

Co-creating pathways to achieving desirable social-ecological futures in northern Kunene

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ABSTRACT Ovahimba pastoralists in the Kunene region of northern Namibia face a complex set of environmental and socio-economic challenges that are gradually undermining their traditional livelihoods and ways of life. Against this background, our project aimed to support the development of inclusive, bottom-up adaptation strategies to strengthen Ovahimba pastoralists' resilience to anticipated climate change impacts. Using a participatory approach, we applied the 3-Horizons framework, through which community representatives from two case study sites identified current circumstances and indicators of crises, desired social-ecological futures, and concrete, community-led pathways to attain those futures. In the process, four community-led project proposals addressing food insecurity, limited income opportunities, rangeland degradation, and weak rangeland governance were developed. Building on these outcomes, we organised a multi-stakeholder workshop that brought together government representatives, NGOs, funding agencies, and academics, during which community project proponents received feedback and explored avenues for implementation. This process surfaced both opportunities – such as relevant funding lines and alignment with existing policy frameworks – and obstacles, including literacy barriers and bureaucratic processes. Several enabling conditions were also identified as essential to initiating and sustaining community projects over time, notably multi-stakeholder coordination and long-term monitoring. In this article, we document the full process involved in translating community-led initiatives into reality and discuss the structural challenges they reflect. We conclude with a reflection on the implications of this process for local communities, policy, and future collaborations. We emphasise that developing adaptation strategies is highly complex, but urgent action is essential. Without it, the pastoral system could reach a tipping point that would be much more costly and more difficult to reverse than the initiatives discussed here.

KEYWORDS adaptation strategies; 3-Horizons framework; co-creation; community-led projects; Ovahimba pastoralists; Kunene; Namibia

INTRODUCTION

Like many dryland pastoral systems worldwide, the Ovahimba pastoralists in the Kunene region of north-western Namibia face a complex set of environmental and socio-economic challenges that are gradually undermining their traditional lifestyles and livelihoods (Dong et al. 2011, Inman 2024). Key factors contributing to these challenges include population growth, rangeland degradation, climate change, and legacies of colonial marginalisation (Bollig 2020, Inman et al. 2020a). Furthermore, post-colonial governments have often lacked the capacity (or the political will) to address these problems adequately and to develop and implement climate adaptation policies that incorporate local knowledge, realities, and gender-specific perspectives (Newsham & Thomas 2011, Davies et al. 2020, Angula et al. 2021). Without prompt and meaningful action, these challenges could push the Ovahimba pastoral system toward a tipping point, resulting in severe social and ecological consequences, especially if forecasts of decreased rainfall and more frequent severe droughts in the near future materialise (Wassenaar et al. 2023, Engelbrecht et al. 2024).

Against this background, the research project TIPPECC-Kunene (Tipping Points Explained by Climate Change in the Kunene region) aimed to contribute to the development of inclusive, bottom-up adaptation strategies that empower Ovahimba pastoralists to address the aforementioned challenges and strengthen their resilience to cope with climate change impacts. Accordingly, we, the TIPPECC-Kunene team, organised a two-day workshop in Opuwo, bringing together a diverse group of representatives from the Ombombo and Okondjombo conservancies, which served as the primary study sites for the project's activities.

By implementing the '3-Horizons approach' – an innovative methodology for the participatory exploration of complex social-ecological systems (Sharpe et al. 2016, Schaal et al. 2023) – the workshop culminated in the development of four tangible community-led project proposals. Each had a specific objective: i) to enhance food security; ii) to promote income diversification; iii) to improve rangeland conditions; and iv) to enhance

rangeland management. This approach was selected precisely for its proven ability to help participants unpack why the status quo fails and to chart a pathway toward a more sustainable future (Schaal et al. 2023). Subsequently, a meeting with government stakeholders, NGOs, funding agencies, and academics was convened in Windhoek to explore ways to support the implementation of the initiatives and to address broader systemic issues reflected therein. All these efforts were integral to the project's participatory research approach, which focused on co-designing research activities and co-creating application-oriented knowledge that directly benefits the involved communities (Wassenaar et al. 2023).

In this article, we seek to highlight TIPPECC-Kunene's interactions with Okondjombo and Ombombo representatives during the two-day workshop in Opuwo and evaluate the feasibility of implementing their initiatives through further engagement with government, NGOs, funding agencies, and scholars in Windhoek. With this, we aim to underscore the pressing needs of Ovahimba pastoralists as they navigate ongoing socio-economic and environmental changes, explore how community-driven initiatives can address these challenges, and identify barriers that must still be overcome. Finally, we offer key reflections on the process and its implications for local communities, future collaborations, and ongoing research projects such as ours.

To set the stage, this paper begins with a concise overview of the TIPPECC project and its goals. It then highlights key insights from the joint workshop in Opuwo, focusing on the methodologies used and the results obtained. Following this, the interactions with stakeholders in Windhoek are briefly discussed, and the paper concludes with a reflection on both engagements and their outcomes.

THE TIPPECC-KUNENE PROJECT

TIPPECC-Kunene is a research initiative funded by SASSCAL¹ and implemented by the Gobabeb Namib Research Institute in collaboration with the Namibia University of Science and Technology (NUST). The project is part of a larger partnership

¹ Southern African Science Centre for Climate Change and Adaptive Land Management

within the Grand Challenge consortium, which runs from 2022 to 2026 and is led by the Global Change Institute at the University of the Witwatersrand in South Africa.² The main goals of this initiative include: 1) evaluating the risks associated with climate change-induced regime shifts (also called tipping points) in southern Africa; 2) delivering a comprehensive array of climate services that are informed by and developed in partnership with various stakeholders; and 3) jointly creating adaptation strategies to protect against the potential impacts of these tipping points.

To support these objectives, we focused on the Ovahimba pastoralist system in arid and semi-arid north-western Namibia. The Ovahimba are a semi-nomadic ethnic group indigenous to the Kunene region (and parts of southern Angola), whose livelihoods are traditionally centred on cattle and small livestock herding. Social organisation is structured around extended family homesteads and customary leadership roles such as headmen (*ozosoromana*). Despite growing exposure to modernisation and external development pressures, the Ovahimba have largely maintained their traditional way of life. However, the system faces increasing pressures, including growing human and livestock populations, rising temperatures, more frequent droughts, and subsequent rangeland degradation (Bollig 2020, Inman et al. 2020a). These challenges raise alarms for desertification, as sudden changes in the duration and severity of droughts, along with increased heatwave frequency, could push the system past critical thresholds, adversely affecting people, livestock, and vegetation (Wassenaar et al. 2023). Despite a surge of publications decades ago (e.g., Bollig 1997, Sander et al. 1998, Müller et al. 2007) and a few more recently (Inman et al. 2020a, Inman et al. 2020b, Coppock et al. 2022), there has been little peer-reviewed research on these social-ecological interactions and their impacts over the last two decades. This has led to considerable uncertainty regarding ecosystem dynamics and the future sustainability of pastoralism in the region. To help fill these knowledge gaps, TIPPECC-Kunene established three primary objectives: 1) to

evaluate the likelihood of climate tipping points inducing regime shifts within the Ovahimba social-ecological system; 2) to identify the drivers of such shifts, with particular emphasis on the role that climate tipping points might play in this process; and 3) to develop practical adaptation strategies in collaboration with affected communities. The latter aim involves empowering local populations to prepare for future climate change and to prevent crossing social-ecological tipping points that could lead to detrimental, irreversible consequences, such as abandoning pastoralism, increased dependence on social grants and aid, famine, and social unrest (Wassenaar et al. 2023; Menestrey Schwieger 2026).

To achieve these objectives, we adopted an inter- and transdisciplinary approach, combining environmental and social science methods with local community insights. This strategy centred on a case study methodology, focusing on two communities along an aridity gradient that highlights Kunene region's climate variability: Okondjombo communal conservancy (area: 1 644 km²; registered members: 150) in the arid west and Ombombo conservancy (area: 1 487 km²; registered members: 465) in the semi-arid east (Figure 1).³ The biome transitions from the arid Tree-and-Shrub Savanna in the east to the Nama Karoo and Namib Desert in the west. Tree and shrub density is greatest in the eastern part of the region, where recent woody encroachment has also been observed (Atlas of Namibia Team, 2022; Venter et al., 2018).

Our first engagement with these communities (in February 2024) involved consultations to incorporate each community's insights and knowledge requirements into TIPPECC-Kunene's research. This consultation process involved twelve representatives from each community, carefully selected to ensure inclusivity across gender, age, and roles, including local headmen, conservancy board members, elders, women, and youth. Selection was conducted with the help of our partners from IRDNC, who know the local structures and households well, in conjunction with the local communities themselves, who were

² See <https://www.climate-service-center.de/science/projects/detail/107781/index.php.en> for more information

³ A conservancy is a legally registered communal area in which residents collectively manage and benefit from local natural resources, particularly wildlife, under Namibia's Community-Based Natural Resource Management (CBNRM) programme established in the mid-1990s. For more information about these conservancies, see <https://nacso.org.na/>

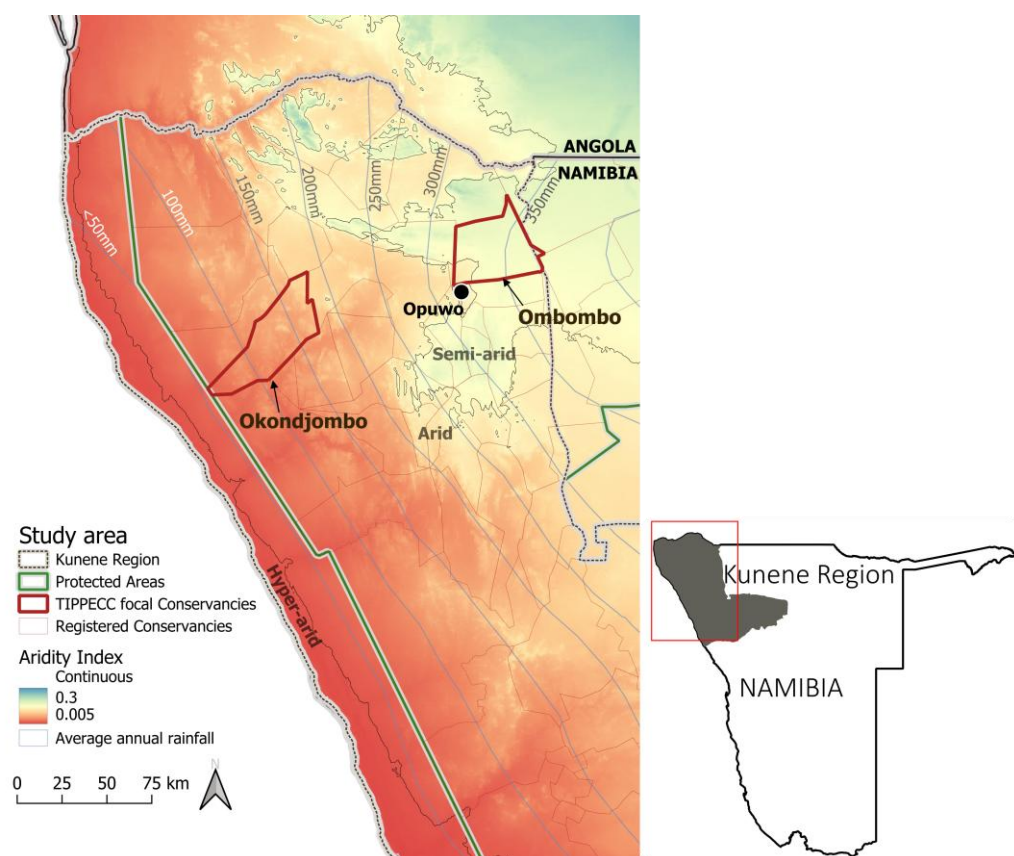


Figure 1 Location of case study communities.

also able to recommend representatives for specific social groups⁴. Together with these representatives, the team co-created research activities across multiple thematic areas, including investigations into vegetation change and degradation, livestock foraging ecology, modifications to resource access regulations, adaptation and livelihoods, as well as the social and environmental impacts of water provisioning through boreholes (Wassenaar et al. 2023). The research activities were then conducted on-site in close collaboration with the residents of our two case study areas over the following months.

The findings from these research efforts were later shared with the communities during on-site meetings in Okondjombo and Ombombo (in November 2025), followed by a two-day joint workshop in Opuwo two weeks later. At this workshop, the same participants from both locations – who had been actively involved since the project's inception – plus a few more (27 in

total)⁵ were guided in creating community-led adaptation strategies based on the project results. This process is described in detail in the next section.

DEVELOPING ADAPTATION STRATEGIES

The development of adaptation strategies was conducted using the 3-Horizons framework (Sharpe et al. 2016, Schaal et al. 2023) – an approach that helps participants engage with complex, intractable issues, and uncertain futures, while systematically guiding them through three essential steps: i) developing a shared understanding of current circumstances and indicators of crisis; ii) identifying preferred social-ecological futures; and iii) formulating narratives of change, or pathways, to attain these futures (Schaal et al. 2023).

To frame the discussion around these three steps, the project team began the workshop by presenting to participants a selection of key results from the

⁴ The project team was well aware of the difference in registered membership numbers between the two conservancies; however, for the purposes of project implementation, we opted to maintain a similar number of representatives per community to preserve balance. Strictly proportional sampling based on registered population figures would not only have been difficult to achieve – since registered populations do not necessarily reflect actual residents – but would also have risked creating an imbalanced group.

⁵ These extra participants were actually selected from the outset to take part in our project activities, but were unable to attend our previous events.



Figure 2 Participants during the joint workshop and drawing artist Nambowa Malua.

co-designed research activities conducted during the preceding engagements in the two conservancies. These results focused on five topics: i) seasonal foraging behaviour of livestock responding to climate change at the two sites; ii) land-use changes and pastoral practices amid global change; iii) historical shifts in vegetation and trajectories of rangeland degradation; iv) impact of mopane thinning on rangeland productivity; and v) rangeland restoration potential as a climate change adaptation strategy.⁶

These presentations highlighted three key points: i) in general, the livestock forage resource base (palatable perennial and annual grasses) is rapidly declining in both study areas, with likely further deterioration; ii) both case study communities are increasingly forced to incur high costs (e.g., buying supplementary feed or moving their livestock to distant areas in search of grazing) to sustain their livestock and pastoral way of life; and iii) targeted restoration (e.g., digging bunds, reseeding, bush-thinning) and management (e.g., grazing rest periods) can significantly improve rangeland conditions (as demonstrated in experiment sites in Ombombo), offering an opportunity for intervention.⁷

In this context, most participants noted they would likely lose their animals within two drought years or after a decade if current declining trends continue. As one participant highlighted: “Everything will depend on the rain (...), but there are also no rules in place managing the grazing” suggesting an imminent tipping point in the pastoral system driven by both climate change and the absence of effective governance measures,

which, while present in many communities, are often not respected. Consequently, the results-sharing discussion concluded with a pivotal question: “How can we then develop a future in which livestock farming remains viable despite the challenges posed by climate change and changing rangeland conditions?”

This inquiry framed subsequent discussions using the three steps of the 3-Horizons approach (see below). Throughout the process, Namibian artist Nambowa Malua interpreted and illustrated the outcomes of the conversations in real time on canvas (Figure 2). The rationale for using art was to create an alternative way to represent and engage with results through concrete visualisations. With this visual approach, we wanted to make the discussion more accessible to participants who might otherwise have found it difficult to engage through text (given the region's high illiteracy rates) or verbal discussion alone. Through this, we aimed to encourage participants to build a more tangible picture of the current crisis, envision desired futures, and, more importantly, develop a concrete vision of the pathways to reach them. Moreover, we hoped that visualising their own projects would help motivate participants to act. Participants were encouraged to provide feedback and give recommendations to the artist during the drawing process, making the artworks a dynamic and collaborative endeavour.

Step 1 – Characteristics of the current situation

The first step of the 3-Horizons approach consists of building a shared understanding of the current situation, its signs of crisis, and their underlying causes (Schaal et al. 2023). To this end, participants

⁶ At the time of writing this paper, most of these outcomes were still in the process of being turned into Master's theses and peer-reviewed articles.

⁷ Due to logistical constraints, a comprehensive ecological assessment of the restoration outcomes in Okondjombo could not be undertaken. Nonetheless, informal observations reported by local residents suggested that vegetation regeneration was occurring around the bunds in that area as well (bush-thinning was not conducted in this area).

were divided into small groups of three to four to discuss indicators of the system's unsustainability and the factors driving it. They then reconvened to share their insights with the larger group.

Figure 3 presents the results of this process, illustrating participants' perceptions of their current situation as depicted by the artist in collaboration with them. In the foreground, the drawing depicts a boy holding an emaciated head of cattle by its chin against a barren, grassless landscape. At the same time, a nearby skull signals that other animals have already perished. In the background, more emaciated livestock are visible, alongside a woman lifting the lid of an empty cooking pot. Together, these images capture several of the key issues that participants raised, including insufficient rainfall, rangeland degradation, hunger, and poverty.

Beyond what the illustration explicitly depicts, participants also identified several underlying causes, such as climate change, population growth, and inadequate infrastructure planning – for instance, too many boreholes located in close proximity to each other, which increases grazing pressure on the land. In this context, they further emphasised a lack of cooperation among herders in organising grazing, as well as insufficient mechanisms to enforce compliance with rangeland management rules, which they saw as a major driver of ongoing degradation. This was reflected in remarks such as “we do not work together”, “some people do not care” and “people move wherever they want”.

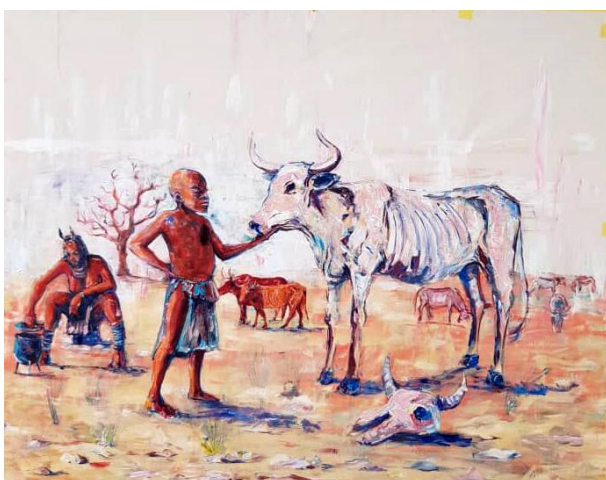


Figure 3 “The current situation” as illustrated by Nambowa Malua, based on participants' discussions in step 1 of the 3-Horizons approach.

Step 2 – The desired future

Following the second step of the 3-Horizons approach, participants were encouraged to discuss and envision the futures they want for themselves and future generations in another group session. The results of these discussions were captured and visualised in the drawing shown in Figure 4.

The illustration depicts a young Ovahimba herder blowing the *Ondjembo* via *Zongombe/Erose*, or cattle gun – an instrument traditionally used to signal the movement of large cattle herds. He stands over a landscape lush with grasses and tall trees, free of encroaching bush, and crossed by a prominent river. His posture, holding the landscape close to his chest, conveys a sense of stewardship and intimate connection with these resources. The river winds through the scene, culminating in a waterfall that supplies water to several households in an otherwise arid area – a powerful symbol of fertility, life, and emerging change. Through abstract and symbolic imagery, the artwork evokes abundance and prosperity, underscoring the central importance of livestock, fodder, and shared water sources to Ovahimba pastoralism, as well as the careful tending these resources require.

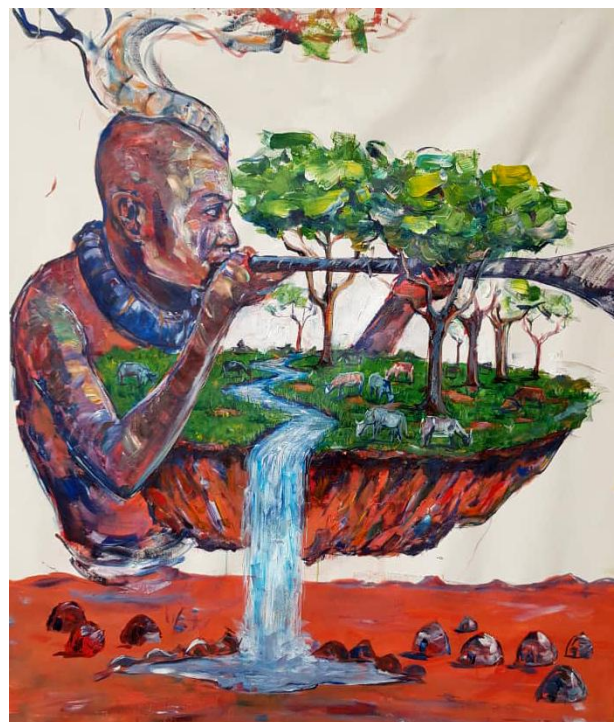


Figure 4 “The desired future” as envisioned by artist Nambowa Malua, with participants' input during step 2 of the 3-Horizons approach.

Beyond what the drawing explicitly portrays, participants also articulated a broader vision for this horizon. In terms of rangeland management, they spoke of wanting to “cooperate like our forefathers did”. Beyond this, they expressed aspirations to “be able to plant fruits, vegetables, and fodder for animals”, to “get higher prices for our livestock”, to “use bush for fodder”, to “produce and sell crafts” and to “manage money better”. Taken together, these aspirations reflect a desire for collective action and solidarity, food self-sufficiency, fairer market conditions, income diversification, productive use of encroaching bush, and greater financial literacy.

Step 3 – The pathways of change

After establishing a common understanding of the current crisis and developing a vision for the future they aim for, participants were guided to the third step of the 3-Horizons framework. This step focuses on creating pathways for change to address present challenges and move toward the envisioned future. To translate this process into practical actions, participants were first presented with the seven thematic categories that had emerged during the discussions in Step 2 (see above): 1) enhance rangeland management, 2) improve food security through horticulture, 3) increase financial literacy, 4) attain better livestock market prices, 5) restore rangelands, 6) diversify income through craft production and sales, and 7) utilise bush resources for fodder during droughts. Participants were then asked to vote on the areas in which they would most like to work, with the aim of identifying the four highest-priority themes for implementation. The four categories receiving the most votes were enhanced rangeland management, improved food security, rangeland restoration, and income diversification.

Participants formed groups of four to eight individuals based on their preferred topics and were encouraged to develop project proposals around them. Throughout this process, they received guidance on considering specific aspects necessary for creating pathways of change aligned with the 3-Horizons framework (Schaal et al. 2023): the requirements for launching their projects, available resources and opportunities, potential barriers and strategies to overcome them, and approaches to sustaining their initiatives in the long term. Beyond this structural guidance, the

participants developed the content themselves. After the group work, each team presented its proposal to the larger group, answered questions, and received feedback from their fellow participants.

Figure 5 shows how participants visualised their plans: on the left, the project to diversify income is illustrated through a 'cultural village'; at the centre, the proposal to increase food security is represented by a community garden; and on the right, the initiative to enhance rangeland management is shown with herders sitting in a circle under a tree – a typical community problem-solving scene, here focusing on rule enforcement. The rangeland restoration project is visible in the background, marked by bunds, or “earth smileys,” dug into the ground. These semi-circular earth embankments are built along contours to capture rainfall runoff, increase water infiltration, and promote vegetation recovery. These four projects are described in more detail in the following sections.

The cultural village

The group that proposed establishing a cultural village and selling crafts to promote income diversification envisaged building a replica of a traditional Ovahimba homestead. The space would allow community members to showcase both tangible and intangible aspects of Ovahimba culture (*ombazu*) to tourists, including ornaments, artefacts, daily practices, and rituals. Crafts, mainly created from natural or recycled materials, would be produced and sold locally, reducing the need for Himba women to travel to faraway towns to sell their products. The proponents of this project (mostly women) reported that locations for these “villages” in Ombombo and Okondjombo have already been identified and secured in consultation with the conservancy leadership, as they had been working on this idea before our workshop. Remarkably, the community of Ombombo had already developed flyers to distribute to lodges, including information about the village and a sign to place along the road (See Appendix 1).

While the community can independently construct the homestead and supply wooden poles for fencing to protect the structures from livestock, the proponents highlighted the need for financial aid to purchase wire fencing, build air toilets, and ensure access to clean water for visitors. To oversee



Figure 5 “Strategies for change” as illustrated by artist Nambowa Malua, based on participants’ project proposals developed in step 3 of the 3-Horizons approach.

the initiative, a project committee will be established, and a dedicated bank account will be opened to manage revenue, with an appointed treasurer. Funds generated are intended to sustain the project and support practical community needs, such as children’s school expenses and assistance for older people. To help attract visitors, participants plan to coordinate with regional lodges to include visits to their cultural villages as part of tourist activities.

The community garden

The group developing the community garden project determined that consultation with the communities in Ombombo and Okondjombo would be an essential first step in identifying a suitable site for the garden. Still, throughout this process, they emphasised the need for assistance from soil specialists to identify an appropriate location based on soil quality and to share knowledge on low-cost soil improvement. A dedicated elephant-proof borehole for each garden would also be required for irrigation, as existing water points are already used to full capacity by livestock. To minimise running costs, they proposed equipping it with a solar pump. While the group committed to contributing funds for irrigation pipes and related materials, they acknowledged that drilling and installing the borehole would require substantial external

financing, including an adequate fence to protect the garden from wild animals and livestock.

Planned crops could include maize, beans, pumpkins, tomatoes, spinach, watermelons (all from organic seeds), and lucerne for livestock fodder. Yet participants expressed that they would need advice on drought-resistant crops. Produce would primarily meet household food needs, with surplus sold to maintain the garden. To this end, participants will also require guidance on how best to market their products. Donations for sick or elderly community members are also envisioned. The project would be open to all, with a particular focus on middle-aged residents who have not yet received a pension. A garden committee will be formed to coordinate activities and oversee finances. Beyond food production, the group sees the planned garden as a means of creating local opportunities for the youth, thereby reducing outmigration and hunger-driven livestock theft.

Restoring rangelands through bunds

The participants who developed the rangeland restoration project built on an initiative co-implemented by TIPPECC Kunene and the conservancy board of Ombombo, which introduced bund digging as a restoration strategy (see Appendix 2). The project proponents aim to scale up these measures, implementing them in

both conservancies by consulting with adjacent communities to jointly identify and prioritise target areas, and building broader awareness of the project's goals. Each participating community would then nominate 10 volunteers to carry out bund digging at the designated locations. However, expanding the initiative will require external funding for fencing, particularly mobile fencing, which is critical for temporarily excluding livestock from areas that are being restored and can be easily relocated to treat adjacent plots.

Seeds from locally extinct grass species will be sourced from areas where they still grow and reintroduced to enhance the restoration efforts. While community members have already collected seeds from areas where key grasses persist, the group has identified the Ministry of Agriculture, Fisheries, Water and Land Reform as a valuable partner for supplying additional seeds of indigenous species that are difficult to locate. To cover ongoing costs and provide sustenance for volunteers during implementation, participants have proposed livestock sales. The conservancy boards of Ombombo and Okondjombo will coordinate efforts and ensure that restoration continues “beyond our lifetimes” as members emphasised.

Improving rangeland management

The group that worked on the rangeland management project aims to ensure the enforcement of clear rules governing access to and use of local rangelands – who moves livestock, when, and where – to improve rangeland conditions and build resilience during periods of stress such as prolonged droughts. Drafts of these rules had already been developed and shared with the broader Ombombo and Okondjombo communities for discussion and approval by the traditional authorities before our workshop. However, enforcement remains a significant challenge. According to the project proponents, traditional courts have had little effect in sanctioning rule-breakers, and competing headmen (*ozosoromana*) have undermined community decisions by granting grazing access permissions without prior consultation. In some cases, communities have also struggled to remove people occupying areas designated as grazing reserves or for seasonal use only. While the police and the Ministry of Agriculture, Fisheries, Water and Land Reform have been approached for

support and have helped in these cases, responses have been slow.

What the people behind this project were calling for is decisive and effective action: the capacity to promptly remove individuals from unlawfully occupied grazing lands (i.e., before grazing is depleted), swiftly bring offenders to court, and manage rivalries among traditional authorities that presently hinder enforcement. They emphasised that those who violate the rules should face consequences comparable to those for livestock theft, as “stealing” grazing affects animals and livelihoods. The most pressing need is therefore legal support to embed the community's governance framework within formal regulatory systems, thereby strengthening its capacity to monitor compliance and to impose sanctions effectively. For this purpose, community representatives would mainly need support with transportation and consultations with all stakeholders involved (police, traditional and government authorities, neighbouring communities, lawyers) to find ways to coordinate and strengthen the much-needed effective enforcement.

Separately, residents of Okondjombo could potentially benefit from the installation of an additional borehole to redirect wildlife away from livestock zones, designating it solely for wildlife use and facilitating better management practices.

EXPLORING AVENUES FOR SUPPORT

Community representatives meet key enabling stakeholders in Windhoek

After developing these projects in the Opuwo workshop, we convened a meeting in Windhoek (May 2026) with government representatives, NGOs, funding agencies, and academics to explore two critical dimensions: 1) the practical implementation of the community-led adaptation projects, and 2) complementary approaches to addressing the core challenges these projects target – namely, lack of income, food insecurity, rangeland degradation and inadequate rangeland management. Attendees included representatives from the Ministry of Agriculture, Fisheries, Water and Land Reform; the Ministry of Environment, Forestry and Tourism; the Environmental Investment Fund; the United Nations Development Program; the University of Namibia; the Namibia

University of Science and Technology; the Namibia Nature Foundation; the Office of the Prime Minister; SASSCAL; and the Drylands Sustainable Landscapes Impact Program, which the Food and Agriculture Organization finances. The project ideas developed during the Opuwo workshop were presented by three community representatives each from Ombombo and Okondjombo. These representatives were selected from among those who had developed the projects during the Opuwo meeting.

After formal welcoming remarks, all attendees were briefed on TIPPECC-Kunene's work and on how the community-led initiatives had previously been developed. After this, community representatives presented their projects in detail to the audience. To explore how these initiatives could receive support and be implemented in practice, we organised roundtable sessions in which each project proponent could receive immediate, constructive feedback from government stakeholders, NGOs, funding agencies, and academics present at the workshop. To facilitate this, members of these organisations and institutions were divided into smaller clusters that rotated among the tables for each project for a set period to discuss each project's feasibility. After completing the rotations, note-takers at each table reported the contents and outcomes of their discussions to the group, emphasising possible ways to move forward with implementation. The final part of the workshop built on this activity by focusing on brainstorming additional measures or strategies needed to implement and scale up the community-led initiatives and address the challenges these projects aim to solve.

The workshop's roundtable discussions provided valuable insights into improving and implementing the community-led initiatives. It also highlighted challenges that need to be addressed and issues that may remain unresolved. Following the workshop, the project team identified four of the most pressing aspects discussed, emphasising the opportunities and necessary conditions for effective implementation.

Funding

Access to funding remains an urgent issue for many community-based projects. Community members are often unaware of specific funding

opportunities or grant schemes available to them. A key result of these engagements was that community representatives became aware of funding opportunities from UNDP and the EIF that they had not previously known about. These opportunities consist of grants ranging from N\$50 000 to N\$150 000 that can be applied for and support a range of financial needs identified by the communities, such as boreholes, gardening-related infrastructure and resources, sanitation and marketing opportunities. They are well aligned with these organisations' funding priorities. Although these organisations help with paperwork and application requirements, many project proponents still struggle to prepare grant applications due to limited English proficiency, low literacy, and lack of access to basic tools such as computers and internet connectivity. Preparing the required business and feasibility plans for initiatives such as community gardens or cultural villages is therefore often not feasible without external support. As a result, even when funding opportunities exist, they frequently remain inaccessible to intended beneficiaries.

Securing land

Regarding the establishment of the community garden and the cultural village in particular, government representatives advised that the projects should follow legal procedures to ensure land security and prevent local disputes afterwards. While the respective proponents were well aware of this issue and had already consulted with traditional authorities and the respective conservancies, it was recommended that they also involve the constituency councillors and the regional council, including submitting the application for leasehold rights through the Division of Lands in Opuwo. In addition, the gardening project in particular should obtain an environmental clearance certificate in compliance with Namibia's environmental management requirements before project implementation. To navigate these processes, applicants were advised to work through the conservancy as the formal applicant, while also engaging external experts and consultants for technical assistance. Project proponents acknowledged these steps as essential to ensure the legality and long-term security of their projects. Still, they also regarded the bureaucratic requirements and the costs of hiring consultants as difficult to shoulder.

Fencing

Regarding the rangeland restoration project, the proponents received guarantees of institutional backing from the Ministry of Agriculture, Fisheries, Water and Land Reform and the Ministry of Environment, Forestry and Tourism. This support included technical expertise, seed supplies, and collaboration with regional initiatives like the Dryland Sustainable Landscapes Impact Program, which seeks to combat further land degradation. However, a key practical challenge was identified: the need to install temporary mobile fencing to exclude livestock from areas that are being restored – an indispensable measure to allow grasses to regrow and establish. This solution is complicated by the fact that any kind of fencing is technically prohibited in communal areas, creating legal ambiguity and room for contestation that could undermine restoration efforts.

Against this background, alternative suggestions included raising awareness among land users, strengthening coordination among herders, and developing grazing plans that incorporate deferred grazing practices – though enforcement of such plans remains a considerable challenge (Coppock et al. 2022). As a last resort, proponents were encouraged to explore mobile fencing as a pragmatic interim measure, pursued through broad stakeholder engagement with communities, traditional authorities, the communal land board, the regional council, and relevant ministries. While this could make restoration efforts more effective, it would require considerable negotiation and institutional goodwill to implement, given the current restrictions on fencing in the commonages.

Rule enforcement

While the project proposal aimed at improving the enforcement of self-governing rules was the only one not strictly dependent on external funding, it proved the hardest to implement in practice. Government stakeholders noted that the existing legal framework – namely the Communal Land Reform Act 5 of 2002 and the Traditional Authorities Act 25 of 2000 – already provides sufficient provisions to implement grazing plans and enforce compliance. In this sense, the government's ability to intervene is limited, particularly given that the project proponents indicated that the management plans are already formally acknowledged by the conservancy boards and traditional authorities.

The deeper challenge is therefore not legal but social. Community members are formally entitled to report headmen to the state authorities who allocate grazing rights to individuals without prior consultation, yet in practice, this rarely happens due to strong norms of conflict avoidance and fear of retaliation. The proliferation of headmen further compounds this: some are state-recognised, others not, and many enjoy local support and compete along lines of political affiliation or loyalty to different traditional houses. Together, these dynamics result in a situation where formal rules exist on paper but are hard to implement in practice, with all participants honestly acknowledging that a quick solution to this issue is unlikely.

In summary, all projects created by community members depend, in some way, on external funding, advice, and legal assistance for initiation and, for some (i.e., the rangeland management project), for ongoing operation. Although various instruments are available to help implement these community-led initiatives more effectively and align them with current policies, they often require skills that may not be readily available within the community. They involve writing proposals and letters, as well as cumbersome bureaucratic processes that risk delaying implementation, exhausting project proponents' energy, and placing additional strain on communities with already limited socioeconomic resources. Furthermore, certain challenges – such as implementing management plans in situations where traditional leaders undermine community agreements – may remain unresolved in the near future, not because of the policy framework itself, but because of existing socio-cultural dynamics and power relations among local community members.

Consequently, while the proposed initiatives tend to focus on local, immediate issues with manageable costs, their implementation and potential scaling up to other communities reveal deeper social and structural challenges that must be addressed first. These include illiteracy, poverty, and a lack of awareness of the bureaucratic processes involved, as well as broader dynamics that community members on the ground have little power to influence – such as poor governance by some traditional authorities. Beyond these community-level constraints, current

policies and procedures also pose significant obstacles: in particular, the general prohibition on fencing, including temporary structures used for restoration purposes, significantly limits communities' efforts to restore rangelands. Alternatives to fencing, such as bush packing (Kellner et al. 2021) – i.e., harvesting branches from spinescent encroacher species to protect establishing plants on the bunds – may help address this constraint. Yet this too may require special permits for bush-thinning (MEFT 2023), which can involve a cumbersome bureaucratic process. This suggests that current frameworks – including the institutional support behind them – may need to be adapted to enable meaningful, lasting change at the local level and improve rangeland conditions.

Given these challenges, in the final part of the workshop we sought to explore with the attendees possible ways forward that could help realise community-led projects and generate broader regional impact. To do so, we asked participants two interconnected questions: What can or should be done to ensure that community projects, and more generally, the community's envisioned future presented above, are realised? What kinds of structures, partnerships, or governance mechanisms are needed to align multiple initiatives and create lasting impacts across many communities?

For this exercise, we used an interactive digital platform (Woodclap) that allowed participants to submit their answers and ideas to these questions via their phones, and the responses were displayed in real time on a large screen for collective viewing and discussion. Participants were encouraged to provide as many answers as possible.⁸ For presentation in this paper, we analysed these ideas by organising and synthesising them thematically in the following sections.

COMPLEMENTARY APPROACHES TO ADDRESS COMMUNITY CHALLENGES

Fewer barriers, skills development and innovation

Many participants emphasised the need to reduce barriers so communities can implement their own initiatives. While establishing critical infrastructure,

such as boreholes for agricultural activities, was deemed fundamental, they also stressed the need to streamline legal frameworks to secure land rights for community projects. Additionally, they advocated for the development of a dedicated legal framework for rangeland restoration that allows the implementation of temporary fencing, in particular, as part of broader restoration techniques. To improve financial access, participants proposed establishing a central agency or counterpart to help communities navigate grants and loans, as well as providing practical support for drafting and submitting funding applications. They also stressed the importance of translating and simplifying application materials into local languages, enabling communities to understand funding requirements better and clearly express their project ideas. Participants further emphasised the value of skills development, recommending financial and literacy training, horticulture and crop production education, and piloting Farmer's Field Schools (hands-on, group-based learning platforms) focused on joint rangeland management and restoration.

In this context, innovation was also seen as essential. Participants suggested thinking outside the box and developing initiatives that go beyond what already exists, particularly referring to the cultural village project, since similar initiatives are already widespread in Kunene. However, their success could be further supported by developing an online presence and adopting modern marketing approaches, as a few participants also suggested. In terms of horticulture, organising local markets to sell garden produce at the village level was proposed as a first step towards sustainability for the community gardens, as one academic pointed out. Participants also recommended forming cooperatives for crop seed production and sale, noting that the Ministry of Agriculture purchases seeds from registered groups. More broadly, they noted that operating as a cooperative increases communities' chances of benefiting from government subsidy programs.

Coordination and support

Another large group of ideas focused on enhancing coordination and support among various actors. At

⁸ The digital tool offered the option of submitting answers anonymously, which most participants chose to do.

the community level, participants emphasised the necessity for local management structures to be grounded in legal frameworks and supported by multi-stakeholder platforms that facilitate engagement across different tiers. For instance, the formation of a regional task force on rangeland management, consisting of diverse stakeholders – including affected communities – to delineate a path forward, was proposed. Moving upward, there were calls to strengthen Regional, Constituency, and Village Development Committees so that these permanent government structures can better coordinate interventions and contribute to long-term sustainability. Participants also suggested establishing sub-regional development and training nodes, supported by all line ministries, as well as a cross-ministerial governance structure – such as a sustainable land management committee – to guide future initiatives, with projects aligned with ministerial objectives and formally endorsed by the relevant line ministries to ensure their continuation beyond the project term. To avoid duplication of effort, Technical Working Groups were recommended to bring together projects with similar or overlapping objectives, so that initiatives complement rather than replicate one another. At the horizontal level, participants highlighted existing programs as valuable entry points for coordination, suggesting that communities engage with the Agricultural Development Centre in their constituency to access capacity building and agricultural implements through the NAMSIP program, and that they participate in the Government Livestock Equalisation Fund, where the creation of livestock markets could incentivise destocking and investment in rangeland improvement.

Monitoring

A third large cluster of ideas concerned monitoring and how to implement it to ensure that community initiatives succeed and endure. A key concern was the risk of losing momentum once funding ends, as communities are often insufficiently capacitated to continue independently. Participants therefore recommended that each project have a clearly defined exit strategy or have government personnel seconded to it, and that long-term partnerships and MoUs with key institutions be established to support initiatives until they are truly self-sustaining. Post-donor monitoring metrics, agreed upon by communities themselves,

were also seen as an important tool for tracking. At a broader level, participants suggested establishing a regional impact assessment centre where lessons from previous studies could be stored and consulted to reduce duplication of efforts, complemented by an in-depth review of past projects to understand what drove their success or failure. Underpinning all of this, a comprehensive database of projects and their outcomes was seen as a practical foundation for effective monitoring.

Awareness raising and dissemination

The final group of ideas concerned awareness-raising and information dissemination. Participants emphasised the need for more engagements like the one conducted, ideally with a broader range of stakeholders. They called for targeted workshops to raise awareness on land rights and training in different adaptation initiatives. Related to this, participants highlighted the importance of improving information sharing with communities about legal frameworks and available funding mechanisms, including simplifying and translating materials to make them accessible to a wider audience. Finally, participants stressed that lessons learned and best practices should be actively disseminated to trainers of trainers, ensuring that knowledge reaches communities in a meaningful way and that initiatives are genuinely implemented rather than treated as tick-box activities.

Summary

The brainstorming session generated a broad range of strategies and pathways to support the emergence and long-term sustainability of bottom-up initiatives. The time available was limited and the resulting list of ideas is likely not exhaustive and the potential for implementation of some proposed interventions or strategies remains to be defined. Nevertheless, several key factors were identified. A first set of factors addresses the immediate capacity needs of communities. This includes the development of relevant skills, as well as a reduction in institutional and bureaucratic requirements so that communities, organisations, and institutions can meet halfway. In other words, enabling conditions must be adjusted to reflect the realities on the ground, not just the standards set from above.

A second set of considerations relates to accompaniment and coordination. It is very challenging for communities to navigate the early phases of project implementation alone. Therefore, coordination among stakeholders at different levels is essential – not only to create an enabling environment but also to implement monitoring and follow-up mechanisms that ensure continuity, reinforce sustainability, and progressively build community autonomy while reducing dependence on external support. The session highlighted the importance of communication and learning. Raising awareness is critical to mobilising stakeholders and building acceptance of community-led projects. Equally important is the systematic sharing of information on project implementation – including honest accounts of what has worked, what has not, and why – so that future community initiatives and external interventions can be better designed and more impactful.

REFLECTIONS AND CONCLUSION

Facilitating the development of collaborative community-led initiatives and exploring their practical implementation were primary objectives of TIPPECC-Kunene. The core idea was the collaborative generation of application-oriented knowledge and strategies to mitigate ongoing rangeland degradation and enhance pastoral communities' resilience to climate change, culminating in the conceptualisation of the four projects described above.

The co-creation workshops clearly showed that communities are aware of their situation and its causes, and have already considered various solutions to mitigate the impacts of global change on their livelihoods. However, it was equally clear that each potential solution would require at least some financial, technical, logistical, and legal support, particularly during the start-up phase.

Reflecting on the first workshop in Opuwo, we found that the 3-Horizons framework was a useful tool for guiding participants through complex problems and generating knowledge and discussion, particularly on pathways to address the current crisis and to achieve desirable social-ecological futures – especially when combined with artworks. Art was an important methodological approach for capturing and visually demonstrating how participants perceived

their current situation, while also helping them develop a vision of the future they would want for themselves and future generations. Most importantly, it allowed participants to visualise how these futures could be achieved through concrete projects, a form of visualisation that we hope can help motivate action. Co-creating the paintings was itself an engaging exercise: participants seemed to enjoy having a say in how the drawings were produced, through a creative and critical process (e.g., telling the artist how individual huts are positioned within a traditional Ovahimba homestead and that the community garden absolutely needs a fence to prevent livestock from eating the plants). More broadly, art proved a powerful tool for generating discussion, and we learned that it is a meaningful way to produce knowledge and visualise local perceptions in ways that words alone might not have achieved.

Nevertheless, our expectation through this process was that participants would engage more fundamentally with the broader-scale implications of the co-designed research results and the prevailing social-ecological circumstances in the region – developing adaptation strategies encompassing larger geographic areas, broader impact, and longer timescales. Instead, participants gravitated towards initiatives they had already been working on, addressing local, immediate needs with a potentially more limited socio-ecological footprint and a lower likelihood of improving sustainable livelihoods. Cultural villages and community gardens, for example, already exist in various parts of northern Kunene with varying degrees of success (Horáková et al. 2023, Mpofu 2023) and projects based on comparable principles – such as sustainable communal grazing management and rangeland restoration – have been tested in the region (Pringle 2021, Coppock et al. 2022) with limited success. It is likely that participants drew on these existing initiatives as inspiration, adapting and reinterpreting them on their own terms, while remaining convinced that their own chances of success were brighter.

The limited large-scale contextual perspective in these initiatives may partly reflect the absence of government representatives and other stakeholders from the workshop. While these actors could have provided broader perspectives, we consciously chose to let communities develop

their own initiatives free from external influence – prioritising full community ownership of both the intellectual and practical dimensions of problem-solving over exposure to a wider range of possibilities.

Yet the proposed initiatives are as diagnostic as they are practical: by revealing what communities prioritise and what they lack, they also expose deeper structural challenges. This points to a more fundamental historical truth – within the prevailing post-colonial framework, communities have few alternative pathways to actively shape their future (Friedman 2011), and it is natural to build on what is known and trusted. There is, however, nothing inherently limiting about the initiatives proposed. Every process of change has to begin somewhere, and familiarity can be an appropriate foundation for ownership and commitment. Moreover, for participants, the pathways they developed for achieving their desired future might be the most realistic, desirable, and actionable. This is not a shortfall, but a strength: these pathways emerge from lived experience and locally held knowledge, rather than being imposed externally.

The follow-up workshop, in which selected community project proponents met with representatives from government, NGOs, funding agencies, and academia, highlighted both obstacles and opportunities. Community members received detailed feedback, gained a clearer understanding of formal requirements, and were exposed to potential funding sources and institutional willingness to support proposal development. Institutional representatives, in turn, gained firsthand insight into the challenges communities face. While the concrete commitments we had hoped for did not fully materialise – partly because stakeholders are bound by institutional procedures and the policy frameworks they help shape – the workshop nonetheless yielded meaningful outcomes and may yet contribute to policy changes that create a more supportive environment for local initiatives. Ideally, the funders and government representatives who attended this workshop would have been involved from the very beginning of the project's co-design, as earlier engagement could have created smoother pathways toward policy alignment and implementation. Opportunities also exist to secure funding through

established channels and to strengthen initiatives by ensuring implementation adheres to relevant regulations.

Following the workshops, it remains unclear whether the communities we worked with will carry their initiatives forward. What this process confirmed is that co-ownership of goals – achieved through co-creation and co-design of both research and solutions – is not a guarantee of success, but it is a key condition for it. Yet co-creating solutions does not necessarily redistribute the power or resources required to implement what has been co-created. Participants may be able to define problems, propose solutions, contribute labour, and commit local resources, while the authority to approve, finance, legalise, or sustain those solutions remains concentrated elsewhere. Those with the capacity to enable locally driven transitions – policy makers, government institutions, funding agencies – are therefore required to dismantle frameworks that maintain power asymmetries, impose barriers, and limit long-term engagement (Ewell et al. 2026).

In this context, we would also have liked to remain involved beyond the project's end, accompanying implementation, tracking outcomes, and understanding why initiatives succeeded or fell short, so that approaches could be refined and replicated. The lessons emerging from Ombombo and Okondjombo may well be relevant for other pastoral communities in northern Namibia facing similar social-ecological challenges, though they would need to be interpreted and adapted to each local context. This points also to a broader reflection on how research programmes are designed and funded. Fixed timeframes and limited budgets make it difficult to support the full arc of change – from knowledge generation to implementation and learning. Funding options for follow-up projects – especially for Namibian researchers – are scarce. Funding institutions would do well to consider how longer project cycles and more flexible resource allocation could better support processes that, by their nature, unfold over years rather than months – deepening both implementation and the evidence base for what works in contexts like Kunene (Ewell et al. 2026).

Regardless of how these structural challenges are addressed, our experience confirms that climate change adaptation in Kunene is a complex, long-term endeavour demanding coordinated action across multiple dimensions – from enhancing food security and diversifying incomes to restoring and sustainably managing rangelands. Urgent action is needed before the region's pastoral system reaches a tipping point, with social-ecological consequences that would be far harder and more costly to address than the initiatives developed within this project (cf. Menestrey 2026). Creating meaningful opportunities for youth participation may further strengthen the long-term sustainability of community-led adaptation and ensure its benefits extend across generations.

For community-led initiatives to have a real chance of success, mutual trust must be established and sustained through deep listening to community concerns and needs – sometimes with the aid of the creative arts – and by identifying barriers and solution to problems. Communities must be directly connected to authorities, donors, and support organisations, and meaningful progress requires significant time and commitment. One of the most compelling indicators of success is communities' willingness to invest their own resources – a commitment evident across all cases in this project. This paper illustrates potential pathways for implementing such approaches, tracing the movement from community-defined priorities into an early pre-implementation phase, and documenting the institutional, financial, legal, ecological, and governance constraints encountered along the way. Reducing these constraints, however, depends largely on those in positions of power – whether through more flexible funding mechanisms, streamlined legal and institutional pathways, or a genuine willingness to share authority – as a necessary condition for enabling change to be driven from below. In highlighting where these constraints lie, this paper aims to inform not only community-based practice but also the institutional reforms needed to support it.

ETHICS STATEMENT

All participants in our research project and workshops agreed to participate voluntarily and explicitly consented to the use of their quotes, statements, and images taken during the events for the production of this manuscript. Permission to conduct fieldwork was

obtained from Namibia's National Commission on Research, Science and Technology (permit reference RA2026/01/30/01). We also received permission from the respective conservancy boards where we worked, including local traditional authorities, in consultation with local residents. The artist who produced the artworks officially transferred ownership of the paintings to the project and gave permission to use and reproduce illustrations of the paintings and the creation process in project outputs, including this article.

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DECLARATION OF INTERESTS

The authors declare that there is no conflict of interest with respect to the authorship and/or publication of this article.

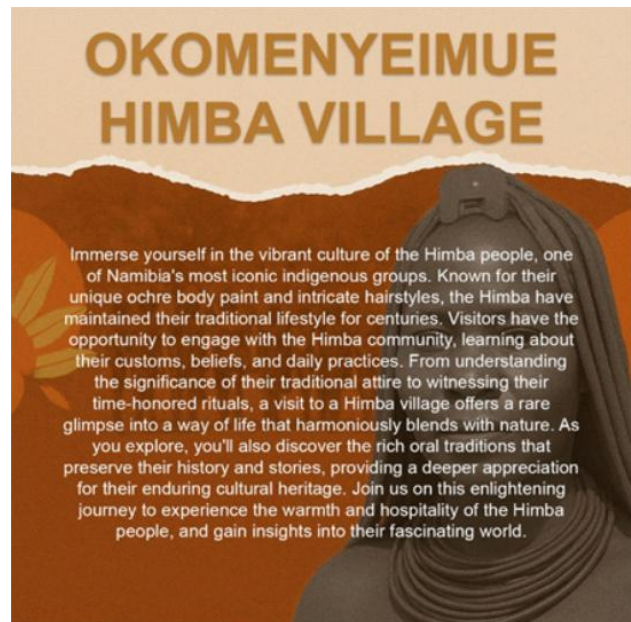
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APPENDIX 1

Flyers for the cultural village in Ombombo conservancy, including a sign to place along the road advertising the project. Illustrations used with permission from Conservancy Chairperson Erwyn Muharukua.



APPENDIX 2

Introduction of restoration bunds during TIPPECC-Kunene's implementation, including results. Photos: Theo Wassenaar.

