:40- 11:55	Presentation of preliminar videos <i>draft</i> on fires	Video	UEM	Amelia Mugabe
		11:55 - 12:20	Presentation of teaching material already produced by the project 1) Fires and controlled burning manual	Presentation	UEM	Romana Bandeira
		12:20 – 13:00 –	Discussion: Strategies for reducing the use of fire 1) The impasse in reducing the use of fire: There are laws, knowledge and technical-scientific motivation; How to reduce the use of fire Note: Group formations	Discussions	SPA	Jornito Muemede
		13:00- 14:00	Lunch			
Parte II Group discussions		14:00- 14:45	 Theme 5: Incentive proposals for the use of alternative fire techniques 1) Discuss the feasibility of proposals for trading carbon credits as a form of incentive for communities that use alternative techniques to the use of fire. 	Group discussions and presentations	DPDTA	Dra Celestina Teofilo
		14:45- 15:05	Final considerations	Speech	FLOMOZ	Dr. Kato Kazuhisa
		15:05- 15:15	Ending notes		SPA	Dr Jornito Muemede
Parte III Demonstrations in the forest (Marrupa)	25 Oct	05h	Concentration on ABC			Amelia e Jone

1	10:30- 11:00	Participants arrival and introductions		All	
1	1:00- 11:30	Visit to the site where ptoject activities were conducted	Practical session	Project staff and community	
1	1:30- 12:00	Field findings on the effects of controlled burning and natural burning (for future comparisons)	Practical session	Project staff and community	
1	2:00- 13:00	Hot burning	Practical session, demonstrations	Project staff and community	
1	13:00- 13:15	Discussion, questions and answers		All	
1	3:15- 13:30	Workshop ending notes & Luch			

Appendix 13



Faculdade de Agronomia e



Faculdade de Ciências Agrárias

Conceptual Note

Workshop to disseminate results of the project "Controlled Early Burning and Community Awareness for Forest Fire Management within the scope of Sustainable Forest Management and REDD+ Project in Mozambique"

1. Introduction

Mozambique, with a land surface of 786,380 km² and 40% of the territory covered by natural forests (MITADER, 2019), occupying around 34 million hectares (MITADER 2018), is considered one of the few countries in Southern Africa that still has a substantial area of native forests and other native woody formations (Wertz-Kanounnikoff *et al.*, 2011).

The miombo ecosystem is known as one of the main woodlands in the country, covering around 2/3 of the forest area (MITADER, 2019). The miombo is an important source of raw material for the timber industry, in addition to contributing to the subsistence of the population residing around it by offering food products (mushrooms, roots, bulbs), medicines, construction material, fuel domestic and for serving spiritual values associated with these forests(MITADER, 2018). Although considered a uniform ecosystem, due to the predominance of *Brachystegias*, miombo woodlands present variations in composition, structure and diversity at a local level resulting from human actions, wildlife, climate and soil (MITADER, 2019). The tree layer has a density average over 500 trees/ha (Ribeiro et al., 2013); in the herbaceous layer, grasses of the genus *Hyparrhenia*, *Andropogon* and various shrubs and vegetables predominate; the shrub and herbaceous strata, in

addition to constituting a source of food for a large number of wild animals, is also a significant source of fuel material for recurrent fires during the dry season (MITADER, 2019).

Ribeiro et al., (2013), observed that on Niassa's reports forests found evidence of an association between the incidence of fires and vegetation structure, forest degradation and GHG emissions. Man is seen as the main catalyst of forest fires caused by uncontrolled burning during the clearing of agricultural fields, hunting, honey harvesting and charcoal production. Therefore, it is important to consider the implementation of controlled burns as a management and sustainability tool for forest resources.

The project "Early Controlled Burning and Community Awareness for Forest Fire Management within the scope of the Sustainable Forest Management and REDD+ Project in Mozambique", has been implemented since May 2022, having started with the pilot project in the community of Revia Comercial, district of Majune, which culminated in the dissemination of project activities in November 2022.

In the current year, activities were fully developed in 3 potential districts selected depending on the presence of a safari or forestry operator, namely: Majune, Marrupa and Maúa, starting with community awareness raising for the local population and training for community members specifically selected fire management committee (hereinafter referred to as "large-scale activity"). Training was also carried out for inspectors from the Lipilichi Wilderness safari company and awareness raising among communities residing within the boundaries of the Chipanje-Chetu community conservation area, in the Sanga district.

As a way of reporting on the results of the Project's activities, as well as discussing possible strategies for the sustainability of the actions, it is intended to hold a Workshop between October 31st and November 1st, 2023, aimed at relevant personnel from various local institutions that work towards the management of forest resources in the province of Niassa, as well as the main representatives of the communities.

2. Workshop objectives

i) Present the results of the Project activities and other studies aimed at conserving forests through fire management;

ii) Discuss and publicize the effectiveness of using controlled burning as a forest management tool;

iii) Present the controlled burning manual developed by the Project, to be used as a guide in other communities and districts in the country;

iv) Present the documentary video on the best practices for preventing and combating uncontrolled fires produced by the Project;

v) Discuss the best strategies to guarantee the sustainability of the activities carried out when implementing the pilot project; It is

vi) Create institutional and community technical capacity in sustainable forest management with regard to preventing and combating forest fires.

3. Expected Results

I) Demonstrated the current situation in Mozambique, in particular the province of Niassa regarding the fire outbreak;

ii) Partners and communities are aware of the importance of fire management for forest management through carrying out appropriate prevention and combat activities;

iii) Demonstrated the controlled burning manual as a product of the Project, to be used as a guide to preventing and combating forest fires in other communities and districts in the country;

iv) Understanding the importance of the video produced by the project to encourage changes in community behavior regarding best practices to combat uncontrolled fires;

v) Proposals for strategies contextualized in local realities were found to ensure continuity in carrying out activities to mitigate and combat uncontrolled fires; It is

vi) Created institutional and community technical capacity for sustainable forest management through forest fire mitigation at the level of Niassa province.

4. Workshop programme proposal

In terms of the structure and strategy of the Workshop, it is organized into three phases as shown in annex (Table 1):

i) Brief presentations and debates in plenary;

ii) Presentation of the draft videos and manual on fires;

iii) Demonstration of controlled burning on the ground and observations of the effects of the fire.

5. Venue and time

The Workshop will take place in Bendiaque, city of Lichinga, between 8:00 am and 3:30 pm on October 25th and in the community of Manhula, Marrupa district, between 7:30 am and 5:30 pm including travel on October 26th, 2023

6. List of articipants

The Workshop is aimed at staff from DINAF, SPA, SDAE and SDPI from all districts of Niassa province, Safari and forestry concession operators, forestry companies and community leaders from the communities of Maumbica (Sanga district), Luambala (district de Majune), Manhula (Marupa district) and Pahua (Maúa district). Around 100 participants will attend the Workshop

Appendix 15







Sustainability analysis of fire management in Niassa Province Implemented within the scope of the Sustainable Forest Management and REDD+ Project in Mozambique

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7. Introduction

Within the scope of the Sustainable Forest Management and REDD+ Project in Mozambique, implemented by UEM, and UNILÚRIO which has been implemented since May 2022.

An initiative called Early controlled burning and community awareness on forest fire management".

Training and monitoring were carried out in the communities of Luambala in Majune, Manhula in Marrupa and Pahúa in Maúa on the different fire management techniques, as well as the socioenvironmental advantages that can result from the management practice. Thus, some people were selected per community to be formed and join a local fire management and management committee.

Aware of the end of the project, the aim is to verify the sustainability of fire management practices in these communities after the withdrawal or end of the FLOMOZ project. Therefore, a social study was carried out in the communities covered with the aim of assessing the potential for continued fire management by the local community using local alternatives, as well as identifying alternative income activities, to those that have some potential risk of causing uncontrolled fires. This study was conducted specifically in the communities

8. General objective

• Evaluate alternatives for continuing fire management in communities in Majune, Marrupa and Maua districts, through local resources or external financing.

9. Specific objectives

- Identify the main reasons for the occurrence of uncontrolled fires in these communities;
- Assess communities' perception of fire management;
- List the main fire management alternatives using local resources.

9.1. Data collection methods:

Focus group interviews were carried out with residents from each of the 3 Districts selected for this study, in the local communities of each of the Districts, the multiple ways in which forest resources are used by local residents were inventoried, including where and for what purpose (See Figure 1).

In-depth mapping interviews were also conducted to develop a broader scale map and characterization of forest resources and distribution within our study area. These maps were made with the aim of revealing the main hotspots and likely starting points for uncontrolled fires.



Figure 1: Meetings held in the communities of Luambala, Manhula, and Paúa in the districts of Majune, Marrupa and Maúa respectively with the aim of inventorying the uses of forest resources and hotspots of uncontrolled fires.

In the focus groups, open questions were asked with no answer options, where all responses were collected and comments provided.

Individual interviews were also carried out with community leaders, representatives of community committee teams, elders, young people and representatives of the district government, to assess the different ways of using fire and also identify alternative activities that can contribute to fire management using resources. locations (See figure 2).



Figure 2:Interview with the governor of the Pahúa community (1), with the community's elders (2).

10. Sampling:

For the focus group discussion, it was possible to identify a group of participants through convenience sampling of the community (These focus groups were set up by the enumerator assisted by local leaders). This is the most common form of qualitative sampling and occurs when people are invited to participate in the study because they are conveniently and opportunistically available in terms of access, location, time and disposition. However, all areas of the community were included to ensure greater representativeness in the sampling.

For individual interviews, purposive/purposive sampling was used. This is also a commonly used sampling strategy, as participants were recruited according to pre-selected criteria relevant to this research.

Selection criteria included being well positioned to engage with a community map, answer questions from their experience that spans wider regions of the current study area, and activities of interest to the community.

11. Results

11.1. Interview results

Based on the assumption that the organization of the community structure plays an important role in coordinating the actions of the community itself, different types of interaction with each community were considered in this study. This interaction made it possible to obtain the following results.

11.2. Community of Pahúa

13 people (9 men and 4 women) were interviewed in the community of Pahúa, of which 1 was the Director of District Services for Economic Activities (SDAE) and 2 were community leaders. The interviewees formed a group composed of Young people (1), Elders (2), housewives (3), local leaders (4), and a government representative (5).



Figure 3: The figure shows the moment of interviews with elders of the Pahúa community, (3) regulo and his deputy.

It was found that 75% of those interviewed are native to the region and the rest are people who came later, almost all of them have always lived in the study region and practice agriculture,

which is the main activity carried out in the area, which is why the answers provided by them are credible.

11.3. Manhula Community

13 people (9 men and 4 women) were interviewed in the Manhula community, of which 1 was the Director of District Services for Economic Activities (SDAE) and 1 was a community leader, elders and young people from the community. The majority of interviewees are native to the study area and the rest have resided in this area for at least 30 years.



Figure: The figure shows an interview in the Manhula community, 1 with an elder and 2 with the Manhula governor.

Luambala Community

11 people were interviewed in the Luambala community (8 men and 3 women), including 3 community leaders. In the community, the interviewees were mostly young. Most of them are natives, the rest have lived in the community long enough to have the knowledge to be involved in an interview and give credible information, almost all of them have always lived in the community or surrounding areas.

12. Main activities of the population

The entire population of the town of Pahúa, district of Maúa, practices family farming as their main day-to-day activity, this is a way of survival and this practice involves all family members, this population spends most of their time in the farm camps.

The local structure of this community is very simple, consisting of a regulus, with maximum powers (Figure 4), a queen who has power equivalent to the power of the regulus, but who takes care of the traditional side of the governmental structure and a secretary who takes care of the powers government politicians of the day, the connection between leadership and the community is made directly.

The population of the Manhula community in the Municipality of Marrupa practices agriculture as their main activity, which is practiced in a mixed manner, where food is produced at the same time as tobacco and sesame are commercially produced. Agriculture has always been the means of subsistence of this population, the leadership of the Manhula community is also very simple, consisting of a regulo and a queen, the population that responds directly to the regulo. In the community of Luambala, among the activities that the population engages in, the one that proved to be common was agriculture, but the population also practices fishing, which means that most of the time this population divides between farming and fishing. , agriculture has long been present in the activities of the population of Luambala.



Figure 5: The figure represents the local leadership of the Luambala community

13. Adherence to fire management

The community of Pahúa district of Maúapractices at least one fire management activity, as fire has always been part of the life of this community, however there has never been anyinitiative of government or local leadership to jointly manage fire among the population.

The type of fire management activities that the population most practices in this community areopening firebreaks in the machambas, cleaning combustible material before burning, directly fighting the fire using branches to smother the fire.

The activities of opening firebreaks and burning combustible material are carried out throughout the year, varying in frequency between the dry season months and before the start of the rainy season (July and August).

The initiative to practice fire management or implement known fire control techniques in the community belongs to each person individually, where each person observes the moisture status of the combustible material and makes the decision, however, local structures Also, by observing the state of combustible material in the environment, they can take management initiatives and inform the community. The regulated entity foresees, with the creation of the fire management committee, the joint implementation of fire management, with the population remaining responsible for management. of the fire, under the guidance of the fire management committee.

In the community of Manhula Municipio de Marrupa, the entire population practices at least one fire management activity, although not in an organized way. The fire management activities that this community practices are cleaning areas, opening firebreaks, burning forestry waste, raising awareness in communities about the dangers of fire, opening firebreaks, controlling and fighting fire using branch dampers.

Another form of fire control applied in the study area is the use of water sprinklers, where for this purpose a 5 meter wide margin is opened but instead of cleaning the expanse of grass as is done in firebreaks in this strategy, with the help of watering cans, the population waters the grass in order to reduce the intensity of the fire when it reaches this area and fight it more easily. In the community of Luambala, the entire population also practices at least one fire management activity, although not in an organized way, the types of fire management that the population of Luambala practices are: Opening firebreaks and cold burning to reduce combustible material, burning of residues after the harvest season, counterfires to reduce the impact of fires, removal of combustible materials to avoid burning the desired areas and fighting fire using branches to smother the fire.

Fire management activities in the Luambala community are practiced between the months of June and October. The responsibility for managing fire in the community belongs to each person, individually or as a family.

The techniques and practices of fire management and knowledge were learned in government lectures and was also passed on to them by their parents, also with the arrival of the FLOMOZ project they learned new techniques (using dampers and fire counters), with the arrival of the project management committees were formed that everyone has their own leadership and is responsible



Figure 6: The figure shows the months in which the population practices fire management (Opening firebreaks), the month of September and the month in which the population is most concerned about applying fire management strategies.

13.1. Motivation to practice fire management/Continuity or start of fire management

In Marrupa, the fire management initiative arose from the need to protect farms, barns, houses, avoid losses and prevent the burning of forest resources. To continue the practice of fire control,

the majority of the population asks for help in controlling Elephants, as the majority of fires in this region arise due to arson resulting from the need to chase these animals away.

In the community of PahúaThe practice of fire management is motivated by the protection of assets against fire, protection of farms, avoiding crop losses due to fire, avoiding burning houses and avoiding the burning of products (harvest).

When asked what would be necessary to continue or start fire management activities (for those who do not practice), the Pahúa community understands that the success of this continuity starts with learning more about the good and bad that can come from fire management. and lack of fire management, but the other part of the population asked for material encouragement, with adequate instruments for controlling, preventing and fighting fire.

In the community of Luambala, Fire management is driven by the need to protect resources and the community against damage that can be caused by fire, protect farms, avoid crop losses due to fire, and prevent fire from reaching homes. In this community, to continue management, the population urged the competent entities to promote more training, instruction and capacity-building actions for the community in matters of fire management, supply of materials or equipment suitable for fire management (mufflers, gloves, machetes, rakes... Etc).

14.

15. Perception of the group's training and qualifications in fire management

Within the scope of the FLOMOZ Project, some community members were trained in matters of fire management strategies (Prevention, control and Importance).

When asked if they understood why they or some of them had been trained in fire management, the answer from the Manhula community was yes, because in the training they were taught control and protection against uncontrolled fires, to teach the rest of the community about fire management. , reduce damage caused by fire.

Both the population of the town of Pahúa and the local leadership realized the importance of training the population in fire management. In this community, the main advantages of fire

management highlighted by the population as gains were: Protection of farms and houses, avoiding damage that can be caused by fire, prevent the loss of agricultural products in the fields that are the basis of their survival, prevent fire from destroying barns and houses, prevent the burning of forests and fields, reduce the damage that appears when there are uncontrolled fires, promote soil conservation, maintenance of natural resources including fauna, avoid the burning of forests and agricultural fields.

16. Continuity of fire management practice

The social success of all activities launched within the scope of the FLOMOZ Project lies in providing the community with techniques for preventing the environment, through the various fire management techniques. Hence the need for autonomy of the groups formed in fire management.

Therefore, when asked if they would like to continue the practice of fire management even after the end of the Project, the population of the Manhula community was unanimous in answering yes. Citing the advantages of fire management learned: because fire management prevents the burning of houses and fields, fire that is not managed properly can impoverish the soil and lower production, fire management makes it possible to continue to prevent the negative effects of fire and helps protect your assets (machambas and barns), helps to avoid unwanted incidents. When asked if the project was giving the desired results/effects, the community responded yes, because through the project they learned several techniques to protect the community against fire, and that currently the population was more concerned about the damage caused by fire, they learned that some practices constitute a danger and they did not know (smoking and leaving behind), the community began to worry more about the effect of fire, they learned some fire-fighting strategies, they also noticed that the fires have been decreasing and they believe that and because of of management.

About the ways that could be used to continue with fire management, the responses were as follows: Encourage teaching other people about fire management and thus continue with the activities, train more members to help with this work, give lectures on the use of fire, continue learning about how to manage fire, continue to disseminate and teach communities about the advantages of fire management, apply the techniques that were taught and talk to people about

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fires, provide more awareness, moral support and reinforce the initiative in relation to groups formed, Try to learn from those trained about all the advantages of the fire engine.

In Pahúa, when asked if they would like to continue practicing fire management even after the end of the Project, the population responded yes. In relation to the effects of the project, the community understands that it is having the desired effects, because there are currently incentives to raise awareness in the fight against fire by the local leadership, lectures are held that were not available before, and there has also been an increase in concern about ensuring that there are no fires.

About the ways that could be used to continue with fire management in this community, the responses were as follows: Accepting teachings from the community that benefited from training on fire management, teaching more people in the community about fire management, creating a fire control team, continue to be part of the fire management group, teach others in the community about the benefits of fire control.

In the community of Luambala when asked if the project is giving desired results, the community also responded yes, because through the project they learned fire management techniques that were not previously implemented to protect the community against fire, and people were already showing concern when talking about fires.

When asked if they would like to continue practicing fire management even after the end of the Project, the Luambala community responded yes, however, there was a need toto create incentive for the community to take the prevention and control of uncontrolled fires more seriously.

17. Reasons for using fire

The perception of the motivation for the use of fire in the community helps control the spread of uncontrolled fires, and also facilitates the focus of efforts, both in prevention and combat, to the points identified as critical.

In the community of Pahúa, The main reasons for using fire outside the family environment are: facilitate the placement of traps by hunters, preparation of food in bamboo cutting camps, hunter camps, charcoal burner camps, and logging camps, fire is also used to light tobacco,

facilitate the collection of honey, preparation of pots clay by women in the forest and cleaning machambas.

When asked if the use of fire by people outside the community affected the community, the answer was yes, because travelers from outside the community misused it, the fire got out of control, spread and destroyed the farms, spread to the locality and destroyed various goods.

In the Manhula community, the main reasons for the use of fire outside the family environment are: Scaring away elephants, facilitating the extraction of honey and lighting cigarettes, facilitating the placement of traps, preparing food in farm camps, opening roads (in the forest), cleaning the farms.

When asked whether the use of fire by travelers or people outside the community affected this community, the answers were: Yes, because the fire caused by travelers suddenly reached the community, spread, and destroyed houses and farms.

In the community of Luambala, the population uses fire to improve visibility and facilitate hunting, cook in fishing camps, to keep warm in the camps, burn waste from cleaning the farm, reduce pasture to more easily hunt the animals that come to eat the regrowth of grasses, facilitate the extraction of honey, drying or smoking of game meat.

The use of fire by people who pass through the community of Luambala also affects this community, as it causes the sudden burning of farms and the loss of agricultural products. These sudden fires cause losses of valuable assets, such as houses and barns, mainly houses that make limits with the community when there is no protection.

18. Main reasons for the occurrence of forest fires within the community

The main reasons for the outbreak of uncontrolled fires pointed out by communities are directly linked to the use of fire by communities.

In the community of Pahúa, the population pointed out as reasons for uncontrolled fires: Remains of fire from hunters, honey collectors, bamboo explorers, producers of clay pots, poor management of fire in the forests by travelers, remains of fire left during the production of coal and timber resources, Fires set by travelers and hunters to increase visibility in the forest. The months most prone to uncontrolled fires are the months of July, August and September. In the community of Manhula, the main reasons cited as the causes of the occurrence of fires are also linked to the types of use of fire by the community: Remnants of fire left by hunters and honey collectors, remains of cigarette butts and children playing with fire, during When cleaning the machambas, there are sparks that spread and fires are placed to scare away Elephants in the machambas.

The causes of uncontrolled fires in the community of Luambala are: Uncontrolled fires in fishing camps, uncontrolled fires during the opening of areas for placing traps, fires caused during the extraction of honey that end up being uncontrolled, fires left by hunters and cigarette smokers Left unextinguished has the potential to cause fires.

19. Fire management alternatives using local resources

In the community of Pahúa, when asked what local alternatives could be used to manage fire, the community responded that: Creation of a delegation to control uncontrolled fires or control sources of ignition, which are hunters and forest explorers, creation of a control team, training of people who can sensitize hunters and bamboo cutters and sensitize travelers not to throw cigarette cigarettes, promote lectures to teach about the adverse effects of uncontrolled fire, ccontrol of bamboo cutters and teach these cutters about the proper use of fire, promotion ofcommunity lectures and control fire sources (pot producers, firewood and bamboo cutters), wcreation of a patrol group in the forests to carry out constant control in the months with the greatest danger of fire outbreaks.

Creation of conditions so that the group formed in fire management can monitor and sanction those who create or cause uncontrolled fires and train the rest of the community in fire management and management, and provide the community with material conditions for controlling and extinguishing fire.

In the Manhula community, alternative responses for fire management using local resources identified by the community were: Promoteperiodic awareness meetings aimed at hunters, honey collectors and children, to teach that fire should not be misused, teach about the disadvantages of burning forests, promote lecture initiatives to raise awareness among the community in mosques and churches about the population to avoid fires, promote control of ignition sources during periods of opening and cleaning machambas.

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In the Luambala community, when asked what local alternatives could be used for fire management, the response alternatives were:Control the sources of fires caused by hunters, promote awareness-raising lectures for the population, intensify activities aimed at training the community in fire management; Create local laws that punish those found burning the forest, carry out control and promote awareness-raising lectures, carry out periodic control of combustible material and apply management strategies learned, Promote meetings with the population to teach about how they can help fight the fire.

20. Alternative activities for generating income

Some income generating activities such as hunting, charcoal production, obsolete honey extraction, represent activities with a high risk potential for the outbreak of uncontrolled fires, so some potentially alternative activities to these were mapped by each community, with a relatively low risk for income generation.

The population of the Pahua community practices agriculture as the main way of generating income and feeding their families. The other activities that the community develops are hunting, charcoal production, cutting bamboo and collecting honey. The way agriculture is practiced is subsistence and without adequate means.

When this population was asked about viable alternatives for generating income other than risky activities, such as cutting bamboo, they responded that they needed support with material for agriculture, support with improved agricultural incentives, to assist agricultural production, incentives with inputs to improve agriculture, reinforcement with agricultural production inputs. The government representative (SDAE) pointed out needs such as: the creation of a controlled production association, creation of a management committee that controls the resources and appropriate means for raising bees and help to acquire a mill and inputs for the Agricultural production.

The population of the Manhula community practices agriculture as the main way of generating income, mainly the production and sale of tobacco and sesame, so the other activities pointed out by community members that can be implemented in this community are linked to improvements in the ways in which this population practices agriculture, these improvements can be achieved according to the community with material support and encouragement

fromhoes, machetes, tractors, rakes, improved seed, provision of production transport at harvest time,strengthening agricultural activity and making it semi-intensive, providing agricultural services and having a mechanization system.

The population of the Luambala community practices agriculture and fishing as the main ways of generating income and feeding their families. Alternatively, or if the opportunity exists, this population would like to forms of agricultural production, through incentives for better agricultural inputs, Facilitation for the opening of an agricultural market for the sale of surplus production.

21. Community mapping

Based on knowledge of the community area, the community population mapped the uses of the community areas and the main sources of uncontrolled fires.

In the community of Pahúa District of Maúa, the population mapped the uses to which each zone is subject, so a community map was drawn and the general limits and areas where the fire started were indicated on the map (See figure 7).

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Figure 7: The figure represents the map produced by community consensus. The map represents the Forest, the bamboo area, the machambas, the community and the area of the experimental plot of the present study, and the areas where the most burning is also indicated.

According to the map drawn, the area where the most burning is the bamboo exploitation area, followed by the forest and finally the machamba areas, this fire that breaks out has a tendency to spread and reach the community, the fires tend to increase and spread to new areas, swampy areas tend to burn less intensely than high areas, due to the humidity of the combustible material.

When asked about the reasons why fires occur in these areas, the answer was that these areas are areas with a lot of wild animals, they are areas of machambas and they are areas with a lot of bamboo, during the exploitation of these resources the community sets up camps and ends up leaving remains fires that cause uncontrolled burning, for this community uncontrolled fire tends to be more intense between the months of June and July and more severe in the months of October and November, in these peak seasons the community always has to paralyze its routine activities to dedicate themselves to putting out the fire, at the risk of losing their possessions. As was done in the individual interviews, in the community meetings we also sought to assess the reasons why the population uses fire on their lands, how they can be affected by fire, so the reasons for the use of fire measured were: cooking food in the machamba camps, collecting honey, to light cigarettes, to scare away ferocious animals. These fires, when managed inappropriately, are a source of uncontrolled fires.

The community mapping of the community of Manhula, District of Marrupa showed the uses to which this area is subject, so a community map was drawn and the general limits and areas where the fire has started and its evolution trend were indicated on the map. (See figure).

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Figure: The figure represents the map produced by community consensus. The map represents the Forest, the machambas, the community and the area of the experimental plot of the present study, and the areas where the most burning is also indicated.

The map shows the Forest area, the machambas area, the location of the houses. According to this map, fires start more frequently in the forest area followed by the farmland area. This trend of fires follows the trend of elephants being driven away by the use of fire. In the machambas, the fire is explained by the burning of cleaning residues, which ends up getting out of control and spreading. There is also a tendency for fires to leave the community for forest areas, which

the community explains by the existence of uncontrolled fires when children play in the community.

In the community of Luambala, the areas where most uncontrolled fires break out are forests and areas along the riverbank. These sources of fires in the community are justified by the main activities that dominate the area, which are fishing and agriculture.

In fishing camps, fire is used to smoke fish and prepare food, opening access to these uses leads to the outbreak of uncontrolled fires that also spread and affect the forests and the community.



Figure: The figure represents the map produced by the community. The map represents the Forest, the machambas, the community and the area of the experimental plot of the present study, and the areas where the most burning is also indicated.

22. Conclusions and recommendations

After the end or withdrawal of the Fire Management Projectof FLOMOZ, implemented by UEM and UNILÚRIO, in the Districts of Majune, Marrupa and Maúa in the communities of Luambala, Manhula and Pahúa respectively, it can be concluded that: Fire management will prevail, that is, fire management in these communities is sustainable. Some management techniques such as opening firebreaks around houses and machambas have always been present in these communities, it has always been done with the aim of protecting the resources (machambas and houses) that guarantee the survival of the community.

For the continuity of fire management using other techniques that were not known by the community before the FLOMOZ project, it is necessary to extend the training of good fire management practices to the entire population of the community, as well as covering adjacent communities.

If there is a support window, it is recommended that the community of Luambala District of Majune inject resources aimed at improving the type of agriculture practiced in this community, moreover, in the case of an area crossed by the Luambala River, where the population practices a type of artisanal fishing based on practices that are the eminent causes of the emergence of uncontrolled fires, it is recommended that work to raise awareness of fire management directly aimed at fishermen and hunters.

For the community of Pahúa, district of Maúa, it is recommended, as a form of alternative support to practices that constitute causes of the outbreak of fire, the facilitation of an agricultural production chain, from seed acquisition to commercialization, it is also recommended that In fire management associations, bee breeders are created or trained in hives, given that honey collection activities are frequently observed in this community using inadequate techniques that cause uncontrolled fires, it is also recommended to enhance the exploitation of bamboo in this area, due to its high availability and preference for the community.

In the community of Manhula, Municipality of Marrupa, it is recommended the creation of a community fire management committee, to ensure control of the main source of uncontrolled fires, which are fires to chase away elephants, it is recommended that this experience be

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replicated urgently in the surrounding communities, because they also practice fires to chase away Elephants..

Appendix 16
Team compositions

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2.	PhD Natasha Ribeiro	Project Coordinator
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MANUAL

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Of Forest Fire Management In The Miombo Forests Of Mozambique

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MANUAL OF FOREST FIRE MANAGEMENT IN THE MIOMBO FORESTS OF MOZAMBIQUE

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DATASHEET

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Title:	Manual Of Forest Fire Management In The Miombo Forests Of Mozambique
Prepared by:	Faculdade de Agronomia e Engenharia florestal - Universidade Eduardo
	Mondlane; Faculdade de Ciências Agrárias - Universidade Lúrio
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Since 2010, Japan has been supporting the Mozambican government's forest conservation efforts through REDD+ by dispatching advisers, providing equipment, technical cooperation, and human resource development. In order to provide further support on the sustainable forest management and REDD+ in terms of the policy, technical and human resource development aspects, Japan International Cooperation Agency (JICA) decided to implement a technical cooperation project on establishment and operation of a national forest monitoring system and formulation of sustainable forest management plan in the provincial level, and efforts to control deforestation in response to the request of the Government of Mozambique. JICA and MTA implemented "The Project for Sustainable Forest Management and REDD+"between 2019 to 2024.

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This manual has been developed through the development of the Provincial Integrated Forest Management Plan and the pilot activities on the countermeasure of deforestation and forest degradation for sustainable forest management in Niassa.

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GLOSSARY

Firebreak

Strips resulted from the removal of vegetation, causing the discontinuity of burning material, in order to prevent the spreading of fire.

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Forest fire

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A forest fire, is an uncontrolled fire that occur and spreads rapidly across vegetation and forest areas fueled by dry weather conditions, strong winds, and an excess of burning material. These fires are unpredictable, unplanned, and destructive, occurring often in a rural area which can be caused by humans or natural causes. When preventing and extinguishing an uncontrolled fire, we try to manage the components of the fire triangle (Figure 1) in order to enable heat control and its spreading.

Early controlled burning

Early controlled burning consists of the application of fire, under certain environmental and ecological conditions, in order to produce the heat intensity and propagation rate to favor certain management objectives. Controlled fires must be conducted at the appropriate time of year, when the weather conditions are favorable. According to Ribeiro et al., (2017), considering the annual pattern of rainfall distribution, three distinct seasons can be identified: wet season (November-April), early dry season (May-July) and late dry season (August-October). Early controlled burning is conducted out in the early dry season, between May and July.

Integrated fire management

It associates ecological, cultural, socioeconomic and technical aspects in the execution, integration, monitoring, evaluation and adaptation of actions related to the use of fire, through prescribed and controlled burning, to the prevention and combat of forest fires.

Fire curtains or green barriers

Represent bands of vegetation composed of species resistant to fires such as Annona senegalensis, Combretum sp. that aim to reduce or prevent the spread of fire.

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List of acronyms, abbreviations

ст	Centimetres
Ø	Diameter
cm/day	Centimetres per day
cm/s	Centimetres per second
DINAF	National Directorate for Forests
EC	Complementary Equipment
EPI	Individual Equipment
FAO	United Nations Organization for Food and Agriculture
FLOMOZ	Sustainable Forest Management in Mozambique
ha	Hectares
JICA	Japan International Cooperation Agency
Kcal/s/m	Kilocalories per second per meter
Kg/ha	Kilogrames per hectar
Кј	Kilojoules
Kj/m/s	Kilogrames per metre per second
LFFB	Forest and Wildlife Law
т	Metres
m/h	Metres per hour
m/s	Meter per second
Mg/ha	Miligrames per hectar
MgW	Megawhats
MODIS	Moderate Resolution Imaging Spectroradiometer
0 ⁰	Degree Celcius
REDD+	Reduced Emission from Defforestation and Forest Degradation
S	Second
SPA	Provincial Environment Services
UEM	Eduardo Mondlane University
UniLurio	Lurio University
MIATA	Ministry of Land and Environment

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CHAPTER I

INTRODUCTION OF THE FOREST FIRE MANAGEMENT

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1.1 Background

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Miombo woodlands represent an ecosystem of great ecological, economic and social importance. Its socio-economic role is reflected in its ability to provide goods and services to rural communities dependent on it (Ribeiro et al., 2016; Dziba et al., 2020). Although fire contributes to shaping the structure, composition and resilience of miombo forests, uncontrolled fires can result in the loss of human and animal life, forests, agricultural fields, homes and pollute water resources. On the other hand, climate change has the potential to impose changes in fire occurrence patterns, with consequences that are still undetermined for natural ecosystems and human lives. For fire to remain within the limits defined for its use there is a need for it to be used in a responsible, planned and guided manner, in accordance with pre-established techniques.

Recognizing the importance of the forestry sector in the context of climate change, Mozambique intends to promote the sustainable management of forest resources through, among others, the mechanism for Reducing Emissions from Deforestation and Forest Degradation and the Conservation of Ecosystems (REDD+), which aims to contribute to mitigating the effects of climate change. In this context, the design of a national forest monitoring system is extremely important, as is the design of sustainable forest management strategies.

1.2 Deforestation and forest degradation caused by forest fires in Mozambique

According to the Integrated Provincial Forest Management Plan 2023 – 2032 for the province of Niassa, the main factors behind deforestation area: the small-scale agricultural expansion, the uncontrolled extraction of firewood and charcoal, and forest fires.

For the forest degradation factor – forest fires, according to data from the MODIS Fire sensor, 1073 fires were observed in the province of Niassa in 2020, which corresponds to 20% of the country. The districts of Mecula, Marrupa, Sanga, Mavago and Majune were listed as those with the highest incidence in the last five years. Forest fires are not only reported in natural forests but also in forest plantations, which has become an obstacle to promoting forest plantation

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industries. The causes of forest fires are mainly related to livelihoods and cultural habits such as clearing agricultural land for agricultural areas, hunting and honey harvesting.

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Some underlying causes of deforestation and forest degradation associated with forest fires were also identified, including: cultural behavior, weak law enforcement, limited management capacity, deficient and ineffective forest management, increased demand for agricultural products in the market and weak coordination mechanism between sectors.

1.3 Purpose of the manual

The aim of this manual is to identify good fire management practices, promoting their sustainable use, through the application of early controlled burning, as a useful tool to achieve management objectives in miombo forests. The manual follows an integrated management approach and focuses on natural resource managers and local communities, given their ancestral relationship with fire.

The design of the manual had financial support from the Japan International Cooperation Agency (JICA), within the scope of the Sustainable Forest Management and REDD+ Project in Mozambique (FLOMOZ). The pilot activity of forest fire management in FLOMOZ was implemented by the Faculty of Agronomy and Forestry Engineering, from Eduardo Mondlane University, and the Faculty of Agricultural Sciences, at the Lúrio University, with technical support from the Ministry of Land and Environment, through the National Forestry Directorate (DINAF) and Provincial Forestry Services and Provincial environmental services of Niassa (SPA). This manual is intended to contribute to the integrated management of forest fires, with a focus on local communities, specifically aiming to:

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- **1.** Describe the basic concepts about forest fires
- 2. Analyze the main elements of integrated fire management
- 3. Describe the main steps for developing a fire management plan
- 4. Explain the steps to conduct early controlled burning

1.4 Target group of this manual

This manual is intended for all stakeholders who are directly involved in managing fires in rural areas in Mozambique, such as: local communities, provincial forestry and wildlife services, district economic activities services and other relevant actors acting in the sector. By identifying this target group, the aim is to strengthen understanding of fires and support the dissemination of good practices for integrated fire management.

1.5 Legal framework of forest fire management in Mozambique

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Although fire has numerous benefits for miombo ecosystems and local communities, several legal instruments have been devised by authorities to regulate its use. These legal instruments support the consolidation of the need to prevent uncontrolled fires, as in the case of the Environmental Law Law n° 20/97 of October 1st, Article 4) and the Forestry and Wildlife Law Law n° 10/99 of October 7th. July, Article 3 and 40 (RM 2002) which prohibit activities that endanger the conservation of natural resources. Liability in the use of fires, infractions and respective penalties relating to fires are dealt with in the Forests and Wildlife Law, Article 40, Penal Code in Article 464 n° 2 and Regulation of the Forests and Wildlife Law in Decree n° 12/2002 of June 6, Articles 106, no. 1; n° 2. In Article 97 of this Regulation, the implementation of actions related to fire control is determined as part of the duties of the Local Councils for the Management of Forestry and Faunistic Resources (RM, 2002).

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CHAPTER II

BASIC INFORMATION OF FOREST FIRE AND METHODOLOGY OF FOREST FIRE MANAGEMENT INCLUDING EARLY CONTROLLED BURNING

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2.1 General information of forest fire in Miombo forest

2.1.1 Foresst Fire classification

According to the terrain (vegetation and topography) and meteorological conditions, fires can be classified into (Ribeiro et al., 2021):

• **Surface fire:** It occur in the surface layer of the soil up to no more than 10 m in height and are particularly fueled by combustible materials located on the soil surface. This is the most type of fire that occurs in miombo woodlands in Mozambique. It may have less impact, as they mainly affect grassy and herbaceous vegetation; usually adapted to fires (some of these plants grow up to

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2.54 cm/day after a fire). However, when frequent, they can kill the natural regeneration of tree species.

• **Underground fires:** It occur mainly below ground, in the first 20-30 cm. These have a high destructive power and can affect roots and microorganisms as well as soil fertility as a result of the destruction of organic matter. This type of fire can occur during prolonged and intense droughts and is uncommon in Mozambique conditions. It occurs



mainly in the boreal forests of the Northern Hemisphere) where the humus layer (the main fuel) is very dense.

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• **Crown fire:** Crown fires burn forest canopy fuels, such as live and dead foliage. They are usually ignited by a surface fire. These type of fires are typically catastrophic, killing mature trees as well as natural regeneration. Occurs mainly in dense pine forests where the conditions for flame escalation are present due to resins and other combustible materials.



2.1.2 Causes of forest fires

The causes of fires are very variable, so determining the main ones is important for precise guidance in prevention efforts. According to FAO, cited by Soares (1985), the causes can be classified into the following categories:

- **1.** *Natural:* One of the main causes of natural fires is electrical discharges, caused by lightning strikes,
- 2. Anthropogenic: arson, burning to clear land, smoking, recreational fires, forestry operations, fire in the railways.
 3. Undetermined: unknown causes

In Mozambique, most fires result from human activities through ancestral

practices. These practices involve:

- Opening of land for agriculture
- Subsistence hunting
- Animal scaring

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- Traditional honey collection
- Land cleaning
- Charcoal production
- Opening of paths to facilitate circulation
- Renewing of pasture areas
- Control of pests and alien species

It is worth mentioning that due to accentuated human growth in a context of current climate change, these practices may become more frequent and of high extent, making the practice of burning unsustainable.

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2.1.3 Fire behavior

Fire behavior refers to its trajectory when a fire occurs (Figure 1) and can be characterized in terms of:

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- **Propagation speed:** related to the linear speed with which the fire front moves, measured in cm/s or m/h.
- *Flame height:* is the average distance from the top of the flame to the ground, measured vertically, in meters.
- *Fire intensity:* represents the rate of energy release per unit of time and unit of length of the fire front and can be expressed in kcal/s/m.



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Figure 1. Elements of fire behavior (adapted from: Fernandes et al., 2002).

The scale in Table 1 assists in the practical assessment of the relative intensity of a fire (Trollope, 1998).

Table 1. Relationship between flame height and fire intensity (kj = kilojoule; m = meter; s = second)

Flame height	Fire intensity (Kj/m/s)	Fire intensity category			
Height at surface level	< 1000	Low intense fire			
Head height of an adult man	1001-2000	Moderate intensity fire			
> head height of an adult man	> 2000	Very intense fire			

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2.1.4 Risk of forest fire

The risk of forest fire represents the probability of an area burning on a particular day according to meteorological conditions (temperature, precipitation and winds) and fuel load. Assessing the degree of danger of an uncontrolled fire occurring makes it possible to determine the probability of fire ignition, its extent and the difficulty in controlling activities related to them.

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It also provides information to ensure the safety of suppression and combat operations. As a daily fire management tool, the fire risk classification system serves as a tool to determine the personnel required for fire prevention and detection activities, the readiness of prevention and suppression forces (readiness/ preparedness levels) and the strength of the initial attack by fire control forces on a reported fire.

For the case of miombo forests in Mozambique, Ribeiro et al., (2021) defined the fire risk assessment method for forest management units. In summary, the method includes the assessment of meteorological conditions in accordance with the details in section 2.2.2. Based on this information, a risk scale is created according to Table 2.

Tabele 2. I	Fire danger	index for	miombo	forests	in Mo	zambique.

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Elammable combuctible fuel	Meteorological conditions								
nammable compussible fuel	Soft	Moderate	Severe						
Low									
Medium		(
High									

Red color means higher danger and green color means lower danger. (Source: Ribeiro et al., 2021).

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2.1.5 Fire regime

The fire regime represents the description of the spatio-temporal pattern of fire occurrence in a given area and, therefore, the history of fires (Krebs et al., 2010). The characterization of the regime is extremely important to understand the trajectory of an area, and an evaluation period of no less than 10 years is recommended in order to obtain more reliable information. The regime can be described in terms of:

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- *Fire frequency:* How many times the area burns during the analysis period, which must be at least 10 years, for a better understanding;
- Sazonality: Time of year (months) in which the fires occur;
- Intensity: How inttense (or hot) the fire is in the dry and wet season;
- Density: Number of fires/area unit (ha);
- Burned area: The extent of burning in ha or in % of the area under analysis.

In general miombo woodland conditions, the fire regime can be described as the following: 3-4 year burn frequency, meaning that fire returns to the same location every 3-4 years, occurring mainly in the dry season between July and October. At this point, density in general can be high in terms of number of fires/ha. They tend to occur in a mosaic, that is, in some areas of the landscape, being interrupted by natural firebreaks (water lines, paths, areas devoid of vegetation). Fires at the end of the dry season are normally of high intensity (up to 1000 MgW).

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2.2 Factors determining a fire

The begin and spread of a fire are influenced by several factors, such as: flammable biomass, meteorological conditions, topography and the presence of the ignition source. In this sense, the favorable conditions for the occurrence and spread of forest fires are described below.

2.2.1 Flammable biomass (fuel)

In most Mozambique forest ecosystems, flammable biomass, or fuel, consists primarily of grasses and herbaceous plants (more than 80%), but also of other dead organic material such as leaves, bark, pods, dry trees, and so on (Figure 2).



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Figure 2. Example of combustible material in a miombo forest in Niassa.

Fuels can be classified using different criteria:

1. Spatial position in the forest

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- *Aerial:* canopies, lichens, mosses, epiphytes, standing dead trees, etc.
- *Surface:* bushes, fallen trunks, exposed roots, leaves, branches, grasses, etc.
- **Underground:** roots, humus and other organic material deposited up to 20 cm below the ground.

2. Size of combustible materials

- Dangerous: they are represented by materials that, under natural conditions, burn easily and quickly. This category includes bark, branches, thin twigs (Ø ≤ 1 cm), leaves, grasses, mosses, lichens, etc., when dry.
- Semi-dangerous: include humus, generally moist, semi-dry branches, fallen trunks, branches (Ø ≥ 1 cm), among others. This refers to woody materials that, due to their structure, arrangement and water content, are not capable of burning quickly.
- Non-hazardous (green): refers to vegetation made up of trees, shrubs, herbs, etc., in a living state. Considering that these green materials contain a high water content, it can be considered that they are non-flammable, however, this does not prevent them from combusting after a process of moisture loss, which may occur while the fire burns the material. hazardous material and releases heat to warm and dry it.

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3. Continuity

- **Continuous:** when the distribution of biomass in the horizontal and vertical direction does not present an interruption of more than 3 m;
- Discontinuous: when its distribution is discontinued by more than 3 m.

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4. Humidity

- Dry: less than 30% humidity
- *Moderately humid: (*30 to 60% humidity)
- *Humid:* (> 60% humidity)

The moisture content of fuels has an inverse effect on the heat yield or energy actually released by burning.

5. Fuel load

The amount of biomass (in kg/ha) existing in an area is of great importance and determines the probability of ignition and spread of fires. Given that the largest fuel load, in miombo, corresponds to grasses and herbaceous plants, field measurements normally focus mainly on these components. For example, Trollope (1990) noted that in Kruger National Park, a flammable fuel load of at least 2000 kg/ha is required for fire to spread. For the case of miombo forests, the amount of herbaceous biomass can be classified according to Table 3 (Ribeiro et al., 2021).

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labele 3. Classification of fuel load in miombo fores	Tabele 3.	Classification	of fuel	load in	miombo	forest
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Category	Grasses/herbaceous biomass (Kg/ha)
Low	D - 1000
Medium	1001-3000
High	+ 3001

Source: Ribeiro et al., 2021

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2.2.2 Meteorological conditions (climate)

Meteorological conditions are also important in determining the ignition and spread of fire. Among several existing factors, the following stand out:

- Temperature;
- Precipitation and its distribution throughout the year (time and duration of wet/dry seasons)
- Relative air humidity,
- Predominant winds, speed, direction and times of the year when they are strongest (for example, August in Mozambique).

In general, hot days with temperatures above 30oC, low relative humidity, normally during the dry season, below 50% and strong wind speeds above 14 m/s, contribute to a greater probability of fire ignition and spread. Under Mozambique conditions, the time of year when these conditions occur is between July and October, with the peak being between August and October. Table 4 presents a classification of meteorological conditions for the context of Mozambique.

Table 4. Criteria for categorizing meteorological conditions in the context of a forest fire (Source: Ribeiro et al., 2021)

Condition Wind apeed (m/s)		Temperature (°C)	Relative air humidity (%)				
Soft	0-11	<18-28	\$70				
Moderate	11-14	29-31	50-70				
Severe	>14	*31	-50				

Souce: Ribeiro et al., 2021

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2.2.3 Topograph

The term topography refers to the surface of the earth, in particular, the physical characteristics of a place or region and includes the relief and position of natural and artificial features. On steep slopes, the fire burns quickly and with greater intensity in the upward direction of the slope, due to the less dense air near the surface (heated by the surface), which forms a path for it to rise. The appearance or direction of the slope is also important.

Slopes facing south to Southwest receive high solar radiation, which results in lower relative humidity, higher temperatures and rapid loss of moisture, implying a greater risk of fires. The shape of the terrain (ridges, mountains, ravines, etc.) also determines the weather conditions, so it is important to know the shape of the \bigoplus

terrain. Table 5 indicates the fire propagation factor in relation to the slope of the terrain. The propagation factor corresponds to the proportion of the heat release rate that heats the adjacent fuel particles.

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Table 5. The effect of terrain slope on fire spread.

Terrain slope (%)	Fire propagation factor
5-15	1,00
16-25	1,05
26-35	1,15
36-45	1,20
46-55	1,25

Source: Soares & Batista, 2007



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2.3 Methodology of forest fire management

2.3.1 Response to forest fires

There are different management options, which can be selected according to the prevailing characteristics of the work area in terms of prevailing ecosystems, fuel load, weather conditions, and topography, among others. According to Ribeiro et al. 2021management options can be:

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- *i) Fire exclusion:* Applicable to forests in which fire would be undesirable and counterproductive to forest management and/or conservation objectives. Such would be the cases of humid tropical forests and plantations of forest species (for example Eucalyptus);
- *ii)* Laissez-faire (let it go): A French expression used to allow the normal regime of fires to occur in an area. In Mozambique, it would be allowing uncontrolled fires to happen at the end of the dry season (July-October), in cases where they do not affect ecosystems, human lives, infrastructures, among others. The principle is that burning patterns (periodicity and frequency of burning) follow traditional land treatment practices and are beneficial to the ecosystem. Therefore, it is not always justified to invest resources in fire management;
- *iii)* Forest fire management: It is based on understanding the impacts of fires according to the type of forest and includes a diversity of options such as the exclusion of fire, the integration of uncontrolled, but tolerable and/or desirable, fires and controlled fires. This option requires the

ability to actively manage all fire situations, such as preventing and suppressing all undesirable fires; use controlled fires to achieve management objectives and define/control the level between the desired effects of uncontrolled fires.

This last option is usually the most appropriate for managing fires in a context that considers the landscape as a whole. This section describes the main elements of integrated fire management.

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2.3.2. Institutional arrangement of forest fire management Fire information system

A fire information system aims to provide and compile information on where to base fire management activities and activities useful in the decision-making process regarding priorities, procedures and advice on fire management involving local communities and other relevant actors (Hoffman, 2009; Ribeiro et al 2021). This analysis makes it possible to continuously identify the origin of the fires, the main targets subject to fires, thus making it possible to determine the current and future risk of fires.

To achieve this objective, data and information must be consistent, reliable, relevant and based on professional interpretation and analysis. They must be delivered on time and communicated through pre-determined and well-understood procedures and standards. These processes guarantee accountability and responsibility and ensure that relevant, open and easily accessible information is available to all interested parties at all administrative levels.

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For this purpose, a fire management unit must be included in the management structure of an area/community. The unit must establish a near real-time data acquisition system through, for example, the Fire Information for Resources Management System (FIRMS; https://earthdata.nasa.gov/earth-observation-data/ near-real-time /firms) or ORORA technologies (OroraTech - https://ororatech.com/ request-demo/). Both platforms provide capabilities for near-real-time daily fire detection and intelligence service, including risk assessment, early detection, real-time monitoring and damage analysis. Remote fire detection should be combined with on-site patrols, such as ground patrols, watchtowers, points and stations, and aerial patrols, depending on available resources.

In the case of Mozambique, this system could be located at the provincial level, but with real-time communication (by telephone and/or radio) with the district and community level. To this end, the role of natural resource management committees is extremely important, which must be composed of brigades to prevent and combat fires. They must also inform the district level about the occurrence of a fire (location, type and image). Figure 3 presents a proposal for the flow of information on fires at the provincial level.

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Figure 3. Fire information system proposed for the provincial level

2.3.3 Fire prevention

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Fire prevention is the means of reducing unwanted and/or uncontrolled fires (Heikkilä et al., 2010). These can occur in any type of vegetation and/or human settlements, when conditions (fuel, climate and ignition source) are favorable to burning (see sections 2.2). Prevention can be considered as the first step to take to prevent fire from occurring, and is therefore considered a continuous activity, integrated into the daily activities of communities and/or forest managers. Some of the actions that can be taken to prevent fires are described below.

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2.3.3.1 Awareness and education

Public awareness and education focuses on the dissemination and sharing of information to people, communities, entities and all relevant actors in areas prone to fires. It aims to create full human awareness about the value of fires, but also their potential for destruction, knowledge of how to manage fires and motivating people to act appropriately (Soares and Batista, 2007).

In this context, it is up to the provincial forestry and education services, the district economic activities services and the natural resources management

committees to lead awareness and education campaigns. However, the conscience must be that of each member of the community and, therefore, each one must have a proactive role.

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Awareness raising and education involving communities should emphasize regions with the highest incidence of fires, prioritizing specific groups such as farmers, hunters, children, honey collectors, travelers, or others who are of interest. In this sense, it is important to highlight the importance of promoting appropriate cultivation practices such as conservation agriculture, agroforestry techniques, pasture management, improved beekeeping, among others.

Awareness-raising materials can be of different types depending on existing resources, but in general they can be: lectures or informal conversations, posters, books, pamphlets, games, dances, films, among others. These can be used continuously (along roads, in villages, markets, etc.), on festive days or used in specific training sessions (Figure 4).



Figure 4. Image illustrasting community awareness

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2.3.3.2 Firebreaks and firebreak curtains in the prevention and control of fires

This technique essentially aims to create barriers to the spread of fire and includes: i) the use of firebreak lines (firebreaks) that are completely or partially devoid of vegetation and ii) firebreak curtains or green barriers made up of strips composed of fire-resistant plant species, through landscape ornamentation, with the intention of limiting the intensity of the fire and reducing its rate of spread.

The use of firebreaks is a crucial tool as it interrupts the continuity of the fire, thus reducing its propagation speed (Figure 5). Generally, a width of between 2 and 5 m may be sufficient, but this should not be less than half the height of the tallest trees and grasses that constitute flammable fuel. The correct dimensioning of the width and number (network) of firebreaks in the forest depends on the characteristics of the landscape, the network of access roads and watercourses and the availability of work teams. To minimize costs, whenever possible, use

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existing barriers in the area, such as rivers/streams, roads, etc. (Soares, 1975).

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The opening of firebreaks should be done using machetes, rakes, shovels and other instruments for cleaning the land, at the beginning of the dry season (between April and May) and kept clean throughout the year but with greater focus on the dry season. burned (June-October) through fortnightly cleaning. In these, regenerating vegetation must be removed, and reproductive material (roots, seeds) must be removed to minimize maintenance efforts. The material removed from firebreaks must not be deposited on the land and can be used as fertilizer in agricultural areas or as feed for livestock. In general, labor needs vary from 1 to 2 men/ha.



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Figure 5. Image showing opening firebreaks

2.3.3.3 Controlled burning

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Controlled burning consists of the planned use of fire under environmental conditions compatible with meeting management objectives. In forest areas, it is the treatment of choice for surface fuel management, as long as the bark of the trees is thick enough to avoid damage to the trunk or the economic use is not hampered by the presence of carbonized material (e.g. pulp and paper production) or by heat/fire (e.g. fruit production; Moreira et al., 2010). The main limitation refers to the need to execute within a relatively restricted meteorological window, corresponding to the beginning of the dry season (between May and July). There are several reasons why controlled burning is carried out, namely:

- 1. Reducing the danger of uncontrolled burning through fuel reduction;
- 2. Conservation of biodiversity;
- 3. Management of the domestic livestock and wild animal breeding area;

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- 4. Improvement of wood and fiber productivity;
- 5. Selection of tree species;

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6. Disease control;

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7. Watershed management.

When conducting a controlled burning, the main aim is to control the fuel load:

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- 1. Effectively reduces accumulated fine fuel, and therefore substantially decreases the energy that subsequent uncontrolled burning can release;
- 2. Reduces the horizontal continuity of the fuel, disrupting the spread of the fire and reducing the likelihood of secondary outbreaks;
- 3. The remaining fuel consists of coarse woody elements arranged on the compact dead blanket and skeletons of bushes, with reduced combustion speed.
- 4. It can eliminate transition fuels between the understory and the tree stratum (dead branches, suspended bark, tall shrubs, and natural regeneration), raise the base of the canopy by leaf dissection in the lowest areas, and cause mortality of less vigorous trees of the forest. These effects contribute to making crown fires more difficult and reducing the potential for secondary outbreaks.

There are several ways to conduct controlled fires and a protocol was produced by Ribeiro et al., (2021) (Appendix I). In general, under Mozambican conditions, they are conducted at the beginning of the dry season, that is, between May-July and in areas where the fuel load is abundant, that is, greater than 3 Mg/ha. This must be correctly planned in terms of the season, location(s) and resources required.

2.3.3.4 Early controlled burning

Early controlled burning is the controlled burning in the early dry season in Miombo forests (Table). Establish fire breaks, etc., and manage the amount of biomass (fuel) in the forest through appropriately timed and controlled burning to reduce forest degradation. Planned burns will be conducted during the early dry season (June to July) to burn biomass in the forest, especially undergrowth. Early controlled burning apear to prevent forest fires from turning into large-scale forest fires because the amount of dry biomass in the forest will have been reduced by the first burn, even though residents conduct burning operations after the middle of the dry season (August to October) for livelihood activities such as burning agricultural fields and hunting, and forest fires occur due to fire loss or other reasons. Preventing large wildfires can also reduce the impact of wildfires on trees and promote tree growth (Figure 6).

The methodology of early controlled burning is described in Chapter 3 in this

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Month	1	2	3	4	5	6	7	8	9	10	11	12
Wet condition in Miombo forest	Wet		Early dry		Late dry			Wet				



Forest condition in Miombo forest in Majune



Late dry season burning

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Early dry season burning

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Figure 6: Forest condition at Late and Early dry season fire in Miombo forest in November 2021

2.3.4. Fire suppression

Fire suppression includes all procedures that begin when an uncontrolled fire occurs and with the intention of extinguishing it. There are many techniques for suppressing an uncontrolled fire and selecting one depends on the type and size, topography and available resources. Generally speaking, it is much more difficult and expensive to suppress a fire than to prevent it. Furthermore, smaller fires can be controlled easily and quickly. Larger fires are difficult to treat and may require the evacuation of villages, animals, etc.

For the timely suppression of fires, a constant and active monitoring system must be maintained. The process begins with the inspection of the forest to determine the occurrence of fires and assess the need to break fuel continuity and determine whether or not it is necessary to build and maintain the firebreak

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network. You can, if possible, use watchtowers, if resources allow. In this case, we must determine the visual distance of a watchtower according to the height and average area of visual capacity. The placement of watchtowers must take into account the topographic and relief characteristics of the terrain and the type of forest.

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The use of patrols (inspectors, community members, etc.) using radio and/or telephone may be one of the most appropriate ways in situations of lack of resources. In more advanced systems there are almost real-time systems, based on satellite images and geographic information system. These require the establishment of adequate infrastructure such as building, internet, computers, etc.

It is recommended that the main actors in fire management receive practical training in the appropriate use of communication instruments such as radio and telephone in the process of detecting fires, as well as practical demonstration of the use of watchtowers and their correct placement; construction of firebreaks or development of other firebreaks such as belts of more fire-resistant local vegetation referred to above.



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Figure 7. Watchtowers are important resources to provide an excellent view point for smoke columns and flames.

Once the fire has been identified, teams must be mobilized to the field, who must analyze the severity of the fire in terms of danger of spread, deaths, damage to infrastructure, etc. If the fires are dangerous, they must be suppressed using various instruments: hoes; brush hooks; shovels; rakes; road brush; machetes; earmuffs; buckets; motorized pumps or others available. Firefighting brigades must wear protective clothing (gloves, helmet, boots, fireproof jacket and pants) and must provide themselves with a first aid kit.

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2.4 Guidelines for Community Involvement

2.4.1 What is the local community?

A Local Community is a group of families and individuals living in an administrative jurisdiction at locality level or less, which aims to safeguard common interests through the protection of residential areas, agricultural areas, whether cultivated or fallow, forests, culturally important sites, pastures , water sources, hunting areas and expansion (Forest Law 10/99 of 7 July). All institutions (religious organizations, government offices, educational institutions, NGOs) that provide various services in this area should also be involved.

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2.4.2 Participation

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Each member must fully participate in development activities, including fire management, based on laws related to environmental conservation. Community participation in fire management is required from the initial phase to the final implementation phase. Involving the community in fire management is a process that requires the will and acceptance of the community so that:

- Build community capacity to lead the process;
- Increase transparency for the community;
- Reduce and control social conflicts over available resources;
- Build community capacity for the sustainability of the fire management plan.

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2.4.3 Strengthening community capacities

Community empowerment is one of the basic principles of wildfire management, building awareness, confidence and competence through training and ensuring that natural resource management committees (or other formally established natural resources user groups), leaders and individuals use this training to carry out their responsibilities in fire management.

2.4.4 Meet community needs

All members of the community must have the opportunity to be sensitized so that they understand the importance of fire management and the benefits they can obtain from such activity.

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2.4.5 Creation of Fire management group training

Each community need to have a strong forest fire management team that works in cooperation with local leaders, natural resource management committees and other community members. The number of members for the fire management team should not exceed ten (10).

The creation of the team must fulfill at least the following requirements:

- Be representative in terms of gender;
- The members should also have some knowledge in forest resources management and environment;
- Be represented by members that works in different activities such as farmers, charcoal producers, etc;farmers, hunters, shepherds, honey collectors and other fire users;
- There must be representatives from all neighborhoods in the community.

2.4.6 The role of forest fire management team

Forest fire management team is responsible to lead activities of fire prevention and control in coordination with local leaders, and other members.

Thus, the team must act in order to:

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- 1. Promote community education on the best use of fire for natural resource management;
- 2. The community implement laws and statutes, as well as follow procedures forbetter use of fire;
- 3. Reinforce surveillance at the interface between bushes or forests andvillages to ensure safety against fires.
- 4. Participate in the creation, implementation and supervision of work plans;
- 5. Be ready to fight fire as soon as it occurs;
- 6. Prepare a fire management plan for the community by:
- a. Involving the community in the design and implementation of the fire managementprogram;
- *b.* Coordinating all burning activities within the village in accordance with countrylaws and regulations.
- 7. Maintain records of fire incidents and share to other stakeholders;
- 8. Present different information about how to control fire at village meetings;
- 9. Identify available opportunities, challenges and sources of uncontrolled fires;
- 10. Provide fire warnings, e.g. posters, to interested parties, passers-by and othervillage members;

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CHAPTER III

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EARLY CONTROLLED BURNING METHODOLOGY

Early controlled burning consists of theapplication of fire, under certain environmental and ecological conditions, in order to produce the heat intensity and propagation rate to favor certain management objectives. Its correct application follows a set of criteria established through specific experimental studies, with a view to establishing predictions about the behavior, speed and intensity of the fire (Schumacher and Dick, 2018; Torres et al., 2020). Previous experiments on burning are important, as it is difficult to predict fire behavior due to variations depending on the types of forests and environmental conditions (Ben-

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Shahar, 1996). In this context, the use of controlled burning aims to minimize the spread and impacts of forest fires, contributing to the balance of ecosystem functions. According to Goldammer and de Ronde (2004), controlled burning is essential for African forests and savannas, as it constitutes an ecological management tool because it allows the manipulation and maintenance of vegetation.

3.1 Defining the objective of early controlled burning

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The reason for conducting early controlled burn must be clearly established, and the effects desired must be precisely defined. Prescribed burning must be used to reduce combustible material, renew pastures, control undesirable species, induce seed dormancy breaking, such as the umbila species (Pterocarpus angolensis), regenerate young plants, and germinate seeds deposited on the surface and underground.

3.2 Planning controlled burning

Controlled burning consists of the use of fire in a planned manner for forestry purposes and the elimination of burning material in early dry season. Burning material deserves special attention in fire prevention, because it is the only component of the fire triangle that can be controlled. In this sense, grasses and other annual herbaceous plants dry out earlier and burn easily, while perennial plants maintain a relatively high moisture content, dry out later and burn more slowly, (Savadogo et al., 2007). However, before carrying out controlled burning, some aspects must be taken into account:

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• **Period:** The best period for burning is the beginning of the dry season, between May and July, when the vegetation has some moisture.

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- **Time of day:** burning is mostly done during the day, a period when there is greater smoke dispersion. Generally, preference is given to the cold hours of the day, that is, the beginning or end of the day.
- Interval between fires: fires must occur at intervals where fuel accumulation is critical, that is, it must respect the appropriate time of year, as well as the interval between one fire and another. After burning, it is important to determine compliance with objectives and develop a final assessment of the positive and negative effects caused by burning. This assessment will provide useful information to improve planning and execution in future burning operations. The fire prevention and combat plan must be evaluated periodically, with the aim of improving it by correcting flaws observed in all its stages (Torres et al., 2020). Therefore, maintaining records of all activities is essential, especially in relation to the combat stage.

3.3 Assessment of burning conditions

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Fires should only be used when there is a need to apply them, based on a clear and precise assessment of the objectives, benefits and possible damage caused by them. Considering that the action of fire on any area is never completely beneficial, it is essential to establish some criteria that allow the burning to be applied and controlled (MOB, 2017). According to Torres et al., (2020), when recommending the use of prescribed fire, the following criteria must be considered:



Figure 8. Criteria to consider when recommending early controlled burning. Adapted from

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Torres et al (2020)

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Ecological objectives – considers the characteristics of ecosystems and their capacity for post-fire recovery, according to the composition and phenological state of the fuels. its life cycle;

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Meteorological parameters – takes into account variations in the main local meteorological parameters, such as relative air humidity, temperature and wind speed. This information becomes important to estimate the moisture content of fuels, reduce the impacts of burning, control the spread, reduce the risks of pyro exhaust and ensure the safety of those carrying out the burning;

Technique definition – defining the correct burning technique and conduction is essential in achieving the objectives, seeking to reduce the impacts of fire on the soil and reduce the fuel load, as these vary depending on the floristic and topographic characteristics of the ecosystems.

Burning period - the time in which we use fire determines the desired results, so the decision on the best season of the year to carry out burning depends on several factors such as the objectives of the burning, type of vegetation, time of greatest fire danger, amount of fuel, habits of local wildlife and climatic conditions. Normally the best periods for cold burning, for example in the conditions of Niassa province, are between the end of August and the beginning of September. However, depending on the objectives, it may be viable to use fire at other times of the year.

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Socio-economic objectives – The needs of local populations are considered, such as renewal of pastures or hunting. In the case of renewing pastures, burning must take into account the type of livestock and the plant formations that constitute its food, as the technique, fire consumption and season are important to obtain the best results according to the needs of each species.

3.4 Early controlled burning plan

Early controlled burning is a highly technical activity that requires mastery and knowledge of fire behavior and its effects on the environment, and to this end it is necessary to draw up a written and detailed plan, observing the following points (MOB, 2017; SENAR, 2018):

i. Description, location and preparation of the area to be burned: a detailed characterization of the habitat must be made, including the type of vegetation, topography, type and quantity of fuel, total area to be

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burned, limits of the area and a map of the distribution of firebreaks and roads. Mapping fires is equally important for defining priority areas. The area to be burned must also be delimited with intermediate firebreaks of at least 5 m wide for better control of the burning;

ii. Burning objectives: the reasons for using fire must be defined (detailed in 3.1).

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- *iii. Ideal climatic conditions:* information must be obtained on temperature, wind speed and direction and relative air humidity (sections 2.2.2), with a view to predicting fire behavior, avoiding possible environmental damage;
- *iv. Burning method:* the best burning method to be used must be defined taking into account the characteristics of the area, quantity of combustible material and desired fire intensity;
- v. Surveillance, Control and Aftermath: surveillance and control during prescribed burning are essential to ensure that the fire does not get out of control. At the end of the burning, all remaining fires must be eliminated;
- vi. Burn Assessment: after burning, the date, time of burning, fire behavior, weather conditions, main observations (speed of spread, intensity and amount of fuel consumed) must be recorded, as well as the effects of the fire on the environment.
- vii. Equipment and tools: in order to avoid accidents, ensure comfort and maintain the physical integrity of those involved in fighting fire, Personal Protective Equipment (PPE) resistant to high temperatures, in good condition and ready for use, must be provided. However, it must be necessary to add Complementary Equipment (CE), consisting of tools that support individual safety (Schumacher and Dick, 2018; SENAR, 2018).

The PPE used to fight fire must be within the recommended parameters for the activity, that is, it must comply with the minimum mandatory requirements that make it protective equipment and, to this end, it must fit into the risk category to be protected. Personal Protective Equipment constitutes:

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• Pants;

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- Shirt;
- Boots;
- Helmet;
- Protective goggles;
- Gloves;
- Protective mask.

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Figure 9. Personal protective equipment

Additionally, in order to facilitate more complex operations that require the application of force, the following tools are used as complementary equipment as illustrated in Figure 9:

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- "Extinguisher" (fire damper)
- Ax;

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- Hoe;
- Machete;
- Rake;
- Firefly;
- Back pump;



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Figure 10. Complementary fire-fighting equipment

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3.4.1 Execution of early controlled burning

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Early controlled bunrning must be carried out when there is a need for its application, taking into account the optimal circumstances for its conduction. Therefore, adequade preparation, clear and precise assessment assessment of the burning objectives are required (Goldammer and de Ronde, 2004), taking into account the following aspects:

- *i. Review the team, equipment and organization of activities:* it is important to define a sufficient number of personnel on the ground, for as long as necessary, in order to avoid the reappearance of outbreaks that constitute one of the main causes of forest fires. The equipment used during the fire must guarantee a better level of protection for the team, in order to support simple or complex operations, especially tasks that require specialized training. In this context, it is necessary to define an operational command that will clearly guide the activities that will be carried out by other team members.
- *ii.* Assess the meteorological conditions and the degree of danger: for the prescribed burning to reach the expected propagation rate, the team must first assess the conditions of temperature, wind, relative humidity of the air and the combustible material in accordance with section 2.2 of this manual, in order to avoid uncontrolled burning and that the people involved are not exposed to dangerous situations. If any problem is identified that could interfere with the safety and control of the operation, such as variation in wind direction and intensity and in cases where unforeseen situations arise, the burning must be postponed until the risk has been overcome.
- *iii.* Safety measures handling fire is a risky activity, as it involves operators being subjected to unfavorable conditions due to smoke and rising temperatures, which is why burning is a process that requires knowledge for better control and speed in execution. Article 106, of the Regulation of the Forestry and Wildlife Law (2002), allows the use of fire when aspects such as the use of firebreaks to delimit the area intended to be burned, the creation of a team to combat fires with the involvement of of local communities and inventory of forest resources that may be affected by fire.

In this context, in order to reduce the occurrence of accidents during burning, several safety measures must be created (Torres et al., 2020), among them:

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3.4.2 Fire behavior

Get information about weather conditions: knowing this parameter allows you to know the direction and speed of the wind, as well as predict its possible changes. With this, firefighting teams will be able to define less dangerous fighting positions. In the absence of wind direction instruments, soil dumped from a hand can be used (Figure 11).

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Figure 11. Wind direction determination using sand dumped from a hand

Understanding fire behavior: through direct observation, the speed, direction of propagation and intensity of the fire, type of combustible material and topography of the terrain must be considered, thus allowing the definition of the best fire-fighting technique.

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3.4.3 Firefighting safety

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- Identify escape routes and keep all team members informed: you must know all routes that lead to safety zones where group members can take refuge when exposed to a risk situation.
- **Ensure surveillance:** Understanding fire behavior: through direct observation, the speed, direction of propagation and intensity of the fire, type of combustible material and topography of the terrain must be considered, thus allowing the definition of the best fire-fighting technique.servers must be placed in safe and visible locations, in order to identify and alert other team members about possible dangerous situations.

3.4.4 Organization

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• **Ensure communication between team members:** it is extremely important that people involved in firefighting maintain clear and objective communication, so that they can easily understand instructions and coordinate their actions, thus reducing the risk of accidents.

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- **Ensure team control:** all team members must be responsible, attentive and cannot leave their positions during the fire.
- **Ensure extinguishing and surveillance:** As a safety measure, after carrying out the prescribed burning, control or surveillance of active outbreaks, embers or the possibility of underground fire spreading must be carried out, in order to avoid the risk of uncontrolled burning.

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CHAPTER IV

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IMPLEMENTING EARLY CONTROLLED BURNING IN THE COMMUNITY

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Early controlled burning is applied to native vegetation or commercial plantations under certain environmental conditions, allowing the fire to mantain restricted in a given area, producing desirable intensity and spreading speed for management objectives. Controlled fire can be used both inside and outside the forest to reduce combustible material. This method is less expensive and more efficient than others for reducing combustible material.

There are several early controlled burning techniques (see related illustrations for each technique). The technique employed is among others, determined by the burning objectives, the quantity and type of combustible material and climatic factors. The appropriate burning technique must be determined to avoid potential damage to environmental forest resources or community assets. Before conducting early controlled burning, the following steps must be followed:

i. Define the areas to be burned while observing to technical criteria and, current rules and regulations. \bigoplus

- *ii.* Open a firebreak with an appropriate 5 m, however depending on local and weather conditions (April-June period). Once opened, firebreaks must be maintained throughout the year
- iii. It must be ensured that the individuals appointed for burning and other tasks are adequately qualified, trained, equipped, and informed about the activity's execution. Ideally, in the community the early controlled burning should be conducted by trained community members such as fire management committees and where possible, under the supervision of local environmental authorities.
- *iv.* Ensure that all materials, tools, and equipment are available, sufficient, and in good condition for use.
- v. Examine all potentially hazardous situations, such as proximity to residences, farms, corrals, fences, barns, etc.
- vi. Examine the factors that influence fire behavior: fuel (in and around the area to be burned), topography, and meteorological conditions such as wind direction and intensity.
- vii. Prepare the land, repair deficiencies in firebreaks, distribute accumulated fuel, if any, mainly on the area's edges, and split very large areas into plots.
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viii. Position teams in strategic locations across the burning area to control flames that may eventually spread to areas not included in the burning plan.

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- *ix.* Organize the teams and execute the burning in the early dry season, usually in May-July, in accordance to the Burning Plan. The exact month depends on the vegetation moisture (humidity content of approximately 70%).
- x. In case of emergency, the team must move to safety areas, such as firebreaks, roads, bodies oln case of emergency, the team must move to safety areas, such as firebreaks, roads, bodies of water, or area been burned.

Safety measures

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Once the burning activity has finished, safety measures must be taken to prevent the fire from rekindling and the consequent risk of fire on neighboring land, or the fire spreeding beyond the control capacity of the team involved in the operation. The team responsible for the burning must patrol the area and extinguish any traces of fire. The duration of this phase will be based on the characteristics of the combustible material and the type of terrain. For example, underground fires may spread in soils with a high organic matter content. Traces of remaining fire can be extinguished with green bush branches, water, or by covering with soil. From August onwards, monitoring late fire in the community must be observed.

4.1.1.1. Early controlled burning techniques

The decision to use a burning technique that best fits a given terrain depends on knowledge of the principles that guide the different types of controlled burning that exist. Among them, the following stand out (MOB, 2017):

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Burns against the wind

It is considered the basic burning technique, in which fire is used to progress in the opposite direction to the wind. Before using it, it is necessary to observe the existence of natural barriers or the creation of artificial barriers such as firebreaks, from where the fire will start. It is important that the wind has a constant direction and speed, forcing the



flames to the surface of the ground, thus preventing them from reaching the tree crown.

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Burns downwind

The application of the method allows the fire to spread towards the wind. Due to the force of the wind, the fire tends to advance quickly, burning the combustible material in a short time. This technique requires greater compliance with security measures. It can be used to clean land and fields.



Burns in bands downwind

It consists of creating many strips of combustible material separated by firebreaks. The fire is placed in each band, allowing them to develop high intensity simultaneously. It is a safe and easy-to-control technique, as it allows the burning intensity to be regulated. It can be used to clear land and renew pastures.



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Flank burning

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In this technique, continuous lines of fire are lit parallel to the wind, allowing it to spread in a right-angled format. Burning is safe, easy to control and adjustable, requiring experienced personnel. It can be used to clear land and renew pastures.



Burning by foci or points

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In this type of burning, the fire is placed in small circles in all directions of the area to be burned. The points must be 50 m apart so that the increase in fire intensity is similar, avoiding the emergence of outbreaks that could eventually lead to uncontrolled burning. It can be used to clear land and renew pastures.



Simple circular burning

In this technique, fire is used to establish burning lines around the entire area to be burned. It is recommended to be applied on flat terrain without wind. However, if there are winds and the terrain has a gentle or moderate slope, the burning must be progressive and begin in the highest part of the terrain. It is used for cleaning farms, forestry remains and renewing pastures.

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Circular burning with heat concentration

In this type of burning, the fire is placed in the center of the area and then burning lines are established around the entire area to be burned. The fire accelerates its spread, increasing the heat and becoming more active as the fire approaches the central point, preventing the spread and increase in intensity towards the limits of the area.



Its application is recommended in forest clearings to improve wildlife habitat, clearing and preparing land, eliminating forest residue and renewing pasture.

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U-shaped burn

After identifying the wind direction, two people start burning on two flanks facing away from the wind. It is a fast, efficient and easily controlled burn that allows the rapid consumption of combustible material, as well as leaving an escape area for wildlife.



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L-shaped burn

Similar to the previous technique, the wind direction is identified and a person starts burning on a flank facing the opposite direction to the wind. It is a quick, safe and low-impact burn for wildlife, as it allows them to escape during the burn.



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別添資料 27 森林管理実践ハンドブックの要約



モザンビーク国土地環境省 (独)国際協力機構



モザンビーク国

持続可能な森林管理・REDD+プロジェクト

技術協力成果品

森林管理実践ハンドブック

和文要約



2024年4月

アジア航測株式会社

国際航業株式会社

モザンビーク国における主な森林減少・劣化要因として小規模農業、薪炭材生産および森林火災などが挙 げられる。持続可能な森林管理・REDD+プロジェクト(以下、「本プロジェクト」とする)では、パイロ ット活動として森林火災管理活動に取り組んだ。森林管理実践ハンドブック(以下、「本ハンドブック」 とする)は、パイロット活動として取り組んだ森林火災対策の手法を現地普及用に取りまとめた。また、 モザンビーク国において森林火災が発生する背景として、地域住民の収入源となる火入れを伴った採蜜 が考えられたことから、火入れによる採蜜方法の代替手法として、巣箱を利用した養蜂採蜜方法をマニュ アル化して記載した。

今後、モザンビーク国で各種森林管理計画が策定されるとともに、計画にもとづく森林管理活動及び森林 減少・劣化対策活動が行われる際に、本ハンドブックが活動の普及、推進の一助になることを目指した。

以下に本ハンドブックの目次と各章の概要を示す。

1章:森林火災対策マニュアル

本プロジェクトの森林火災管理パイロット活動を通して実施した現地での活動手法や、実際の活動を通 して得られた知見をマニュアルとして取りまとめた。

- 1. : モザンビーク国における森林火災管理の状況を整理した。
- 2.:集落における森林火災対策の一般的な方法を取りまとめた。
- 3. : 早期火入れによる森林火災管理手法の方法論と取りまとめた。
- 4. : 集落において実際に早期火入れによる森林火災管理を行う手順を取りまとめた。

<u>2章:巣箱を利用した養蜂・採蜜マニュアル</u>

ケニア式巣箱を利用した養蜂方法を以下の3節に分けて解説した。

- 1. 養蜂の始め方の節:養蜂器具の説明及び蜂の生態及び蜂群の捕獲方法等について整理した。
- 2. 内検方法:巣箱の開け方や巣板の移動及び蜂群の強化方法等を整理した。
- 3. 採蜜:採蜜時に気を付ける点及び花粉、花蜜、蜂蜜及び蜜蝋など蜂産品の説明を整理した。

3章:森林減少・劣化対策への提言

ニアッサ州 PPIGF 策定をとおして得られた知見や、森林火災管理パイロット活動の実施にあたって収集 した情報等に基づき、モザンビーク国における主な森林減少・劣化要因である小規模農業、薪炭生産及び 森林火災に対する対策を行う際の提言をとして取りまとめた。

- 全体について:森林減少・劣化対策の全体にかかる提言として、森林減少・劣化の要因を特定して、効果的な対策を実施すべきである点や、集落単位で活動を実施する点、森林減少・劣化対策を実践するための資金の確保の重要性について提言を取りまとめた。
- 2.小規模農業による森林減少・劣化対策:生産性の高い農業技術の普及、代替生計手段の導入、アグロフ オレストリーの導入及び焼畑農業からの転換に対するコミュニティへの啓発活動が有効であると提言

を記載している。

- 3.薪炭材生産による森林減少・劣化対策:植林による薪炭材生産林の造成、改良かまどの導入、レンガ窯 を利用した炭生産及び炭の生産・管理のための生産者組合の組織化について提言を整理した。
- 4.森林火災対策:森林火災予防・消化のパトロールへのコミュニティの巻き込み、防火帯の設置と管理された早期火入れ作業の実施、焼畑、狩猟採集及びハチミツ採集のための火入れの延焼の防止及びコミュニティラジオ等を利用した森林火災の危険性などの環境教育活動について提言を取りまとめた。

別添資料28事業完了報告書の英文要約



Ministry of Land and Environment Japan International Cooperation Agency



Project for Sustainable Forest Management and REDD+ in Mozambique Project Completion Report

(Summary)



May 2024

Asia Air Survey Co., LTD. Kokusai Kogyo Co., Ltd.

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Abbreviations

AD	Activity Data		
AE	Accredited Entity		
ANAC	National Administration of Conservation Areas		
BUR	Biennial Update Report		
C/P	Counternart		
CSO	Civil Society Organization		
DAC	Development Assistance Committee		
DINAE	National Directorate of Forests		
DIPE	Department of Forest Pesources Inventory		
	Provincial Directorete for Development Land and Environment		
	Filovincial Directorate for Development Land and Environment		
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FIRIVIS	File Information for Resource Management System		
FIS ENDC	Forest mioritation System		
FNDS	National Sustainable Development Fund		
FREL/FKL	Forest Reference Emission Level/ Forest Reference Level		
FRIP	Forest Resource Information Platform		
GCF	Green Climate Fund		
GFW	Global Forest Watch		
GHG	Greenhouse Gas		
GIS	Geographic Information System		
GLAD	Global Land Analysis and Discovery		
IUCN	International Union for Conservation of Nature and Natural Resources		
JAXA	Japan Aerospace Exploration Agency		
JCC	Joint Coordination Committee		
JICA	Japan International Cooperation Agency		
JJ-FAST	JICA-JAXA Early Warning System for Tropical Forest		
JV	Joint Venture		
MITADER	Ministry of Land, Environment and Rural Development		
MODIS	Moderate Resolution Imaging Spectroradiometer		
MRV	Measurement, Reporting and Verification		
MTA	Ministry of Land and Environment		
MozNorte	Mozambique Rural Resilience Project		
MozRural	Sustainable Rural Economy Program		
NDA	National Designated Authority		
NDC	Nationally Determined Contributions		
NFI	National Forest Inventory		
NFMS	National Forest Monitoring System		
NFP	National Forest Program		
NGO	Non-Governmental Organization		
NRS	National REDD+ Strategy		
NSD	National NEDD+ Strategy		
	On the Joh Training		
	Droiost Design Metrix		
	Project Design Maura		
PPIGF	Integrated Provincial Forest Management Plan		
PK D-M-	Public Kelanons		
PaMs	Policy and Measures		
KEDD+	DD+ Reducing Emissions from Deforestation and forest Degradation and the role of conservation		
	sustainable management of forests and enhancement of forest carbon stocks in developing		
	countries		
SDAE	District Services for Economic Activities		
SDRS	Satellite-based Deforestation Reference System		
SDPI	District Services for Planning and Infrastructure		

SFM	Sustainable forest management
SIS	Safeguards Information Systems
SPA	Provincial Service for Environment
TF	Task Force
TWG	Technical Working Group
UEM	Eduardo Mondlane University
UniLurio	Lurio University
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank
WCS	Wildlife Conservation Society
WG	Working Group

1 Background

In Mozambique, forests cover approximately 48% of the country's land area, or 38 million ha, but 220,000ha (a deforestation rate of 0.58%) are lost each year. The main drivers of deforestation include mining exploitation, excessive use of slash-and-burn agriculture, firewood extraction and charcoal production, land conversion to commercial agriculture, illegal logging, and forest fires, while underlying factors include the high dependence of rural populations on forest resources and weak governance of the forest administration.

Deforestation in Mozambique is estimated to 12 million tonnes of CO_2 equivalent emissions per year, and REDD+ initiatives have been promoted with support from international organizations and donor agencies since 2012, including a REDD+ Readiness Plan using the WB's Forest Carbon Partnership Facility. In addition, Mozambique's NDC transmitted in October 2015 aims at GHG reductions of 76.5 mt CO₂ in the period 2020-2030, and REDD+ has been positioned as one of the climate change mitigation measures. Furthermore, the Government of Mozambique developed a REDD+ National Strategy in 2016.

Since 2010, Japan has also supported Mozambique's forest conservation efforts through REDD+ in the form of dispatching policy advisors, providing equipment, technical cooperation, and human resource development. In addition, from 2013 to 2018, "The Project for the Establishment of Sustainable Forest Resources Information Platform for Monitoring REDD+" (hereinafter referred to as the "the Preceding Project") was implemented to develop a forest resource information platform to promote REDD+, and to develop land cover/land use maps and FRLs in Gaza and Cabo Delgado provinces, through appropriate forest monitoring.

Thanks to this support from the international community including Japan, capacity building to promote sustainable forest management and REDD+ in the Ministry of Land, Environment and Rural Development (MITADER) (which was reorganized into the Ministry of Land and Environment (MTA) following the January 2020 presidential inauguration) has been strengthened and is ongoing. However, further support on policy, technical aspects and human resource development was still required to ensure that MITADER and local administrations, with their vast land areas and extremely limited staff and budgets, can sustainably implement REDD+ in line with international standards and manage the forests. To this end, the Government of Mozambique requested the Government of Japan to cooperate in the establishment and operation of the NFMS by updating and utilizing the forest resource information platform and other outputs established in the Preceding Project, as well as in efforts to reduce deforestation and/or forest degradation at the sub-national (provincial) level.

2 Objectives of the Project

The objective of the Project for Sustainable Forest Management and REDD+ in Mozambique (hereinafter referred to as "the Project") is to promote REDD+ and sustainable forest management in Mozambique through the operation of the NFMS and the implementation of sustainable forest management, including REDD+ activities, in Niassa province. The Project Purpose and other components under the PDM are listed in Table 1 below.

Table 1 Composition of the Project

[Overall Goal]

Sustainable forest management and REDD+ are promoted through the operationalization of the National Forest Monitoring
System (NFMS) in Mozambique, and sustainable forest management including through REDD+ in Niassa is promoted.
[Project Purpose]
The capacity of MTA and Niassa Province is strengthened for implementing sustainable forest management and REDD+.
[Expected output].
Output 1: National Forest Monitoring System (NFMS) (/M&MRV System) is operational for REDD+ and sustainable forest
management (SFM).
Output 2: Provincial planning process for sustainable forest management including REDD+ and its implementation exercise
are promoted.
[Project Site]
National for Output 1, Niassa Province for Output 2
[Project Period]
8 April 2019 - 7 April 2024.

3 Project results

3.1 Activities related to Output 1

Activities related to Output 1 are to be implemented to achieve "National Forest Monitoring System (NFMS) (/M&MRV System) is operational for REDD+ and sustainable forest management (SFM)". The NFMS needs to be built to qualify for REDD+ results-based payments (e.g., GCF); and in developing it, the UNFCCC requires that the NFMS be transparent and provide data/information using consistent time series. The NFMS is also important for Mozambique to practice sustainable forest management. In general, a NFMS needs to specify the methodologies of how forests are to be measured (area, volume, etc.), and how the results of monitoring using such methodologies are to be managed and analyzed. In order to develop and operate such NFMS, preparation of a guiding NFMS document, which should be the common and unique NFMS document in Mozambique, is needed. It should be noted that the NFMS document should include not only the forest measurement and data management methods mentioned above, but also the institutional arrangement and the implementation calendar of the NFMS.

The Project supported the development and operation of the NFMS, including the preparation of the NFMS document. The main activities carried out under Output 1 are described below.

3.1.1 Establishment and operation of inter-organizational coordination mechanisms



Figure 1 NFMS inter-organizational coordination mechanisms

In order to facilitate the establishment and operation of the inter-organizational coordination mechanism of the NFMS, a definition document (hereinafter referred to as "the TOR") containing its objectives, structure, roles, members, TF and WG outlines, etc. was first agreed and signed by the DIRF Director at DINAF and the Head of MRV Unit at FNDS. The structure of the inter-organizational coordination mechanisms is shown in Figure 1.

Based on the agreed TOR, three TF and

one WG meetings were held in the first period, three TF and one WG meetings in the second period, and one TF and one WG meetings in the third period, for a total of seven TF and three WG meetings. The TF mainly discussed 1) its purpose and mandate, 2) the definition, objectives, scope, concept, technical content, and future improvements of the NFMS, 3) the preparation and updating of the NFMS document, 4) a summary report on activities related to the NFMS, and 5) the development and operation of the SDRS. Meanwhile, the WG mainly discussed 1) confirming the background and objectives of its establishment, 2) reporting on and approving the definition, objectives, scope, concept, technical content, future improvements, and inter-organizational coordination of the NFMS, and 3) approving the content of the NFMS document.

3.1.2 Confirmation of NFMS definition and common understanding among relevant organizations

In order to confirm the NFMS definition and its common understanding among the relevant organizations, the TF discussed the definition, objectives, scope and concept of the Mozambican NFMS. As a result, the NFMS consisted of three functions: a Monitoring Function, a MRV Function and a Data Management Function as shown in Figure 2.





Following discussions in TF and WG, the NFMS document was developed as Ver. 1 and approved by the MTA Technical Committee in September 2021. Subsequently, it was agreed to update the Data/Reporting Calendar, and the document was updated from Ver. 1 to Ver. 1.1. Eventually, a Ver. 2 was agreed upon in the third WG, which included updated Data/Reporting Calendar, Participatory MRV, etc. The table of contents of the NFMS document is as follows.

Chapter 1: Background and Purpose Chapter 2: Objectives of the NFMS Chapter 3: Communication processes and action calendar 3.1 Reporting requirements and the role of the NFMS 3.2 Action calendar for the NFMS Chapter 4: Forest in Mozambique 4.1 State of forests in Mozambique

-	
	4.2 Drivers of deforestation and forest degradation
	4.3 National policies, legal frameworks and institutional arrangement
	Chapter 5: Summary of the technical scope of NFMS
	5.1 Scope of forest monitoring
	5.2 Scope of MRV
	5.3 Scope of data management
	Chapter 6: Technical processes of current forest monitoring.
	6.1 Forest monitoring
	6.1.1 PaMs (policies and measures)
	6.1.2 Satellite based monitoring
	6.1.3 Field based monitoring
	6.1.4 Activity based monitoring
	6.2 MRV
	6.2.1 Emission factor (EF)
	6.2.2 Activity data (AD)
	6.3 Data management
	Chapter 7: Future improvements.
	Chapter 8: Institutional arrangement
	8.1 Overall responsibility and coordination mechanism
	8.2 Competencies of the key agencies and partners in relation to the NFMS

Chapter 9: Budget

3.1.3 Integration of annual deforestation monitoring function into the NFMS



Figure 3 Flow of aggregation from existing systems to the FRIP

The monitoring function of the NFMS is intended to monitor forest changes (deforestation, forest degradation, etc.). Regarding satellite-based monitoring, the Satellite-based Deforestation Reference System (SDRS) was

established as a system that utilizes existing deforestation warning systems and other systems based on publicly available satellite imagery. Figure 3 shows how the information from each existing system is aggregated into the FRIP for use as an SDRS.

Figure 4 is a screen capture (image) of the deforestation areas detected from the existing (early) deforestation warning systems (JJ-FAST and GLAD Alert) with fire information from FIRMS superimposed over a background of the latest satellite imagery (©Planet Labs PBC). By displaying multiple data sources on one screen, users can easily visualize the data/information needed for monitoring.



Figure 4 Screen capture of deforestation detection sites and fire information confirmation

The SDRS has been updated based on the results of test operations and has been fully operational since May 2022. Furthermore, studies have been conducted within DINAF on how to utilize it. As a result of these studies, SDRS utilization patterns have been identified, such as visualization of deforestation detection sites by month and province/district through JJ-FAST/GLAD Alert and identification of deforested areas around concessions and simple license areas for concession management.

3.1.4 Review, revise and finalize operational manuals on the NFMS

As the FRIP was migrated to a new server and the SDRS was newly established, a new FRIP/SDRS system operation and management manual was prepared for DINAF staff to operate these systems properly, while reviewing and referring to the manuals developed in the Preceding Project. The contents of the system operation and management manual is listed in Table 2 below.

chapter	Contents
1	Introduction
2	Server configuration
3	Database software configuration
4	ArcGIS Enterprise configuration
5	How to handle a geodatabase
6	How to handle ArcGIS Server
7	How to handle Portal for ArcGIS
appendix	SDRS basic design specification

 Table 2 Table of contents of the new FRIP/SDRS system operation and management manual

SDRS database definition table
SDRS tools functional design specification
SDRS tools setup manual
SDRS tool production release procedure
SDRS Introduction for internal user
SDRS Introduction for general user
Procedure for developing web-based GIS application for monitoring within/out concession
areas by SDRS

3.1.5 Reflection of findings in relevant policies and plans and efforts to mobilize funds for implementation

The Project assisted the preparation of funding applications to the GCF for the implementation of NDC, NFP and NRS.

Following the formal decision by the MTA which requests IUCN to be the AE in July 2022, formal preparations of the application for the GCF funding began, a Concept Note preparation proceeded and the final version of the Concept Note was prepared with its outline summarized in Table 3 below.

Т	able 3	Outline	of the	GCF	Concept	Note	

Provisional title of the Project	Accelerating climate change mitigation and resilience of forest ecosystems and communities through sustainable forest management and restoration of Miombo woodland in the Zambezi River Basin.		
Components/Outputs	Output 1 (National level): Forest governance arrangement and institutional capacity of the sector is enhanced to create enabling environment. Output 2 (National level): Identify sustainable financing pathways. Output 3 (Sub-national level): Climate-responsive planning and interventions are implemented in the selected provinces and landscapes through enhanced partnership with the local communities, CSOs and private sectors to reinforce climate change mitigation and adaptation capacities. Output 4: Regional and Global Cooperation are facilitated to further integrate Mozambique into the global effort on addressing climate change. Output 5 (Cross-cutting): Project Management, Monitoring and Evaluation to inform the progress and contribution in climate change approach		
Project Period	2026 - 2031.		
Institutional	Accredited Entity: IUCN		
arrangement	Implementing agencies: MTA, IUCN.		

3.2 Activities related to Output 2

With regard to activities related to Output 2, the target province was Cabo Delgado province in the original work plan, but due to the deteriorating local security situation, discussions between DINAF, JICA Headquarters and the JICA Mozambique Office resulted in the need to consider an alternative province. In the selection process, security, current forest cover, deforestation rate, carbon dioxide emissions, deforestation and degradation drivers, access, forest concessions, land use plan, other donor activities and potential for external funding were considered, and Niassa province was ultimately selected as the alternative province.

As mentioned above, the activities related to Output 2 had to be initiated based on a modified work plan due to the change of the target province from Cabo Delgado province to Niassa province. The activities related to Output 2 were implemented to achieve "Provincial planning process for sustainable forest management including REDD+ and its implementation exercise are promoted". In order to promote sustainable forest

management in Mozambique, it is necessary to develop PPIGFs in the context of the national forest management policy. PPIGFs should also include a management concept for functionally classified forests, a methodology for managing forests according to that concept, and measures to address forest-related issues such as deforestation and forest degradation.

The Project supported the formulation of a PPIGF based on the practical implementation of measures against deforestation and forest degradation in the field through a pilot activity. The main activities carried out under Output 2 are described below.

3.2.1 Stakeholder consultation on the Niassa PPIGF

(1) Kick-off meeting for the development of the PPIGF

The kick-off meeting of the PPIGF was held on 20 November 2019 in Lichinga, Niassa Province. The objectives of the meeting were to 1) inform stakeholders about the PPIGF, 2) agree on the process, timeline and institutional arrangements for development, and 3) identify challenges and priority measures related to deforestation, forest degradation, and sustainable forest management in the Niassa Province. A total of 76 participants were invited to the meeting, representing a wide range of stakeholders involved in the forest and forestry field in Niassa, including central and local government, universities, research institutions, private companies, NGOs, and donors.

During the Q&A session and the exchange of views at the meeting, suggestions were made on how to establish facts and improve the accuracy of data on forest information in Niassa, and active opinions were expressed on forest and forest management issues in Niassa and measures to address them. Based on the suggestions made at this meeting, the formulation of the PPIGF was initiated.

(2) PPIGF review meetings

In accordance with the process and timeline for the formulation of the PPIGF, review meetings were held at the central and provincial levels based on the draft PPIGF Ver. 1 (held in Maputo on 3 October 2022 and in Lichinga, Niassa Province on 7 October 2022, respectively). The objectives were to 1) promote understanding of the PPIGF among stakeholders and 2) collect comments on improvements for the development of the draft PPIGF Ver. 2. A wide range of stakeholders involved in forest and forestry in Niassa Province were invited to these meetings, including central and local government, universities, research institutions, private companies, NGOs and donors, with a total of 30 participants in Maputo and 82 in Niassa.

During the Q&A session and the exchange of views at these meetings, concrete suggestions for improving the PPIGF were made, and issues based on practical experience and knowledge were raised, especially at the provincial level meeting. The suggestions made at these meetings were compiled and used to revise the draft Ver. 2.

3.2.2 Development of the draft Provincial Forest Management Plan.

At the kick-off meeting, it was firstly confirmed that the PPIGF would be positioned at the middle level between the national and field levels in the Mozambican forest planning system, that it would provide medium- and long-term forest management measures based on the Forest Law, the National Forest Program and other legislation, that it would be formulated based on existing forest information/data such as forest cover maps, and that forest management based on the PPIGF is expected to address deforestation and forest degradation (see Figure 5).



The specifics of the forest management planning system will be sorted out in the Regulation (Decree) of the new Forest Law; it remains uncertain whether the PPIGF will be positioned between the national and the filed levels.

For the preparation of the Niassa PPIGF, surveys were conducted with relevant district departments to gather information on deforestation drivers and the current status and challenges of forest management in each district; interviews were conducted with the Mozambique Leaf Tobacco Company and plantation companies which are private sector that have impacts on forest management; and SPA and Provincial AQUA provided a review and reconfirmation of the current status and challenges of forest management, including protected area management, concession management, management of benefit sharing of concession revenues to communities, afforestation, firewood and charcoal production management, forest fires, and timber industry, etc.

In addition, demographic data and data relating to the current production area locations and production targets for food consumptions and cash crops in Niassa were compiled in accordance with the strategic plan of Niassa province and the agricultural land development plan. With regard to the definition and specification of the functional classification of forests in Niassa, a work was also undertaken to improve the quality of GIS data on rivers, roads and railways, which are necessary for the classification of protection forests in the province.

Furthermore, as the forest management activities in the PPIGF are required to be consistent with national policies, a systematic organization of activities contributing to addressing deforestation and forest degradation and improving forest management in Niassa was carried out, referring to the activities presented in the NFP.

Through the above work, the Niassa PPIGF was developed and the contents of the PPIGF are as follows (see Table 4). Then, the Niassa PPIGF was approved as an MTA Ministerial Diploma in March 2024.

Chapter	Section
1. Overview of Forestry and	1.1 Recent Forest Cover, Forest Volume and Forest Change
Forest Management in	1.2 Deforestation, Forest Degradation and Natural Disasters
Niassa: Status and Issues	1.3 Provincial Plan for Land Use and Current Forest Areas
	1.4 Conservation Area Management
	1.5 Productive Forest Management
	1.6 Forest plantations and non timber forest products
	1.7 Forest Fire Management
	1.8 Forest industry management
2. Zoning and Forest	2.1 Principles and Policies for Conservation, Protection and Productive
Management	Forestry
	2.2 Conservation, Protection and Productive Forest Area
	2.3 Estimated Annual Allowable Cut for Sustainable Exploitation
3. Provincial Forest	3.1 Vision.
Management Plan	3.2 Strategic objectives
	3.3 Planning period
	3.4 Theory of Change
	3.5 Activities to Mitigate Deforestation and Forest Degradation
4. Forest Management	Objective 1 - Strengthen socio-economic development and food security
Activities	with a focus on community involvement
	Objective 2 - Increasing resilience to climate change and natural disasters
	Objective 3 - Build capacity and integrate the principles of good
	governance into forestry development
5. Operational and Financial	5.1 Institutional and implementation arrangements
Plan	5.2 Indicative Budget
	5.3 Source of funding
6. Monitoring and Evaluation	1

Table 4 Table of Contents of Niassa PPIGF

7 Recommendations and lessons learned in Provincial Forest Management Planning

3.2.3 Search for sources of funding to promote implementation of forest management plans

The search for funding sources to promote the implementation of the Niassa PPIGF has been discussed in conjunction with activity mentioned in 3.1.5, and is as follows.

- In Niassa, there are already supports by the WB's rural development and natural resource management projects which also include climate change response measures (namely MozNorte and MozRural which are both already approved and are in the preparatory stage of implementation), and another support by the WCS for the Niassa Special Reserve. In the short term, these supports are expected to be the main financial resources for the implementation of the Niassa PPIGF. Therefore, in the future, the leadership of the central and Niassa provincial governments are expected to ensure that these projects are coordinated with the Niassa PPIGF.
- In addition, the GCF Concept Note includes a budget line that will fund the implementation of the Niassa PPIGF. In practice, first the Concept Note will be approved by the GCF and then the specific target areas and activities will be elaborated during the preparation of the Funding Proposal. It is expected that the activities indicated in the PPIGF will be adopted as appropriate during this stage.

In addition to this, formulation of PPIGFs for the provinces targeted under the GCF project is indicated in the GCF Concept Note so that the Project's PPIGF-related results will be expanded.

3.2.4 Strengthening the capacity of government officials and others in forest management

The Project has strengthened the capacity of national, provincial and district level counterparts, etc. in the forest management sector by providing on-the-job training opportunities through the implementation of activities, and trainings (seminars). The capacity building efforts in PPIGF development and pilot activities are described below.

(1) Capacity building related to PPIGF formulation

The process of formulating the PPIGF was positioned as on-the-job training to strengthen the capacity of the staff in charge of DINAF and the SPA of Niassa. The data collection surveys in the field required for the formulation of the PPIGF were carried out jointly by members of the TWG for the drafting of the PPIGF in DINAF and the SPA, and the survey results were compiled and reflected in the Niassa PPIGF. In addition, the Project also discussed the criteria for zoning of forest functional categories with DIRF/DINAF personnels, who then collected and prepared the GIS data. Through these collaborative efforts, the Project was able to promote the counterparts' understanding of the formulation process of the PPIGF and improve their technical capacity in collecting the necessary data.

Based on the findings from the planning of the PPIGF, a guideline for the development of the PPIGF was also prepared. The table of contents of the guideline is shown in Table 5.

Table of Contents		
Part 1 Introduction of the Guideline		
Background		
Objectives of the Guidelines.		
Target Users of the Guideline		
Part 2 Development Principle and Process of PPIGF Formulation		
PPIGF Rationale and Development Principles		
PPIGF Development Process		
Step 1 Preparation for Development of PPIGF		
Step 2 Collection and Analysis of Existing Data, Field Survey/Interviews		
Step 3 Forest Inventory		
Step 4 Preparation of the PPIGF First Draft		
Step 5 Stakeholder Meeting to Review and Revise the PPIGF First Draft		
Step 6 Government Approval Process		
Part 3 Development Methodology and Contents of PPIGF		
PPIGF Chapter 1; Overview of Forests and Forest Management: Status and Issues		
PPIGF Chapter 2: Forest Zoning and Management		
PPIGF Chapter 3: Provincial Forest Management Plan		
PPIGF Chapter 4: Activities on Forest Management		
PPIGF Chapter 5: Operational and Financial Plan		
PPIGF Chapter 6: Monitoring and Evaluation		

Table 5 Table of contents of the PPIC	FF development guidelines
---------------------------------------	----------------------------------

In addition, a workshop was organized on 2 November 2023 to ensure the future development of PPIGFs in other provinces except for Niassa province using the PPIGF development guidelines. A seminar was organized for central and provincial forestry organizations (SPA and DPDTA), donors and universities, with 65 participants. A Niassa SPA official presented an overview of the Niassa PPIGF, followed by an

introduction to how the PPIGF was developed, mainly by the counterparts involved in the planning process.

(2) Capacity building related to the pilot activity

On-the-job training, forest fire management leadership seminars, and a forest fire management symposium for SPA, DPDTA, SDAE and SDPI staff were implemented as capacity building through the pilot activity of forest fire management. These capacity building activities are listed in Table 6.

Activity	Period	Target group	Number of participants
Seminars on the dissemination of forest fire management activity	Nov 2022	Central and Niassa provincial government officials, etc.	35 persons
	Oct 2023	Central and Niassa provincial government officials, etc.	70 persons
Forest fire management symposium	Apr 2023	Central and Niassa provincial government officials, etc.	113 persons
Monitoring of Forest fire management activity	Jul-Nov 2022	Niassa Provincial Government Officials (SPA, SDAE)	4 persons x 3 times
	Jul-Oct 2023	Niassa Provincial Government Officials (SPA, DPDTA, SDAE, SDPI)	4 persons x 4 times

Table 6 List of implemented capacity building activities for forest management for government officials

3.2.5 Selection and implementation of field activities as sustainable forest management to be prioritized in accordance with the Provincial Forest Management Plan

In response to forest fires, which are one of the main drivers of deforestation and forest degradation identified in the PPIGF, the Project implemented "The Early Controlled Burning and Community Awareness of Forest Fire Management" pilot activity through subcontracting to a JV of UEM and UniLurio. Forest fire management methods included creating firebreaks and conducting controlled burns during the early dry season (June-August) to burn forest biomass, mainly in the undergrowth. This prevents large-scale forest fires from occurring even when local people set fires in the forests or in the fields after the middle of the dry season (September to November) for livelihood activities such as slash-and-burn agriculture or hunting, because the amount of dry biomass in the forest has decreased after the early controlled burning. Preventing large-scale forest fires can also reduce the impact of forest fires on trees and promote tree growth.

In 2022, activities were carried out in the following communities.

 Community for forest fire management: Revia Comercial in Majune District.

In 2023, activities were carried out in the following communities.

- Communities for forest fire management (in conjunction with public awareness raising activities in surrounding communities):
 Luambala in Majune District; Manhula in Malupa District; Pahua in Maua District.
- Community for Monitoring:
 Revia Comercial in Majune District (community where pilot activity was implemented in 2022).
- Community for training of concession management body: Maumbica in Sanga District.

Table 7 shows the detailed activities undertaken for the early controlled burning and community awareness of forest fire management.

phase of activity	Activities
1. advance	1.1 Definition of the forest areas to be managed
preparation	1.2 Meetings with the communities / Arrangements and Agreements
	1.3 Community awareness in prevention and fight of forest fires
	1.4 Selection of the workforce in the community
	1.5 Training for community members
2. forest fire	2.1 Opening firebreaks
management	2.2 Analysis of combustible material including a reconnaissance
	2.3 Analysis of meteorological variables (relative humidity, temperature and wind
	speed)
	2.4 Early Controlled burning
	2.5 Monitoring the Activity with the staffs from SPA and SDAE of target districts
	2.6 Late burning (One block for comparison purposes)
3. overall	3.1 Monitoring the evolution of late fires and the effect of fire on vegetation.
activities	The biomass of the fuel material and carbon emissions for the two target areas will
	be estimated
	3.2 Seminar for Trainers (DINAF, SPA and SDAE staffs, etc.)
	3.3 Orientation for sustainability of the early controlled burning

Table 7 activities for the early controlled burning and community awareness of forest fire management


Before creation of firebreaks (Luambala)



Creation work of firebreaks (Luambala).



Before early controlled burning

After creation of firebreaks (Luambala)



Operation of early controlled burning



After early controlled burning

Photo 1 Work during the forest fire management activity

(i) Forest fire management symposium

A forest fire symposium was held on 3 April 2023. The Secretary of State and the Governor of Niassa Province were present, and more than 100 people attended, including district directors from each district, universities, private companies such as concession operators, NGOs and community representatives. The JV between UEM and UniLurio, which was the sub-contractor for the forest fire management activities, gave a presentation on the methodology and results of the forest fire management activities conducted in Majune District in 2022, and several private companies gave presentations on their own forest fire management initiatives. It was also decided to establish a committee on forest fire management, and it was stated that this committee would be used for forest fire management in the future. During the discussions, several district directors expressed their expectations for the implementation of the Project's forest fire management pilot activities.

(ii) Forest fire management leadership training seminar

A leadership training seminar was organized to share the results of forest fire management activities as the pilot activity and to disseminate forest fire management activities.

(iii) Preparation of Forest fire management promotion video

Three video materials were produced with the aim of disseminating the forest fire management activities in Niassa Province and Mozambique Country and to serve as PR for the Project's forest fire management initiatives. The summary of these videos is as follows.

Туре.	Target groups	Language
PR video promoting the	Central and local government officials,	English, Portuguese.
Project's forest fire management	donors and NGOs in Mozambique and	
activities	other countries	
Video for training of trainers for	Central and local government officials	Portuguese
early controlled fire activities	within Mozambique	
Video for community for early	Community residents within Mozambique	Portuguese, Makua.
controlled fire activities		-

Table 8 List of forest fire management promotion videos

Through the forest fire management activities conducted as the pilot activity in 2022 and 2023, changes in the awareness of local people about forest fire management were observed in the communities where the forest fire management activities were conducted. The implementation of measures such as the creation of firebreaks in necessary areas (around target areas for forest conservation) to prevent fire spread were confirmed as voluntary initiatives by the community residents. In addition, no forest fires were detected in the communities where the pilot activities had been implemented. Therefore, it can be said that the forest fire management activities, such as controlled burns in the early dry season and the establishment of firebreaks, were effective in preventing forest fires. After the completion of the Project, it is hoped that efforts would continue to contribute to the prevention of large-scale forest fires by establishing firebreaks and so on in accordance with the actual conditions in each community (e.g., extension and width of firebreaks).

Through these activities, it was also confirmed that there is a strong concern about forest fire outbreaks among local people as well as among central and local government officials. On the other hand, it was also confirmed that there is a lack of dissemination of knowledge and technology related to forest fire management, and that measures are not being taken. As a result, this pilot activity was able to demonstrate to local people that they can safely remove the undergrowth and other vegetation by creating firebreaks and carrying out early controlled burns. In the future, it is hoped that the communities where the pilot activities were carried out would become a model of good practices in the province and serve as a reference for forest fire management in neighboring communities.

In addition, a total of 218 people participated in seminars and symposia through the pilot activities for forest fire management. These participants can be expected to serve as human resources for the future dissemination of forest fire management in the various districts and communities of Niassa Province. In addition, it is hoped that the Practical Handbook for Forest Management and the videos developed by the Project will be used after the completion of the Project to disseminate forest fire management activities in other provinces of Mozambique as well as in Niassa province.

4 Status of Project Achievement

4.1 Achievement of Outputs and their Objectively Verifiable Indicators

4.1.1 Achievement of Output 1 and its Objectively Verifiable Indicators

In Output 1 "National Forest Monitoring System (NFMS) (/M&MRV System) is operational for REDD+ and sustainable forest management (SFM)", three objectively verifiable indicators were set, namely 1) A document to define NFMS is developed (including description of an annual deforestation monitoring function, a database function of FRIP, and evaluation of ground exercise in Niassa), 2) Operational Manuals on NFMS elements (remote sensing, forest resource inventory, carbon stock calculation ...) are developed and consolidated, and 3) More than 20 MTA personnel participated in trainings (including OJTs) and the institutional coordination mechanism on NFMS operation. The status of indicators achievement is as follows.

Indicator 1: this indicator was achieved as the NFMS document Ver. 1 was developed and further updated to Ver. 1.1 and Ver. 2.

Indicator 2: this indicator was achieved as the new FRIP/SDRS system operation and management manual were developed and the NFMS-related manuals developed in the Preceding Project were consolidated, including updates by FNDS.

Indicator 3: this indicator was achieved as a total of 22 MTA staff, 21 DINAF staff and 1 ANAC staff participated in training (including on-the-job training) on the operation of the NFMS as well as in TF and WG meetings as inter-organizational coordination mechanisms.

4.1.2 Achievement of Output 2 and its Objectively Verifiable Indicators

In Output 2 "Provincial planning process for sustainable forest management including REDD+ and its implementation exercise are promoted", three objectively verifiable indicators were set, namely 1) Provincial forest management plan is developed, 2) Recommendations for the development of provincial forest management plans in other areas are developed with lesson learned on its process, and 3) Based on the management plan, recommendations for countermeasures against deforestation and forest degradation drivers are made. The status of indicators achievement is as follows.

Indicator 1: this indicator was achieved as the final version of the Niassa PPIGF was produced.

Indicator 2: this indicator was achieved as guidelines for the development of the PPIGF was developed and recommendations and lessons learned for the development of the PPIGF are included in Chapter 7 of the Niassa PPIGF.

Indicator 3: this indicator was achieved as the final version of the Niassa PPIGF, chapter 3.5, includes measures to mitigate deforestation and forest degradation, and recommendations on measures to address deforestation and forest degradation drivers are included in the Practical Handbook for Forest Management.

4.2 Achievement of the Project Purpose and its Objectively Verifiable Indicators

In the Project Purpose "The capacity of MTA and Niassa Province is strengthened for implementing sustainable forest management and REDD+", three objectively verifiable indicators have been set, namely 1) NFMS is defined and officialized (e.g. submission to UNFCCC, NFMS descriptions in BUR), 2) Deforestation level is regularly monitored through the Satellite-based Deforestation Reference System (SDRS), and 3) Provincial forest management plan in Niassa is approved. The status of indicators achievement is as follows.

Indicator 1: This indicator was achieved as the NFMS document Ver. 1 was approved by the MTA. The NFMS document has been further updated from Ver.1 to Ver.1.1 and Ver.2.

Indicator 2: This indicator was achieved since a satellite-based deforestation reference system (SDRS) was developed, which enables regular monitoring of deforestation and includes monthly and yearly reporting systems by province and district.

Indicator 3: This indicator was achieved as the Niassa PPIGF was approved by MTA as a MTA Ministerial Ordinance (Diploma Ministerial).

5 Review of results based on DAC evaluation indicators

5.1 Relevance

Relevance was analyzed in terms of consistency with development policies and development needs. As a result of this analysis, the Project's objectives were judged highly consistent with the development policies and development needs of Mozambique, and the relevance of the implementation of the Project was judged to be "very high".

5.2 Coherence

Coherence was analyzed in terms of linkages with JICA other projects, other donor agencies, and international frameworks. As a result of this analysis, the Project was judged to be "high" in terms of coherence, as it is well coordinated with other JICA projects and other donors and is in line with the international frameworks.

5.3 Effectiveness

Effectiveness was analyzed in terms of the clarity of the Project Purpose, the likelihood of achieving the Project Purpose and the relationship between the Project Purpose and the Outputs. As a result of this analysis, the results/implementation of the activities led to the achievement of the Outputs, and the Project Purpose was achieved. Therefore, the effectiveness of the Project was judged to be "high".

5.4 Efficiency

Efficiency was analyzed in terms of the planned and actual costs and duration of the Project and the causal relationship between the Project's activities inputs and the achievement of Outputs. As a result of this analysis, the inputs (costs and duration) of the Project were deemed efficient for the Outputs, and the efficiency of the Project was judged to be "high".

5.5 Impact

Impact was analyzed in terms of the achievement of the Overall Goal and ripple effects. As a result of this analysis, the impact of the Project was judged to be "high", since the impact realized by the implementation of the Project has a wide range of institutional, socio-cultural, technological, and economic impacts.

5.6 Sustainability

Sustainability was analyzed in terms of updating the NFMS document and developing the PPIGF in provinces other than Niassa. As a result of this analysis, the sustainability of the Project was judged "high" since the updating of the NFMS document developed by the Project and the development of the PPIGF in the other provinces is likely to be done.

6 Lessons learned from the Project

6.1 Lessons learned from the overall issues

6.1.1 Lessons learned from the impacts of COVID19 and post-COVID regime

The Project started on 8 April 2019, but due to the impact of COVID19 outbreak, Japanese experts could not travel to Mozambique between February 2020 and May 2021. During the period when travel was not possible, the Project was able to continue its activities without interruption by promoting online work as much as possible, such as holding JCC and NFMS TF meetings online and conducting regular consultations with the C/Ps online. However, online communication took longer than usual and was not easy due to problems with the network environment. In addition, since it was not possible to conduct field surveys for the development of the PPIGF and supervision work of pilot activities online, the implementation of activities for which field work was essential had to be postponed. Therefore, it must be said that it will be difficult to rely on online-only project management even in the future.

On the other hand, it is also necessary to find more efficient ways to transfer technology from Japan online, as the above-mentioned external factors may continue to prevent travels for project implementation in the future.

6.1.2 Lessons learned on fund mobilization

The Project provided assistance in obtaining GCF funds as one of its fund mobilization activities. While the IUCN being nominated as the AE, the extent to which JICA's view can be incorporated into the GCF Concept Note could have varied. Under the situation where IUCN being the AE and DINAF being the lead government agency, the Project was able to technically engage in the application preparation process as one of the task team members. The IUCN was open to collaborate and has incorporated some of JICA's perspectives, but it should be noted that this form of collaborative approach may not be always replicable in other countries or for other projects.

6.2 Lessons learned from Output 1

6.2.1 Lessons learned from the development of NFMS documentation and inter-organizational coordination mechanisms

The development of the NFMS document is not a task for DINAF alone but needs to be done through interorganizational coordination with other departments, such as FNDS, which is responsible for many REDD+ related tasks. FNDS and DINAF did not have a good relationship at the beginning of the Project, but it was a significant achievement that they eventually established an inter-organizational coordination mechanism and continued to hold TF and WG meetings, leading to the creation of a single NFMS to be agreed upon. One of the factors that contributed to the successful coordination between the two organizations, despite the lack of good relations between them prior to the start of the Project, was the need to set common goals. Specifically, getting DINAF and FNDS to understand the need for an NFMS document was the first step in rebuilding the relationship, given that the establishment of an NFMS is necessary in order to qualify for REDD+ results-based payments.

Furthermore, as mentioned above, while the NFMS document is in a sense a necessary document for obtaining REDD+ results-based payments, its content is not biased towards REDD+ alone, rather, by adding the scope of DINAF's work on sustainable forest management, it is a meaningful document for both DINAF and FNDS.

The lesson learned was that even organizations that did not have a good relationship at the outset could develop a good relationship over the course of a five-year project by aligning interests and aligning their respective goals and benefits.

6.3 Lessons learned from Output 2

6.3.1 Lessons learned from the development of the PPIGF

The Niassa PPIGF developed in the Project is based on 2013 map data, which may partly differ from the land cover/land use situation in 2023. In principle, it is more effective to use the most recent maps possible, but a considerable budget and time are required to produce up-to-date maps. In addition, the Mozambican side requested that a forest inventory be conducted at the provincial level during the formulation of this PPIGF, but for Niassa Province, it was decided to use data from the existing NFI already conducted by the Government of Mozambique for the estimation of the allowable cutting volume, as the error margin was acceptable even if the results of the NFI were used. It would normally be more accurate if a provincial level forest inventory had been conducted and the data used. However, as with mapping, conducting a forest inventory in Niassa would have required budget and time. Under these circumstances, the use of existing maps and inventory results, instead of carrying out a new mapping and inventory, allowed to minimize the budget and time required to develop the first PPIGF for Mozambique. Thus, although not the best data, using the second-best data to formulate the deliverables such as PPIGF was a more effective method within a limited budget and timeframe.

6.3.2 Lessons learned from the inclusion of PPIGF approval as an objectively verifiable indicator of the Project Purpose

The approval of the PPIGF was not included in the objectively verifiable indicators for Project Purpose up to PDM Ver. 3. This is because the approval of such documents takes time depending on the protocols of the partner government, etc. There are many conditions that make it uncertain whether it could be approved by the end of projects, making it difficult to include in the indicators. However, the setting of an ambitious indicator regarding "approval of the Niassa PPIGF" in PDM Ver. 4 may have encouraged MTA/DINAF to try its best towards its approval by the end of the Project, including the decision on how to approve the PPIGF. Therefore, it is worth considering setting ambitious indicators, as these can be a driving force for achieving the project purpose. However, it may also be necessary to document that the indicators are of an ambitious

nature and to agree that the project's reputation might be compromised in the unlikely event that the indicators are not achieved.

6.3.3 Lessons learned from the sustainable implementation of pilot activities

The Project successfully engaged concession operators in forest fire management activities conducted as a pilot activity in Niassa Province. Concession operators in Niassa Province are responsible for wildlife hunting and management in their concession area, and have a strong interest in the control of forest fires, which have a negative impact on the wildlife being hunted. By establishing a system that involves concession operators in forest fire management activities, there is a potential that forest fire management activities will be promoted under the initiative of concession operators even after the end of the Project. Thus, incorporating private entities that have a demand for the activity will increase the possibility of securing sustainable funding for the activity.

6.3.4 Lessons learned from selecting pilot activities to be implemented in the Project

The Project initially selected the early controlled burning and community awareness of forest fire management (hereafter, "the forest fire management activity") as well as the boundary delimitation and livelihood improvement activities within the Niassa Special Reserve (NSR) (hereafter, "the boundary delimitation activity") as the pilot activities to be implemented by sub-contracting to other entities. However, for several reasons, the boundary demarcation activity could not be implemented. Since the Project had planned two potential pilot activities, one of them could not be implemented, but the other one (in this case, the forest fire management activity) could be implemented. In this way, it is not always possible to conclude a sub-contract agreement as originally planned, or sub-contractors may suddenly make a proposal that reverses the results of previous discussions. The lesson learned was that it is very important to always have a second and third option when working in developing countries.

7 Prospects for Achieving the Overall Goal

In the Overall Goal "Sustainable forest management and REDD+ are promoted through the operationalization of the National Forest Monitoring System (NFMS) in Mozambique, and sustainable forest management including through REDD+ in Niassa is promoted", two objectively verifiable indicators have been set, namely 1) Continuing implementation of NFMS is documented (e.g. revised NFMS document, NFMS descriptions in latest BUR), and 2) Measures against key drivers of deforestation and forest degradation are implemented in more than three areas (besides the Project's pilot areas) in Niassa Province.

With regard to Indicator 1, the WG and TF as inter-organizational coordination mechanisms for the operation of the NFMS will continue to hold meetings after the end of the Project, enabling the NFMS documents to be revised on a regular basis. In addition, the first BUR was submitted to the UNFCCC in December 2022. This first BUR was accompanied by a REDD+ Technical Annex. Chapter 5 of the Annex describes the NFMS, and a link was shared to allow downloading the NFMS document. Therefore, it is expected that the second BUR, which will be issued in 2024, will describe the NFMS document Ver. 2, which was agreed upon in March 2024. The prospects for achieving Indicator 1 are therefore high.

With regard to Indicator 2, as mentioned in the lessons learned above, the continuation and promotion of the forest fire management implemented in the Project as a pilot activity may not be possible without funding and outreach to the local people, and for this reason, the inclusion of the concession operators in the same activity is important. In addition, government budgets and external funding will need to be obtained to

implement the PPIGF developed under the Project. Currently, Mozambique is applying for GCF projects and support from other donors, and it is important that these funds are used consistently with the results of the Project.

Furthermore, the new Forest Law contains provisions for the establishment of a Forest Resources Operational Management Organization. This organization is to be established by the Government with a view to decentralization. Once operational, this organization is expected to implement measures against the main drivers of deforestation and forest degradation described in the PPIGF, using funds from forest concessions and timber import tax. Thus, the prospects for achieving Indicator 2 are high.

In view of the above, the prospects for achieving the Overall Goal are high.

8 Recommendations to the Mozambican side

Mozambique is expected to continue to implement the following recommendations in order to sustainably utilize the results of the Project.

(1) Recommendations on Output 1

DINAF is expected to work with FNDS to regularly update the NFMS document using the TF, etc. Recommendations for improving the NFMS are included in the NFMS document, and a summary of the recommendations is as follows.

First, the monitoring methods described in the current NFMS document were developed based on the current Mozambican national technology and budget. Therefore, as monitoring technology advances in the future, it will need to be improved accordingly. In addition, although existing systems have been used to build the IT systems for the NFMS, the data to be stored in each IT system and the access levels for downloading/editing/using such data are not yet clear. It is important that future WG and TF meetings clarify the roles and responsibilities of each organization and define the access levels. In addition, the NFMS document specifies the years when the land cover/land use data (hereafter, "LULC data") shall be updated in Wall-to-Wall (scheduled for update in 2024 and 2029 in the NFMS document Ver. 2.0) and the year when the next NFI shall be implemented (scheduled for implementation in 2024 only in Tete Province in NFMS document Ver. 2.0, other provinces yet to be determined). In particular, LULC data is supposed to be updated in 2024, but there are no concrete plans. Budget security and timing need to be urgently reconsidered.

If used properly, the SDRS will make it possible to use the images of deforestation detection areas detected by GLAD and other means for field inspections, and to identify regional trends in deforestation areas by aggregating the areas where deforestation was detected by GLAD by month and by province/district. The technical transfer for the use of SDRS to DINAF staff was carried out during the Project period through onthe-job training and the preparation of manuals. When the SDRS is implemented in all provinces in the future, various problems and issues are expected to arise as SPAs that have not used the system before will be using it for the first time. Therefore, it is important not to move in the direction of not using the SDRS because of problems, but to adopt a positive attitude towards the occurrence of problems and how to solve them and link them to forest management in each province of Mozambique. From this perspective, DINAF staff are expected to take ownership and implement activities to use the SDRS in all provinces.

(2) Recommendations on Output 2

The PPIGF developed under the Project is a very useful plan that will form the basis for future forest

management planning in the provinces of Mozambique. Although the new Forest Law contains provisions for a forest management planning system, the details of this system are left to a future Decree to promote the Forestry Law. It is hoped that the forest management planning system at the provincial level will be clearly defined in this new decree in order to promote the preparation of the PPIGF in other provinces (except for Niassa Province) with institutional support.

The technical recommendations for the development of the PPIGF are also included in the Niassa PPIGF, and a summary of the recommendations is given below.

Firstly, Mozambique has inadequate statistical and GIS data for the preparation of PPIGFs in all provinces. For instance, there is a lack of statistical data on the volume of timber harvested by companies in the provinces, which affects the estimation of timber and firewood demand. In addition, in order to manage timber and firewood harvesting by district in the future, it will be necessary to estimate the allowable cutting volume by district, but it is difficult to estimate it, quantitatively and qualitatively, using data from the current NFI. In order to estimate the allowable cutting of timber and firewood by district, forest inventories need to be designed and conducted, preferably at the district level, or at least at the provincial level. In addition, it would be more appropriate to conduct province-level inventories and use data from these province-level inventories rather than NFI data, not only for managing timber and firewood harvests per district, but also as baseline data when formulating PPIGFs in provinces other than Niassa Province.

Moreover, forest cover maps are very useful data for understanding the current status of forests during the development of PPIGFs. Therefore, regular updating of forest cover maps will allow for more realistic planning, taking into account the latest land use and its changes when formulating and updating PPIGFs.

Furthermore, the forest management activities listed in the Niassa PPIGF were compiled for the activities required as necessary measures to address deforestation and forest degradation from the list of activities proposed in the NFP, based on the current status and issues of forests and forest management in Niassa and the results of interviews with relevant stakeholders in the field. Of course, implementing these activities will require a budget. However, the Government of Mozambique faces the challenge of a chronic shortage of funds, so even if it is difficult to implement the activities listed in the PPIGF based on the national budget, it is necessary to seek coordination with existing donor support and to actively challenge new donor support and external funding. For example, an approach to the GCF was initiated during the Project period, including a support request for the implementation of the Niassa PPIGF among others, and this work will continue with IUCN as the AE and DINAF in order to apply for GCF funding after the Project ends. The Government of Mozambique needs to continue and develop these efforts and ensure that the PPIGF does not end with the development of a plan, but that external funding is actually obtained, and activities are actually implemented as a matter of priority.