

Understanding and Managing Desertification Tipping Points in Dryland Social-Ecological Systems – A Namibian Perspective

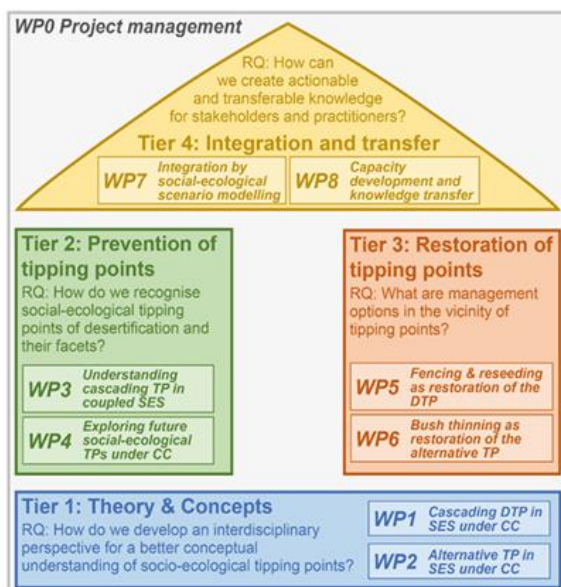


Report of NamTip Stakeholder Workshop

March 6th, 2024 – NIPAM, Windhoek, Namibia

Session #1: Project presentation and sharing of results

NamTip Research Plan for Phase 2



Four main foci („tiers“):

Tier 1: Theory & concept development

- Concepts for studying interlinked social-ecological tipping points
- Integrating climate change

Tier 2: Prevention of tipping points

- Tipping point experiment TipEx
- Additional focus on climate change

Tier 3: Restoration of tipping points

- Experimental reseeded & fencing
- Harnessing bush thinning trials

Tier 4: Integration & transfer

- The main goal of NamTip is to gain a better knowledge on the development of **desertification tipping points** (DTPs), as well as to explore desertification (i.e. loss of grass vegetation to bare land) impacts on local people’s livelihood. As a result, we’ll identify suitable management interventions aiming to prevent crossing a DTP.
- As an extension to phase 1, in phase 2 of NamTip we also include **bush encroachment** as alternative tipping (TP) point in arid rangelands (**Fig. 1**):
 - added research question: is **bush control** a management option in the vicinity of a TP?
 - added methodology: comparing bush-thinned sites (chronosequence) in freehold farms and communal areas
 - added planned outputs: effects of bush control on soil, soil seed bank, density of grass populations and forage provision + social and political aspects.

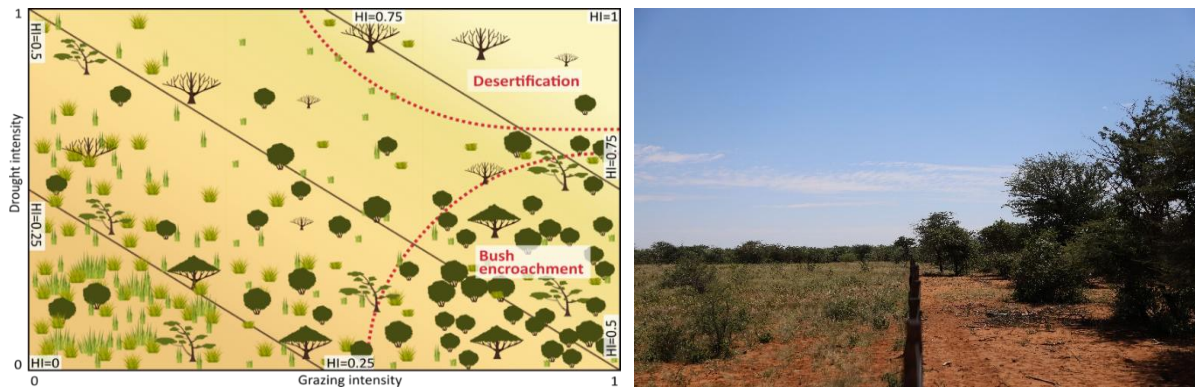


Fig 1: The NamTip fieldwork in Namibia's Waterberg region has shown that, besides desertification, farmers face the alternative tipping point of bush encroachment, which is also associated with land degradation, although in this case palatable perennial grasses are not replaced by bare ground but by shrubs, interspersed with bare soil patches. In NamTip Phase 2 we want to investigate whether bush control can be a management option in the vicinity of a tipping point.

Feedback from Stakeholders

- Integrating bush encroachment in the research objectives of NamTip Phase 2 is a good idea as it is a serious degradation problem in Namibia's rangelands. However, investigating bush encroachment can be tricky because of the different environmental conditions either favoring bush encroachment or the loss of perennial grasses.
- In Namibia, bush control is favored over bush thinning as a general term, as the latter is very specific.
- The grasslands are managed ecosystems; what is the balance of minerals when we consider the removal of shrubs from the system and the previous growth of the shrubs?
- The drought in Namibia has become so bad that even the bush is dying.
- The first tipping point of desertification is when the most favorable grass species for cattle are lost. To investigate a reversal of this process, seed dispersal must be considered.



Fig 2: Prof. Anja Linstädter and Dr. Stefan Liehr (left) opened the NamTip Stakeholder Workshop, which was moderated by Bertus Kruger (right)

- Although NamTip has paid considerable attention to the importance of soils with regard to desertification and rangeland management, more efforts should be undertaken to generate awareness of this relationship.
- Water management and utilization could also be an important aspect to be considered as part of NamTip's research, in particular regarding the question how soils can be enriched with water.

- It was useful to get more insights from the practical experience of farmers regarding rangeland restoration (e.g. about the long time needed for rangeland resting, efforts and time needed to recover and maintain good rangeland conditions).



Fig 3: After a round of introductions from all participants, the NamTip researchers presented a selection of their project findings from NamTip Phase 1, and introduced the research plans for Phase 2

Session 2: Climate change impacts on rangeland management

Summary of Stakeholders' Group Discussions

Question 1: What impacts of climate change on degradation are already evident or do you expect in future?

Current evidence:

- Increased temperatures and evapotranspiration
- Changes in rainfall patterns (frequent flash rains & severe, more frequent droughts)
- Rainfall variability and distribution favor bushes more than grasses
- Less water infiltration, mainly in bare patches (hydrophobic effects)
- Reduction in groundwater levels
- State of land (degraded vs. better) enhances effects of climate change (bare ground \square higher evaporation and water loss)
- Bush encroachment (linked to CO₂ increase)
- Loss in perennial grasses (even after intervention e.g., de-bushing/bush thinning or resting)

Future evidence:

- The above-mentioned impacts will worsen, with regional differences
- Higher soil erosion is expected due to heavy rains and wind erosion (dry spells)

Concrete examples:

- Kamanjab area: previously in good years it had a succession of grasses but after severe drought from 2013 and 2019 only annual grasses are present (possible sign of seedbank depletion?)
- Omaheke region: underground water quantity has declined, which affects groundwater recharge and water supply from boreholes (livestock water points)
- Communal areas around Okakarara: longer periods between rain events; reports of changes in species composition from preferred perennial grasses to annuals and weeds



Fig 4: The participants were then divided in small groups to intensively discuss questions related to rangeland management under climate change.

Question 2: If climate change continues and intensifies, what tipping points (TPs) do you see?

Ecological aspect:

- Different effects in different regions (spatial variability → difficult to generalize findings and observations)
- Shifts in species composition (disappearance of perennial grasses, prevalence of less desirable annual species, introduction of new pioneer plant species and weeds)
- Loss of topsoil (irreversible)
- Bare soil and soil seed bank depletion
- Less or inaccessible groundwater
- Increased bush encroachment
- Decreased productivity (despite sustainable management)
- Decreased forage quality

Socio-economic and sociopolitical level:

- Lower animal production, more dead animals
- Maintaining a pastoral lifestyle becoming even more difficult
- Human population continues to grow despite compromised livelihoods → land competition
- Increase in human migration (e.g. Ovahimba people) due to permanent loss of livelihoods
- Increased production costs, lower profits
- Increased income diversification strategies (e.g. charcoal production) and farm/livestock sales
- Cultural impacts (e.g. no animals to slaughter during Herero funerals; difficulties to find firewood)
- Policy/ political-related issues

Question 3: Do you see this process as a sudden event or as a cascading process (which stages)?

- Cascading process or change in phases more than actual “point”
- Processes are happening over time, but more accelerated in proximity of tipping points (TPs)
- Degradation is a slope, but with steps of varying impacts & lengths (loss of perennial grasses → loss of soil cover → erosion & run-off → gullies); bush makes it more difficult to observe a stepwise process
- Soil dynamics may reflect TPs better



Fig 5: Each discussion group included a mix of NamTip researchers, rangeland experts, freehold and communal farmers.

Session 3: Scenarios of future rangeland management

Summary of Stakeholders' Group Discussions

Question 1: What management and/or restoration strategies are farmers (a) currently employing (b) planning to employ (c) generally interested in?

Freehold farms:

Measures they are currently employing:

- Bush-control
- Bush to feed
- Rest and reduce stocks OR increase stocks to survive
- No reseeding, doesn't work
- Rotational grazing and timing (intense grazing periods followed by long resting periods)

Measures they are generally interested in:

- Preventing erosion (cost-intensive)
- Bush-clearing
- Chemical debushing
- "Controlled fire" (but difficult to implement)
- Long-term rest
- Split ranching approach (helps to build soil carbon and enhances grass competition)
- Full time farmers cannot afford to lower stock rates due to lack of alternative income
- Carbon credits as incentives

Communal farmers:

Measures they are currently employing:

- Doing little as it is difficult to mobilize community members
- No camps as in freehold farms because farmers live in communal land
- De-stocking (mostly resulting from the necessity to access cash)
- Diversification (e.g. rain garden, but growing crops becoming more difficult due to climate change)
- Occasional firewood production and sale (depending on permits and buyers)

Measures they are generally interested in:

- Debushing and charcoal production (waiting for the Ministry of Environment to allow them to apply for correspondent permits; even so, debushing is cost and labor intensive)
- Split grazing but difficult to implement in communal land (absence of fences, lack of cooperation)
- Rotational grazing but difficult to implement (same reasons as for split grazing)
- Fencing around villages to better control livestock mobility into and outside the settlement



Fig 6: The main discussion points were collected on flipcharts and later presented to the plenum.

Question 2: What drivers are most important to consider looking at (a) climate (b) socio-economy (c) politics?

Climate:

- Rainfall amounts and (temporal) distribution
- Temperature
- Wind speed
- Sun shine duration / radiation intensity (stress for animals)
- CO₂

Socio-economy:

- Stock size (increased pressure on grazing areas)
- Beef prices
- (In)efficiency of the value chain
- Road connectivity (especially for communal farmers)
- Land ownership (especially for communal farmers)
- Lack of capital, poverty
- Population growth
- Changes in cultural values (e.g. about cattle)

Politics:

- Restoration programs not implemented (e.g. Land Degradation Act)
- Lack of extension officers and support for farmers
- Type of drought relieve (e.g. giving subsidies for forage incentives to keep animals)
- Policies in communal areas currently restricting bush control
- Lack of financial incentives (e.g. carbon credits)
- Limited efforts towards preparedness currently in place

Question 3: What are management-relevant time horizons and practice-related indicators for farmers?

Time horizons:

- First benefits can be obtained already one year after bush control
- 5-year timeframe basis with annual checks (business related)
- 'Full' restoration is a long-term endeavor (20-30 years)

Indicators:

- Production (livestock/ha)
- Perennial grass presence/return
- Mid of February with no rain → starting to sell

Additional considerations:

- Individual decisions are possible in freehold farms but more difficult in communal settlements.
- Without periodic aftercare, bush encroachment will return.
- *Sida cordiflora* might take over space after debushing without proper aftercare (reseeding).



Fig 7: Group picture with the participants of the NamTip Stakeholder Workshop on March 6th, 2024



Thank you very much once again for your active participation!

And see you again at the NamTip Final Meeting in June 2025

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