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RESEARCH ARTICLE

Understanding preferences for nature's contributions to people between and within social actors sheds insights for inclusive conservation

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Abstract

1. Despite calls for wider inclusion of diverse actors in conservation management, researchers tend to lump actors together into one group, potentially overlooking heterogeneity within the groups themselves—in turn, hampering inclusiveness. The risk of stereotyping social actors and oversimplifying their differentiated preferences for Nature's Contributions to People (NCP) can, however, be addressed by better understanding the NCP preferences of multiple actors and within the same group, simultaneously strengthening justification for more inclusive conservation.
2. Using a sociocultural approach, we conducted 261 face-to-face surveys in the social–ecological system of Mount Kilimanjaro, Tanzania, to examine the preferences for 25 context-specific NCP of and within three groups of social actors: nature conservationists (n=50 respondents), tour guides (n=55) and tourists (n=156). We compared NCP preferences between and within the three groups and explored how socio-demographic attributes and interaction with nature drive NCP preferences.
3. We found that NCP preferences of actors in the conservation–tourism nexus were highly diverse and distinct between them. Including the voices of all actors in conservation management would ensure that conservation efforts meet the needs of multiple actors.
4. Furthermore, additional heterogeneity existed within actor groupings: the level of formal education and interaction with nature both influence NCP preferences, suggesting that broad-brushed assessments of a social actor's needs from nature can be misleading.
5. We conclude that unpacking between- and within-group NCP preferences of actors can reduce the risk of stereotyping and oversimplifying social actors in scientific results. Such a research approach also fosters more inclusive conservation

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by accounting for plural needs from nature, particularly if distinct between and within social actor groups.

KEYWORDS
human–nature interaction, methods, national park, NCP demand, stakeholder heterogeneity

1 | INTRODUCTION

> *The single story creates stereotypes, and the problem with stereotypes is not that they aren't true, but they are incomplete. They make one story become the only story.*
> (Adichie, 2009)

Inclusive conservation calls for integrating diverse social actors into conservation management to overcome approaches that focus on a limited set of needs for a limited—and often privileged—set of social actors (Jacobs et al., 2016, 2018; Tallis & Lubchenco, 2014). In turn, integrating diverse social actors usually requires categorizing them into affinity groups with the risk of overgeneralizing the needs of people and potentially undermining within-actor variations (hereafter internal heterogeneity). We interpret Adichie's (2009) statement about the danger of stereotyping, with which we open this work, as follows: By virtue of grouping actors into categories, we simplify complexity and invite single stories that are often incomplete and thus, non-representative of within-group diversity. In the field of conservation, ignoring diversity in actors and within-actor heterogeneity jeopardizes inclusiveness. Or framed with agency: Intentional acknowledgement of actor pluralism and ensuring that one understands the internal heterogeneity of groups should be strongly advocated for in inclusive conservation research and practice in order to diversify stories, complete the truthfulness of stereotypes and promote inclusiveness.

Conservation approaches that ignore social actor pluralism are prevalent in market-based conservation approaches, such as nature[1]-based tourism (e.g. Brockington et al., 2008; Honey, 2008; Nelson, 2012). Such approaches tend to assume that focusing on tourists' needs can contribute to designing measures that ensure tourist satisfaction while guaranteeing nature conservation. In doing so, conservation researchers and practitioners often override the needs of local social actors residing and working in and around the protected area (Brockington et al., 2008; Holroyd, 2016; Honey, 2008; Nelson, 2012; Sébastien, 2010). Indeed, it is rare to find the needs of protected area managers, governmental and non-governmental conservation employees and tour operators and tour guides—both local and foreign—incorporated into inclusive conservation research and practice. Although tourists, nature conservationists and tour guides might share some concerns about nature and its protection, their needs from nature and thus, their justification for its protection might differ, potentially leading to tension between conservation goals and differing social needs (García-Llorente et al., 2018; Kovács et al., 2015).

Actors' needs from nature can be revealed by assessing the 'stated interests' in or 'stated preferences' for Nature's Contributions to People (NCP) (hereafter NCP preferences), that is, which are the most important NCP for a person in a given context (Castillo-Eguskitza et al., 2018; Díaz et al., 2018; Iniesta-Arandia et al., 2014). Bidegain et al. (2019) found, for example, that nature conservationists' primary goal is to preserve regulating NCP, while Felipe-Lucia et al. (2015) showed that tourists are mainly interested in non-material NCP. While differences between actors in the nexus of nature conservation and nature-based tourism were empirically revealed (e.g. Ebner et al., 2022; Felipe-Lucia et al., 2015), scientific evidence on internal heterogeneity remains scarce (but see Tauro et al. (2018) and Sanya et al. (2025) for evidence on farmers). To our best knowledge, this is the first empirical study that explores and critically reflects on how assessing NCP preferences between and within actors could influence the outcomes of the study and subsequent implications for conservation decision-making.

NCP preferences vary between and within social actors for numerous reasons. It is necessary to disaggregate NCP preferences by socio-demographic attributes, such as the level of formal education (hereafter education), to begin understanding variations in preferences. Martín-López et al. (2012), for example, found that respondents with lower levels of education tended to prefer material NCP provided by Spanish landscapes with protected areas. Connections and scope of experiences with nature can also impact NCP preferences. Former studies discussed the link between people's disconnection with nature and NCP preferences, whereby the disconnection was usually investigated through proxies such as the rural–urban gradient. For instance, urban respondents tend to have a high preference for regulating and non-material NCP (Martín-López et al., 2012; Zoderer et al., 2019). Yet, Bashan et al. (2021) argue that indicators that capture people's connection with nature, such as how close people perceive themselves as related to nature or the time spent in nature, are to be favoured over proxies such as the rural–urban gradient. So far, it remains unclear how these two indicators, that is, subjective 'closeness with' and 'time spent in' nature, are associated with NCP preferences.

To strengthen inclusiveness in conservation research and practice, we applied a sociocultural approach to elicit between- and within-actor NCP preferences in the conservation-nature-based tourism nexus of the social–ecological system of Mount Kilimanjaro, Tanzania (hereafter Kilimanjaro). Mountains offer an excellent platform to study NCP preferences in this nexus, as they provide

[1]People differ in their understanding of and relationship with nature, depending on their worldview and knowledge system (Coscieme et al., 2020). Therefore, we use the term 'nature' in its most inclusive framing.

recreation opportunities but also many other NCP derived from conservation and livelihood efforts (Grêt-Regamey et al., 2012; Martín-López et al., 2019; Payne et al., 2020; Wamucii et al., 2021). The diversity of NCP supplied by mountains can result in competing NCP preferences between various (nexus) actors as well as within the same group, leading to divergent opinions on conservation priorities (Ebner et al., 2022). To assess and reflect on the NCP preferences expressed by social actors in this nexus, that is, nature conservationists, tour guides and tourists, we aimed to answer the following three research questions: (1) Which NCP do actors in the conservation–tourism nexus prefer?; (2) How do NCP preferences differ between actors?; and (3) Which socio-demographic attributes and type of interaction with nature drive NCP preferences between and within actors? Based on our findings, we discuss implications for inclusive conservation in landscapes with protected areas and for research by reflecting on how methodological practice can generate more 'complete' stories on actors' needs from nature.

2 | CASE STUDY: THE SOCIAL–ECOLOGICAL SYSTEM OF MOUNT KILIMANJARO

Kilimanjaro consists of the biophysical unit of Mount Kilimanjaro and its associated social actors, including nature conservationists, tour guides and tourists. The highest free-standing mountain in the world is located 300 km south of the equator in Tanzania (Figure S2.1). Across its elevational gradient, the tropical mountain harbours a broad and unique range of ecosystems, making it a biodiversity hotspot (Hemp & Hemp, 2018).

The different ecosystems foster a diverse supply of NCP that can fulfil the needs of multiple social actors. Kilimanjaro encompasses both non-protected and officially protected areas. The non-protected southern slopes of the mountain (ca. 700–1700 metres above sea level [masl]) are inhabited and cultivated as agricultural fields and Chagga home gardens. Cash crops such as coffee are grown in large-scale mono-crop fields, mainly providing the NCP food (Misana et al., 2003; Soini, 2005). The local communities residing on the southern slopes mainly belong to the Chagga tribe. They traditionally farm in multilayered biodiverse coffee–banana agroforestry systems, known as Chagga home gardens (Hemp, 2006), which supply, among others, material NCP, for example, food and energy, and non-material NCP, for example, cultural heritage and identity (Sébastien, 2010). Other parts of the mountain have also been culturally important for the Chagga (Frömming, 2009). For example, Kifunika Hills is a culturally important site which is nowadays enclosed within the borders of Kilimanjaro National Park (KINAPA); the Park ranges from approximately 1600 to 2350 masl depending on the location on the mountain to 5895 masl (Hemp et al., 2017). It primarily provides regulating NCP, including regulation of freshwater, and other non-material NCP, such as recreation (Masao et al., 2022).

The conservation history of Mount Kilimanjaro started in the early 20th century. Under the German and British colonial governments, the foothills were officially designated as a game reserve and forest reserve, with changing rules for local communities to manage and/or benefit from the half-mile forest stripe (Kivumbi & Newmark, 1991). In 1973, KINAPA was established above the forest reserve setting the stage for pursuing the dual goals of nature conservation and tourism in the region. Kilimanjaro National Park Authority (KINAPA Authority), under the mandate of Tanzania National Parks (TANAPA), began to 'sustainably conserve [the Park] (…) and optimiz[e] tourism development for human benefits' (Tanzania National Parks, n.d.). In 1977, the Park officially opened for tourists. In 2005, the forest reserve was integrated into the national park, whereby locals' access to the social buffer forest was completely banned in 2021 (personal communication with the KINAPA ecologist officer). With ca. 47,000 tourists in 2022/2023, Mount Kilimanjaro is one of the most popular nature-based tourism attractions in Tanzania, with trekking as the main tourism activity (Kilungu et al., 2019). Tourism in KINAPA plays a crucial role in the local and national economy (Tanzania National Parks, 2023). Local tourism actors, such as tour guides, sustain their livelihoods through salaries and tips (Christie et al., 2014; Peaty, 2012). The estimated income of a guide per year is US$1830, an income that is noticeably higher than the average national income (US$300 per person), making tour guiding an attractive job opportunity (Mitchell et al., 2009). Nationally, KINAPA generated US$51 million in revenue through governmental park fees in 2013 (Musa et al., 2015), the second highest revenue of any Tanzanian national park after Serengeti National Park (Christie et al., 2014). This revenue is proportionally reinvested in its conservation (Adili & Robert, 2016), while a comparatively low share benefits the local communities adjacent to the Park (Murusuri & Nderumaki, 2013). Moreover, the non-protected southern slopes attract day-trip visitors interested in waterfalls and biocultural experiences with the Chagga (Kilungu et al., 2019; Tanzania National Parks, 2023).

3 | METHODS

3.1 | Designing the survey to assess NCP preferences

We collected data using an English-speaking questionnaire implemented in ArcGIS Survey 123 (Version 3.15.165) to guide face-to-face surveys between the researcher and the respondent. To answer our research questions, we used three questionnaire sections: (1) NCP preferences, (2) interaction with nature and (3) socio-demographic attributes.

To elicit NCP preferences, we first conducted 130 semi-structured interviews with people residing on, working at or visiting Kilimanjaro to contextualize this section (interview guides in Supporting Informations S1.1–S1.3; information on interview collection and analysis in Supporting Information S2, see also Gross, Shepeleva, et al. (2025)). While former studies have used socio-cultural methods to reveal ecosystem service preferences (e.g.

García-Llorente et al., 2018; Martín-López et al., 2012; Zoderer et al., 2019), applying the context-specific perspective of the NCP framework in such a methodological approach, and with diverse actors, remains novel. Through the interviews, we identified 25 context-specific NCP, which we linked back to the generalizing NCP categories (Díaz et al., 2018) through an interwoven approach (Hill et al., 2021), except for the NCP *new and unique experiences* (Table 1). Following Díaz et al. (2018), we classified the identified NCP into regulating ($n = 10$ NCP), material ($n = 6$) and non-material ($n = 8$) NCP groups (Gross, Pearson, et al., 2025). The NCP *intergenerational benefits* cross-cut the three groups, and hence, we kept it separately (Gross, Shepeleva, et al., 2025).

Second, we designed an interactive survey section to elicit the NCP preferences in three steps: First, we asked respondents to select up to five of the 25 NCP according to the importance of these NCP to their life (e.g. Zoderer et al., 2019) (survey questionnaire and material in Supporting Information S1.4; variables obtained from the questionnaire in Table S2.2). We provided respondents with laminated sheets presenting the 25 NCP in lay language by using examples taken from the interviews and two exemplary pictures as visual assistance (Supporting Information S1.4). We created three sets of laminated sheets with NCP in a randomized order (Supporting Information S1.4). The software ArcGIS Survey 123 randomly chose the NCP set we presented to each respondent. Second, respondents ranked their five selected NCP by placing physical cards on a laminated ranking template. They could not assign the same rank to multiple NCP, even if they preferred them equally. It is, therefore, important to recognize that the ranking method forced an order. This was to ensure respondents carefully considered their choices rather than placing all NCP at the same preference level. Nevertheless, we allowed respondents to nuance their ranking in a final step: respondents specified the importance by distributing between 1 and 100 points to the NCP ranked first and then subsequently lower points to the descending ranks (hereafter NCP points). Here, we introduced the following three rules: First, respondents could not distribute the same number of points to two NCP, as we assumed that NCP could not be equally important, even if they were. However, this step allowed respondents to express a one-point difference between similarly important NCP, while increasing the difference between two ranked NCP because one is certainly more important than the other. Second, the accumulated points did not have to add up to a specific sum. The last rule allowed respondents to reorder the ranks assigned to the selected NCP and then redistribute the points accordingly, if necessary.

To study people's interaction with nature, we considered two indicators: (1) the scale of closeness to nature based on Schultz's (2002) Inclusion of Nature in Self (INS) scale and (2) the relative share of time spent in nature during the week and on the weekend. Using the INS scale, respondents indicated their perceived closeness to nature on a seven-level visual gradient (scale displayed in Supporting Information S1.4). Additionally, a final section covered socio-demographic attributes on age, gender, nationality, belonging to Kilimanjaro's local communities and level of formal education. Before collecting data, we pretested the questionnaire in iterative rounds with former tourists and students at the University of the first author and in Kilimanjaro.

3.2 | Surveying social actors

Between August and November 2022, we surveyed respondents representing nature conservationists, tour guides and tourists, who were at least 18 years old. We conducted surveys in 51 locations, including offices of respondents, our fieldwork office and hotels in Kilimanjaro (Figure S2.1).

We defined nature conservationists as officers who work for the KINAPA Authority as well as water, forest, agricultural and natural resource officers at the regional and district levels and members of environmental non-governmental organizations, community-based organizations and advisory boards, all engaged in conservation activities in Kilimanjaro. Conservation activities outside the Park comprised resolving human–wildlife conflicts, ecosystem restoration and tree planting. Tour guides consisted of both freelancing guides and tour operators who have also been working as guides, all of whom operate in Kilimanjaro. Mountain guides in Kilimanjaro usually follow a professional ladder, starting as porters, advancing to assistant guides and finally becoming full guides (personal communication with the KINAPA tourism officer and several senior guides). Guiding requires an official certificate issued after completing at least a 4-week training programme by the College of Wildlife Management, Mweka or other recognized training institutions. Guides leading tours outside the Park are usually informally trained by friends and family members (personal communication with several senior guides). Most conservationists and guides comprised members of Kilimanjaro's local communities, that is, their family history is rooted in Kilimanjaro, and they are sometimes also involved in typical livelihood activities such as farming. While guides used to be from Kilimanjaro's farming communities (Peaty, 2012), the share of guides originating from other parts of Tanzania and Kenya has increased (personal communication with several senior guides in Kilimanjaro). Tourists were predominantly international, with a small proportion of nationals. We sampled tourists only after they had experienced at least one nature-based activity in Kilimanjaro, for example, a multiple-day tour to reach the summit, a 1-day hike within the Park and hikes to waterfalls outside the Park.

It is worth noting that many respondents take on multiple roles in their lives. Hence, they could represent multiple, including non-targeted, social actors, for example, a local person who is a tour guide—sensu our definition—might also volunteer in conservation activities in Kilimanjaro. In this study, we considered the respondents' actor group as their main role which they expressed when we encountered them. To avoid reducing respondents' multiple identities to the targeted actor and instead, to account for potential variances of NCP preferences within the same group, we deliberately chose to explore the internal heterogeneity. We recognize that the methodological focus of the study led us to limit rather than

TABLE 1 Description of 25 context-specific Nature's Contributions to People (NCP) used in the survey (Gross, Von Wehrden, et al., 2025; Sanya et al., 2025) based on interviews (Gross, Shepeleva, et al., 2025; Pearson et al., 2024) and adapted from Díaz et al. (2018), and NCP linked with the generalizing NCP category sensu Díaz et al. (2018), using an interwoven approach (Hill et al., 2021).

Context-specific NCP		Generalizing NCP
Regulating NCP		
	*Habitat creation and maintenance* refer to nature's processes and conditions to form a place for people and non-human organisms to live and thrive and to continue providing such.	1. Habitat creation and maintenance
	*Pollination* refers to animals' contribution of distributing pollen among flowers.	2. Pollination and dispersal of seeds and other propagules
	*Dispersal of seeds* refers to animals' contribution to moving seeds.	
	*Regulation of air quality* refers to nature's processes of purifying air to improve its quality for people.	3. Regulation of air quality
	*Regulation of climate* refers to nature's regulation of atmospheric conditions, including effects on greenhouse gases and temperature, carbon sequestration and storage and pleasant weather conditions.	4. Regulation of climate
	*Regulation of freshwater quantity* refers to nature's hydrological processes to regulate the water flow and function as a source of water for various people-related purposes, such as irrigation and water for domestic use.	6. Regulation of freshwater quantity, location and timing
	*Regulation of freshwater quality* refers to nature's processes of purifying water to improve its quality for people.	7. Regulation of freshwater and coastal water quality
	*Regulation of soil fertility and protection of soils* refers to nature's processes to create and maintain soils and soil fertility, and to prevent soil erosion.	8. Formation, protection and decontamination of soils and sediments
	*Regulation of hazards and extreme events* refers to nature's processes to prevent people and their infrastructure from damage caused by, for example, strong winds and storms.	9. Regulation of hazards and extreme events
	*Regulation of detrimental species* refers to the controlling effects derived from organisms and abiotic conditions on organisms that are pests or transmit diseases, e.g. the temperature limits the spatial coverage of anopheles mosquitos that can transmit the Malaria disease.	10. Regulation of detrimental organisms and biological processes
Material NCP		
	*Energy* refers to the production of timber-based fuels such as firewood and hydropower.	11. Energy
	*Food* refers to the production of food and beverages derived from wild, managed, or domesticated organisms such as maize, banana, coffee, milk and meat.	12. Food and feed
	*Feed* refers to the production of forage and fodder for domesticated animals such as grasses.	
	*Building materials* refer to producing materials derived from nature to construct buildings such as timber.	13. Materials, companionship and labour
	*Materials for domestic use* refer to producing materials derived from nature to make furniture, everyday objects, tools, aids and accessories.	
	*Medicine* refers to the collection and production of materials derived from non-human organisms used for medicinal purposes such as insects and herbs.	14. Medicinal, biochemical and genetic resources
Non-material NCP		
	*Learning* refers to the different levels of learning that can be experienced by and through nature, from education on different species to gaining new profound insights, which can influence one's outlook on life.	15. Learning and inspiration
	*Aesthetic enjoyment* refers to the pure enjoyment of the aesthetic appearance and beauty of nature.	
	*Recreation* refers to the provision of opportunities for physical, including recreational and touristic, activities in nature.	16. Physical and psychological experiences
	*Therapeutic and restorative benefits* refer to nature's opportunities for therapeutic and restorative benefits such as healing, stress-relief and relaxation.	
	*New and unique experiences* refer to the provision by nature of new and unique opportunities for the human experience.	*Context-specific NCP that cannot be linked*

(Continues)

TABLE 1 (Continued)

Context-specific NCP		Generalizing NCP
	Connectedness with nature refers to the opportunities for people to develop or deepen a feeling of being part of and immersed in nature.	
	Cultural heritage and identity refer to the opportunities in which nature and cultural rootedness, traditions, historical incidences and people's identification blend, e.g. a whole country identifies with a natural entity.	17. Supporting identities
	Social cohesion and bonding refer to the basis of nature for people to develop new connections or nurture their existing relationships with other people.	
Cross-cutting NCP		
	Intergenerational benefits refer to maintaining the existence of nature for future generations to experience.	18. Maintenance of options

Icon design credit: Jelke Meyer.

expand the diversity of actors included in our sample. As such, we have maintained our understanding of variations in NCP preferences within a limited set of social actors and intentionally avoided trying to capture a complete representation of all actors in Kilimanjaro. We fully acknowledge that there are many other actors residing and working in the study area, such as smallholder farmers, business owners and non-tourist-related employees and that their views were not included for this study. The NCP preferences of smallholder farmers were studied separately within the Kili-SES research project (https://kili-ses.de/) and have been reported in Gross, Von Wehrden, et al. (2025) and Sanya et al. (2025) on smallholders' internal heterogeneity.

To determine the sample size for each social actor, we consulted the natural resource officer from Moshi municipality, district officers involved in nature conservation and the KINAPA tourism officer. Then, we estimated a representative sample size of respondents at a confidence level ranging from 90% to 98% with a margin error of 10% (Table S2.4). The final sample size was 261 respondents: 50 nature conservationists, 55 tour guides and 156 tourists.

We identified respondents through (1) contacting governmental, regional and district officers; (2) searching the web for conservationists and guides; (3) approaching guides and tourists, for example, at the gates, in their offices or during nature-based activities; (4) contacting conservationists and guides who were previous interviewees; and (5) snowballing, that is, asking the respondent for prospective respondents upon completion of the survey.

The surveys lasted between 30 and 115 min ($\bar{x}$ = 46 min; SD = 18). However, the duration of responding to the three sections we used was shorter, as the survey was a joint effort among several researchers of the Kili-SES project. We opted for a joint questionnaire to minimize respondent fatigue. To succeed in the sampling process, we relied on a team composed of a postdoctoral researcher, Ph.D. students and research assistants who participated in survey training over 6 days (Supporting Information S3). To account for potential language barriers and cultural values, Tanzanian field assistants mainly surveyed respondents based in Kilimanjaro, while international researchers surveyed foreign respondents.

3.3 | Implementing ethical requirements

Before data collection, the Ethics Committee at the university of the first author (EB-Antrag_202104-07-Martin-Lopez_KiliSES; EB-Antrag_202109-12-Martin-Lopez_KiliSES-02; EB-Antrag_202111-17-Martin-Lopez_KiliSES-03; EB-Antrag_202206-11-Martin-Lopez_KiliSES 02) approved both the interview and survey based on ethics applications including the interview guides and questionnaire. Respective Tanzanian institutions, including Tanzania Commission for Science and Technology (COSTECH; 2021-225-NA-2021-09; 2022-308-NA-2021-09), Tanzanian Wildlife Research Institute (TAWIRI) and TANAPA granted research permits. As is required protocol for undertaking research in Tanzania, executive commissioners at regional and district levels as well as tour guides, tour operators or tour agents provided written or oral permission.

We explained the goals of the survey to respondents and their rights as research participants (written explanation in Supporting Information S4.1 and consent form in S4.2). We collected data pseudo-anonymously. We granted respondents the right to withdraw their data before data analysis by emailing the first author and stating their ID. Furthermore, they could request a summary of the results in laypeople's terms. For all respondents, we obtained written consent.

Another ethical issue—in the context of any scientific work—concerns the researchers' positionality (first author's positionality statement in Supporting Information S4.3).

3.4 | Quantitatively analysing NCP preferences

For all analyses, we used the NCP points (Step 3 in the interactive survey section explained in Section 3.1; dataset: Gross, Pearson, et al., 2025) to represent NCP preferences. First, we conducted descriptive statistical analyses of the relative share of NCP preferences by all respondents and each social actor. Second, because the Shapiro–Wilk normality test did not indicate a normal distribution, we used the non-parametric Kruskal–Wallis test for each NCP to unravel differences in preferences between actors. When the Kruskal–Wallis test achieved at least 95% significance—*p*

values were adjusted for multiple testing based on the Holm method, we applied Dunn's pairwise comparison tests with Bonferroni adjustment to detect the differences between the three actors ($p < 0.01$). We used the *stats* (R Core Team, 2013) and *FSA* packages (Dinno, 2017; Ogle et al., 2022) in RStudio Version 1.4 (RStudio Team, 2021). Finally, we performed predictive canonical correspondence analyses (partial least squares extension; hereafter merely CCA-PLS; ter Braak & Schaffers, 2004) in XLSTAT Version 2020.3.1 (Addinsoft, 2020) to assess the strength of socio-demographic attributes and variables representing people's interaction with nature in predicting NCP preferences. We ran one CCA-PLS for all respondents to compare between the actors and one CCA-PLS for each social actor to reveal their internal heterogeneity. We conducted permutation tests (1000 iterations) and chose significant models ($p < 0.05$; CCA-PLS for all respondents $p < 0.0001$; nature conservationist $p = 0.043$; tour guides $p = 0.021$; tourists $p = 0.013$) for final interpretation. To counteract potential biases of variables with low frequencies in the analyses, we removed the variable diverse gender ($n = 1$ respondent). Additionally, we excluded NCP that were <5% chosen by all respondents and tourists and increased the exclusion threshold to <10% for conservationists and guides due to their comparatively smaller sample sizes (excluded NCP in Table S2.5). We visualized the CCA-PLS results in biplots. We applied a log $(x + 1)$ transformation for the variables NCP points and age in Kruskal–Wallis tests and CCA-PLS.

4 | RESULTS

4.1 | Sample characteristics

The sample consisted of 261 respondents, whose age ranged from 18 to 81 years ($\bar{x} = 36.5$ years; SD = 12), predominantly men (67% of respondents) (full summary of sample characteristics in Table S5.1). Most nature conservationists (94%) and tour guides (98%) were Tanzanian citizens. Almost every second conservationist (42%) and more than half of the guides (62%) belonged to Kilimanjaro's local communities. The tourist sample consisted of citizens from all regions of the world, with the majority from Europe and Central Asia (65%) and the Americas (22%), followed by Africa (7%) and Asia and the Pacific (6%). Formal education varied: guides mainly received school education and vocational training, whereas most conservationists (82%) and tourists (76%) completed academic degrees. Almost every respondent (95%) visited the Park. 74% of the respondents had additionally visited at least one other protected area in the world within the past year. Most tourists (82%) visited Kilimanjaro for the first time, and 93% of tourists hiked to the top of Mount Kilimanjaro or attempted to do so.

Regarding the respondents' interaction with nature, conservationists and guides felt closer to nature (median = 6 on a scale from lowest [1] to highest [7] closeness to nature) than tourists (median = 4.5). Guides spent the most time in nature during the week ($\bar{x} = 67.5\%$ of their time, SD = 23.8) and on the weekend ($\bar{x} = 65.8\%$, SD = 25.8), followed by conservationists and tourists (Table S5.1). While conservationists also spent more time in nature during the week ($\bar{x} = 57.8\%$, SD = 29.1) than on the weekend ($\bar{x} = 43.0\%$, SD = 30.7), the opposite pattern was visible for tourists (week: $\bar{x} = 26.8\%$, SD = 22.5; weekend: $\bar{x} = 45.8\%$, SD = 22.2).

4.2 | Which social actor prefers which NCP?

The respondents preferred all 25 NCP, with different levels of preference. They gave the highest preference to *food*, *regulation of freshwater quality* and *air quality*, whereas minor preference to *regulation of detrimental species*, *materials for domestic use* and *dispersal of seeds* (Figure S5.1). We detected significant differences in the preferences for 12 of 25 NCP between the social actors (Figure 1; Table S5.2).

Nature conservationists and tour guides expressed higher preferences for four regulating NCP—*regulation of air quality*, *freshwater quantity and quality*, *soil fertility and protection of soils*—and three material NCP—*food*, *feed* and *building materials*. Tourists expressed higher preferences for four non-material NCP—*aesthetic enjoyment*, *therapeutic and restorative benefits*, *new and unique experiences* and *connectedness with nature*. Furthermore, conservationists preferred *energy* more than guides and tourists (Figure 1; Table S5.2). In contrast, they expressed higher preferences for *social cohesion and bonding* (Figure 1; Table S5.2).

4.3 | What drives between- and within-social actor NCP preferences?

The CCA-PLS revealed effects of different variables associated with socio-demographic attributes and interaction with nature on NCP preferences (Figure 2; Table S5.3). Across all CCA-PLS, we found that age, gender and visiting another protected area did not explain NCP preferences. In contrast, variables related to formal education and interaction with nature were pivotal.

For all respondents, the first axis of the CCA-PLS (89.7% of the explained variance) distinguished two groups of respondents (Figure 2a; Table S5.3a). Positive scores of the first axis represented preferences for a mix of regulating—*pollination*, *regulation of air quality*, *freshwater quantity* and *quality*, *soil fertility and protection of soils*—and material NCP—*energy*, *food*, *feed*, *building materials* and *medicine*. These preferences were explained by feeling very close to nature, spending much time in nature during the week and being from the Global South. *Regulation of climate* and *detrimental species*, *learning*, *aesthetic enjoyment*, *recreation*, *therapeutic and restorative benefits*, *new and unique experiences*, *connectedness with nature* and *social cohesion and bonding* were represented in the negative scores. These NCP preferences, in turn, were explained by the respondents' origin in the Global North and the social actor tourists. The positive scores of the second axis (10.3%) revealed

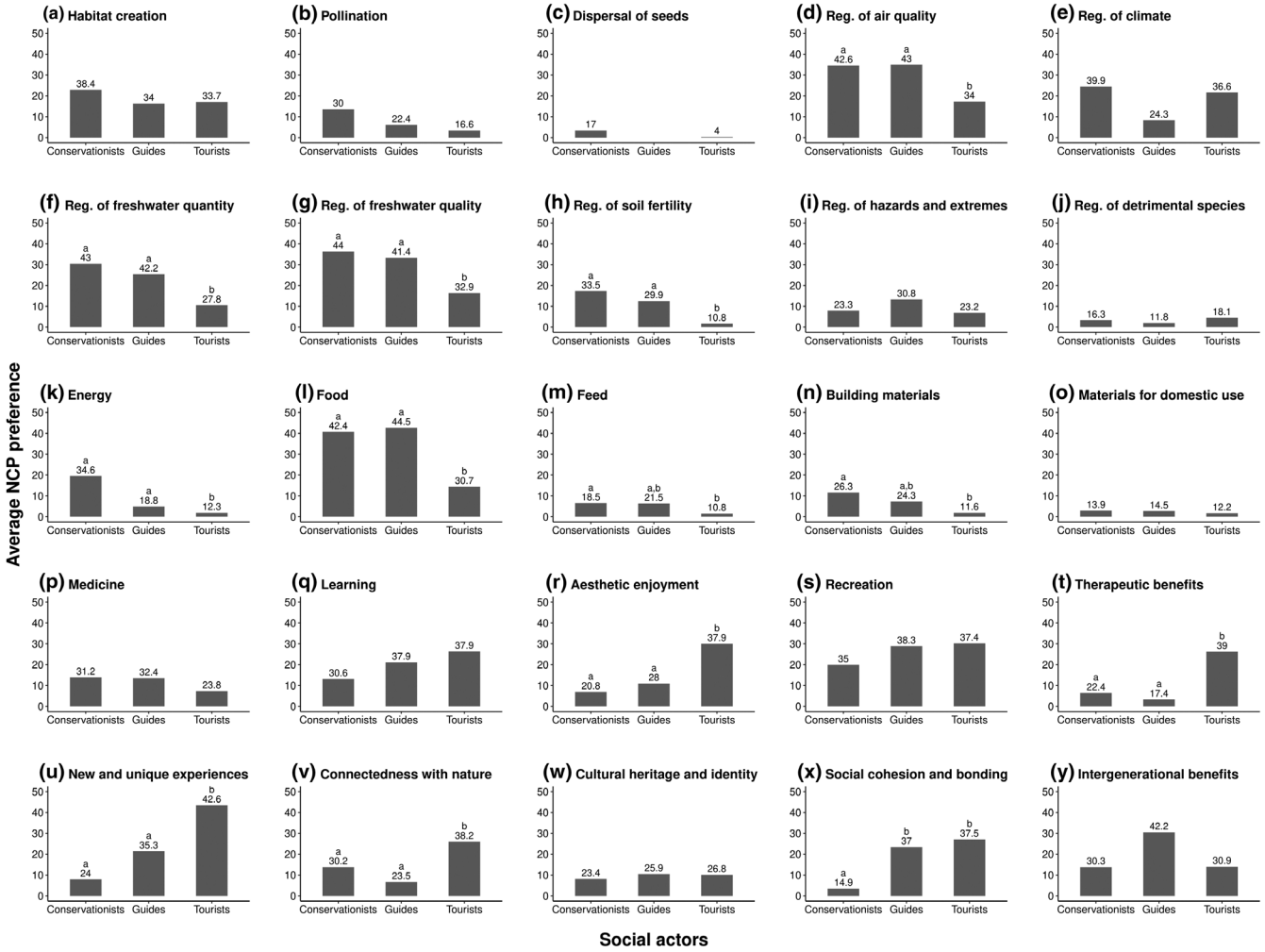

FIGURE 1 Bar plots representing the mean value of Nature's Contributions to People (NCP) preferences—the number above the bar indicates the standard deviation—for each social actor, and statistical differences for (a)–(y) each NCP between the actors based on the Kruskal–Wallis test (df = 2; significance level of $p < 0.05$) (summary of test results in Table S5.2). Bar plots with different letters (a or b) indicate significant differences based on the Dunn test with Bonferroni correction ($p < 0.01$). Description of NCP in Table 1. *Habitat creation*, habitat creation and maintenance; *Reg. of hazards and extremes*, regulation of hazards and extreme events; *Reg. of soil fertility*, regulation of soil fertility and protection of soils; *Reg.*, regulation; *Therapeutic benefits*, therapeutic and restorative benefits.

that highly educated respondents were associated with the preferences for *cultural heritage and identity*. In contrast, the negative scores showed that those who felt very close to and spent much time in nature were more likely to prefer *habitat creation and maintenance*.

For nature conservationists, the first axis (61.7%) captured a gradient between those conservationists who spent more time in nature during the week versus during the weekend (Figure 2b; Table S5.3b). In positive scores, conservationists who spent much time in nature during the week expressed preferences for *pollination*, *regulation of air quality*, *medicine*, *learning* and *intergenerational benefits*. In negative scores, conservationists with graduate degrees or higher who are in nature on the weekend were associated with preferences for *habitat creation and maintenance*, *regulation of climate*, *freshwater quantity*, *learning* and *cultural heritage and identity*. The negative scores of axis 2 (38.3%) represented those conservationists who felt extremely close to nature and spent much time in nature and preferred *recreation* and *connectedness with nature*. In contrast, those who felt moderately close to nature and spent less time in nature expressed preferences for *regulation of soil fertility and protection of soils*, *regulation of hazards and extreme events*, *energy*, *feed* and *building materials* (positive scores of axis 2).

Regarding tour guides, we found that only those with undergraduate degrees preferred *regulation of freshwater quantity*, *soil fertility and protection of soils*, *aesthetic enjoyment*, *cultural heritage and identity* and *social cohesion and bonding* (positive scores of axis 1; 65.6%) (Figure 2c; Table S5.3c). By contrast, less educated guides, that is, mainly with school diplomas and vocational training, preferred diverse NCP, that is, *regulation of freshwater quality*, *food*, *medicine*, *new and unique experiences* and *intergenerational benefits* (negative scores). The second axis (34.4%) captured a gradient between non-material and regulating NCP, which can be explained by the level of interaction with nature. Guides who felt moderately close to nature and spent little time in nature during

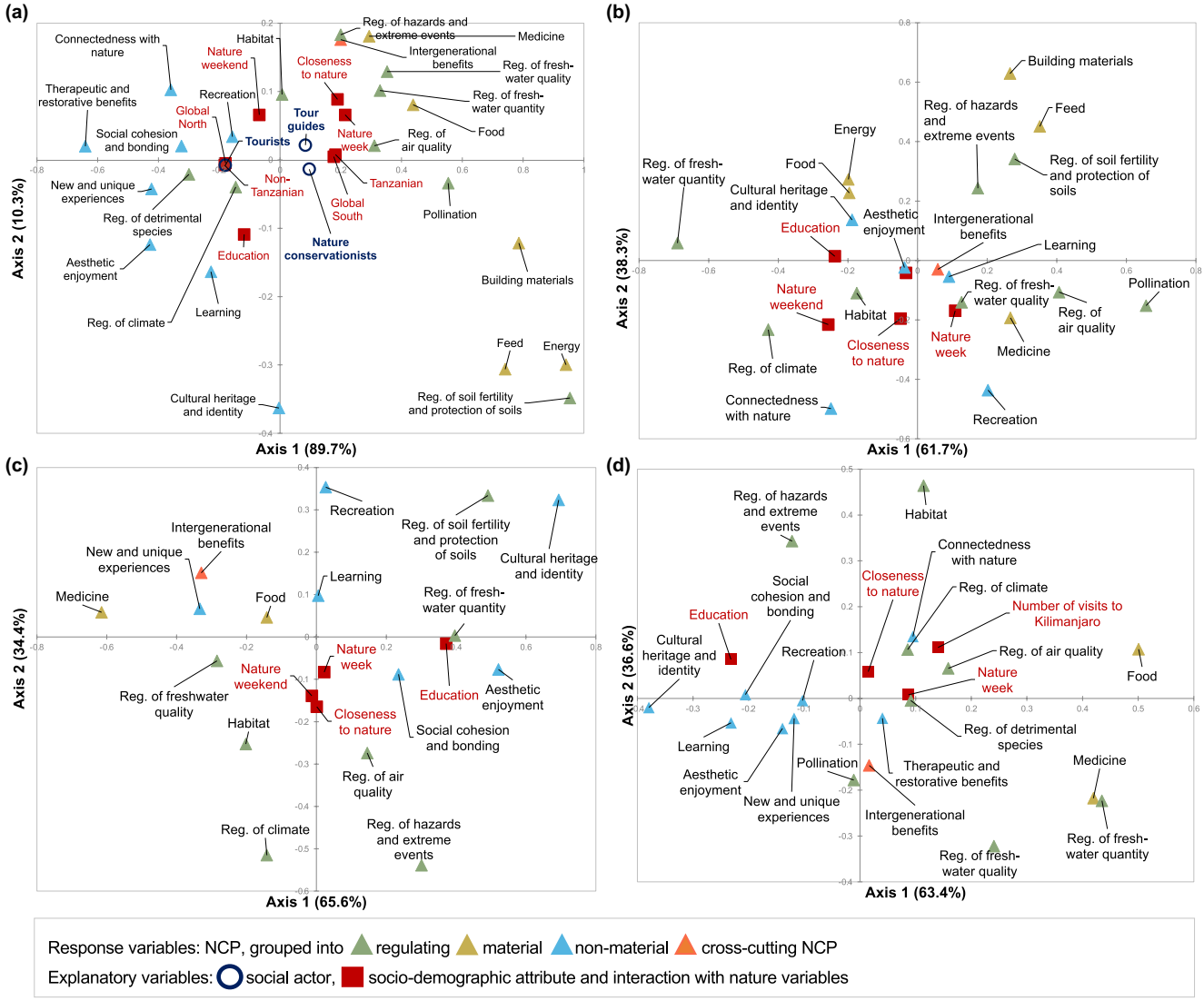

FIGURE 2 Biplots of the first two axes of the predictive canonical correspondence analyses (partial least squares extension) (CCA-PLS), showing the association between preferences for Nature's Contributions to People (NCP) and explanatory variables for (a) all respondents, (b) nature conservationists, (c) tour guides and (d) tourists. The biplots do not represent NCP preference variables with squared cosines <0.6 and explanatory variables with absolute values of standard coefficients <0.3 (full statistical results in Table S5.3). NCP with low frequencies were excluded (details on NCP exclusion in Section 3.4). *Habitat*, habitat creation and maintenance; *Nature week*, time in nature during the week; *Nature weekend*, time in nature on the weekend; *Reg.*, regulation.

the weekend were related to *learning* and *recreation* (positive scores). Guides who felt extremely close to nature and spent much time in nature on the weekend preferred *habitat creation and maintenance*, *regulation of air quality*, *climate* and *hazards and extreme events* (negative scores).

For tourists, the first axis of the CCA-PLS (63.4%) revealed preferences distinct in NCP groups: regulating and material NCP (positive scores) versus non-material NCP (negative scores) (Figure 2d; Table S5.3d). Tourists who spent much time in nature during the week and frequently visited Kilimanjaro preferred *regulation of air quality*, *freshwater quantity*, *detrimental species*, *food* and *medicine* (material NCP). However, tourists with (post-)graduate degrees who spent less time in nature during the week and only visited Kilimanjaro once or a few times preferred *learning*, *aesthetic enjoyment*, *recreation*, *new and unique experiences*, *cultural heritage and identity* and *social cohesion and bonding*. Axis 2 (36.6%) reflected a gradient in NCP preferences explained by education, closeness to nature and the number of visits to Kilimanjaro. Tourists with undergraduate degrees or higher who felt close to nature and frequently visited Kilimanjaro preferred *habitat creation and maintenance*, *regulation of climate*, *hazards and extreme events* and *connectedness with nature* (positive scores). In contrast, tourists with academic and non-academic degrees who felt more separated from nature and visited Kilimanjaro once or a few times preferred *pollination*, *regulation of freshwater quality* and *intergenerational benefits* (negative scores).

5 | DISCUSSION

5.1 | NCP preferences in the conservation–tourism nexus

Our results indicate that *food*, *regulation of freshwater quality* and *air quality* are the three NCP most preferred by all respondents in this study. Masao et al. (2022) also found that diverse actors from the same study area prioritized similar NCP. Both our and the Masao et al. (2022) studies are in line with existing literature highlighting the significance of mountains in providing essential NCP particularly *food* and *regulation of freshwater quality* (Grêt-Regamey et al., 2012; Martín-López et al., 2019; Payne et al., 2020). The high preference for *food* corresponds with existing evidence depicting Kilimanjaro as an important source of food for local people through subsistence farming (Misana et al., 2003; Sébastien, 2010) and as one of the largest cash crop regions in Tanzania (Agrawala et al., 2003; Misana et al., 2003). It also highlights the life-supporting role of the mountain as a water tower for millions of downstream users (Said et al., 2019; Sébastien, 2010) (Figure S5.1), as is the case of other tropical mountains in East Africa, for example, Mount Kenya (Dell'Angelo et al., 2016). Respondents' high preference for *regulation of air quality* can be explained by the health benefits of air regulation provided by forests in Kilimanjaro (Hemp, 2009; Hemp & Hemp, 2018).

Examining NCP preferences expressed by social actors revealed distinct differences among them (Figure 1; Table S5.2): conservationists showed a high preference for regulating NCP, while tourists mostly preferred non-material NCP, aligning with existing research (e.g. Bidegain et al., 2019; Masao et al., 2022). Recognizing and integrating these diverse preferences into conservation decision-making is essential to ensure that conservation efforts are inclusive and responsive to the varied needs of diverse groups. Understandably, the most preferred NCP by tourists was *new and unique experiences*, an NCP that is distinct from other generalizing NCP categories of the NCP framework. This NCP was identified only through the application of the context-specific perspective of the NCP framework (Díaz et al., 2018), demonstrating the value of such an approach for capturing locally relevant benefits of nature and informing conservation decision-making that is better aligned with place-based characteristics.

Tour guides expressed the most diverse NCP (groups) preferences (Figures S5.1 and S5.2), reflecting their desire to fulfil basic needs and their interest in maintaining nature for younger and yet-to-be-born generations. Four reasons can explain this result. First, more than half of the guides (62%) belong to Kilimanjaro's local communities that traditionally grow a share of their food and source water from streams (Hemp, 2006; Sébastien, 2010). Second, guides not only spend a significant proportion of their time in nature as part of their job but they have also been trained to discuss different aspects of nature with their clients—tourists. They are, thus, more likely to have reflected on the perpetuity of nature with colleagues and tourists. Third, guides are more aware of the significance of nature in providing jobs for future generations, as proved by their NCP preferences associated with their work. Finally, local guides' desire to maintain Kilimanjaro nature for future generations could reflect the contribution it makes to their own identity and sense of place reinforced by their occupation as guides. Moreover, guides had the highest overlap of preferences with conservationists and tourists (Figure S5.2), suggesting including their preferences in conservation decision-making would maximize NCP satisfaction for most (if not all) actors in the conservation–tourism nexus.

5.2 | Drivers of within-social actor heterogeneity of NCP preferences

The level of formal education and interaction with nature seems to powerfully drive within-actor variations in NCP preferences. Our results suggest that formally educated people might depend less directly on material NCP (Figure 3) and be more prone to identify intangible benefits from nature as their most preferred NCP. In similar studies, Martín-López et al. (2012) and Zoderer et al. (2019) also found that people with lower levels of formal education were more likely to list material NCP as their most preferred NCP, while those with higher education listed non-material NCP. This is not a generalizable pattern, however; Lau et al. (2018) found that the number of years of formal education did not influence NCP preferences expressed by fisher communities in four countries in the western Indian Ocean. In our study, tour guides without academic degrees were more likely to prefer *intergenerational benefits* (Figure 3). Here, we assume that guides who are less educated have limited opportunities to take on other well-paid jobs that can contribute to the welfare of their children, and hence, the quality of life of younger and yet-to-be-born generations might rather rely on the benefits that nature directly provides to them.

Respondents' level of interaction with nature highly explained NCP preferences (Figure 3). Mainly, nature conservationists who felt moderately close to nature showed a relationship with nature based on material NCP, while those who felt highly connected to nature showed a relationship based on non-material NCP. At the same time, people in all groups who felt close to nature are more likely to appreciate regulating NCP and the non-material NCP *connectedness with nature* (Figure 3). Scientists have debated how the loss of time spent in nature might contribute to a sense of disconnectedness from nature and impaired interest in biodiversity conservation (Soga et al., 2023; Soga & Gaston, 2016). According to our results, less experience with nature does not necessarily lead to a lack of NCP appreciation but rather to particular NCP preferences distinct for each social actor (Figure 3).

5.3 | Implications for inclusive conservation

Successful conservation of protected areas and the landscapes within which they are embedded needs to simultaneously respond

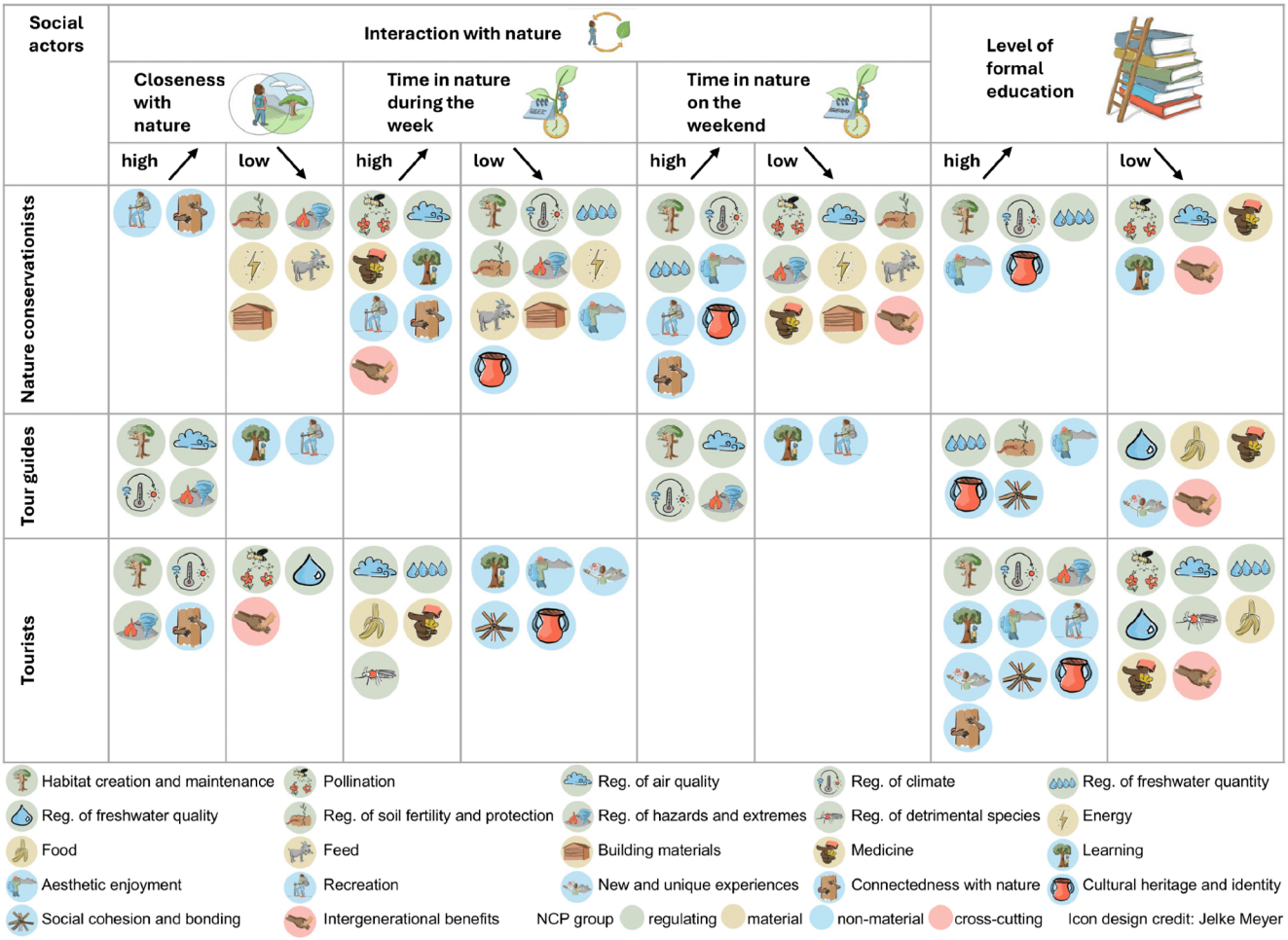

FIGURE 3 Factors—interaction with nature and level of formal education—that drive preferences for Nature's Contributions to People (NCP), shown for each social actor. *Reg.*, regulation.

to the needs of diverse actors whose NCP preferences can vary across and between them. In Tanzania, tourism is the second largest contributor to national revenue (Kyara et al., 2021) and the National Park Authority aims to conserve these areas for the benefit of 'humans' and 'mankind' versus *just* 'Tanzanians' (Tanzania National Parks, n.d.). The 'beyond Tanzanians' focus can overemphasize fulfilling tourists' expectations and their NCP preferences can overlook the needs of local actors which, as demonstrated in our study, can be quite different and even divergent.

Prioritization of tourism and conservation interests at the expense of local people can result in conflict (García-Llorente et al., 2018; Kovács et al., 2015) which has occurred in the region, historically and more recently. In 2005, local communities in Kilimanjaro lost access to a key buffer forest following its incorporation into the national park, when KINAPA instituted a ban on forest access and use, deeming it the most effective measure to curb the extraction of forest-derived material contributions (Holroyd, 2016; Sébastien, 2010). The result was, among others, armed tensions with locals (Holroyd, 2016) and increased demand for material NCP around the Park (personal communication with the KINAPA ecologist officer). Our findings highlight the importance of including the needs of those people adjacent to the protected area in conservation decision-making, that is, inclusive conservation (Palomo et al., 2014). A people-inclusive approach to conservation makes understanding NCP preferences meaningful for two reasons. First, it provides insights into which NCP are preferred and by whom, which allows conservation decision makers to cater to all actors while also addressing the trade-offs implied by divergent preferences. Second, when people are excluded from areas designated as protected, and subsequently seek to meet their NCP needs outside these boundaries, a better understanding of NCP preferences provides insights into potentially increased human pressure on the ecosystems surrounding the protected area, with potential consequences for ecosystem functioning and the continued supply of NCP (Palomo et al., 2014). More inclusive conservation in Kilimanjaro and similar landscapes in Tanzania and in Africa more generally does require dismantling conservation approaches that separate people from nature and benefit more powerful actors while disadvantaging local communities and their diverse NCP preferences (Holroyd, 2016; Kiwango & Mabele, 2022; Reyers & Bennett, 2025). An inclusive approach to conservation that considers local circumstances and legacies within and beyond protected areas can ensure that NCP preferences by

various actors are explicitly reflected in conservation management (García-Llorente et al., 2018).

In this vein, tour guides might serve as key actors to include in decision-making given the bridging role they seem to have between conservationists, tourists and local communities. In particular, local tour guides have a vested long-term interest in the integrity of nature on Mount Kilimanjaro and experience the mountains and their landscape in a multitude of ways that are both unique to them and shared with others. Nature is the 'office' for tour guides who are trained to serve as 'stewards of the mountain' (Murusuri & Nderumaki, 2013, 74). Through their interaction with tourists, guides also serve as 'intercultural mediators (…) who reveal unfamiliar destinations to their guests in a culturally sensitive manner' (Scherle & Nonnenmann, 2008, 120), and in this way can transfer unique local knowledge and understanding of the mountain to tourists. Hikes with tourists offer opportunities for intercultural exchange, where guides can discuss the landscape, conservation and local culture with tourists. Given their key role in shaping tourist experiences, conservation management should work with guides to create tours that not only meet tourists' interests but also raise awareness of NCP for local communities. Cultural eco-tourism, as suggested by several interviewees, can help by letting tourists experience local ways of life while providing economic benefits to communities. This can support both biodiversity and cultural heritage conservation, potentially reducing tensions between conservation and local interests (Anderson, 2015; Mgonja et al., 2015).

Our study suggests that formal education and interaction with nature are essential variables explaining NCP preferences. This finding highlights the importance of considering internal heterogeneity within actors when designing inclusive conservation and the danger of assuming homogeneous actor groups. Sesabo (2007) supports this argument, suggesting that conservationists and policymakers should look beyond classical portrayals of social actors when designing strategies for conservation to account for potential variations within them. To make conservation measures truly more inclusive, it is not only necessary to assess the NCP preferences by various actors, that is, actor pluralism, but also to test for internal heterogeneity within the actor groups.

5.4 | Implications for research

With this study, we encourage researchers to challenge rather than reinforce stereotypes, complete the truthfulness of stereotypes and in doing so, avoid oversimplifications of social actors (Böhme et al., 2024; Klain et al., 2014; Moon et al., 2019). It has long been known that methodological decisions shape scientific evidence that can subsequently either reinforce or challenge 'stereotypes' (Böhme et al., 2024; Turnhout, 2024). As such, the seemingly objective methodological choices that are made in the process of designing and implementing research should be explicitly acknowledged as a reflective component of the research process (Turnhout, 2024) and measures should be taken to understand within-actor diversity rather than assume that it is minimal or non-existent. Our exploration of the internal heterogeneity of social actors is an example of such an intentional approach to avoid stereotyping and oversimplifying. Neither is—per se—incorrect (Adichie, 2009); the risk lies in their potential to reinforce 'incomplete' understandings, however. Being inclusive of diverse actors and their needs requires—to begin with—acknowledging context-specific people–nature relationships (Díaz et al., 2018; Hill et al., 2021; Kadykalo et al., 2019), engaging diverse actors as research participants (Jacobs et al., 2016, 2018; Tallis & Lubchenco, 2014) and using multiple data collection strategies (e.g. Gross, Shepeleva, et al., 2025; Jacobs et al., 2018). Additionally, accounting for inclusiveness must extend to data analysis and interpretation, as neglecting it can lead to overlooking internal heterogeneity (Moon & Blackman, 2014; Vatn, 2009).

6 | CONCLUSION

To fulfil the NCP preferences of diverse social actors in the conservation–tourism nexus, conservation research and practice should account for differences between and within actor groups. We found that NCP preferences do not only differ between nature conservationists, tour guides and tourists, but that within-group differences existed informed by formal education levels and extent of interaction with nature. Being attentive to internal differences within social actor groups requires researchers to engage in deliberate and critical reflections of their methodological choices. This necessitates an ongoing commitment to asking the question: 'what kind of stereotypical views is my research challenging or perpetuating?' (West & Schill, 2022). In line with Adichie's (2009) warning on the 'danger of a single story' stereotyped stories on NCP preferences can jeopardize inclusive conservation. On the contrary, plural stories can provide 'more complete' arguments for improving inclusive conservation.

AUTHOR CONTRIBUTIONS

Milena Gross, John Sanya, Berta Martín-López and Jasmine Pearson conceived the ideas, conducted the interviews, identified context-specific nature's contributions to people and designed the methodology; Milena Gross, Berta Martín-López and their field assistants collected the data; Milena Gross and Berta Martín-López analysed the data; Milena Gross supervised by Berta Martín-López led the writing of the manuscript. Tuyeni Heita Mwampamba and Jennifer Sesabo contributed to the discussion section. All authors contributed critically to the drafts and gave final approval for publication.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

DATA AVAILABILITY STATEMENT

The survey data are publicly available from https://doi.org/10.48548/PUBDATA-1705 (Gross, Pearson, et al., 2025). A list of data sources used in the study is provided in the Data Sources section.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Supporting Information S1. Interview guides, survey questionnaire and material.

Supporting Information S2. Additional information on data collection and analysis.

Supporting Information S3. Training week and team agreement.

Supporting Information S4. Ethics.

Supporting Information S5. Additional results.

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