

1 **Local Perceptions and Community Engagement in Conservation:**
2 **Insights from Protected Areas in Guinea-Bissau**

3 **Short running title: Community Engagement in Guinea-Bissau Conservation**

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Abstract

Understanding community perceptions of conservation initiatives is critical for evaluating their effectiveness and fostering long-term local engagement in biodiversity protection. This study employed a multidimensional framework to assess how socio-economic, governance, ecological, and future-oriented factors influence community engagement across four protected areas in Guinea-Bissau: Boé, Dulombi, Cufada, and Cantanhez National Parks. We conducted semi-structured questionnaires (N = 117) across 24 villages and analysed responses using descriptive statistics and Principal Component Analyses (PCA). PCA explained 79% of variance in socio-economic patterns, revealing that project availability and perceived skills strongly predicted engagement. Participation in conservation projects ranged from 50% in Dulombi to 91% in Cufada, and perceived benefits peaked at 100% in Cufada. Ethnic diversity was greater in Cufada and Cantanhez than in the more homogeneous Boé and Dulombi, whilst gender and age showed no significant associations with engagement. Attitude changes toward conservation outside culturally or ecologically significant areas accounted for 80% of variance, with support reaching 100% in Cantanhez, 89% in Boé, and 75% in Dulombi. Communities demonstrated consistently high chimpanzee conservation awareness (86–100%), linking it to reduced hunting and recognition of ecological roles (71% variance explained). Alternative livelihood initiatives in Cufada directly reduced hunting pressure. Over 68% of respondents expressed willingness to engage in future initiatives (77% variance explained), though motivations varied. Persistent challenges included authority conflicts, limited transparency, uneven benefit distribution, human-chimpanzee conflict, and inadequate infrastructure. Conservation success in Guinea-Bissau requires inclusiveness, cultural alignment, and equitable livelihood benefits, underpinned by strengthened local governance and sustained, non-dependency-creating institutional support.

Keywords

Chimpanzee conservation; Community-based conservation; Local perceptions; Participatory management; Protected areas.

Plain language summary

Conservation efforts are more successful when local communities understand, support, and benefit from them. This study explored how people living in four protected areas in Guinea-Bissau — Boé National Park, Dulombi National Park, Cufada Lagoons Natural Park, and Cantanhez National Park — perceive and engage with conservation activities. Researchers interviewed 117 people across 24 villages to understand how livelihoods, governance, conservation awareness, and future opportunities influence participation. The results showed that communities were more likely to support conservation when projects provided clear benefits, skills, or alternative income sources. Participation and perceived benefits were especially high in Cufada. Awareness of chimpanzee conservation was consistently strong across all parks, and many respondents linked conservation to reduced hunting and protection of ecosystem health. Most participants also expressed willingness to join future conservation initiatives. However, several challenges remain, including conflicts with authorities, unequal sharing of benefits, lack of transparency, human-wildlife conflict, and limited infrastructure. The study highlights that long-term conservation success depends on inclusive decision-making, culturally appropriate approaches, fair livelihood opportunities, and stronger local governance.

1. INTRODUCTION

Conservation of biodiversity has become a pressing challenge as global ecosystems face unprecedented threats from human activities, climate change, and habitat loss (Pfenning-Butterworth et al., 2024). In Africa, these threats are particularly acute as human populations are

mostly concentrated in hotspots of diversity (Cincotta et al., 2000; Williams, 2012). Historically, many conservation initiatives used top-down strategies, establishing protected areas (PAs) that often excluded local communities from decision-making and restricted resource access (Goldman, 2003; Montgomery et al., 2020). Such exclusionary approaches created tensions between conservation authorities and local populations, especially where communities were excluded from the land and resources they had depended on for generations, increasing conflicts and diminishing conservation effectiveness (Oates, 1999; St. John et al., 2010; Temudo & Abrantes, 2013).

In contrast, community-led conservation empowers local populations by recognizing their essential role as stewards of the environment (Andrade & Rhodes, 2012; Ming'ate et al., 2014; Montgomery et al., 2020; Oldekop et al., 2016). These initiatives involve local communities in decision-making, management, and restoration protection, with better conservation outcomes often found where positive socio-economic benefits are perceived locally (Andrade & Rhodes, 2012; Oldekop et al., 2016; Pienaaah, Baruah, et al., 2024). This approach not only promotes biodiversity protection but also aligns with the broader goals of sustainable development (Bennett, 2016; Oldekop et al., 2016; Pienaaah, Baruah, et al., 2024; Pienaaah & Luginaah, 2024).

Across Africa, community-led initiatives take various forms, including community-managed conservancies, PAs, sustainable wildlife programs and ecotourism ventures (Abukari & Mwalyosi, 2018; Bauer, 2003; Fonteyn et al., 2024). Examples include Kenya's community wildlife conservancies reducing human-wildlife conflicts and generating local income (Sambu, 2025), and Kenya's forest reserves improving the livelihoods of forest-dependent households through co-management (Ming'ate et al., 2014). Likewise, Ghana's community resource management areas integrate traditional ecological knowledge into sustainable resource management and promote gender equity (Pienaaah, Baruah, et al., 2024); and Tanzania's wildlife management areas

provide community-based natural resource management, serving as vital buffer zones and wildlife corridors (Abukari & Mwalyosi, 2020).

Community-led conservation projects deliver significant socio-economic benefits, particularly in rural areas where poverty levels are high, employment opportunities are limited, and marginalised groups – women and young – are often overlooked (Oldekop et al., 2016; Pienaaah, Bipasha, et al., 2024). By creating jobs, generating income, and supporting sustainable and equitable livelihoods, such initiatives empower local communities while advancing conservation goals (Abukari & Mwalyosi, 2020; Andrade & Rhodes, 2012; Oldekop et al., 2016; Pienaaah, Bipasha, et al., 2024; Vodouhê et al., 2010). Moreover, by strengthening local capacity through environmental education and training, they promote fairness, transparency, and sustainability, ensuring that community-led initiatives are both socially inclusive and ecologically effective (Kaltenborn et al., 2008).

Although promising, community-led conservation faces challenges. Effective implementation requires strong governance, transparent management, equitable benefit-sharing, and partnerships among communities, government authorities, and NGOs (Abukari & Mwalyosi, 2020; Bennett, 2016; Cinner et al., 2012). When PAs are established, local communities are not always recognised as integral to the socio-ecological diversity that conservation aims to protect (Kaltenborn et al., 2008; O’Riordan & Stoll-Kleemann, 2002). Furthermore, depending on the level of protection defined by the IUCN management categories (IUCN, 2014), restrictions on resource use and hunting through law enforcement can generate resentment and negative responses among communities (Abukari & Mwalyosi, 2018, 2020), sometimes leading to outcomes that further degrade PAs (Leisher et al., 2013). Effective PA management must also account for complex regional socio-political contexts (Oldekop et al., 2016) to ensure equitable participation in decision-making and maintain human wellbeing as a central objective (Bennett, 2016; Marvier, 2014). Another major constraint is the heavy reliance on external funding (Kaltenborn et al., 2008)

which, despite being vital for project implementation, can also foster dependency and raise concerns about long-term sustainability (Andrade & Rhodes, 2012).

Guinea-Bissau, situated on the westernmost edge of West Africa's Upper Guinean Forests, one of the world's most culturally and ecologically rich yet threatened regions (Mittermeier et al., 2011), provides a compelling case study of both opportunities and challenges of community-led conservation. The creation of PAs coincided with shifts in land tenure systems inherited from the colonial period, when ownership authority transitioned to the state and national policies began to exert greater influence over local resource management practices (Temudo & Abrantes, 2014, 2013). To safeguard biodiversity and local livelihoods, the Institute for Biodiversity and Protected Areas (IBAP) was established in 2004. Guided by national strategies, community consultations, and partnerships, IBAP co-developed a National System of PAs encompassing eight sites that together cover ~26% of the country's territory (495,510 ha) (IBAP, 2014). All PAs include resident populations from diverse ethnic groups whose livelihoods depend on agriculture, fishing, and small-scale forestry, activities that also threaten biodiversity (IBAP, 2008, 2014; Temudo, 2009). This interdependence positions local communities as both key stakeholders and essential partners in conservation (Andrade & Rhodes, 2012).

Community-led conservation initiatives have targeted sustainable resource management, deforestation reduction, biodiversity conservation, and protection of sacred sites (BioGuinean Foundation, 2019; IBAP, 2008). Complementary projects promoting food security, climate change resilience, gender equity, and capacity building have also been central to IBAP's Strategic Plan (IBAP, 2014). Community involvement in biodiversity management is further reflected in the establishment of central oversight units and action plans (IBAP, 2025). However, PA establishment also led to human-wildlife conflicts (Casanova & Sousa, 2007; Chaves et al., 2024; Hockings et al., 2009; IBAP, 2008), resource restrictions, perceptions of inequitable benefit-sharing, and limited participation in decision-making, generating local resistance in some regions

(Temudo, 2009; Temudo & Abrantes, 2013). In certain areas, state-based land tenure frameworks weakened customary structures (i.e. “donos do chão”, traditional landowners), leading to insecurity and conflicts (Temudo & Abrantes, 2014).

In this study, we apply a socio-ecological system framework (Colding & Barthel, 2019; Manyani et al., 2024; Ostrom, 2009) to investigate how social, governance, and ecological factors influence community engagement and conservation outcomes across PAs in Guinea-Bissau. To address these interconnected dimensions, we employ a multidimensional analytical approach structured around four domains: socio-economic, governance, ecological and future-oriented.

2. MATERIALS AND METHODS

2.1 Study area

Guinea-Bissau covers 36,125 km², with ~1.9 million people, of whom 56.2% reside rurally (Aikins, 2025; INE, 2022). Women constitute 51.5% of the population and represent the group with the lowest educational levels (48.7%). Approximately 63.9% of the population lives below the international poverty line of US\$1.90 per day. The country is ethnically diverse, with the Balanta, Fulani, and Mandinka representing ~65% of the population (Temudo & Abrantes, 2014). Despite religious conversion over recent decades, many Balanta and Manjak communities maintain animist traditions, while Fulani, Nalu, Mandinka, and Susu are predominantly Muslim (Leite et al., 2024; Sousa et al., 2013). Traditionally, the Fulani are pastoralists, the Manjak and Mandinka engage in rainfed agriculture, and the Balanta specialize in floodplain rice farming (Leite et al., 2024). However, colonial intervention, and socio-political and global market dynamics have significantly influenced land-use patterns, contributing to shifting cultivation systems (Temudo, 2009), and reliance on cashew (*Anacardium occidentale*) production which plays a central role in rural livelihoods and represents > 90% of the country’s exports (KAFO, 2019).

The PAs encompass mangrove forests, wetlands, savannas and tropical forests which support a diverse fauna including the Critically Endangered western chimpanzee (*Pan troglodytes verus*) (IBAP, 2014). The Lagoas da Cufada Natural Park (hereafter Cufada) (established in 2000, covers 89,000 ha) holds Ramsar site status (IBAP, 2008, 2014) (Fig. 1), with the largest lagoon system in Guinea-Bissau. Approximately 5,187 residents from Biafada, Balanta, Fulani, and other ethnic groups live in 33 villages (Amador et al., 2015). Cantanhez National Park (established in 2011, spans 105,800 ha) represents the westernmost extent of the sub-humid West African old-growth forests (IBAP, 2014). About 23,000 people from Balanta, Nalu, Tenda, Fulani, and Susu communities live across 13 villages. The Nalu maintain strong cultural connections as traditional landowners with forest conservation traditions (Temudo, 2009). Cantanhez is also known for chimpanzee tourism (IBAP, 2014). Boé (105,370 ha) and Dulombi (160,100 ha) National Parks, established in 2017, are connected by wildlife corridors: Tchétche (49,922 ha), Cuntabane–Quebo (55,003 ha) and Salifo–Xitole (36,162 ha), with the last two connecting these parks to Cantanhez and Cufada (IBAP, 2014). Boé supports ~4,975 inhabitants across 29 villages, while Dulombi has 13,444 inhabitants in 61 villages, both dominated by Fulani communities. The landscape of these parks is characterised by savanna-woodland mosaics (Chimbo Foundation, 2024).

2.2 Data collection

Following a multidimensional analytical approach, we conducted semi-structured questionnaires between 2024 and 2025 in 24 villages across the four parks: Cufada (September–October 2024), Boé (March–April 2025), Dulombi (May–June 2025), and Cantanhez (August–September 2025) (Fig. 1). Villages were selected through stratified random sampling to ensure representation with respect to accessibility and ethnic diversity. The questionnaire combined closed-ended (binary and multiple-choice) questions to quantify community participation and

perceptions, and open-ended questions to explore motivations and contextual explanations in greater depth (Table 1, Appendix 1). Although male-headed households are common across West Africa (George et al., 2016) and some ethnic groups tend to dominate in certain areas (Amador et al., 2015; Temudo, 2012), we made deliberate efforts to include women and diverse ethnic groups by initially consulting with the community chief ('régulo').

The questionnaire was organised around four domains and respective themes (Table 1): **socio-economic domain** – capturing household composition, livelihood benefits, skill development, and employment opportunities through two themes: *demographics and household information* – identifying social and economic characteristics of participants, and *community engagement and project experiences* – exploring awareness, participation, and perceptions of existing community-led initiatives; **governance domain** – encompassing participation, management practices, and resource-use restrictions through one theme: *conservation values and attitudes* – assessing knowledge, perceptions, and community roles in biodiversity management; **ecological domain** – addressing community attitudes, perceptions, and awareness related to biodiversity and chimpanzee conservation through one theme: *chimpanzee conservation* – examining how community projects relate to chimpanzee protection and local coexistence; and **future-oriented domain** – reflecting local motivations, external support, and aspirations for new initiatives through one theme: *future priorities and development opportunities* – identifying needs, aspirations, and ideas for potential new projects. In villages where no community-led projects were reported, participants were still encouraged to share their views on chimpanzee conservation and to suggest potential future initiatives. The study focused on chimpanzees because their ecological importance and conservation status as well as cultural importance make them central to human–wildlife relationships and local perceptions (Hockings & Sousa, 2013)

A male language specialist, fluent in English, Portuguese, Creole, Fulani and Wolof conducted interviews individually and in an informal setting to ensure neutrality and privacy, and reduce peer influence (Montgomery et al., 2020). Eligible participants were ≥ 18 years old and, where possible, from different households. The purpose of the study was clearly explained, informed consent was obtained, participation was voluntary, and data was anonymized. Research was approved by the University of Derby Ethics Committee (Reference: ETH2324-4599).

2.3 Data analysis

We conducted Principal Component Analysis (PCA) to reduce dimensionality and explore patterns across domains. For each village, we calculated proportions from binary data to visualise community perceptions across parks. We also summarised quantitative data using descriptive statistics and tested variables for normality using the Shapiro-Wilk test. For each park, we used the Fisher Exact test with Bonferroni correction to examine associations between village and demographics. We applied Binary Logistic Regression to assess relationships between villages and the presence of hosts from other villages. Kruskal-Wallis tests were used to compare household sizes across villages and perceived benefits across ethnic groups. Pearson's chi-square tests evaluated relationships between projects and various outcome variables (Table 1). All analyses were conducted in R version 4.5.1 (R Development Core Team, 2025), with significance at $p < 0.05$.

We coded qualitative data from open-ended questions in NVivo version 14 using in Vivo Coding (Lumivero, 2023) (Table 1, Appendix 2). We then analysed responses by counting participant contributions to topics and present results as percentages.

3. RESULTS

3.1 Socio-economic domain

Demographics and household Information

A total of 117 questionnaires were completed in 24 villages: 33 respondents from eight villages in Boé, 30 from six in Cantanhez, 29 from eight in Dulombi and 25 from five in Cufada (Fig. 1-2, S1). Gender was balanced (55% male, 44% female, 1% other), with most participants aged 21-50 years (74%). Most identified as Fulani (68%), followed by Biafada (8%). Hosts from other villages were most frequently Fulani (34%), followed by Balanta (12%) and Boencas (10%).

Gender distribution varied by park, with 61% female participants in Boé, 88% males in Cufada and a balanced representation in Cantanhez and Dulombi but showed no significant associations with village (Boé: $p = 0.995$; Cantanhez: $p = 1.000$, Cufada: $p = 1.000$, Dulombi: $p = 0.843$). Age distribution was similar across parks, with 31-40 years most represented (30-33%). No significant age-village associations were found (Boé: $p = 0.825$; Cantanhez: $p = 0.925$, Cufada: $p = 0.061$, Dulombi: $p = 0.844$).

All respondents in Boé and Dulombi identified as Fulani (Fig. 2, S1). Cufada showed higher ethnic diversity: Biafada (36%), Fulani (36%), Manjak (16%), Balanta (4%), and Mansoanka (4%). Cantanhez also exhibited high diversity: Fulani (27%), Susu (23%), Nalu (20%), Tenda (17%) and Mandika (13%). Significant ethnicity-village associations were found in Cufada and Cantanhez ($p < 0.001$). Mean household size ranged from 9 individuals in Boé (± 4 SD) to 15 individuals in Dulombi (± 12 SD), with intermediate averages in Cantanhez (13 ± 8 SD) and Cufada (13 ± 10 SD). In Boé, 91% reported hosting others, mainly Fulani (52%) and Boencas (36%). In Cantanhez, all hosted individuals from other villages, commonly Balanta (30%), Nalu (20%), and Susu (17%). In Cufada, only 32% hosted others, primarily Biafada (8%) and Mandinka (4%). In Dulombi, all hosted individuals including Fulani (62%), Balanta (17%), and Mandinka (3%). No significant village-level associations were found (Boé: $\chi^2 = 11.49$, $df = 7$, $p = 0.112$; Cantanhez: $\chi^2 = 5.33$, $df = 5$, $p = 0.345$; Cufada: $\chi^2 = 2.51$, $df = 4$, $p = 0.456$; Dulombi: $\chi^2 = 9.53$, $df = 7$, $p = 0.268$) (Table S1).

259

260 *Community engagement and project experience*

261 PCA revealed clear socio-economic patterns, with PC1 (66%) and PC2 (13%) explaining most
262 variance. PC1, characterized by high loadings for project presence, participation, and skills
263 acquisition, indicates that projects mostly provide skills, particularly in Boé and Cantanhez (Fig.
264 3; Table 2). PC2, associated with benefits, reveals both a positive correlation between individual
265 and community-level benefits, notably in Cantanhez and Cufada, and a negative correlation with
266 job creation and project engagement.

267

268 *a) Project participation and benefits*

269 In Boé, 85% reported active initiatives (Fig. 4, S2). Among these, participation was high (82%), and
270 nearly all projects focused on conservation (97%), with a small proportion addressing wellbeing
271 (3%) (Table S2). These initiatives were supported by IBAP, the Chimbo Foundation, and other
272 partners. Despite strong participation, perceived benefits were modest: 25% identified
273 community-level advantages, with 54% reporting individual benefits. No significant correlation
274 existed between community and individual benefits ($r = 0.54$, $p = 0.759$). Reported benefits
275 included training (49%), provision of personal items (41%), awareness (7%), and funding (3%).

276 In Cantanhez, a lower percentage (43%) reported projects, but participation was relatively high
277 (85%). All were conservation-oriented, supported by IBAP, UE-Activa, and research partnerships
278 such as Wetlands International. One-third (31%) perceived community gains and 15% individual
279 gains, with significant correlation between the two ($r = 0.64$, $p < 0.05$). Benefits included
280 environmental awareness (29%), social inclusivity (29%), production activities (29%), and
281 training (13%) (Table S2).

In Cufada, 44% of respondents reported projects, but participation was widespread (91%). Projects focused on agriculture (45%), conservation (44%), and education (11%), supported by IBAP, NGO Tiniguena, and international partners. Unlike other parks, Cufada showed highest recognition of both community (91%) and individual (100%) benefits, including training (24%), awareness (20%), funding (13%), infrastructure (13%), social inclusivity (13%), production (10%), and education (7%).

In contrast, Dulombi showed the lowest engagement: only 28% reported projects but only half (50%) participated. All projects were conservation-focused, supported by IBAP alone. Only 13% perceived benefits from these projects, though there was strong correlation between benefits ($r = 1.00, p < 0.001$), but no specific examples were provided.

b) Skills development and employment opportunities

In Boé, most reported skills acquisition (82%) and job creation (68%) from community meetings and knowledge exchange (Fig. 4, S2). These were significantly correlated ($r = 0.47, p < 0.05$). Only 25% reported formal employment, though employment correlated positively with job creation perceptions ($r = 0.42, p < 0.05$).

In Cantanhez, outcomes were less pronounced: 31% reported skills acquisition but 85% job creation, with no significant correlation ($r = -0.18, p = 0.561$). Only 15% indicated direct employment, with no significant correlation ($r = -0.41, p = 0.165$).

In Cufada, skills development was prominent (82%) through training and capacity-building activities, 45% identified job creation and 27% reported employment, but no significant correlations were detected between variables (job creation and skills: $r = 0.40, p = 0.292$; job creation and employment: $r = 0.16, p = 0.684$).

In Dulombi, 50% reported new skills, mostly from awareness activities. Job creation (25%) and employment (25%) were mentioned but showed no significant relationships (job creation and skills acquisition: $r = 0.95, p = 1$; job creation and employment: $r = 0.33, p = 0.420$).

3.2 Governance domain

PC1 (48%) and PC2 (32%) explained most governance variance (Fig. 3, Table 2). Both axes were driven by project location, attitude change, and concerns (Table 3), indicating that positive attitudes and concerns are shaping the location of initiatives, particularly in Boé, Cantanhez and Cufada.

Project location and restrictions

In Boé, about one-third of projects were located in the PA (36%) and fewer in sacred forests (29%) (Fig. 4, S3). Most (71%) imposed no restrictions. Participants valued the PA for its intrinsic biodiversity (64%), protection (24%) and community benefits (12%) (Table S2). In Cantanhez, most projects (69%) were inside the PA, with 46% overlapping sacred forests. Few projects imposed restrictions (8%), but participants noted park administration controls (75%) and emphasized intrinsic values (13%) and protection needs (12%) as central motivations for support. In Cufada, all ongoing projects were in sacred forests within the PA, with 45% imposing restrictions—mainly on honey collection (33%), oil palm harvesting (33%), and charcoal production (33%). No information was shared regarding PA value. Dulombi showed least spatial integration: no projects in sacred forests or protected zones. Nonetheless, 45% of projects imposed some restrictions, though examples were not provided. Intrinsic PA value was mentioned by all participants.

329 *Community attitudes and perceived impact*

330 Across parks, 55-100% reported positive attitude changes (Fig. 4, S3), primarily through
331 environmental education and knowledge transfer (55-93%) (Table S2). Additional drivers included
332 inclusive training (25%), provision of tools (7-20%), and job creation (9%).

333

334 *Concerns and suggested improvements*

335 Concerns were widespread (69-88%) across parks (Fig. 4, S3; Table S2). Common issues
336 included lack of work tools (35%), no market access (32%), institutional conflicts (25-38%),
337 delays (12-25%), wildlife conflicts (3-25%), infrastructure deficits (15%), and insufficient training
338 (3-13%). No significant correlations existed between attitude change and concerns across parks.
339 Suggested improvements included enhanced institutional collaboration (29-76%), tool provision
340 (9-57%), increased funding (14-33%), and community collaboration (18%).

341

342 **3.3 Ecological domain**

343 PCA revealed PC1 (51%) and PC2 (20%) explaining most variance (Fig. 3, Table 2). PC1,
344 dominated by chimpanzee proximity and importance, support for chimpanzee projects and
345 chimpanzee hunting, indicates that awareness reinforces conservation relevance and reduces
346 hunting. PC2, associated with hunter participation and project–chimpanzee linkages, suggests
347 that livelihood alternatives influence protection attitudes, notably in Cufada.

348

349 *Chimpanzee conservation and importance*

350 Across parks, 86-100% reported that projects contributed positively to chimpanzee protection
351 (Fig. 4, S4), with impacts including increased awareness (24-63%), reduced hunting (14-40%),
352 reforestation (14-24%), and disturbance avoidance (6-20%) (Table S2). Participants emphasized

chimpanzee importance (40-100%) due to their role in seed dispersal (5-79%), biological similarity to humans (17-75%), pest control (4-48%), ecotourism potential (13-33%), and job creation (17%).

Population trend, distribution and hunting practices

Across parks, consensus existed that chimpanzee populations are increasing (44-100%) and approaching villages (32-100%) (Fig. 4, S4), trends that were attributed to greater awareness (86-100%) and hunting declines (14%) (Table S2). Few admitted hunting, with only Cufada reporting 32% of project participants were hunters. Most attributed hunting absence to no primate consumption (6-100%), improved awareness (68-100%), and law enforcement (32%).

Chimpanzee project support

Support for chimpanzee-focused initiatives was high (32-97%) (Fig. 4, S4), with participants citing ecotourism potential (67%), community benefits (50-57%), and income opportunities (33-50%) (Table S2) as reasons for this. In Cufada, strong correlation existed between project presence and alternative livelihoods for hunters ($r = 0.77$, $p < 0.001$).

Some reflections

In Boé, 42% of participants shared supplementary comments:

'Need support in all aspects - water, a school, market and livestock farming'.

'We need support from many NGOs that talk about animals and forests'.

'NGO shall help women with water across different villages.'

376 In Cantanhez, 50% of the respondents provided additional insights:

377 *'Help the women as they are vulnerable'*

378 *'Support the community, decentralise opportunities and focus on conservation'*

379 *'We need support in the area of conservation and environmental protection'.*

380

381 In Cufada, 36% of participants contributed additional comments:

382 *'The savings bank creates many groups that work on lots of things'*

383 *'We have a harsh life. We walk miles to get a small from agriculture; some sleep in these areas.*

384 *Lack of transport, only once per week'*

385 *'Our concerns is a problem within communities; chimpanzees almost killed young of 25 years.'*

386

387 In Dulombi, 83% of participants provided additional reflections:

388 *'We ask for support to the community (training, work tools, financing), children and women'*

389 *'We do not have activities related to conservation, but we are in process of getting there'*

390 *'We have lots of problems with governance'.*

391

392 **3.4 Future-oriented domain**

393 PC1 (50 %) and PC2 (27%) explained most of the variance (Fig. 3, Table 2). PC1, associated with
394 willingness to participate and need for new projects, indicates strong motivation for future
395 engagement, notably in Boé and Dulombi. PC2, linked to participation without compensation and

need for NGO support, suggests that intrinsic motivation and external assistance jointly shape participation, particularly in Boé and Cufada.

Perceived need for new initiatives

Most respondents (68-100%) proposed future initiatives (Fig. 4, S5), primarily environmental protection and conservation (44-80%) and wellbeing benefits (80%), with smaller proportions advocating community benefits (20-52%), and agricultural activities (4-42%) (Table S2).

Barriers to project implementation

Key barriers included institutional conflicts (29-90%), inadequate infrastructure (7-89%), limited access (11-43%), weak leadership (4-14%), lack of skills (13%), and past project failures (7%). Governance-related challenges were prominent in Dulombi and Cantanhez (Table S2).

External support for project success

In Boé, most (76%) emphasized that external assistance is essential (Fig. 4, S5) though not statistically significant ($r = -0.18$, $p = 0.319$). In Cantanhez, only 30% believed projects require NGO assistance ($r = -0.12$, $p = 0.522$). In Cufada, association was significant ($r = 0.560$, $p < 0.05$), with 40% highlighting NGO importance, though 24% expressed confidence in autonomous management. In Dulombi, 41% emphasized NGO support to be important. General assistance (57-100%), financial support (13-29%), and training (12-14%) were identified as the main needs (Table S2).

Motivation to participate in future projects

419 Most participants (68-97%) expressed willingness to participate in future projects (Fig. 4, S5),
420 driven by community and individual benefits (33-69%), improved living conditions (23-67%) and
421 need to protected nature (8%) (Table S2). Financial compensation needs varied: 85-90% in Boé,
422 Cantanhez and Dulombi emphasized financial incentives as essential, while in Cufada, 68%
423 would participate even without direct incentives, motivated by community cohesion and shared
424 progress.

425

426 *Final reflections*

427 In Boe, only 15% of participants shared additional reflections:

428 *‘Need support to obtain palm oil processing tools’.*

429 *‘We have a lot of difficulties’.*

430 *‘We need support for a school, water and a rice machine’.*

431

432 In Cantanhez, 63% participants provided some additional comments:

433 *‘We want to be part of the conservation area’*

434 *‘Come back more to the community’*

435 *‘The chimpanzees are causing damage to our bananas and lemons, but we do not receive*
436 *compensation from the park’*

437

438 In Cufada, only 18% respondents shared additional reflections:

439 *‘Everything I said is very important’*

440 *'We like living in a protected area because the animals that live in the forest are important for the*
441 *community'*

442 *'We need to leave the forest and find other places for farming'.*

443

444 In Dulombi, 79% participants provided final comments:

445 *'Help us with drinking water'*

446 *'Support to the children'*

447 *'Support with water and bridges'*

448

449 **4. DISCUSSION**

450 Community-led conservation in Guinea-Bissau reveals a fundamental pattern: widespread
451 ecological awareness and cultural support for biodiversity protection coexist with governance
452 challenges and legacy effects that undermine conservation effectiveness. Across four national
453 parks, we found consistently high recognition of conservation values—particularly regarding
454 chimpanzees (86-100% awareness) and sacred forests—yet this awareness translated into
455 sustained engagement only where projects delivered equitable benefits, respected cultural
456 authority, and maintained governance transparency. Notably, project availability alone proved
457 insufficient; Cufada, Cantanhez and Boé (82-100% participation) succeeded not merely through
458 project presence but through long-term institutional support and livelihood integration, while
459 Dulombi's limited engagement (50% participation) despite conservation projects highlights how
460 governance immaturity constrains outcomes. These patterns illustrate the importance of
461 conservation approaches that recognise local communities' roles as environmental stewards to

generate less tensions and increase effectiveness (Montgomery et al., 2020; Temudo & Abrantes, 2013), achieving better outcomes (Andrade & Rhodes, 2012; Oldekop et al., 2016).

4.1 Socio-economic domain

Demographics and household information

Our findings revealed that gender, age, and household composition did not significantly influence responses, consistent with other studies (Vodouhê et al., 2010). However, ethnicity emerged as a significant influence where multiple ethnic groups coexist, such as in Cantanhez and Cufada. Ethnicity identity shapes nature perceptions, underscoring the importance of integrating socio-cultural diversity into conservation planning (Amador et al., 2015). Fulani, Biafada and Nalu communities exhibit stronger biospheric value orientations, emphasizing wildlife's right to exist, reinforced by cultural norms that restrict wild meat consumption (Amador et al., 2015; Leite et al., 2024). By contrast, Manjak relationships with forest environments are structured primarily through a cosmological system based on kinship and reciprocity with non-human beings rather than explicit conservation norms, while Balanta display comparatively fewer cultural restrictions on wild meat consumption. Despite efforts for representative sampling, this study remains a cross-sectional case with unequal ethnic and gender representation. To gain a deeper understanding of these dynamics, future research should explicitly examine the distinct cultural roles of each ethnic group in shaping local conservation outcomes across PAs (Amador et al., 2015).

Land ownership and tenure represent important but unexplored dimensions. Traditional land rights can be undermined without community consent, leading to conflicts that compromise conservation (Temudo, 2009; Temudo & Abrantes, 2014). Furthermore, land ownership does not always guarantee access to natural resources, potentially constraining equitable participation in

conservation (Pienaaah, Bipasha, et al., 2024). For example, tensions have arisen during staff recruiting in Cantanhez when ethnic representation was prioritised over customary authority, reinforcing local perceptions that projects often overlook traditional governance systems. Future research should examine land tenure as a key factor shaping conservation legitimacy.

Community engagement and project experiences

Community engagement was consistently higher where initiatives delivered tangible skills and employment, underscoring the role of project presence and inclusiveness in shaping local participation and fostering positive perceptions of conservation (Andrade & Rhodes, 2012; Ming'ate et al., 2014; Montgomery et al., 2020; Oldekop et al., 2016). Boé exhibited the strongest involvement through long-term programmes supported by NGOs like the Chimbo Foundation (2024). In contrast, Dulombi showed the lowest engagement, likely reflecting recent establishment, the challenges of managing a large human population, and reliance solely on government support. This aligns with evidence from a meta-analysis of 55 PAs in developing countries that PA age and size influence engagement, with older PAs showing higher participation, whilst larger PAs face reduced engagement (Andrade & Rhodes, 2012). This suggests that maturity of governance systems, diversity institutional support, and spatial management constraints jointly influence the effectiveness of community participation.

Where projects align with local needs, communities demonstrate stronger ownership and sustained commitment to conservation activities (Kohler & Brondizio, 2017). Cufada respondents reported highest benefit recognition, suggesting stronger integration into local contexts. Cantanhez and Boé showed intermediate recognition, while Dulombi recorded extremely low perception. Training, awareness, and income-generation were the most acknowledged benefits, though the extent varied by implementation level. Some participants emphasised strong community cooperation as sustaining conservation motivation even without

continuous support, aligning with evidence that benefits are recognized when initiatives involve genuine collaboration among communities, government, and NGOs (Cinner et al., 2012; Vodouhê et al., 2010).

Participants in Boé and Cufada, dominated by women and men respectively, reported gaining skills more frequently than securing stable employment. This aligns with national trends where jobs are concentrated in the private sector (85.8%) and with similar access for women (92.3%) and men (80.3%), while public-sector employment remains scarce and male-dominated (17.2% vs. 5.9% for women) (INE, 2022). Beyond limited positions created by park managers and NGOs, most conservation projects in Guinea-Bissau operate under short-term funding, resulting in temporary and unequal employment. Importantly, efforts to promote gender-specific skills have been considered by IBAP, with initiatives in the Tarrafes de Cacheu National Park supporting 60 fisherwomen with skills for sustainable fishing practices, improved hygiene standards, and reduction of environmentally harmful techniques (BioGuinean Foundation, 2019). Thus, expanding gender-sensitive approaches that strengthen women's roles in conservation governance will ensure equal capacity building access, and translate skills into sustainable employment and decision-making.

4.2 Governance domain

Community-led initiatives in PAs and sacred forests—especially in Boé, Cantanhez and Cufada—were negatively associated with attitude changes, suggesting that local communities recognise the ecological significance of these areas and avoid disturbing them (Vodouhê et al., 2010). These perceptions reflect how PA boundaries are locally understood. Many community members consider areas 'inside the PA' to correspond to forest and savannah zones, while areas 'outside the PA' are associated with villages, human activities, and farmland. Consequently, when initiatives take place in village or agricultural zones that are geographically located within the PA

boundaries, local people may perceive these areas as ‘outside the PA’. Thus, moving initiatives into these areas is perceived as a result of attitude changes, with environmental education and awareness cited as key drivers. Attitudes were most positive in Cantanhez and Boé, where longer project histories strengthened trust and perceived benefits (Chimbo Foundation, 2024; Hockings & Sousa, 2013). In contrast, Cufada showed moderate attitude change due to limited livelihood gains (Amador et al., 2015), reinforcing the importance of tangible benefits (Sousa et al., 2013).

Resource restrictions were also linked to attitude changes. In Cufada, resource restrictions aiming at curbing unsustainable practices such as charcoal production and honey harvesting were generally understood, indicating awareness of their conservation purpose. However, conflicts over benefit-sharing and limited decision-making participation contributed to more ambivalent perceptions. In Cantanhez, while no project-specific restrictions were reported, participants referred to broader park-associated limitations, demonstrating awareness even without direct interventions.

Persistent concerns across PAs included uneven institutional support, limited tool access, and inadequate market opportunities. In particular, respondents in Cufada and Dulombi reported inadequate representation in land management and exclusion from decision-making. These factors align with broader evidence where livelihood constraints and institutional fragmentation diminish effectiveness, emphasizing the need for inclusive frameworks respecting community rights and knowledge (Abukari & Mwalyosi, 2020; Bauer, 2003a). Ensuring fair representation and shared authority is therefore essential for cultivating positive attitudes (Abukari & Mwalyosi, 2020; Bauer, 2003a; Cinner et al., 2012).

4.3 Ecological domain

Chimpanzee conservation awareness was consistently high, reflecting the species' strong cultural importance. Long-standing beliefs among Muslim and animist communities, including perceived ancestral links between humans and chimpanzees, underpin taboos against chimpanzee consumption (Amador et al., 2015), supporting positive attitudes and coexistence, enabling ecotourism and enhancing ecological knowledge (Hockings & Sousa, 2013; Sousa et al., 2013). These attitudes are reinforced by formal protection since Decree Law 21/80, and widespread awareness of this legislation (Sousa et al., 2013). However, reduced hunting of chimpanzees does not imply declining wild meat use generally, which remains critical for subsistence and income (Abukari & Mwalyosi, 2020; Amador et al., 2015). Cufada was the only park where former hunters participated in projects, underscoring the importance of providing viable livelihood alternatives for mitigating hunting-related threats. This is particularly noteworthy as Biafada engage in professional hunting primarily for income, while Balanta relies on wild meat mainly for protein (Amador et al., 2015).

Despite positive attitudes, persistent socio-economic constraints limit progress. Respondents reported human–wildlife conflict, insufficient agricultural tools, and inadequate access to clean water as key issues—ones already documented in Guinea-Bissau (Chaves et al., 2024). Evidence shows that credit access enhances livelihood by enabling investment in tools, and improved practices (Pienaaah, Bipasha, et al., 2024). Addressing socio-economic barriers is therefore crucial for translating positive attitudes into sustained behaviour.

Restrictive IUCN protection categories alone do not guarantee outcomes. Although all assessed PAs fall under strict classifications, communities retain seasonal resource access (Amador et al., 2015), a pattern also observed elsewhere (Horowitz, 1998; Vodouhê et al., 2010). In Guinea-Bissau, governance approaches increasingly recognise socio-cultural contexts and incorporate flexible, locally negotiated practices aligning biodiversity objectives with livelihood priorities

(IBAP, 2014), reinforced by involving communities in management roles such as park staff and village committees (Chimbo Foundation, 2024; Vodouhê et al., 2010).

4.4 Future-oriented domain

Respondents demonstrated strong interest in future conservation projects, driven by expectations of individual and community benefits. Financial incentives and tool access emerged as primary motivators, particularly in Dulombi and Boé. In Cantanhez and Cufada, participants additionally emphasised non-monetary benefits such as technical training and credit schemes. Important to highlight is that community wellbeing and intergenerational benefits were mentioned as key elements that communities gain from projects (Bauer, 2003; Vodouhê et al., 2010).

Despite broad support for projects, Cufada exhibited lower enthusiasm for new initiatives and external support, along with reduced motivation linked to income needs. This appears to reflect past experiences where projects failed to deliver sustained benefits, reducing trust in external organisations. These findings reinforce that biodiversity protection receives stronger backing when projects ensure equitable benefit-sharing, skills development, and consistent financial support (Pienaaah, Bipasha, et al., 2024). Strengthening institutional cooperation through transparent governance and participatory decision-making will be essential for maintaining community engagement and securing durable conservation outcomes across Guinea-Bissau's PAs (BioGuinean Foundation, 2019; IBAP, 2014).

5. CONCLUSIONS

This study represents the first comprehensive assessment of local perceptions of community-led conservation initiatives across all chimpanzee-inhabited PAs in Guinea-Bissau. Findings

indicate that initiatives have contributed positively to livelihoods through skill development—consistent with evidence from other African contexts (Abukari & Mwalyosi, 2020; Bauer, 2003). Observed variations in ethnic diversity, livelihood systems, and institutional maturity reflect regional and cultural differences in socio-economic conditions and governance capacity (Oldekop et al., 2016), underscoring that uniform conservation strategies are unlikely to succeed unless locally adapted. Effective PA management must therefore address both human wellbeing and conservation goals, emphasizing inclusive participation and sustainable livelihood alternatives. Furthermore, extending the investigation of community perceptions to other PAs, including wildlife corridors, would provide valuable guidance for the design and implementation of future interventions.

Environmental education emerged as a key factor. Ensuring youth access to formal education, integrating environmental curricula, and promoting informal learning and training can strengthen stewardship. Greater involvement of women and youth in decision-making within community committees, park management, and ecotourism activities is essential for equity and long-term engagement.

To minimise potential conflicts between resource-use restrictions and livelihoods, planning must balance ecological objectives with socio-economic needs through dialogue, equitable benefit-sharing, and adaptive management. Policy interventions should enhance access to financial resources, training, and markets for sustainable practices, supporting multiple Sustainable Development Goals—notably poverty reduction (SDG 1), gender equality (SDG 5), clean water (SDG 6), decent work (SDG 8), climate action (SDG 13), and biodiversity conservation (SDGs 14 and 15).

These findings highlight that conservation project success in Guinea-Bissau depends not only on the project's existence, but on encompassing inclusiveness, cultural alignment, and capacity to deliver equitable benefits. By linking biodiversity protection with tangible wellbeing outcomes,

community-led conservation can serve as a cornerstone for sustainable development and long-term ecological resilience across West African landscapes.

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AUTHORSHIP CONTRIBUTION STATEMENT

Joana S. Carvalho – Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing – original draft. **Iussuf Dias** - Data curation, Methodology, Writing – review and editing. **Mamadu Djalo** - Data curation, Methodology, Writing – review and editing. **Mark Bulling** - Data curation, Formal analysis,

657 Validation, Visualization, Writing – review and editing. **Callum Carpenter** - Investigation, Writing
658 – review and editing.

659

660 **CONFLICT OF INTEREST STATEMENT**

661 The authors declare no conflict of interest.

662

663 **DATA AVAILABILITY STATEMENT**

664 The datasets generated during this study, including anonymised questionnaire responses and
665 coded qualitative data, are available from the corresponding author upon reasonable request,
666 subject to ethical approval conditions that protect participant confidentiality and community
667 privacy.

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834

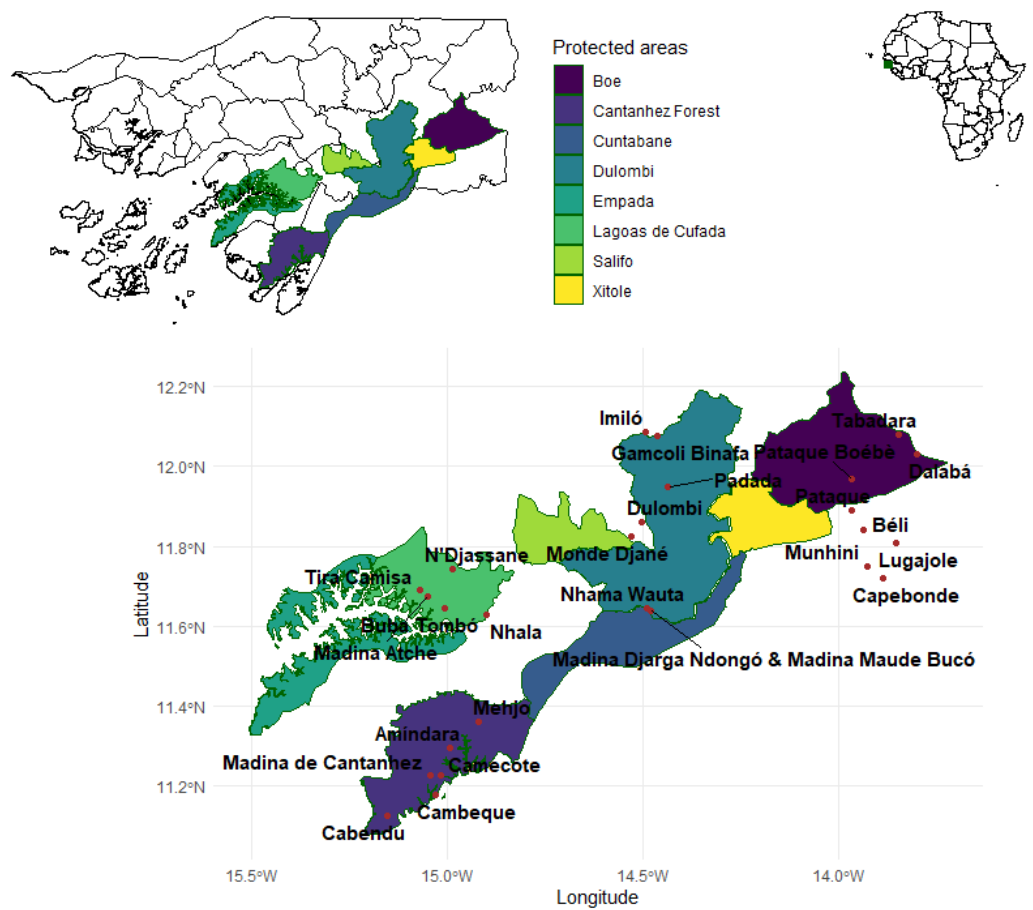


Figure 1. Location of the chimpanzee-inhabited protected areas in Guinea-Bissau and respective villages where the questionnaires were conducted.

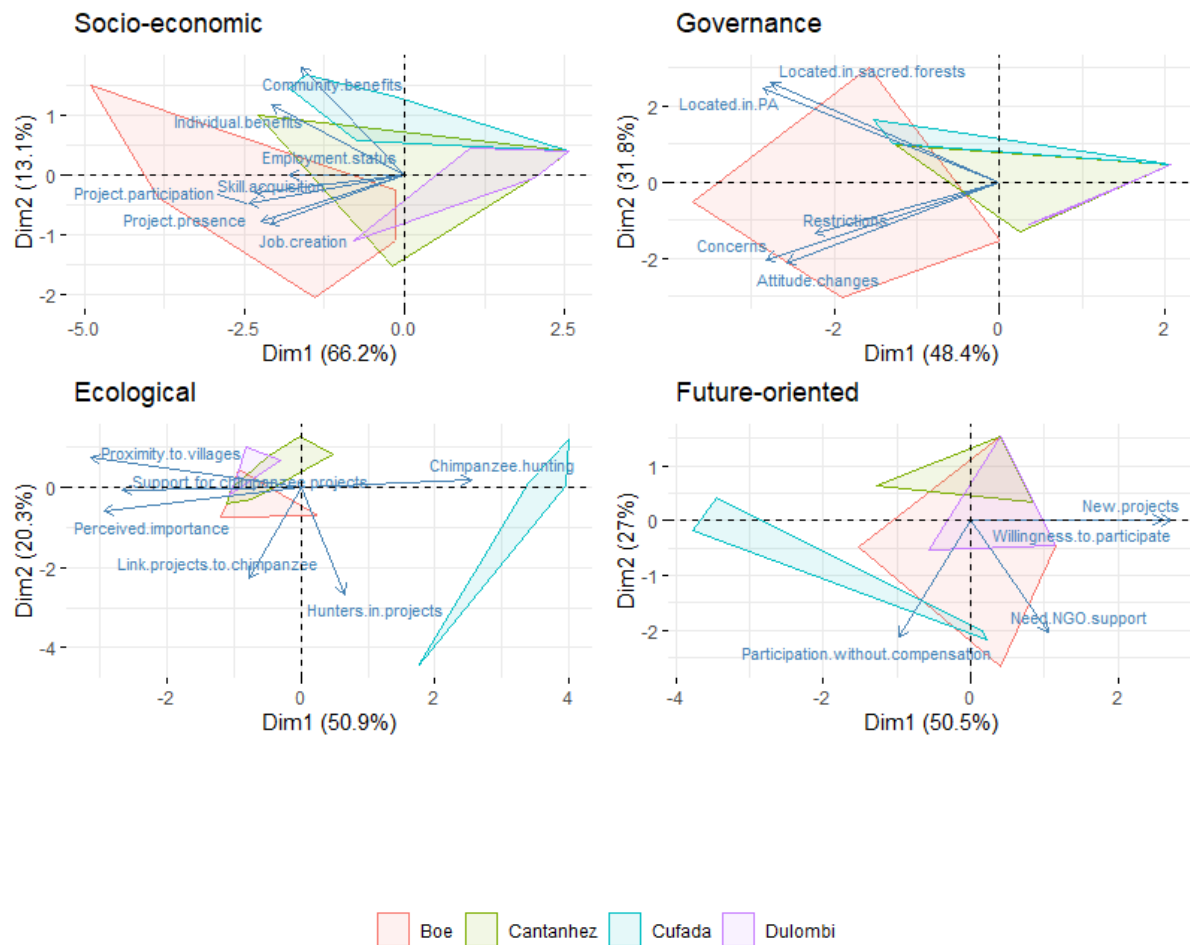
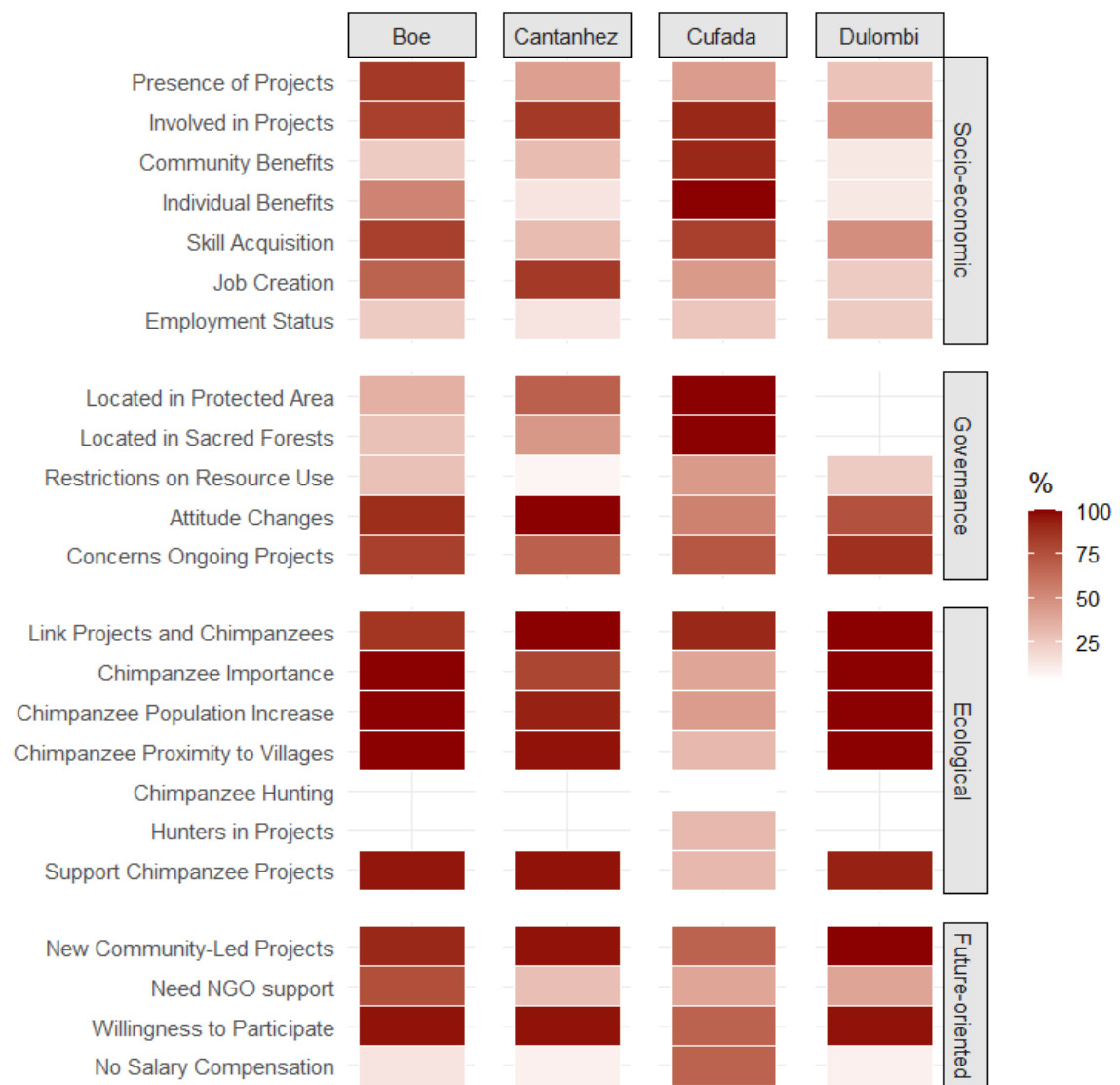


Figure 3. Principal component analysis (PCA) showing clusters of all domains and respective dimensions across parks for each theme. See Table 2 for more details.



847

848 Figure 4. Percentages showing perceptions of ongoing projects across domains and their

849 respective dimensions in the parks.

850 Table 1. Overview of the analytical domains, themes and dimensions used to assess quantitative (closed-
851 ended) and qualitative (open-ended) aspects of community perceptions, participation and attitudes
852 towards conservation initiatives. Additional details are provided in Appendix 1.

Domains	Themes	Dimensions	Closed-ended questions	Open-ended questions
Socio-economic	Demographics and household information	Village, gender, age, household size, ethnic group, hosts from other villages	Gender, age group	Village name, household size, ethnic group, host details
	Community engagement and project experience	Project participation and benefits	Presence of projects, Involved in projects, individual and community benefits	Examples of activities, list of individual and community benefits
		Skills and employment opportunities	Skill acquisition, Job creation, and Employment status	
Governance	Conservation values and attitudes	Project location and restrictions	Located in protected areas and/or sacred forests, Restrictions on resource use	Why not in a protected area? List of resource restrictions
		Community attitudes and impact	Attitude changes towards biodiversity	Examples of attitude changes
		Concerns and suggested improvements	Concerns ongoing projects	Examples of concerns, suggestions for improving benefits
Ecological	Chimpanzee conservation	Chimpanzee conservation and importance	Link projects to chimpanzee conservation, perceived importance	How projects support chimpanzee conservation, Why are chimpanzees important?
		Population trend, proximity and hunting practices	Chimpanzee population trend, proximity to villages, chimpanzee hunting and hunters in projects	Why proximity? Why noy hunting chimpanzees?
		Chimpanzee project support	Support for chimpanzee projects	Why support chimpanzee-focused projects?
Future-oriented	Future priorities and development opportunities	Potential new projects	New community-led projects	List of suggestions
		Barriers to project implementation	Barriers to project implementation	Reasons for lack of conservation projects

		External support for project success	Need for NGO support	List of NGO support needs
		Motivation to participate in future projects	Willingness to participate Participation without financial compensation	Reasons for participation, reasons for participating without financial compensation

853

854 Table 2. Principal Component Analysis (PCA) loadings for different themes and dimensions
855 across protected areas. Threshold $\geq |0.4|$ is highlighted (Hair, 1998).

Domain	Theme	Dimensions	Variables	PC1	PC2
Socio-economic	Community engagement and project experience	Project participation and benefits	Presence of community-led projects	-0.40	-0.31
			Project participation	-0.44	-0.20
			Community benefit	-0.29	0.72
			Individual benefit	-0.38	0.47
		Skills and employment opportunities	Skill acquisition	-0.42	-0.12
			Job creation	-0.38	-0.33
			Employment status	-0.32	0.00
Governance	Conservation values and attitudes	Project location and restrictions	Located in protected areas	-0.48	0.51
			Located in sacred forests	-0.46	0.54
			Restrictions on resource use	-0.38	-0.28
		Community attitudes and impact	Attitude changes towards biodiversity	-0.43	-0.44
		Concerns and suggested improvements	Concerns ongoing projects	-0.48	-0.42
Ecological	Chimpanzee conservation	Chimpanzee conservation and importance	Link projects to chimpanzee conservation	-0.13	-0.62
			Perceived importance	-0.51	-0.16
		Population trend, proximity and hunting practices	Proximity to villages	-0.55	0.20
			Chimpanzee Hunting	0.44	0.05
		Chimpanzee project support	Hunters in projects	0.11	-0.74
			Support for chimpanzee projects	-0.46	-0.02
Future-oriented	Future priorities and development opportunities	Potential new projects	New community-led projects	0.65	0.01
		External support for	Need for NGO support	0.26	-0.69

		project success			
		Motivation to participate in future projects	Willingness to participate Participation without financial compensation	0.67	0.01
			Participation without financial compensation	-0.24	-0.72

856

857

858

859 **Appendix 1. Semi-structured Questionnaires**

860

861 **SECTION A: Socio-economic domain**

862 1) What is your village?

863

864 2) What is your gender?

Male	☐
Female	☐
Other	☐

865 3) What is your age?

18-20	☐	41-50	☐
21-30	☐	51-60	☐
31-40	☐	60+	☐

866

867 4) How many members of your household?

868

869 5) What is your ethic group?

870

871 6) Are there members from other villages living with you?

872

873 **SECTION B: Governance and Ecological domains**

874 7) Is there any conservation project led by your community?

Yes ☐

No ☐ If no, go to question 22.

875 If yes, provide name(s).

876

877

878 8) Are you involved in any conservation project?

Yes ☐

No ☐

879

880 If yes, provide names.

881

882

883 9) Does the whole community benefit from the project(s)?

Yes ☐

No ☐

884 Provide reasons for your question.

885

886

887 10) Do you benefit from the project(s)?

Yes ☐

No ☐

888 If yes, how?

889

890 11) Does the project(s) offer skills to the community?

Yes ☐

No ☐

891 If yes, which?

892

893

894 12) Does the project(s) create jobs?

Yes ☐

No ☐

895

896 13) Are you employed by any project?

Yes ☐

No ☐

897

898 14) If yes, is the income enough for your livelihood?

Yes ☐

No ☐

No income ☐

899

900 15) Is the project(s) allocated inside any protected area?

Yes ☐

No ☐

901

902 If not, why?

903

904

905 16) Are there any sacred forests where the project(s) occur?

Yes ☐

No ☐

906

907

908 17) Does the project(s) prohibit the use of natural resources?

Yes ☐

No ☐

909 If yes, which?

910

911

912 18) Do you think the project(s) changed the community attitude to biodiversity
913 conservation?

Yes ☐

No ☐

914 If yes, provide examples.

915

916

917 19) Do you have any concerns about the project(s)?

Yes ☐

No ☐

918 If yes, please specify.

919

920

921 20) What could be done to make the project(s) more beneficial?

922

923

924 21) Does ongoing project(s) support the conservation of chimpanzees?

Yes ☐

No ☐

925 If yes, how?

926

927

928 22) Do you think that chimpanzees are important?

Yes ☐

No ☐

929 Why?

930

931 23) Are the number of chimpanzees increasing or decreasing in your area?

Increasing ☐

Decreasing ☐

No change ☐

No idea ☐

932

933 24) Are chimpanzees moving close to your house?

Yes ☐

No ☐

No presence of chimpanzees ☐

934

935 Why?

936

937

938 25) Do locals hunt chimpanzees?

Yes ☐

No ☐

939 If yes, for what?

940

941 26) Do you have hunters involved in the project(s)?

Yes ☐

No ☐

942

943 27) Do you think that new projects led by communities should target chimpanzee
944 conservation?

Yes ☐
No ☐

945 Provide an explanation.

946

947

948 28) Do you have any other comments?

949

950

951

952

953

SECTION C: Future-oriented domain

29) Would you like to have community-led conservation projects in your village?

Yes ☐

No ☐

If yes, suggest a few.

30) Why do you think that there is not any ongoing project?

31) Would a project need support from any conservation organisation?

Yes ☐

No ☐

If yes, give examples.

32) Would you be interested to make part of a project?

Yes ☐

No ☐

If yes, give examples.

33) Would you agree in not getting any income if involved in a project?

Yes ☐

No ☐

Why?

34) Do you have any other comments?

Appendix 2.

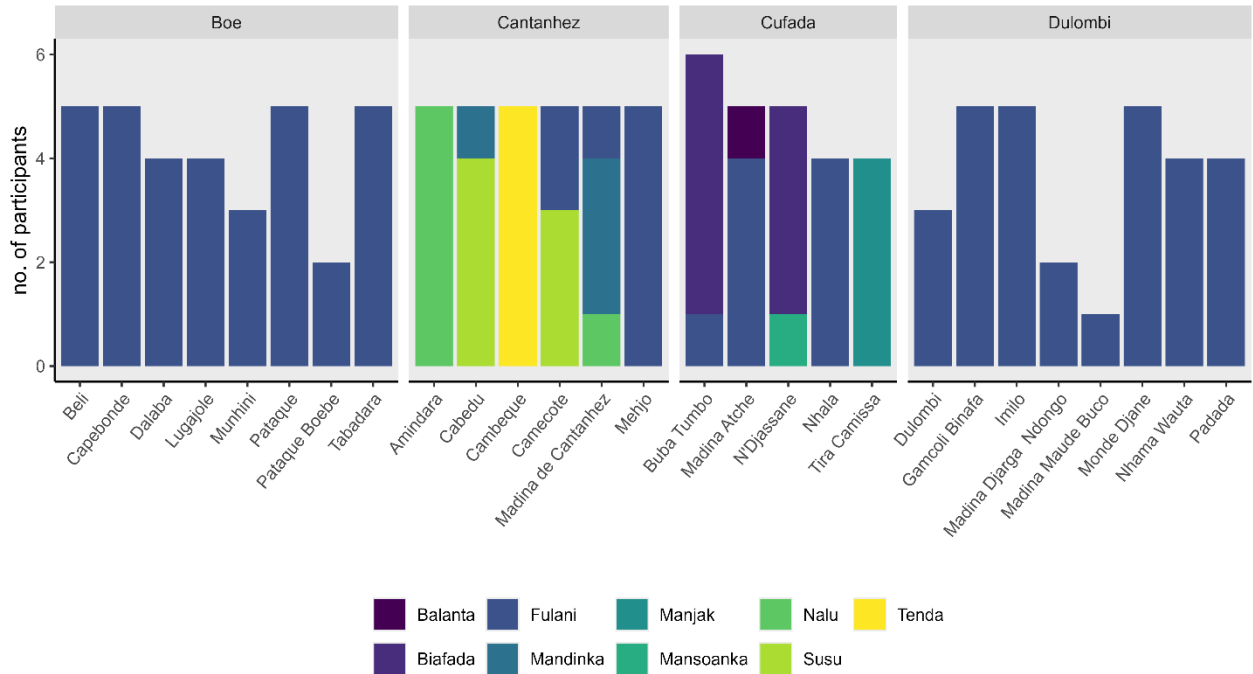
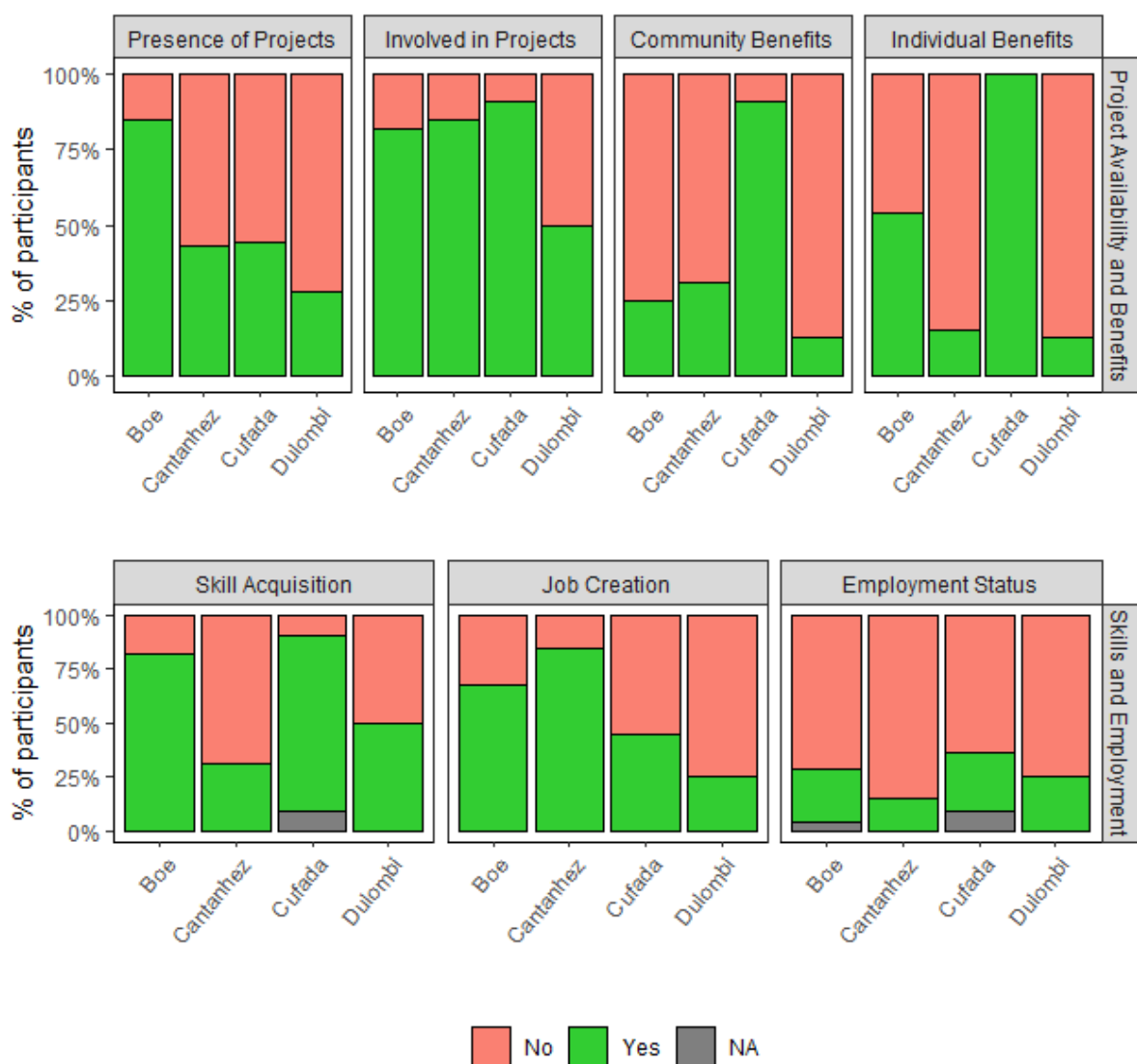


Figure S1. Number of participants by ethnic group across villages in all protected areas.



991

992 Figure S2. Perceptions of participants (%) on the socio-economic domain and respective
 993 dimensions across the parks. NA – no answer.

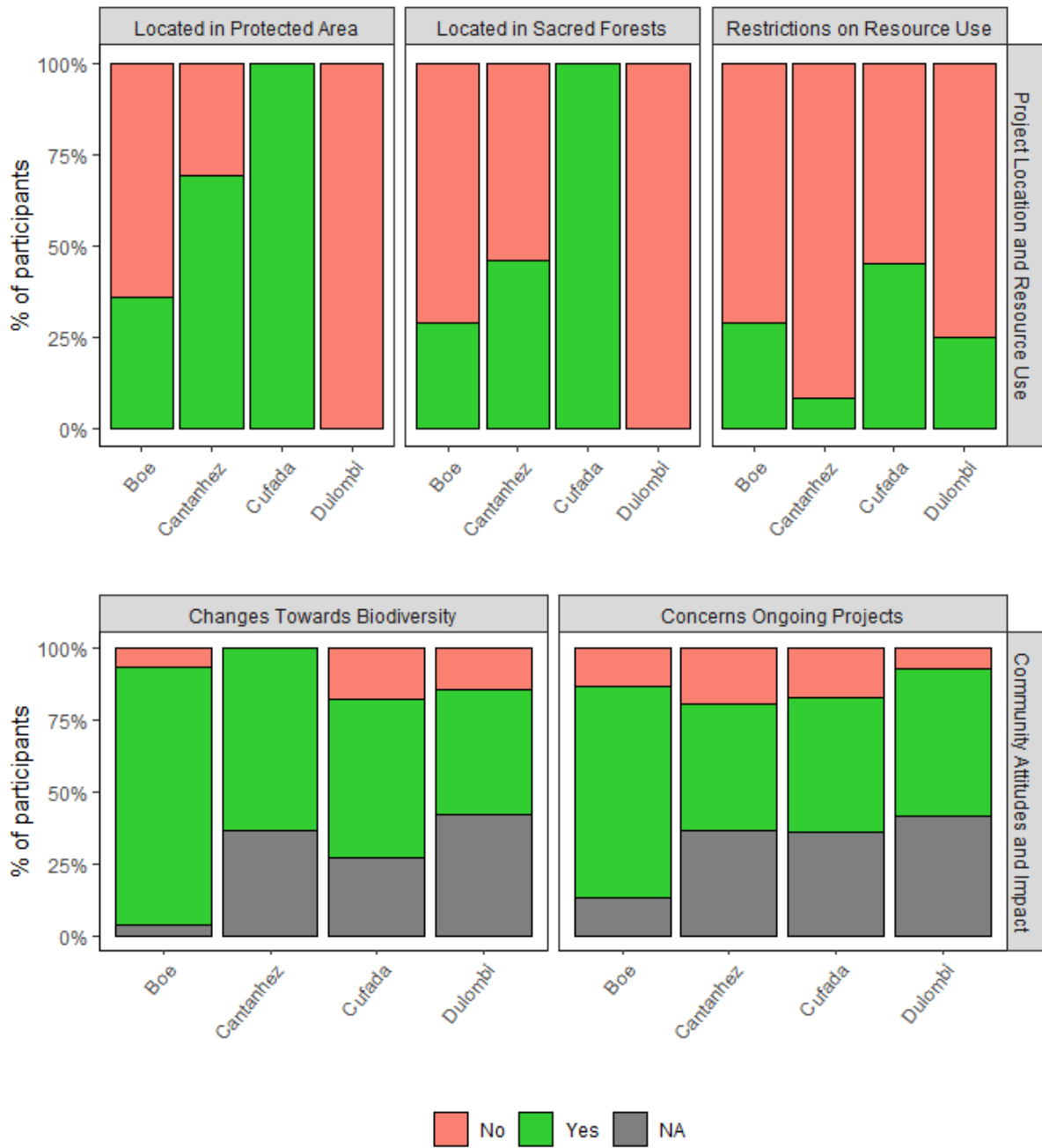
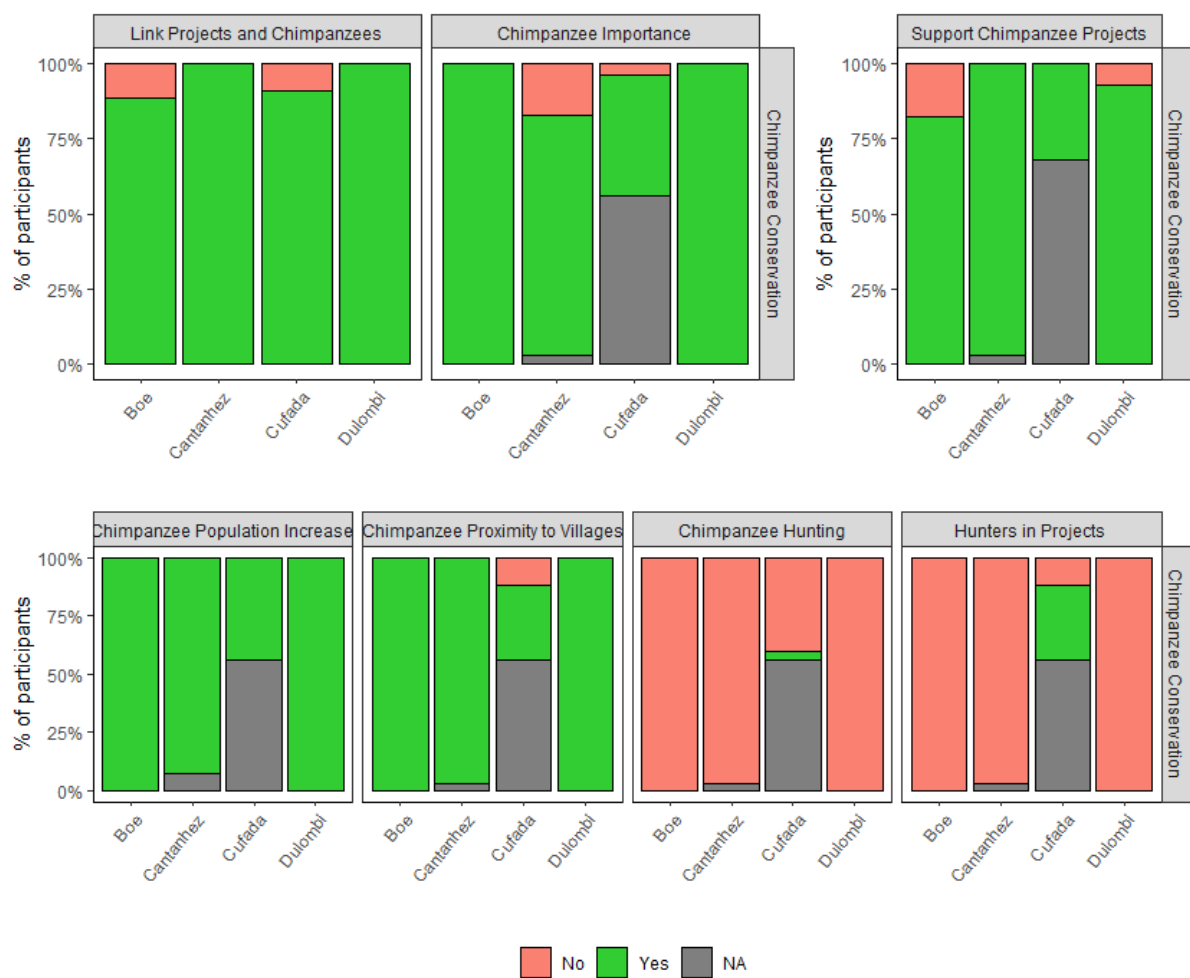
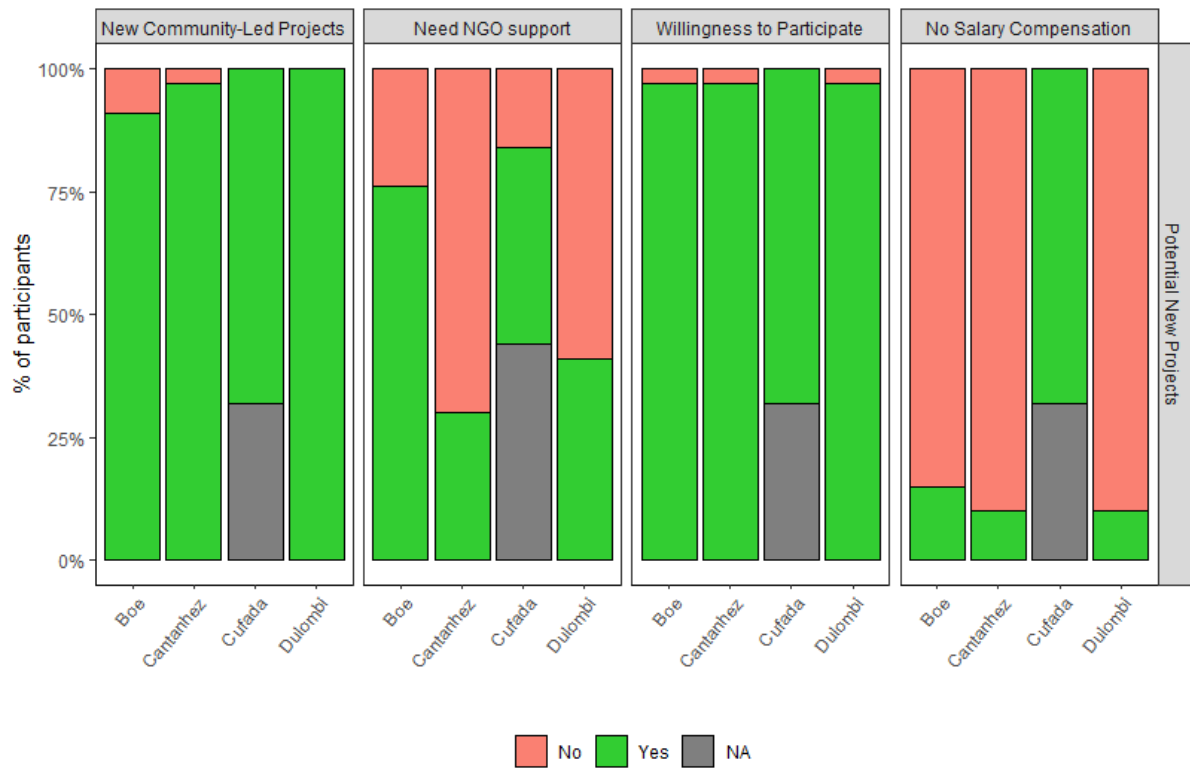


Figure S3. Perceptions of participants (%) on the governance domain and respective dimensions across the parks. NA – no answer.



998 Figure S4. Perceptions of participants (%) on the ecological domain and respective dimensions
 999 across the parks. NA – no answer.



1000

1001 Figure S5. Perceptions of participants (%) on the future-oriented domain and respective

1002 dimensions across the parks. NA – no answer.

1003

1004 Table S1. Linear regression results for villages and presence of hosts from other villages
 1005 across the protected areas.

Park	Village	Estimate	Std. Error	Chisq	p-value
Boe	Beli	2.40	1.477	4.876	0.0272
	Capebonde	3.27e-16	2.089	0.000	1.000
	Dalaba	-0.200	2.098	0.009	0.924
	Lugajole	-0.200	2.098	0.009	0.924
	Munhini	-4.344	2.114	7.000	0.008
	Pataque	-8.296e-16	2.089	0.000	1.000
	Pataque Boebe	-0.788	2.140	0.133	0.715
	Tabadara	5.154e-16	2.089	0.000	1.000
Cantanhez	Amindara	-20.57	7929.26	-0.003	0.998
	Cabedu	41.13	11213.67	0.004	0.997
	Cambeque	41.13	11213.67	0.004	0.997
	Camecote	41.13	11213.67	0.004	0.997
	Madina de Cantanhez	21.95	7929.26	0.003	0.998
	Mehjo	20.16	7929.26	0.003	0.998
Cufada	Bubatumbo	-2.319e-16	0.756	0.000	1.000
	Madina Atche	-0.588	1.092	0.293	0.588
	N'Djassane	-0.336	1.121	0.090	0.764
	Nhala	-2.197	1.671	2.321	0.128
	Tira Camisa	-0.847	1.234	0.488	0.485
Dulombi	Dulombi	-0.693	1.225	-0.566	0.571
	Gamcoli Binafa	0.288	1.528	0.188	0.851
	Imilo	21.259	7929.26	0.003	0.998
	Madina Djarga Ndongo	21.259	12537.27	0.002	0.999
	Madina Maude Buco	21.259	17730.37	0.001	0.999
	Monde Djane	21.259	7929.27	0.003	0.998
	Nhama Wauta	21.259	8865.18	0.002	0.998
	Padada	21.259	8865.18	0.002	0.998

1006

1007

1008

Table S2. Percentages of coded qualitative responses from open-ended questions across the four analytical domains for all protected areas included in the study.

Domains	Open-ended questions	Codes	Boe	Cantanhez	Cufada	Dulombi
Socio-economic	Project activities	Agriculture			45	
		Conservation	97	100	44	100
		Education			11	
		Wellbeing	3			
	Benefits	Awareness	7	29	20	
		Education			7	
		Funding	3		13	
		Infrastructure			13	
		Personal items	41			
		Production and selling		29	10	
		Social inclusivity		29	13	
		Training	49	13	24	
Governance	PA value	Benefits	12			
		Intrinsic value	64	13		100
		Protection	24	12		
		Restrictions		75		
	Attitude changes	Environmental education/knowledge transfer	91	93	55	75
		Job creation	9			
		Tool provision		7	20	
		Training			25	25
	Concerns	Food insecurity	9			
		Human-wildlife conflict	3	12	25	25
		Infrastructure deficits	15			
		Institutional conflicts		38	25	38
		Insufficient training	3		13	
		Labour shortage			12	
		Lack of tools	35			
		Lack of skills		25		25
		No market access	32			
		Project delay		25	25	12
		Weak law enforcement	3			

	Suggestions for improving benefits	Access to tools	20	24	57	9
		Awareness	6			
		Community collaboration	18			
		Funding	14		14	33
		Improve infrastructure	12			
		Increase PAs	14			
		Institutional collaboration		76	29	58
		Need labours	4			
		Training	12			
Ecological	Link to chimpanzee conservation	Awareness increase	63	24	44	50
		Less disturbance	11	6	14	20
		Reduced hunting	26	40	14	30
		Reduced resource use		6	14	
		Reforestation		24	14	
	Chimpanzee importance	Biological similarity	6	17	75	33
		Ecotourism	33		13	14
		Job creation	17			
		Pest control	27	4		48
		Seed dispersal	17	79	12	5
	Closer to villages	awareness	86	100		
		Reduced hunting	14			
	Hunting	Awareness	94	100		68
		Law enforcement				32
		No primate consumption	6		100	
	Chimpanzee project support	Community benefits		50	50	57
		Ecotourism	67			
		New income	33	50	50	43
Future-oriented	List of suggestions	conservation-focused activities	80		58	44
		Agricultural activities	20		42	4
		Community benefits		20		52
		Wellbeing benefits		80		

	Key barriers	Inadequate infrastructure	89		7	10
		Institutional conflicts		83	29	90
		Lack of skills/understanding		13		
		Limited opportunities	11		43	
		Past failures			7	
		Weak leadership		4	14	
	List of support needs	General assistance	100	75	57	80
		Funding		13	29	20
		Training		12	14	
	Motivation for participation	Benefits	69	72	33	
		Better conditions	23	28	67	
		Protect nature	8			
	Financial compensation	No direct benefits	100	85	35	91
		No indirect benefits		15	65	9

1011

1012

1013