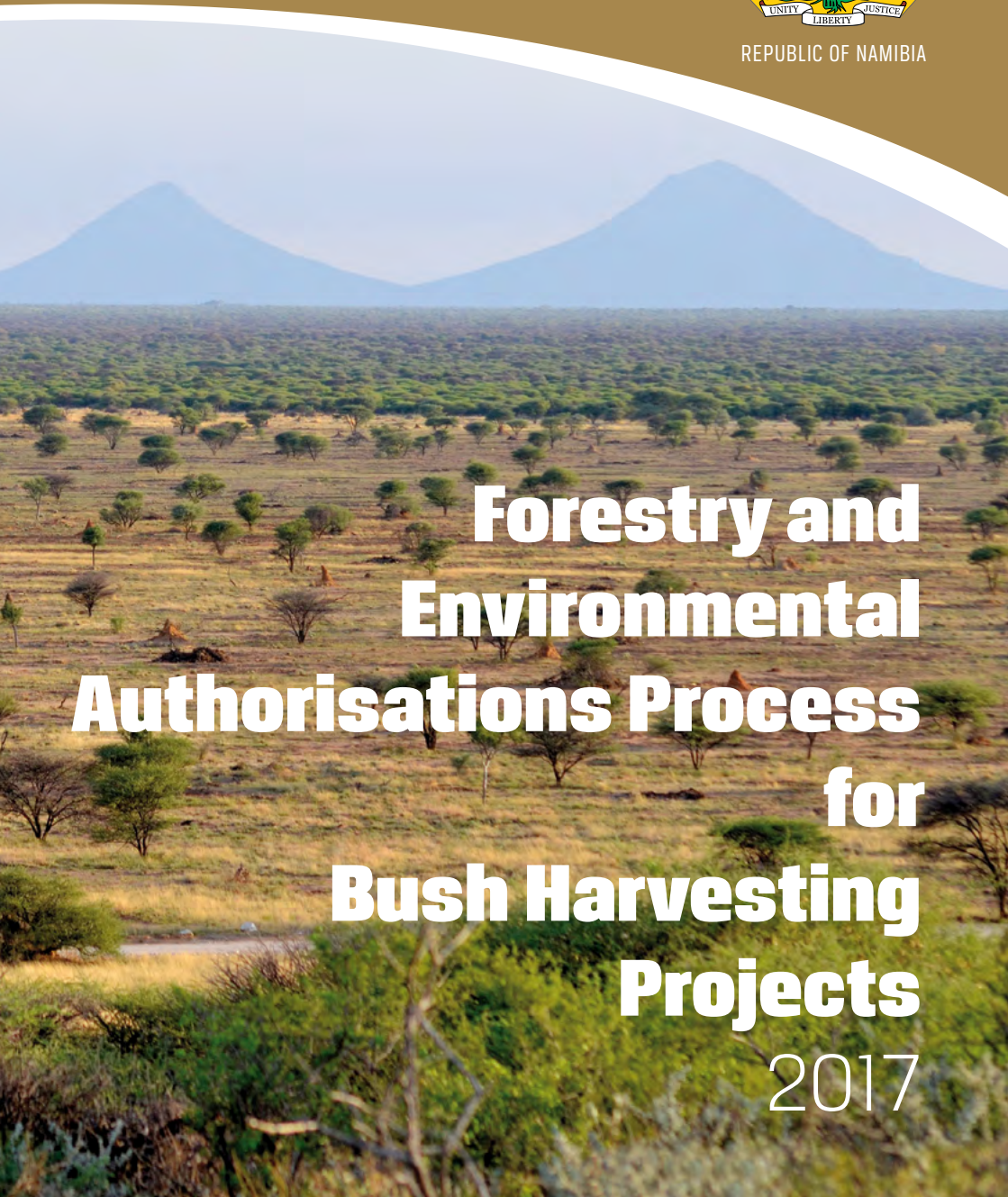
Ministry of Agriculture, Water and Forestry
and Ministry of Environment and Tourism

REPUBLIC OF NAMIBIA



Forestry and Environmental Authorisations Process for Bush Harvesting Projects

2017


LIEBHERR

Forestry and environmental authorisations process for bush harvesting projects

Guidelines for complying with regulations governing bush thinning and value addition projects

WHAT IS THIS BOOKLET ABOUT?

This booklet explains the Namibian environmental laws and regulations that must be complied with in bush harvesting and value addition projects.

It is based on the study "Strategic Environmental Assessment of large-scale bush thinning and value-adding activities in Namibia" (2016), compiled by the Southern African Institute for Environmental Assessment (SAIEA) for the MAWF/GIZ Support to De-bushing Project.

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Foreword by the Director of Forestry

Namibia used to be a land of open savannas. Now, more than half of the country is covered by thorny and impenetrable bush, greatly reducing the productivity of our land. As well as decreasing the carrying capacity of rangelands, encroacher bush also has a catastrophic effect on Namibia's water resources, drastically decreasing water inflow into underground reserves. For these reasons, the Government of Namibia has committed itself to combat bush encroachment so that our rangelands can be restored.

At the same time we must not forget that the species that form this thorny problem are indigenous to Namibia. They form part of our savannas, and they are important for the ecological processes that sustain us. For instance, trees help to provide nutrients to the soil, they give shade and shelter for livestock and wild animals, and they help to retain soil moisture which in turn keeps grasses going. For these reasons, it is important that we do not totally eradicate the bush. Rather, the emphasis must be on selectively removing the problem bushes, and retaining those larger individuals that are most useful for the health of the rangelands. We must aim to thin the bush, not to de-bush entirely.

People are realising the economic value of the bush, and harvesting of wood products is on the increase. The opportunity to profit from bush therefore carries with it a risk that there will be irresponsible harvesting.

The Directorate of Forestry, in the Ministry of Agriculture, Water and Forestry, plays an important role in ensuring that bush thinning is done appropriately. Our Forestry officials are responsible for granting permits to cut bush, and for monitoring bush harvesting operations. We want to facilitate the right kind of bush thinning, and prevent the unscrupulous cutting of our most useful and protected trees. We commit to helping to restore our "beloved land of savanna", as proclaimed in our National Anthem.

Joseph Hailwa

Directorate of Forestry, Ministry of Agriculture, Water and Forestry

Foreword by the Environmental Commissioner

As a result of bush encroachment, Namibia has an enormous biomass resource at its disposal. It is estimated at 200 million tonnes! Already, people are at work making use of this wood. Encroacher bush is sold as firewood to local communities, made into charcoal for export, and compressed to briquettes. It is used for carving, to make furniture, floorboards and fencing materials. Bush is being turned into fertiliser and even into animal fodder. Wood chips are being used to produce heat for cement production, and other industries such as abattoirs and breweries are starting to realise the potential of this resource. Namibia could even use the woody biomass for decentralised electricity production. Creative and innovative product ideas are developing across Namibia, turning the problem of encroacher bush into an economic opportunity.

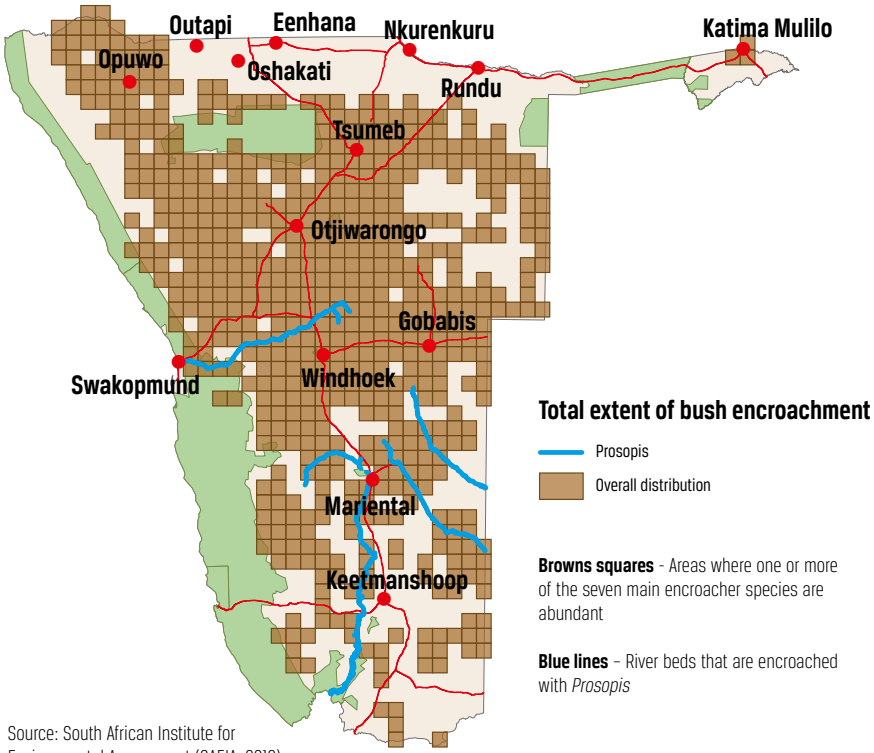
The harvesting of encroacher bush will have to be up-scaled drastically to fulfil these hopes. This carries some risk for the natural environment, and it is the responsibility of the Ministry of Environment and Tourism to ensure that ecological damage is avoided. We are here to prevent over-exploitation and environmentally harmful practices, so that our resources are sustained for the benefit of future generations. We should be mindful that these bushes serve as refuge for a number of wildlife habitats.

We trust that investors and project developers will recognise the necessity for monitoring and control of bush harvesting operations. To ensure responsible and sustainable bush thinning, the Ministry of Environment and Tourism through the Department of Environmental Affairs will facilitate the authorisation process for bush-harvesting projects by issuance of environmental clearance certificate. Thus, large scale (more than 150 hectares) bush thinning will require an environmental clearance certificate as per the Environmental Management Act No.7 of 2007.

Teofilus Nghitila
Department of Environmental Affairs, Ministry of Environment and Tourism

Extent of bush encroachment in Namibia

Bush encroachment remains a major agricultural problem in Namibia, covering about 45 million hectares of the country's savannas, and reducing livestock productivity significantly. The map below is based on the distribution of the main encroacher species, and information on where they have shown dramatic increases in density over the past ±60 years. According to this map, approximately 55% of Namibia is bush encroached.



Source: South African Institute for Environmental Assessment (SAEIA, 2016)

Economics of bush encroachment

An economics study of bush encroachment* states that a programme of bush thinning in Namibia could generate an estimated net benefit of N$48.0 billion (2015 prices) over 25 years, when compared with a scenario of no bush thinning. Bush thinning would generate benefits from livestock production, groundwater recharge, production of firewood and charcoal, and generation of electricity, as well as carbon offsets for electricity. The study estimates that the total benefits from ecosystem services would be about N$76 billion, while the total costs would be about N$28 billion. This results in an estimated net benefit of N$48 billion.

Obviously, such figures are based on various assumptions which affect the final estimates. Under various scenarios which differ in terms of the quantity of bush that is harvested, the amount of groundwater recharge that is restored, and how rapidly the investments depreciate, the net benefit could range from N$25 billion to N$112 billion. Therefore even under conservative estimates, the economic impact would be significantly positive, and could make a considerable contribution to Namibia's welfare. There are also many unquantified ecosystem services which would be positively affected by bush thinning, which are not included in the dollar estimates provided.

* Namibia Nature Foundation. 2016. An assessment of the economics of land degradation related to bush encroachment in Namibia. A report based on the Economics of Land Degradation (ELD) methodology commissioned by the MAWF/GIZ Support to De-bushing Project.

The extensive network of roots of an *Acacia mellifera* explains how bush encroachment can dominate groundwater resources, to the extent that groundwater availability in encroached areas is significantly reduced. One of the main benefits to rangelands from thinning bush is the recovery of groundwater recharge.

Policy framework

The Namibian Constitution

Article 95(1) of the Namibian Constitution commits the state to actively promote and maintain the welfare of the people by adopting policies aimed at the "... maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilisation of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future..."

Vision 2030

Vision 2030 recognises that bush encroachment reduces land productivity, and notes that bush encroachment is complex and expensive to reverse. Overall, as a component of land degradation, it is one of the causes of economic loss, declining food security, and escalating poverty. This leads to human migration, urbanisation and an increased need for the government to import food.

National Agriculture Policy (2015)

This Policy recognises the problems of bush encroachment, desertification and environmental degradation caused by the destruction of forest cover, soil erosion, overgrazing and bush encroachment. The policy defines the aim to "establish mechanisms to support farmers in combating bush encroachment effectively over the short and long term".

National Rangeland Management Policy and Strategy (2012)

The Rangeland Policy and Strategy, adopted by Cabinet in 2012, aims to enable farmers to manage their rangeland resources in such a way that –

- animal production per hectare is sustainably improved
- vulnerability of users to a highly variable resource base is decreased, and
- biodiversity is improved and maintained, so that it is able to continue to provide essential ecosystem services.

For these ends it advises that emphasis should be placed on:

- Improving the nutrient cycle through the promotion of plant diversity, healthy soil structure and functioning ecosystems,
- Improving the water cycle through the promotion of good soil cover and aeration; the creation of sufficient soil organic matter; reducing competition for soil moisture between undesirable bushes and preferred grasses (bush thinning); and restoring eroded land responsible for rapid runoff during high rainfall events, and
- Improving and maintaining the biodiversity of rangelands through: encouraging the correct intensity of plant utilisation; adequate recovery of utilised plants (frequency of utilisation); the reclamation of denuded rangelands; erosion control; the use of biodiversity-friendly parasite control; and managing rangelands for heterogeneity rather than for homogeneity.

The overriding theme in Namibia's policy framework is sustainable use of Namibia's rangelands and combating bush encroachment for their restoration and a recovery of livestock productivity.

Legal requirements: Forestry Permits

Forest Act (2001) and Regulations (2015)

All harvesting of trees and wood, anywhere in Namibia, is governed by the Forest Act and its Regulations. The Act also governs activities which take place in classified forests, namely State Forests, Forestry Management Areas and Community Forests as well as non-classified forest areas. This Act is administered by the Directorate of Forestry (DoF) in the Ministry of Agriculture, Water and Forestry (MAWF).

Harvesting Permits

A Harvesting Permit is required for any tree cutting and/or harvesting of wood in an area greater than 15 hectares per annum as stated under Section 22 (1), 23 (1), 24 (2&3) and 33 (1&2) of the Forest Act (Act 12 of 2001). The permit is issued by a Licensing officer, and stipulates conditions of the harvesting on the reverse side of the permit. Inspection of an area to be harvested is done before the permit is issued, and when an application for renewal is made every 3 months.*

* The period of validity is periodically reviewed by Directorate of Forestry.

Transport Permits

A Transport Permit is required to convey any wood or wood products (e.g. droppers, planks, charcoal, and firewood). It is obtainable from any Forestry Office, and is valid for 7 days.

Export Permits

An Export Permit is required to send any wood or wood products outside Namibia. It is obtainable from any Forestry Office, and is valid for 7 days.

Marketing Permits

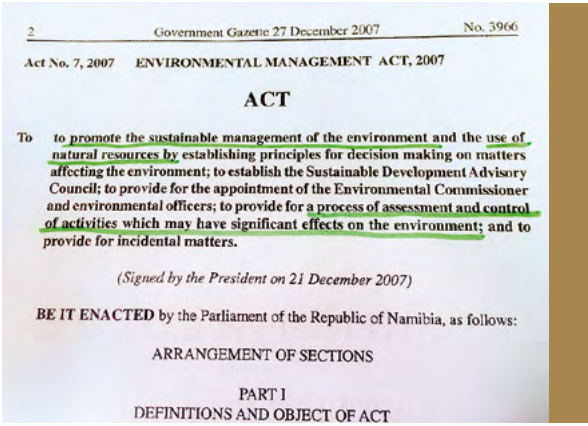
A Marketing permit is required to enable the producer to sell his/her products to any other party. The permit is valid for 3 months in commercial areas while in communal areas the permit is valid for 1 month only.

Legal requirements: Environmental Clearance Certificate

Environmental Management Act (2007) and Regulations (2012)

Under the Environmental Management Act, forestry activities which require authorisation under the Forest Act, may require an Environmental Clearance Certificate. As stipulated in these guidelines, all wood harvesting activities in an area greater than 150 hectares per annum must comply with the Environmental Management Act. This act is administered by the Environmental Commissioner in the Department of Environmental Affairs (DEA) in the Ministry of Environment and Tourism (MET).

Normally, to get Environmental Clearance, an Environmental Impact Assessment (EIA) has to be completed, together with an Environmental Management Plan (EMP). An EIA is an assessment of the environmental damage that a project might cause, and the EMP provides advice on how the negative impacts can be avoided or reduced. An EIA is usually carried out by an independent environmental practitioner. The EIA report is evaluated by the DEA, and if the Environmental Commissioner is satisfied that the negative impacts are minimised, an Environmental Clearance Certificate is issued. The certificate requires the project proponent to diligently implement the EMP.



2 Government Gazette 27 December 2007 No. 3966

Act No. 7, 2007 ENVIRONMENTAL MANAGEMENT ACT, 2007

ACT

To to promote the sustainable management of the environment and the use of natural resources by establishing principles for decision making on matters affecting the environment; to establish the Sustainable Development Advisory Council; to provide for the appointment of the Environmental Commissioner and environmental officers; to provide for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters.

(Signed by the President on 21 December 2007)

BE IT ENACTED by the Parliament of the Republic of Namibia, as follows:

ARRANGEMENT OF SECTIONS

PART I
DEFINITIONS AND OBJECT OF ACT

This can all be a lengthy and expensive process, and it can bring delays to implementing a project.

For bush harvesting projects, this process has been simplified to avoid the heavy costs and time delays that would hinder bush thinning (see overleaf).

Categories of projects requiring Environmental Clearance

The level of detail for the Environmental Clearance is divided into three categories:

1. Environmental Clearance not necessary

Small bush harvesting operations, covering an area less than 15 ha, requires a harvesting permit to be issued by the District Forestry Office. Areas above 15 ha requires an approval by the Director of Forestry as indicated in Section 23 (1) of the Forest Act.

2. Environmental Clearance based on Generic EMP

Medium-sized bush harvesting operations, covering an area between 150–5,000 hectares, need to obtain Environmental Clearance from DEA. The area to be thinned should be less than 5,000 ha altogether, in one vicinity. The environmental assessment for this Clearance can be customised from the generic Environmental Management Plan provided in this booklet. The level of consultations with interested and affected parties (I&APs) for this category should focus on the neighbouring farms. This is under the assumption that the potential impact is foreseen to be localised. The consent should be submitted to DEA with the application for Environmental Clearance.

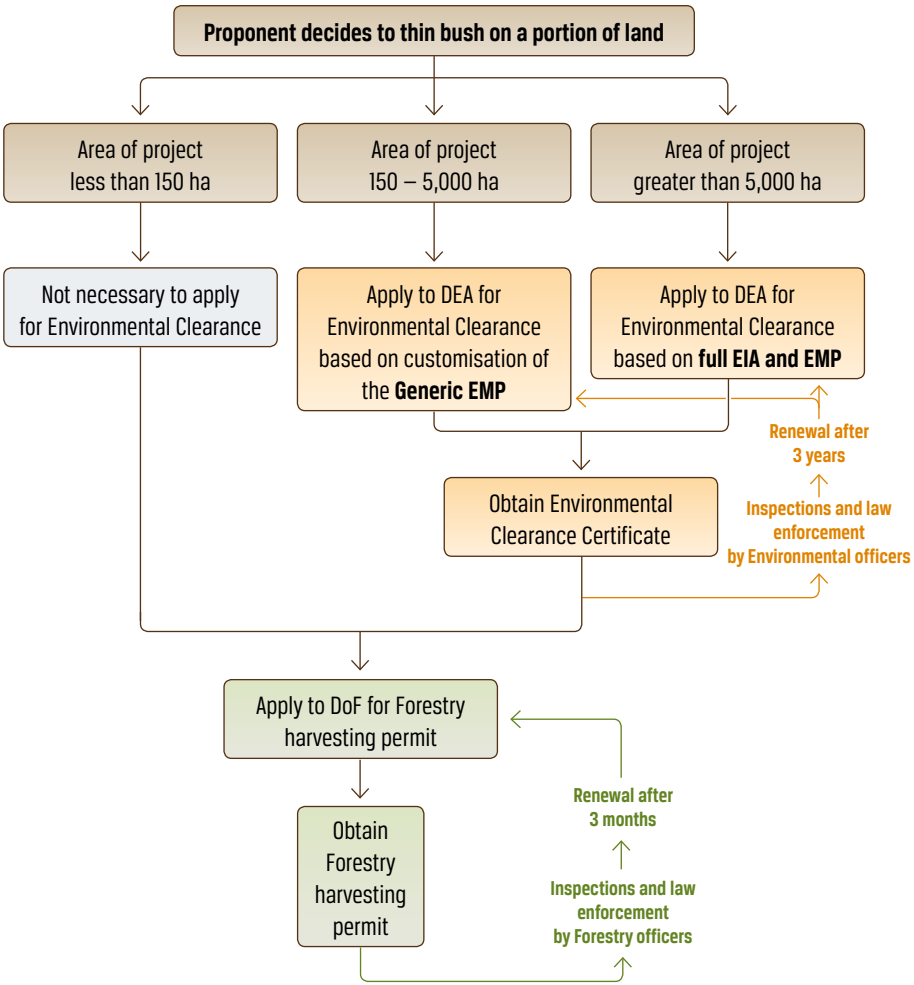
If a farmer harvests individual areas that are less than 5,000 ha, but they contribute to a larger project that covers an area greater than 5,000 ha, then the activities fall into category 3 (full EIA).

3. Environmental Clearance based on dedicated EIA and EMP

Large bush harvesting operations, covering an area greater than 5,000 hectares, need to obtain Environmental Clearance from DEA. These operations are likely to have extensive, complex and/or long-term environmental impacts. They require a full EIA and include a thorough EMP. The EIA must cover all the specific details of the source areas, and individual farms that contribute harvested wood to a large project will all be bound by the conditions described in the EMP.

Violations of the Environmental Management Act are punishable by law.

Combining Forestry and Environmental Clearance authorisations



Customisation of the Generic EMP – Project particulars

The following details must be provided by the project initiator to describe the project and the environment where it will be carried out.

A. LOCATION AND ENVIRONMENT

1. Name of farm(s) / land where project is located. If known, GPS coordinates should also be provided.
2. Legal status of the land.
3. Description of current use of the land, including livestock numbers, water points, camps etc.
4. Name and contact details of farmer / land custodian / manager.
5. Name and contact details of immediate neighbouring farmers / land custodians / managers.
6. Description of the general ecology of the land (e.g. topography, soil type, flora, fauna,...).
7. Description of the bush encroachment problem on the land:
   - 7.1 Tree species causing problems
   - 7.2 At least 3 density estimates for the area to be thinned. (These should be samples that represent the overall problem, and preferably the same places depicted in photos [see page 25–27]).
8. Description of past efforts to manage the bush encroachment problem on the land.

B. DESCRIPTION OF THE PROPOSED BUSH THINNING PROJECT

9. Size of area to be thinned.
10. Expected duration of the project (years).
11. Species to be thinned.
12. Approximate density of trees to remain after thinning (see page 24).
13. Methods of bush thinning to be used.
14. Equipment / machinery / chemicals to be used.
15. Number of staff to be employed.
16. How staff will be recruited.
17. Where staff will live.
18. What contractual arrangements will be made with staff.

Monitoring and control of wood harvesting operations falls under the jurisdiction of the Ministry of Agriculture, Water and Forestry, and the Ministry of Environment and Tourism.

C. DESCRIPTION OF THE BUSH VALUE-ADDING PROJECT

19. Expected duration of the project.
20. Products to be produced (description, quantity).
21. Size of area where value addition project will be located.
22. Methods of production to be used.
23. Equipment to be used.
24. What liquid or solid waste will be generated (type and quantity).
25. Where the waste will be disposed.
26. Where the water will come from.
27. How much water will be used.
28. What air emissions will be generated.
29. How the product will be taken to market.
30. Who and where the off-taker/market is.
31. Number of staff to be employed.
32. How staff will be recruited.
33. Where staff will live.
34. What contractual arrangements will be made with the staff.

D. ADDITIONAL INFORMATION

35. Farm map (can be Google Earth image showing farm boundaries).
36. Photos of bush encroached areas (corresponding with the places where tree density estimates were made, see point 7.2).
37. Any other information that further describes the project.

Generic Environmental Management Plan (EMP)

The Generic EMP deals with most of the impacts that need to be managed, irrespective of where the project is located. However, no two farms or projects are identical, so this Generic EMP **must be customised for each and every project**. The proponent must study the generic EMP, delete those actions that are not relevant to his/her project/site, modify those actions that need fine-tuning, or even add new actions that are relevant. It is not acceptable to just submit this Generic EMP as it stands.

This EMP considers a range of issues, clustered under suitable headings for ease of reference. The issues are not listed in order of priority – they are all important.

1. AVOID DAMAGE TO PROTECTED AND LARGE TREES, AND TO RANGELANDS

Impact description	Mitigation measures	Indicators
Loss of protected tree species	• Avoid cutting protected trees (Annex 2, page 28). Many of the protected species are frequently found amongst dense encroacher bush, so they are at risk of being destroyed by bush management practices e.g. harvesting machines, arboricides, and even hand labour, if not adequately supervised. • Protected trees must be marked (e.g. with hazard tape) and all staff must know that marked trees are out of bounds. • All staff must be informed in writing about the consequences of breaking this rule, and it must be clear that the rule is understood.	• No Protected trees are cut, unless permitted in the Harvesting Permit.
Loss of large trees	• All trees taller than 4 m, or greater than 18 cm diameter at the base, must be retained. Large dead trees should also not be cut. The only exception is if the vegetation consists entirely of encroachers that are all over 4 m. In that case, follow the formula for desired density after thinning (Annex 1).	
Ecological imbalance due to over-harvesting	• All bush thinning should aim to leave a heterogeneous mix of trees and bush. The veld that remains should have a variety of tree species (including some of the encroacher species), of different size classes, and spaced so that there are some open patches and some dense patches, to provide a variety of habitats for animals. • The desired density after thinning depends on the encroacher species, the soil and the average rainfall. Annex 1 describes the approximate density to aim for.	• Correct level of harvesting, adequate numbers of trees and islands remain.

Impact description	Mitigation measures	Indicators
Disturbance of sensitive plant habitats	With the exception of *Prosopis* and *Black wattle*, there must be no bush/tree cutting in sensitive habitats including: • All plant communities within 100 m of a fountain or spring or river bed. • *Acacia erioloba – Tylosema esculentum* habitats, and all stands of *Acacia erioloba* trees. • *Kirkia acuminata – Danthoniopsis dinteri* woodlands in the Otavi Mountains. • *Spirostachys africana* thickets/woodlands. • *Olea europea subsp. africana – Euclea undulata* thickets. • *Terminalia sericea – Acacia fleckii* thickets occurring on remnants of sand dunes within the karstveld. • *Palmveld (Hyphaene petersiana).*	• No tree / bush cutting in such areas, with the exception of *Prosopis* and *Black wattles.*

2. AVOID DISTURBANCE TO WILDLIFE AND LIVESTOCK

Impact description	Mitigation measures	Indicators
Loss of livestock and wildlife from poaching	• Killing of livestock or wildlife, and setting of snares, is prohibited. Anyone caught involved in such activities should be fired immediately. • Possession of a firearm or snare is prohibited. Such items should be confiscated if detected, and the offender issued with a warning. • All staff must be informed in writing about the consequences of breaking these rules, and it must be clear that the rules are understood.	• No snares or firearms on site. • No incidences of poaching.
Escape of livestock or wildlife due to damaged fences and/or gates left open	• Fences may not be damaged. • Gates should always be left the way you find them.	• No livestock or wildlife escape from the property due to damaged fences or gates left open by project staff.
Disturbance of sensitive animals and birds	• Nests of large raptors (e.g. eagles, vultures) must be avoided by at least 100 m. If such nests are found, the clump of vegetation around them should not be harvested. • Some reptiles such as tortoises and pythons move very slowly. Staff, especially machine drivers, should look out for any such animals and avoid causing harm to them.	• No raptors disturbed or nests abandoned. • No reptiles or other animals killed by harvesting operations.

3. AVOID SOIL EROSION AND LOSS OF SOIL FERTILITY

Impact description	Mitigation measures	Indicators
Loss of topsoil as a result of bush thinning	• No bush cutting permitted on slopes steeper than 12.5% (i.e. 1-in-8). • Bush cutting is also not recommended on slopes of 5 – 12.5% (i.e. between 1-in-20 and 1-in-8). • Machinery should always move approximately along the contours, not directly up and down slopes. • If slopes are significantly bush encroached it is recommended that they be set aside as part of the area that is not harvested.	• No bush cutting on steep slopes. • No gullies or erosion caused from bush harvesting machinery or tracks made for the machines.
Erosion or destabilisation of river banks as a result of bush thinning	• No bush cutting permitted within 100 m of a watercourse, pan or spring. • Two exceptions are permitted: – Where bush has encroached into seasonal pans, one may clear the floor of the pan but not around the outside margins. – Prosopis and black wattle may be removed from within a watercourse and from river banks.	• No trees cut in riverbeds or within 100 m of the banks.
Loss of soil fertility	• Bush encroachment on sandy soil should be thinned less vigorously than on non-sandy soils, as the trees are responsible for most of the soil fertility. All sites where *Terminalia sericea* and *Acacia fleckii* are dominant should be harvested according to the formula TE* per hectare = 3 × annual rainfall.	• Correct level of harvesting, adequate numbers of trees remain.

*TE = Tree equivalent is a woody tree or bush of 1,5 m (3 m tree represents 2 TEs, 0,75 m tree represents 0,5 TEs)

4. PREVENT POLLUTION OF WATER SOURCES

Impact description	Mitigation measures	Indicators
Pollution of soil and water from waste products (e.g. tars, ash, brine) generated in bush-to-energy plants or factories for wood products	• Where appropriate, the waste should be re-used. E.g. i) ash should be re-distributed in the harvested areas, so that nutrients are returned to the soil; ii) Some of the tars produced in a wood gasifier might be re-usable as fuel in the plant. • Where re-use is not possible, appropriate disposal must be considered e.g. in a site equipped for hazardous waste disposal, with measures to prevent seepage into the soil and groundwater. • Brine and contaminated water should be collected and stored in sealed evaporation ponds. The residue should be regularly scraped up and disposed of in an appropriate site.	• Composition of effluents should be specified by the proponent. Sporadic sampling of local water and soil should test for contaminants. • Water quality inspectors from MAWF and/or MoH need to exercise control over disposal of effluents.
Small-scale, local pollution patches (e.g. fuels, oils, greases) caused by spillages and servicing of machinery	• Regular maintenance and servicing of vehicles and machinery, to prevent breakdowns and the need for on-site repairs.	• Sporadic sampling of local water and soil should test for contaminants.

5. PREVENT AIR POLLUTION

Impact description	Mitigation measures	Indicators
Smoke given off from charcoal kilns can, under certain conditions, accumulate to harmful levels	• Training and supervision of charcoal producers can improve the efficiency of the process, so that less smoke is produced. • Retort kilns, operated efficiently, produce almost no smoke.	• No complaints about air emissions from neighbours / local people.
Wood factories may generate smoke, soot and other air pollutants	• Air emission control measures e.g. scrubbers installed in chimneys.	• No complaints about air emissions from neighbours / local people.

Smoke from charcoal kilns is generally quickly dispersed and makes relatively little impact. But under certain conditions – cold nights, in hilly terrain – the smoke can collect in valleys and cause considerable nuisance.

6. PREVENT REGROWTH THROUGH AFTER-CARE

Impact description	Mitigation measures	Indicators
The original encroacher species, or more aggressive colonisers, will establish themselves in the thinned-out areas	Preventing bush regrowth following harvesting can be achieved through: • Hand application of arboricides, • Mechanical removal of problematic single plants, • Stem burning, • Judicious use of fire, • Intensive browsing by goats or antelope, especially when regrowing plants are still small.	• Thinned areas remain at the required tree density.
After-care burning and/or stem burning generates air pollution (e.g. smoke, soot) and fires may run away, threatening other rangeland and neighbours	• No burning when the day temperature exceeds 25 °C and/or the wind exceeds 20 kph during the months of April to July. • Notify neighbours a day or two before the controlled burning. • Remove livestock from the area prior to burning. • Ensure there are escape routes for larger forms of wildlife so that they do not succumb to the fire. • Avoid burning in areas where there are active nests of endangered bird species (e.g. vultures, eagles). • Fire-fighting equipment (fire-cart, rubber beaters and/or backpack spray) must be accessible and in working condition. • Prepare firebreaks that are at least 15 metres wide, prior to the controlled burn, or define an area bordered by roads which are wide enough to prevent a fire 'jumping'. • Monitor the area after the burn is over, in case a smouldering coal or dung is blown into an unburnt area.	• Fires are "fit for purpose" and contained as planned.

7. FOLLOW HEALTH AND SAFETY PRECAUTIONS

Impact description	Mitigation measures	Indicators
HIV/AIDS infection due to risky sexual behaviour	• Provide HIV/AIDS awareness information to workers. • Provide free condoms. • Provide recreation facilities (games/TV etc.).	• Evidence of training events. • Facilities are accessible.
Bites / stings from snakes, scorpions, insects	• Staff may not catch or kill snakes or scorpions. • Staff must wear protective glasses, gloves, closed shoes, hard hat and overalls while working. • A First Aid kit, which includes an aspivenom pump, must be accessible for all staff. • Accommodation / eating areas should be kept clean at all times, garbage placed in closed containers to avoid attracting vermin, insects. • All staff must be informed in writing about the consequences of breaking these rules, and it must be clear that the rules are understood.	• Written instructions regarding handling of animals. • Protective gear being worn. • Evidence of First Aid training events. • First Aid kits accessible.

Impact description	Mitigation measures	Indicators
Injuries to face, eyes, skin and other parts, from thorns, dust, etc.	• Staff must wear protective gear while working.	• Protective gear being worn.
Loss of life / injury from traffic accidents	• Vehicles roadworthy and properly maintained. • Drivers comply with all road safety regulations, including avoiding overloading and speeding, and wearing safety belts. • Vehicles travel with lights on whether using tar or gravel roads. • No driving at night. • Instruction in road safety must be given and repeated periodically amongst all drivers. • All staff must be informed in writing about the consequences of breaking these rules, and it must be clear that the rules are understood.	• Vehicles roadworthy. • Zero traffic fines and accidents. • Evidence of drivers receiving instruction and/or training in road safety. • All drivers licenced.
Loss of life / injury from machinery accidents	• Machines properly maintained. • Operators know and comply with machine instruction manuals. • Instruction in machine operating safety must be given periodically to operators.	• Machine service records available. • Zero machine-related accidents. • Evidence of drivers receiving instruction and/or training in road safety.
Loss of life / injury from fire accidents	• Fire-fighting equipment (rubber beaters and/or backpack spray) must be accessible at key points during controlled burning. • If a fire starts, notify the farm owner/ manager immediately. Deploy beaters/backpack sprayers immediately. • A fire cart must be available at each work station with water supply and pumps to deal with fire. • Regular training for site staff on fire prevention and control, especially in the dry season. • Open fires only permitted in a designated facility at the site camp. Campfire must be extinguished when staff go to bed, or leave the camp. • No cigarette butts, matches or any other burning object may be thrown into the veld. • An area of at least 3 metres must be cleared of grass around active charcoal kilns. • Combustible refuse must be burnt in a drum. An area of 3 metres must be cleared of grass around such a drum. The drum may not be left unattended until the fire is extinguished and a lid has been placed on the drum. • All staff must be informed in writing about the consequences of breaking these rules, and it must be clear that the rules are understood.	• No fire incidents. • Evidence of a fire-fighting training events. Written instructions regarding fire prevention accessible. • Fire-fighting equipment available at base camp, on vehicles and at charcoal kilns. • Suitable drum available for combustible refuse, and located in cleared area. • Suitable cleared area designated for campfire at base camp.

Best practice / Poor practice in bush harvesting

Poor practice:
Unselective and excessive bush clearing

Severe disturbance of the soil, and almost complete clearing of the bush, will result in aggressive regrowth, producing worse bush encroachment than before.

Too much bush has been cleared.

Patches of cleared bush in the Otavi Mountainland. The camps that have been cleared have almost no trees at all. This is undesirable as scattered trees improve the quality of the rangelands.

Good practice:
Examples of selective bush thinning, leaving some trees as prescribed by the TE formula

Poor practice:
Aerial spraying of arboricides

Aerial spraying of arboricides is prohibited under the Forest Act. Aerial application is also condemned for ecological reasons, as it does not thin the bush selectively. Note that all the trees in this landscape have been killed, except for a few broad-leafed species which are not affected by the chemical.
Arboricide pellets are also not advised, as they can get washed along the surface by rain, and end up killing non-target trees.

Good practice:
Foliar (leaf spray) and stem-applied arboricides

Foliar (leaf spray) and stem-applied arboricides are recommended. They can be applied directly to selected trees.

Good practice:
Not clearing bush along the margins of rivers (unless the trees are *Prosopis*)

Bush is naturally denser along the margins of rivers. The trees are usually taller, providing important habitat for birds and animals. This bush should not be cleared, unless the trees are *Prosopis*.
This is the Swakop River in the area north-east of Okahandja. The rangelands appear to be in good condition, with little bush encroachment.

Annex 1

Recommended density of trees after bush thinning

This annex defines what level of bush thinning is most appropriate, to achieve the goal of ecological restoration of rangelands. The information is categorised according to the main encroacher species. It uses a formula based on 'tree equivalents' (TEs) and average annual rainfall. A TE is defined as a woody tree or bush of 1,5 metres height. Therefore a 3 m tree represents 2 TEs. A 0,75 m tree/bush represents 0,5 TEs.

Main principles for bush thinning

- All bush thinning should aim to leave a heterogeneous mix of trees and bush. The veld that remains should have a variety of tree species (including some of the encroacher species), of different size classes, and spaced so that there are some open patches and some dense patches, to provide a variety of habitats for animals.
- Bush thinning should be carried out in a phased approach so that the system is not shocked by an abrupt change from dense bush to open veld.
- All protected plants as listed in Annex 2 should not be harvested for bush thinning, however, exceptions can be made in cases of high densities. Felling of such plants (e.g. Colophospermum mopane) should be done under strict supervision by Forestry officials.
- If arboricides are going to be used, foliar (leaf spray) and stem-applied arboricides are recommended. Pellets should not be used, as they tend to get washed along the surface by rain, and end up in non-target areas.
- Dry river beds tend to carry more trees, and larger trees. Forestry regulations state that trees should not be killed within 100 m of a river course. Thinning is required in densely encroached river margins, but one should leave a higher density of trees than on the adjacent habitat. It is especially important to leave the large trees and protected species along a river course. The exception to this is *Prosopis*, which invades river beds, and should be eradicated completely.
- Judicious thinning should leave behind a sufficient number of trees (following the formulas provided below) to create a stable savanna that does not need major intervention at short intervals after the initial thinning.
- Training of the work force is necessary before harvesting starts, so that workers know which trees to target and which to avoid. Work teams need to be managed so that any excessive harvesting or killing of the wrong species is noticed and corrected.

DOMINANT ENCROACHER SPECIES

Acacia (mellifera, reficiens, luderitzii, erubescens, fleckii, nebrownii)

- Leave all trees greater than 18 cm diameter (measured at ground level).
- Leave all protected species.
- Leave enough Acacias so that the total density of TEs per hectare = 1.5 times the average rainfall. I.e. in an area with ~400 mm rain, the total density of all trees should be ~600 TEs / ha.
- In sandy substrates, leave enough Acacias so that the total density of TEs per hectare = 2 times the average rainfall. I.e. in an area with ~400 mm rain and sandy soil, the total density of all trees should be ~800 TEs / ha.

DOMINANT ENCROACHER SPECIES

Dichrostachys cinerea

Open veld in Windhoek with a few medium-sized *Dichrostachys* trees and *Combretum apiculatum* trees. Hidden in the grass are small *Dichrostachys* trees that should be thinned out.

- Leave all trees greater than 18 cm diameter (measured at ground level). Any *Dichrostachys* greater than 10 cm diameter (these are the taller individuals) should also be left.
- Leave all protected species.
- Leave enough *Dichrostachys* so that the total density of TEs per hectare = 1.5 times the average rainfall. I.e. in an area with ~400 mm rain, the total density of all trees should be ~600 TEs / ha.
- Protect the soil by packing brush.
- Aftercare is essential to prevent re-infestation.

DOMINANT ENCROACHER SPECIES

Terminalia sericea

- Leave all trees greater than 18 cm diameter (measured at ground level).
- Leave all protected species.
- Leave enough *Terminalias* so that the total density of TEs per hectare = 3 times the average rainfall. I.e. in an area with ~400 mm rain, the total density of all trees should be ~1,200 TEs / ha. This recognises the high importance of the trees in supplying nutrients to the sandy soil.
- Remember that a large *Terminalia sericea*, approximately 6 m high, is 4 TEs.

DOMINANT ENCROACHER SPECIES

*Mopane**

*Mopane is classified as a protected plant, thinning is only exceptional in cases of high densities.

- Leave all trees greater than 18 cm diameter (measured at ground level).
- Leave all protected species.
- Leave enough mopanes so that the total density of TEs per hectare = 2 times the average rainfall. I.e. in an area with ~400 mm rain, the total density of all trees should be ~800 TEs / ha. This recognises the importance of mopanes as fodder.
- All cases where thinning is planned in mopane-dominated veld, especially where the veld is degraded (e.g. lack of grass, soil erosion), the area should first be inspected by Forestry officials or a bush expert, to assess the level of harvesting that should be done. It might be advisable in such conditions to leave more trees than 2 times the annual rainfall as specified above.

DOMINANT ENCROACHER SPECIES

Rhigozum trichotomum

- Leave all other tree and bush species, including all protected species.
- Leave enough *Rhigozum* so that the total density of TEs per hectare = 2 times the average annual rainfall. I.e. in an area with ~200 mm rain, the total density of all trees and bushes should be ~400 TEs / ha.
- Remember that a *Rhigozum* bush is usually ~0.75 m tall, i.e. 0.5 TE. If there are no other trees or bushes, the density of *Rhigozum* should be ~800 bushes / ha.

DOMINANT ENCROACHER SPECIES

Prosopis

Prosopis trees in the Auob River at Gochas. Note that they are not confined to the river; they are also invading areas beyond the river bed.

- Take out all *Prosopis* trees.
- Use only approved methods, such as manual chopping or responsible use of arboricides. Do not use polluting methods such as applying engine oil to stems which have been cut.

Annex 2

List of Protected trees

All the tree species listed below are classified as Protected under the Forest Act (2001) and Regulations (2015).

Species name	English common name	Reasons to be protected (ES = Ecosystem Services)
Acacia erioloba	Camel-thorn	Heavily utilised by humans and animals - medicinal, cash crop, unsustainable harvesting of fuel wood for export, slow growth rate, cultural value, economic value. **ES** - *keystone species*
Acacia nigrescens	Knob-thorn	Used by humans and animals -wood used for construction, utensils, fuel, tanning, browsed by game). **ES** - *retains river banks.*
Acanthosicyos horridus	!Nara	Cultural and economic value. **ES** - *Dune stabiliser.*
Adansonia digitata	Baobab	Heavily utilised by humans and animals. **ES** – *keystone species*
Adenia pechuelii	Harms Elephants-foot	Unsustainable harvesting for horticultural trade, slow growth rate, slow and/or episodic recruitment.
Adenium boehmanium	Bushman poison	Unsustainable harvesting for horticultural trade.
Afzelia quanzensis	Pod mahogany	Extensively used by humans and animals - curios, medicinal, timber, potential as ornamental trees, browsed by animals. Slow growth rate, restricted range.
Albizia anthelmintica	Worm-cure albizia	Utilised by humans and animals - medicinal, utensils, browsed by livestock and game.
Aloe dichotoma	Quiver tree	Unsustainable harvesting for horticultural trade, slow growth rate, cultural value, slow and/or episodic recruitment.
Aloe pillansii	Giant quiver tree	Slow growth rate, restricted range, slow and/or episodic recruitment.
Aloe ramosissima	Maiden's quiver tree	Slow growth rate, restricted range, slow and/or episodic recruitment.
Baikiaea plurijuga	Zambezi teak or Rhodesian teak	Heavily utilised for timber, implements, utensils, wood carvings.
Berchemia discolour	Bird-plum	Heavily utilised by humans and animals.
Boscia albitrunca	Shepherd's tree	Heavily utilised by humans and animals.
Burkea africana	Burkea	Heavily utilised by humans - timber, firewood, implements.
Caesalpinia merxmeullerana	Orange-river caesalpinia	Restricted range.
Citropsis daweana	Wild citrus	Wild crop relative - genetic resource, restricted range.
Colophospermum mopane	Mopane	Heavily utilised by humans and animals (browse and forage) - charcoal, timber, fuel wood, construction, medicine, host to important edible caterpillar; slow growth rate, cultural value.

Species name	English common name	Reasons to be protected (ES = Ecosystem Services)
Combretum imberbe	Leadwood	Heavily utilised by humans and animals - fuel wood, construction material, implements, illegally harvested for charcoal, other purposes, browse, shade; Cultural value, extremely slow growth rate.
Commiphora capensis	Namaqua corkwood	Illegally harvested for horticultural trade, restricted range.
Commiphora cervifolia	Antler-leaved corkwood	Illegally harvested for horticultural trade, restricted range.
Commiphora dinteri	Namib corkwood	Illegally harvested for horticultural trade.
Commiphora gariepensis	Orange River corkwood	Restricted range.
Commiphora giessii	Brown-stemmed corkwood	Restricted range.
Commiphora gracilifrondosa	Karee corkwood	Restricted range, Illegally harvested for horticultural trade.
Commiphora kraeuseliana	Feather-leafed corkwood	Illegally harvested for horticultural trade, restricted range.
Commiphora namaensis	Nama corkwood	Illegally harvested for horticultural trade.
Commiphora oblanceolata	Swakopmund corkwood	Very small, widely scattered populations, restricted range.
Commiphora saxicola	Rock corkwood	Illegally harvested for horticultural trade.
Commiphora virgata	Slender corkwood	Cultural value - host to edible caterpillar.
Commiphora wildii	Oak-leaved corkwood	Cultural value - resin for perfume.
Cyphostemma bainesii	Gouty vine	Illegally harvested for horticultural trade, restricted range.
Cyphostemma currorii	Kobas	Illegally harvested for horticultural trade.
Cyphostemma juttae	Blue kobas	Illegally harvested for horticultural trade, restricted range.
Cyphostemma uter	Kaoko kobas	Restricted range.
Dialium engleranum	Kalahari podberry	Extensively used by humans – fruit an important part of diet of San and Kavango peoples, medicinal, timber, implements.
Diospyros mespiliformis	Jackal-berry	Heavily utilised by humans and animals - important fruit tree, timber, cash crop, utensils, watos, fuel wood, medicinal, fruit eaten by animals and frugivorous birds. Slow growth rate.
Elephantorrhiza rangei	Karas elephant-root	Restricted range and habitat.
Entandrophragma spicatum	Owambo wooden-banana	Cultural value, slow growth rate, restricted range.

Species name	English common name	Reasons to be protected (ES = Ecosystem Services)
Erythrina decora	Namib coral-tree	Small populations scattered over wide area, cultural value, potential horticultural value.
Euclea asperrima	Mountain guarri	Restricted range.
Euclea pseudebenus	Wild ebony	Slow growth rate. **ES** - *keystone species, prevents erosion of water courses.*
Faidherbia albida	Ana tree	Heavily utilised by stock and game, important shade tree in arid west. **ES** - *Important component of riparian fringe, prevents erosion of river beds, keystone species.*
Ficus burkei	Strangler fig	Fruit for humans and animals, restricted range.
Ficus cordata	Namaqua rock-fig	Fruit for humans and animals.
Ficus sycomorus	Sycamore fig	Fruit for humans and animals.
Guibourtia coleosperma	False mopane	Heavily utilised by humans and animals - food, cash crops, very important shade tree, timber, watos, utensils.
Hyphaene petersiana	Makalani palm	Heavily utilised by humans and animals - utensils, basketry, thatching, fuel, ropes, palm wine, food.
Kirkia dewinteri	Kaoko kirkia	Restricted range.
Lannea discolor	Live-long	Used by humans and animals, restricted range.
Maerua schinzii	Ringwood tree	Heavily used by humans and animals, slow growth rate.
Moringa ovalifolia	Phantom tree	Heavily used by humans and animals - horticultural value, browse, tourism.
Neoluederitzia sericeocarpa	Silk-seed bush	Restricted range.
Ozoroa concolor	Green resin-bush	Restricted range, scattered distribution.
Ozoroa namaquensis	Gariep resin-tree	Restricted range.
Pachypodium lealii	Bottle tree	Slow growth rate, unsustainable harvesting for horticulture trade.
Pachypodium namaquanum	Elephant-trunk	Slow growth rate, unsustainable harvesting for horticulture trade, restricted range.
Pappea capensis	Jacket-plum	Utilised by humans and animals - important shade tree, edible fruit, browsed. **ES** - *Keystone species, prevents erosion in rivers.*
Philenoptera violacea	Apple-leaf, rain tree	Important component of riparian and floodplain canopy. Utilised by humans and animals - fences, watos, medicines, browse, fodder.
Protea gaguedi	African white protea	Restricted range, heavily utilised by humans – medicinal overharvesting of roots.
Pterocarpus angolensis	African teak, kiaat	Economic value, heavily utilised for timber, implements, utensils, wood carvings.
Salix mucronata subsp. capensis	Small-leaved willow, river willow	Stabilisation of river banks, shade, heavily utilised by humans – overharvesting for fuel wood, potentially threatened, restricted range.

Species name	English common name	Reasons to be protected (ES = Ecosystem Services)
Schinziophyton rautanenii	Manketti	Heavily utilised by humans and animals - utensils, curios, musical instruments, timber, shade, fruit a very important food and cash crop.
Schotia afra var. angustifolia	Karoo schotia	Utilised by humans for wood, restricted range.
Sclerocarya birrea	Marula	Heavily utilised by humans and animals for fruit, shade, browse, medicines, wood.
Searsia lancea	Karee	**ES** - *prevent erosion of river banks.*
Sesamothamnus benguellensis	Kaoko sesame-bush	Illegally harvested for the horticultural trade, slow growth rate, restricted range.
Sesamothamnus guerichii	Herero sesame-bush	Illegally harvested for the horticultural trade, slow growth rate.
Sesamothamnus leistneri	Large-leaved sesame-bush	Illegally harvested for the horticultural trade, slow growth rate, restricted range.
Spirostachys africana	Tamboti	Heavily utilised by humans – timber.
Sterculia africana	African star-chestnut	Economic value - tourism and horticulture. Utilised by humans – medicinal and food.
Sterculia quinqueloba	Large-leaved sterculia	Economic value - tourism and horticulture, restricted habitat.
Strychnos cocculoides	Corky monkey-orange	Economic value - cash crop. Heavily utilised by humans and animals – fruit.
Strychnos potatorum	Black bitterberry	Utilised by humans - fish poison, shade; and animals (food and shade), restricted range. **ES** - *important component of river and flood plain vegetation.*
Strychnos pungens	Spine-leaved monkey-orange	Economic value - cash crop. Heavily utilised by humans and animals - fruit, medicinal.
Strychnos spinosa	Spiny monkey-orange	Economic value - cash crop. Heavily utilised by humans and animals - fruit and furniture, restricted range.
Tamarix usneoides	Wild tamarisk	Browsed by game. **ES** - *prevents erosion of river beds and river banks, important component of riparian vegetation.*
Tylecodon paniculatus	Southern botterboom	Unsustainable harvesting – horticultural trade, restricted range.
Welwitschia mirabilis	Welwitschia	Cultural value, scientific value, economic value - tourism.
Ziziphus mucronata	Buffalo-thorn	Utilised by humans and animals - medicinal, construction, implements, fuel wood, browsed by livestock and game. **ES** - *prevents erosion of river beds and river banks, important component of riparian vegetation.*

Annex 3

Scientific and common names of key encroacher species

Scientific name	Common names
Acacia erioloba	Camel-thorn, omuthiya, omumbonde, omuonde, //ganab, kameeldoring, kameldornbaum
Acacia erubescens	Yellow-bark acacia, omungongomwi, withaak, berkebos
Acacia fleckii	Sandveld acacia, blade-thorn, mungamba
Acacia hebeclada	Candle-pod acacia, otjimbuku, trassiebos, kerzenakazie, stehschote
Acacia luderitzii	Kalahari acacia
Acacia mellifera	Black-thorn acacia, swarthaak, omusaona
Acacia nebrownii	Water-thorn, /nubib, orupunguya, slapdoring, pfannenstrauch
Acacia reficiens	Red umbrella-thorn, rooihaak, rotrindenakazie
Colophospermum mopane	Mopane, omusati, mupani, mopanie
Dichrostachys cinerea	Sickle-bush, omutjete, sekelbos, papwielbos, farbkätzchenstrauch
Kirkia acuminata	Mountain kirkia, omulemba, omuhoho, bergsering, weisseseringe
Rhigozum trichotomum	Three-thorn rhigozum, //hau.b/s, okatakambindu, driedoring, dreidorn
Spirostachys africana	Tamboti, omuhongo, ohongo, tambotie, tambuti, adlerholz
Terminalia prunoides	Purple-pod terminalia, omuhama, //gaetab, bloedvrugboom, deurmekaarbos, blutfruchtbaum
Terminalia sericea	Silver cluster-leaf, mugaro, omugolo, za'o, geelhout, vaalboom, fahlbaum, gelbholz
Tylosema esculentum	Gemsbok bean, marama bean

Acacia erioloba open savanna north of Rehoboth.

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REPUBLIC OF NAMIBIA

Ministry of Agriculture, Water and Forestry and
Ministry of Environment and Tourism

Harvesting of encroacher bush is expected to increase dramatically in Namibia, with support for bush thinning and biomass utilisation coming from government, donors and commercial institutions.

Bush thinning operations need to be carried out carefully, to avoid causing environmental harm. Two government departments are responsible for authorising and monitoring bush harvesting activities – the Directorate of Forestry in the Ministry of Agriculture, Water and Forestry, and the Department of Environmental Affairs in the Ministry of Environment and Tourism. They administer a process which has been streamlined with the specific intention to avoid unnecessary time delays and high costs for farmers wishing to undertake bush thinning.

Guidelines in this book show what permits and authorisations are required, and the process to obtain them. The book includes a generic Environmental Management Plan that can be adapted as needed to obtain Environmental Clearance for a bush harvesting operation. Also, guidelines are provided on best practices in bush thinning.

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