Received: 28 January 2024 | Accepted: 15 May 2025

DOI: 10.1002/pan3.70083

People and Nature

RESEARCH ARTICLE

Weaving values, knowledge and context to care for human–nature relationships in protected areas

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Funding information
Federal Ministry of Education and Research (Germany), Grant/Award Number: 01LC18064; National Science Foundation (USA), Grant/Award Number: 1854767

Handling Editor: Mollie Chapman

Abstract

1. Transformative change necessitates a profound shift in how people relate to, understand, value and envision landscapes to find effective pathways for conservation science and practice. In response, we examined the relationships among broad values—biospheric, altruistic and egoistic—that work in conjunction with ecological knowledge acquisition and social–ecological contextual factors to explain specific values assigned to landscapes, visions for human–nature relationships and pro-environmental behaviour.
2. We conducted in-person surveys with residents of the Sierra de Guadarrama in central Spain, which is embedded in an extensive network of protected areas. It includes a national park and two biosphere reserves, and it is close to the capital city of Madrid. Our data were analysed using a path model to test a series of hypothesised relationships.
3. Our models revealed that self-transcendence (i.e. biospheric and altruistic) values as well as the combined effects of local and scientific ecological knowledge were positively associated with (i) specific values prioritising ecological aspects and care for nature, but also with multiple relational values with the landscape and some instrumental values focused on the provision of goods; (ii) visions highlighting a prominent role of nature over humans for the surrounding landscape (ecocentric); (iii) and pro-environmental willingness and behaviour. Indirect positive associations included social–ecological factors such as the intensity of experiences with and learning about nature, lower levels of urbanity and the combined

effects of age and income. Our results revealed that these are the kinds of values that, in general, newcomers would be more likely to foster.
4. We conclude that inclusive plural valuations aimed at improving nature conservation interventions should consider the roots of how people hold and assign values to landscapes, envision their relationship with nature and vary in their intentions to perform pro-environmental behaviours for leveraging transformative change around protected areas. An integrative and holistic social–ecological systems perspective will improve human–nature relationships in conservation research and practice. We therefore call for more explicit consideration of the combined associations of social–ecological context, broad values and knowledge systems to expand and articulate the multilevel value of interest groups in protected area management contexts.

KEYWORDS
broad values, diverse values of nature, inclusive conservation, local ecological knowledge, specific values, stewardship, structural equation model

1 | INTRODUCTION

Inclusive conservation is expected to open transdisciplinary dialogues among rightsholders, local and indigenous communities, practitioners and scientists to co-produce knowledge on how to manage protected areas while enhancing human well-being more effectively. Inclusive approaches to conservation are gaining traction, given priorities to represent a range of voices more broadly in environmental decision-making (Cebrián-Piqueras et al., 2023; Goodson et al., 2022; Raymond et al., 2022; Ulug et al., 2024). As a corollary, there is growing recognition of the plurality of values that people assign to nature, both in science (Díaz et al., 2018; Pascual et al., 2023) and policy (CBD, 2024), as reflected by the IPBES Values Assessment (IPBES, 2022). Indeed, there is a strong need to engage community members who often hold diverse expectations and preferences for resource management agencies, expressed as desired futures (visions or normative scenarios) (Oteros-Rozas et al., 2015), particularly around protected areas (Palomo et al., 2017). Empirical knowledge of people's values, attitudes and behaviours will more accurately reflect the underlying reasons why diverse visions for nature are expressed, and in turn, acted upon by decision makers (Lamarque et al., 2014). Indeed, previous research has called for deeper consideration of people's 'inner worlds' that span the values, beliefs and emotions underpinning conservation outcomes and pro-environmental behaviour (Ives et al., 2020; Manfredo, Berl, et al., 2021; Shipley & van Riper, 2022; Wamsler & Bristow, 2022), as well as the multiple ways through which humans relate to (Riechers et al., 2020), perceive (Bennett, 2016) and understand nature (Cebrián-Piqueras et al., 2017).

Research on how values guide human behaviour that benefits the environment has received widespread attention in the environmental social sciences (Andrade et al., 2022; de Groot & Steg, 2008; Stern et al., 1999). In particular, the hierarchical structure of values has been established to inform dynamic conservation strategies (Vaske & Donnelly, 1999) and test hypotheses rooted in the psychological stability of different value concepts (van Riper et al., 2018). According to the IPBES (2022) Values Assessment, broad values reflect fundamental core beliefs that serve as guiding principles in life and transcend contexts and situations (building on Schwartz, 1992; Stern et al., 1999). This value domain dictates how people prioritise their desires to protect the environment, other people and self-interests; it can be a powerful force to move society towards greater inclusivity in the management of social–ecological systems (Jones et al., 2016; Raymond et al., 2022, 2023), under the assumption that the delineation between social and natural systems is artificial and arbitrary (Berkes & Folke, 1998). Specific values are contextual, place-based qualities assigned to or perceived in a particular landscape (Manfredo, Berl, et al., 2021; Raymond et al., 2014). This value domain also reflects 'judgements regarding the importance of nature' (IPBES, 2022, p. 20) that link broad values to different contexts (Gould et al., 2019). Although specific and broad values can be empirically distinguished (e.g. Andrade et al., 2023), the latter are deeply rooted in society's material culture, collective behaviours, traditions and institutions (Kendal & Raymond, 2019), such that broad values cannot be understood without a specific context being invoked (Eyster et al., 2022). A recent systematic review shows that convergences, overlapping areas and 'fuzzy boundaries' across specific and broad values can facilitate engagement about nature's values (Himes et al., 2024). However, empirical research rarely integrates multilevel values with knowledge systems to understand visions for human–nature relationships, despite the strong need to understand how values and knowledge underpin citizens' visions—desired or normative scenarios—for landscape management in protected areas (Cebrián-Piqueras et al., 2020; Horcea-Milcu et al., 2022; Lo et al., 2022).

Knowledge systems are the dynamic bodies of knowledge, practices and beliefs pertaining to the relationships among all living beings

(IPBES, 2022). Previous research has highlighted a diversity of knowledge systems, including Indigenous and local knowledge, that carry the potential to catalyse transformative change towards sustainability (Pascual et al., 2023; Raymond et al., 2023). Broad values and local ecological knowledge are important to understand as pathways for addressing the current biodiversity extinction crisis because they are slow to change and challenging to disentangle from a socio-cultural context. They represent deep leverage points with a higher potential for transformation towards sustainability (Ives & Fischer, 2017). Social–ecological systems are complex adaptive systems in which people and nature are inextricably linked. Both the social and ecological components of a given system exert strong influence over outcomes. Therefore, the social–ecological context refers to those contextual intertwined social and ecological processes, such as specific biocultural diversity of one territory, urban–rurality gradients, cultural landscapes and relational practices and specific ways of interacting with nature (Berkes & Folke, 1998; Stojanovic et al., 2016). Given evidence suggesting the connection between broad values and social–ecological contexts (Manfredo et al., 2014), more research is needed to understand how our inner worlds (Kendal & Raymond, 2019) are formed, shaped and contextually affected by 'social–ecological contextual factors' (e.g. urban–rural gradients, practices and experiences with nature, learning with and about nature, socio-cultural and economic status), to predict and anticipate how changes in the social–ecological context affect sustainability-aligned values (Kendal & Raymond, 2019). Indeed, we acknowledge that broad values are formed in response to a dynamic social–ecological system (Manfredo et al., 2014; van Riper et al., 2018) but are also expected to have an impact on how people perceive and make use of landscapes (Kendal & Raymond, 2019). By that, values and knowledge are antecedents to pro-environmental behaviour (Stern et al., 1999; van Riper & Kyle, 2014), alongside specific values and visions for the future (Horcea-Milcu et al., 2022; Lo et al., 2022). Empirical research in this vein can shed light on the psychological processes that can be leveraged to develop more resilient, adaptive and effective management strategies that favour nature conservation interventions under the challenges raised by the rapid loss of biodiversity (Kunming-Montreal Global Biodiversity Framework, CBD, 2022).

In this study, we investigate how broad values and ecological knowledge relate to the social–ecological context and personal experiences with the landscape, specific values, visions of human–nature relationships and pro-environmental willingness and behaviour. We tested and explored previous assumptions (Figure 1; Appendix S1) in the literature, and our expectations were derived from value-related theories, which were unpacked in the following section (Conceptual Background) using a path model. With an empirical view of a protected area network in the Sierra de Guadarrama (Spain), we address the following research questions:

1. How does the social–ecological context, including socio-economic status, experiences with nature, learning and residence along an urban–rural gradient, relate to the ecological knowledge and broad values of residents living within and around the protected areas of the Sierra de Guadarrama?
2. What is the structure, intensity and relationship among broad values that work in conjunction with ecological knowledge?

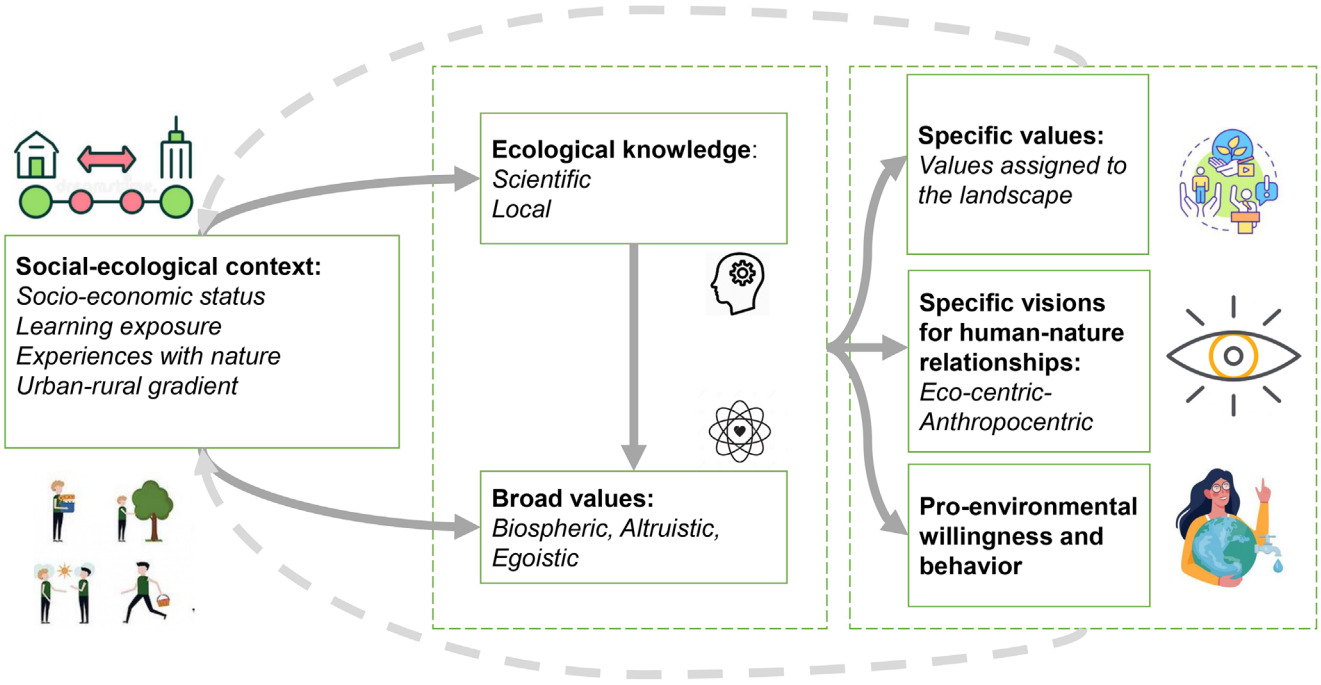

FIGURE 1 A place-based conceptual model of the relationships among variables examined in this study. The solid, grey-coloured pathways were our hypothesised relationships. This model represents a temporal snapshot of broader, dynamic and iterative feedback loops over time that were not empirically tested here but depicted by dashed grey-coloured pathways.

3. How do ecological knowledge, broad values and social–ecological contextual factors relate to specific values assigned to landscapes, visions for human–nature relationships and pro-environmental willingness and behaviour?

2 | CONCEPTUAL BACKGROUND AND EXPECTED PATHWAYS

2.1 | Broad values and ecological knowledge

Three distinct domains of individual human values have been distinguished in the Value Belief Norm Theory of Environmentalism (Stern et al., 1999): (1) biospheric (i.e. concerns about non-human species and the biosphere), (2) altruistic (i.e. concerns towards other humans) and (3) egoistic (i.e. maximisation of individual gain). All three categories contribute to understanding pro-environmental behaviour, beliefs and intentions (de Groot & Steg, 2008). In line with Schwartz's Theory of Basic Human Values (1994), altruistic and biospheric values are located on a self-transcendent motivational axis, which contrasts egoistic values on the self-enhancement axis.

Current research investigating plural values suggests an intertwined relationship between knowledge and values (Horcea-Milcu et al., 2022; Raymond et al., 2023; Topp et al., 2022). Specifically, interactions among local ecological knowledge, beliefs and management practices have been positioned as a critical element of social–ecological systems (Berkes & Folke, 1998). For example, previous research has suggested the iterative process of biodiversity assessment, dialogue and feedback among local gardeners is conducive for improving ecological knowledge and shifting behaviours towards greater respect for biodiversity (van Heezik et al., 2012). These and other efforts shed light on the iterative association of values, knowledge and behaviour, but these interactions are rarely empirically tested (for exception, see van Riper et al., 2020) and have yet to be examined in conjunction with the social–ecological context of protected areas. There are some hints about positive associations between biospheric values and residents' ecological knowledge (Bradley et al., 1999; Fryxell & Lo, 2003; Huambachano & Cooper, 2021; Kollmuss & Agyeman, 2002; Steel & Soden, 1990). Previous work in Sierra de Guadarrama (Spain) revealed relationships between local and scientific ecological knowledge and specific values assigned to landscapes, but also traditional practices, that are compatible with conservation (i.e. extensive grazing) or sensitivity to ecological impacts of tourism and recreation (Cebrián-Piqueras et al., 2020).

2.2 | Relating broad values and knowledge to specific values, visions for human–nature relationships and behaviours

Previous research has suggested close connections among self-reported visions for human–nature relationships for specific contexts, values assigned to nature-based settings and pro-environmental behaviour. The four visions highlighted by Mace (2014) comprise: (1) nature for itself, (2) nature despite people, (3) nature and people and (4) nature for people. Specific values geared towards nature conservation and pro-environmental behaviour are likely to be positively influenced by biospheric values and ecological knowledge (Arias-Arévalo et al., 2017; Mace, 2014; Martin & Czellar, 2017; Schunko et al., 2021; van den Born et al., 2001). Similarly, altruistic values—where equity, justice or peace play a prominent role—often underpin more socially inclusive visions for nature management (see 'nature and people' or 'nature for people' visions), pro-environmental behaviour and preferences for non-material values (Arias-Arévalo et al., 2017). Finally, given that egoistic values have been negatively associated with preferences for intrinsic values of nature (Arias-Arévalo et al., 2017; Raymond & Kenter, 2016), we might expect positive effects from the egoistic domain (Shin et al., 2022) on specific values related to the material values of nature, as well as more anthropocentrically oriented visions of human–nature relationships (Manfredo, Berl, et al., 2021) (i.e. 'nature for people').

2.3 | The relation of the social–ecological context with human values and knowledge

We define the social–ecological context as the proximate context-based processes and parameters that exemplify coupled ecological and social interactions and influence individuals and communities. However, we acknowledge that, from a systems thinking perspective, it is difficult to detach people, their values and knowledge systems from the social–ecological context (Kendal & Raymond, 2019). Previous empirical research has placed particular emphasis on the role of increasing urbanisation and modernisation as contextual factors that work in conjunction with technology for entertainment, and cause people to spend less time in the outdoors (Kareiva, 2008; Soga & Gaston, 2016). Martin and Czellar (2017) demonstrated that heightened self-nature connections (i.e. feeling part of nature) correlated with stronger biospheric values and positively impacted pro-environmental behaviour. Nevertheless, urbanisation and modernisation trends may alter visions of human–nature relationships in other ways, with urban individuals aligning more with the idea of wildlife as part of their social community, deserving rights akin to humans and rural residents having a more utilitarian vision of nature (Manfredo, Teel, et al., 2021; Vaske et al., 2011).

In addition to the urban–rural gradient and levels of experiences with nature, other contextual forces drive people's broad values and ecological knowledge. Socio-economic factors have decisively explained key differences in people's understanding and preferences for ecosystem services in protected areas (Cebrián-Piqueras et al., 2017; Martín-López et al., 2012). For instance, in northern Germany, conservationists associated forage production with actual land use in a protected landscape, whereas farmers recognised the potential of ecosystems to produce forage, including salt marshes (Cebrián-Piqueras et al., 2017). Additionally, both

individual and social learning processes concerning landscapes and nature have been positioned as important elements for catalysing broad and specific value shifts (Andrade et al., 2023) and determining perceived inclusion and representation in the decisions made by local and regional institutions in the context of protected areas (Goodson et al., 2022). To our knowledge, no previous research has examined the above-mentioned contextual factors as a broader social–ecological context of people living around protected areas.

This study aimed to examine the interrelationships among local and scientific ecological knowledge of protected areas that worked in conjunction with the broad values of residents living within and around a network of protected areas. We hypothesised that ecological knowledge would increase self-transcendence values and be influenced by a range of contextual social–ecological factors including the urban–rural gradient, socio-economic status, learning processes and experiences with nature (Figure 1). We also expected that ecological knowledge and broad values would, in turn, explain specific values, four visions for human–nature relationships (Mace, 2014) and pro-environmental willingness and behaviour (de Groot & Steg, 2008; Steg & Vlek, 2009; Stern et al., 1999).

3 | METHODS

3.1 | Study site

We focused our research on the landscapes of the Sierra de Guadarrama mountain range (Figure 2), situated between the province of Segovia (Castilla y León Region) and the Madrid region in central Spain. This landscape provides a useful site to research social–ecological systems dynamics and inclusive conservation due to the multiple and overlapping protected areas and land uses along a dramatic altitudinal gradient. The area comprises 30 municipalities with up to 170,000 permanent inhabitants. The area experienced a transformation in the 1960s and 1970s from mostly subsistence rural economies to service- and tourism-oriented economies, as well as second residential homes proximate to cities like Madrid and Segovia. Some types of agriculture and forestry persist and are allowed under strict national park regulations and other protected area categories, such as forest logging and cattle grazing. Scots pine (*Pinus sylvestris*) and Pyrenean oak (*Quercus pyrenaica*) forests characterise most of the landscape at an intermediate altitude (900–1800 m). Around the settlements, wood pastures composed of ash trees are found, which served local

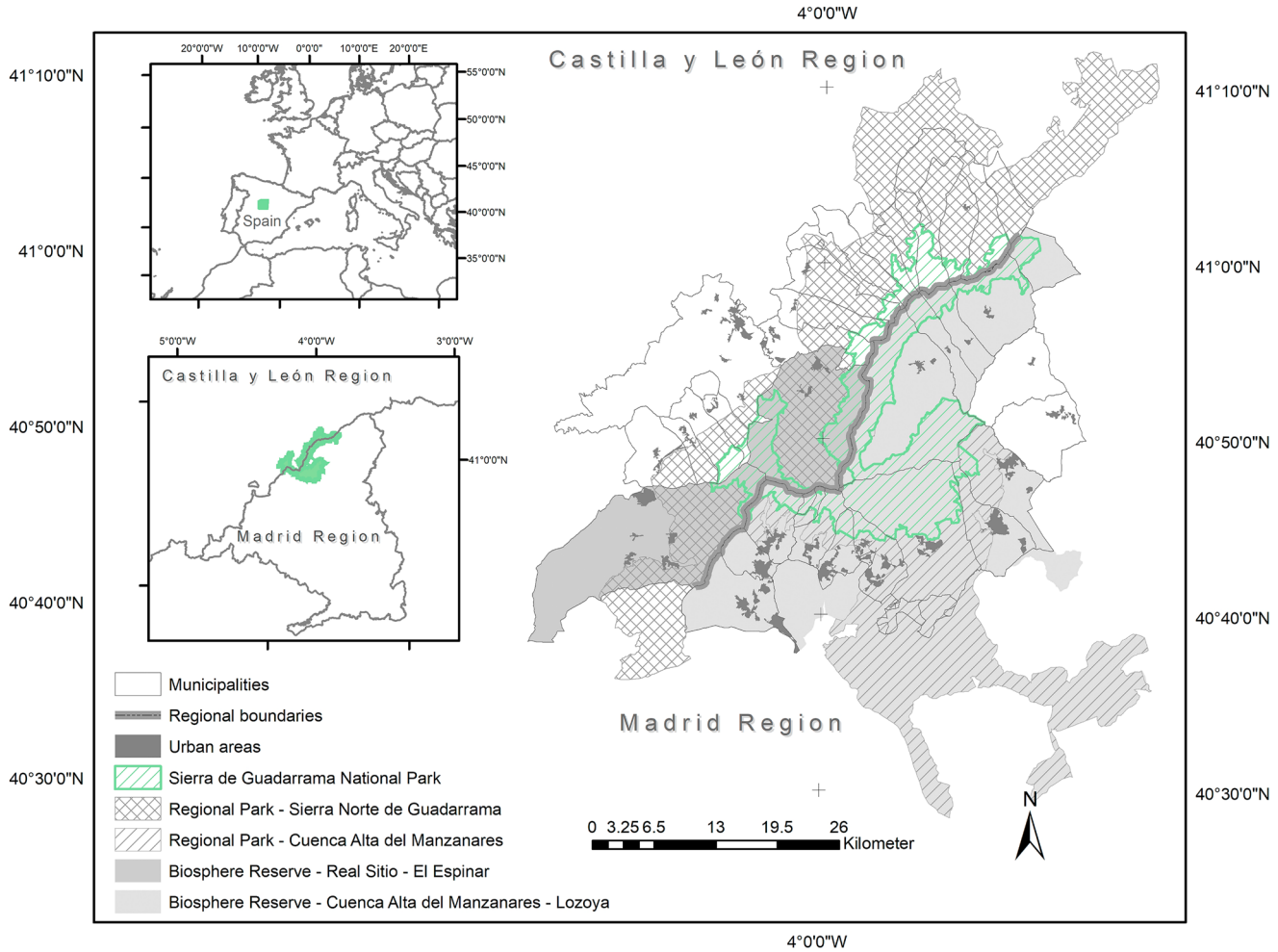

FIGURE 2 Location of protected areas that comprise Sierra de Guadarrama, Spain.

economies in the past. In the upper parts of the mountain range, traditionally grazed pastures together with Pyrenean broom (*Cytisus oromediterraneus*) dominate the landscape (up to 2400 m). The study site includes a National Park (established in 2013), two Nature Parks and two UNESCO Biosphere Reserves. Tensions often arise in these areas due to climate change impacts (e.g. a growing scarcity of water and snow), coupled with population growth, urbanisation, tourism, abandonment of traditional practices and insufficient community representation (López-Rodríguez et al., 2022).

3.2 | Data collection

Data were collected from residents via face-to-face surveys in fall 2019 to understand the perspectives, values and knowledge systems of local communities affected by protected area policies. We focused on municipalities from the designated area of socio-economic influence of the National Park and an additional municipality, Bustarviejo, which is also bio-geographically and socio-economically associated with the Sierra de Guadarrama system (Cebrián-Piqueras et al., 2020). Prior to our study, we pilot tested our questionnaire and adjusted the materials accordingly. In the fall of 2019, we launched our survey by inviting citizens in diverse common gathering locations (e.g. places of employment, bars, libraries, local markets) to participate. Due to the difficulties of gaining access to respondents due to potential factors such as lack of trust in unfamiliar interviewers and the length of our survey, we then relied on a snowball sampling method (Heckathorn, 2011), meaning that we recruited additional respondents that were recommended by individuals included in the initial sample and local interviewers. We invited 310 residents to participate in the study, a total of 272 of whom agreed (response rate = 90%). The survey was conducted in Spanish and took an average of 1 h. Only 78 residents completed all sections included in this study (response rate = 24%). We used portable computers that recorded data with the cloud software Maptionnaire (https://maptionnaire.com), a hassle-free citizen engagement platform that enables researchers and spatial planners to collect local insights with surveys and participatory mapping tools. The software was appropriate for our research and specific survey because we also collected perceived spatial attributes from respondents for use in another research. The purpose and voluntary nature of the research were clearly explained to all respondents. Consent was obtained and individual identities were not revealed throughout our research process. No sensitive or personal data (e.g. names or addresses) were collected or stored. This study followed the guidelines of the University of Göttingen, Germany, for ethical social research and participant privacy but did not require formal approval.

3.3 | Survey measures

The structured survey included closed-ended questions about socio-demographics, experiences with nature, diversity of ways people learn about nature, scientific and local ecological knowledge, broad values, specific values, visions for human–nature relationships and willingness and behaviour concerning nature conservation. A description of our approach to measuring key concepts is included in Appendix S2. Table 1 summarises concepts, items, measurement types, examples and key-related references included in the survey.

As indicators for contextual specific values, respondents were asked about the values they assigned to the landscapes of Sierra de Guadarrama, using a Likert scale ranging from 1 (irrelevant) to 10 (highly relevant). The final range of landscape values was inspired by the concept of Nature's Contributions to People (Díaz et al., 2018; Pascual et al., 2017, 2023). Therefore, for this work, we focused on the anthropocentric perspective of values of nature as contributors to human well-being (Pascual et al., 2017). We followed the definition of specific values as referring to how judgements regarding the importance of nature and its contributions to people are justified in 'specific' contexts (Pascual et al., 2023). The final list of specific values was adapted to the context based on pilot data. Value categories were not introduced to the participants to avoid further complexity and bias towards some value categories and the obvious fuzzy boundaries among them. Our values list could be further categorise for discussion purposes into several major categories: (i) instrumental values focused on regulating nature contributions to people overlapping with certain intrinsic values characteristics (e.g. pollination) or with instrumental values focused on the provision (e.g. soil erosion prevention) (Himes & Muraca, 2018), (ii) instrumental values focused on provisioning nature contributions to people (e.g. food provision, ethnobotanical resources), with certain overlaps with relational values (Chan et al., 2012) and (iii) relational values focused on non-material contributions to people (e.g. spiritual relation with nature, recreation, sense of place, stewardship and care), with some overlaps with intrinsic values (e.g. stewardship and care) (Lliso et al., 2022) (see Appendix S2).

3.4 | Data analysis

Prior to testing our hypothesised relationships (Figure 1; Table 1; Appendix S1), all data were tested for normality, skewness and kurtosis. Next, we estimated a structural equation model using partial least squares (PLS-SEM) path modelling in SmartPLS 2.0 (Ringle et al., 2005). We selected PLS-SEM instead of covariance-based structural equation model following Hair et al. (2011) because (i) our research was exploratory rather than theory confirming given that some of the anticipated relationships had not been studied previously, and (ii) our path model was complex. Additionally, our sample size was lower than the minimum recommendations in previous research on covariance-based SEMs (Hair et al., 2011). For PLS-SEM, the sample size should be equal to or larger than (1) 10 times the largest number of formative indicators used to measure one construct; or (2) 10 times the largest number of structural paths directed at a particular latent construct in the structural model. We met the required criteria, given that 78 residents responded to all questions (ca. 80). Besides, we ran a bootstrap analysis of 6000 runs for model evaluation to test the significance of path coefficients and indicator weights. All paths and indicators that

TABLE 1 Summary of the concepts, items, measurement types, examples and key references.

Overarching concept	Specific concepts	Items	Measurement type	Examples	References
Social-ecological contextual factors	Socio-economic status	Formal education, monthly net income, age	Ordinal		McLain et al. (2017)
	Experiences with nature	Nature exposure (diversity of forms), nature-related profession, visits to the site, years living in the study area	Summative score including binary and ordinal scales	Exposure to nature through observations, hunting, fishing	Hughes et al. (2018)
	Learning exposure	11 items (Diversity of learning sources)	Summative score from binary scales	Reading, formal education, direct contact with nature	Cebrián-Piqueras et al. (2020)
	Urban–rural gradient	Population, population density, distance to an urban centre; and altitude	Ordinal and continuous		Cebrián-Piqueras et al. (2020)
Ecological knowledge	Scientific Ecological Knowledge (SEK)	4 items	Summative score from weighted means of ordinal scales	Endemic species, invasive species	Reyes-García et al. (2014); Gómez-Baggethun et al. (2010); Cebrián-Piqueras et al. (2020)
	Local Ecological Knowledge (LEK)	4 items	Summative score of weighted means from ordinal scales	Traditional practices	
Broad values	Egoistic	3 items	Ordinal—10-point Likert	Wealth, authority	de Groot and Steg (2008); van Riper and Kyle (2014)
	Biospheric	4 items	Ordinal—10-point Likert	Unity with nature	
	Altruistic	4 items	Ordinal—10-point Likert	Equality justice	
Specific values	Instrumental values—Regulating	7 items	Ordinal—10-point Likert	Pollination support	Díaz et al. (2018); Chan et al. (2012, 2016); Himes et al. (2024)
	Instrumental values—Provisioning	4 items	Ordinal—10-point Likert	Raw materials, food	
	Relational values	5 items	Ordinal—10-point Likert	Stewardship, spiritual	
Visions for human–nature relationships for the local landscape	Nature for itself	1 item	Ordinal—5-point Likert		Mace (2014)
	Nature despite people	1 item	Ordinal—5-point Likert		
	Nature and people	1 item	Ordinal—5-point Likert		
	Nature for people	1 item	Ordinal—5-point Likert		
Pro-environmental willingness	Willingness to pay for conservation interventions	1 item	Ordinal—4-point Likert		Tianyu and Meng (2020)
	Willingness to contribute with time on conservation interventions	1 item	Ordinal—4-point Likert		
Pro-environmental behaviour	Actual contributing to protecting and caring of the landscapes and nature	1 item	Binary—Yes (1), No (0)		van Riper et al. (2019)

showed bootstrapped values lower than the critical *t*-value of 1.96 (*p*-values <0.05) were removed from the model (Hair et al., 2011). Latent variables that showed values equal to or higher than 0.5 and 0.7 for average variance extracted (AVE) and composite reliability (CR), indicating sufficient or good convergence validity and internal consistency, respectively, were retained (Hair et al., 2011, 2019). Additionally, our modelling followed a stepwise testing process and eliminated non-significant paths.

4 | RESULTS

4.1 | Socio-demographics and profile of survey respondents

Our sample ($n = 78$) included more women (55%) than men (45%) who reported an average age of 46.8 (SD = 17.63) (Table 2). The median net income was 1000–1500€, and nearly half of respondents reported obtaining either a higher (45%) or secondary education (46%). The sample was representative regarding age, gender and income compared to the study site population. However, it was slightly biased towards highly educated people (45%, compared to 32% of the study site population). Respondents displayed an average of 28.7 years living in the study site, clearly less than the average age. Specifically, ca. 63% of inhabitants from the researched sample had moved to the study site over the course of their life. On average, residents who had moved were ca. 28 ± 11 years old during their relocation. Residents who moved to the site displayed a higher education level and income, higher learning exposure about the local landscapes and nature and were slightly older. They tended to live in smaller and less dense settlements but did not show notably higher exposure to nature than long-term residents. They displayed significantly higher ecological knowledge, both local and scientific, and a higher percentage of these residents had an environmental-related profession. In terms of broad and specific values, broad sample groups displayed similar scores in general. However, long-term residents, who have always lived in the site, displayed, in general, stronger egoistic values (wealthy and autonomy) and scored higher for specific instrumental values such as food production and raw materials extraction, as well as relational values such as sense of place and identity. The newcomer sample displayed significantly higher scores for the two pro-environmental willingness items (time and monetary contribution) and a slightly higher score for pro-environmental behaviour. In terms of specific exposure to nature, the following activities were prevalent: hiking (96%), nature observation (75%), art-related activities (67%), plants or mushrooms collection (64%) or picnic and recreation (59%) (Appendix S3). Long-term residents displayed higher scores for activities such as sport, picnic, walking the dog or mushroom collection, while newcomers displayed higher scores for hiking/walking, observing nature and bathing. Direct contact to other people (94%) and direct contact to nature (85%) were the most important sources for learning about nature. Newcomers displayed higher scores for all types of learning.

4.2 | Path modelling

Path modelling was used to evaluate how the expected exogenous constructs (i.e. socio-economic status, learning exposure, experiences with nature, urban–rural gradient) predicted two endogenous constructs (ecological knowledge, self-transcendence), which in turn linked to three different blocks of final dependent variables including specific values (Model 1, Figure 3), visions for human–nature relationships (Model 2, Figure 4) and pro-environmental willingness and behaviour (Model 3, Figure 5).

4.2.1 | Interactions among ecological knowledge, broad values and specific values in relation to the social–ecological context

In the first model (Figure 3), scientific and local ecological knowledge were strongly and positively associated and were retained in the model as a single latent construct. Both AVE and CR values were quite high, 0.85 and 0.92, respectively (Appendix S4), and the factor loadings for the latent variable were +0.93 (SEK) and +0.91 (LEK), indicating that residents displaying high scientific ecological knowledge had also high local ecological knowledge. A preliminary test of correlation already suggested a strong association between SEK and LEK ($r = 0.7$; $p < 0.001$). The model showed a strong association among the biospheric and altruistic value survey items. Besides, the model results indicated that this latent variable, expressing self-transcendence values, could be retained in the model as a single latent construct, as the AVE value was higher than 0.5 (i.e. 0.55) and CR value was higher than 0.7 (i.e. 0.90) (Appendix S4). The survey items that reflected egoistic value were neither associated with the latent construct self-transcendence nor did they meet the minimum acceptable thresholds for AVE and CR to be retained as a latent variable. Egoistic values were therefore dropped from the final model. The results confirmed a positive association between the latent constructs of ecological knowledge and self-transcendence ($R^2 = 0.26$, $\beta = 0.34$).

Visits to the site and exposure to nature were retained as indicators in the latent variable experiences with nature. However, the indicator of years living on the site was not retained in this latent variable, indicating that this variable might not imply more experiences with nature. A subsequent additional correlation test did not reveal an association between years living on the site and scientific and local ecological knowledge (SEK: $r = 0.005$; $p = 0.54$; LEK: $r = 0.0002$; $p = 0.99$).

The first resulting model confirmed a negative association between the latent constructs of Ecological knowledge and Self-transcendence with urbanity (i.e. higher population density, population size or proximity to urban centres) ($\beta = -0.17$). Our results confirmed that socio-economics, learning exposure and experiences with nature were positively associated with ecological knowledge ($R^2 = 0.46$, $\beta = 0.34$, $\beta = 0.23$, $\beta = 0.25$, respectively). However, the final model revealed a negative direct association of socio-economic status and self-transcendence ($\beta = -0.13$), and an irrelevant positive indirect total association mediated by the acquisition of ecological knowledge ($\beta = 0.01$; Appendix S5). Learning exposure about nature and the landscape did not directly relate to self-transcendence but showed a weak indirect total positive association mediated by ecological knowledge acquisition ($\beta = 0.07$; Appendix S4). Experiences with nature directly and indirectly positively linked to self-transcendence ($\beta = 0.10$; $\beta = 0.20$; Appendix S5).

TABLE 2 Residents' socio-demographics and characteristics ($n = 78$).

Variable	Unit	Residents all (*n*: 78)	SD	Residents born in site (*n*: 29)	SD	Residents non-born in site (*n*: 49)	SD	Site
Socio-demographics								
Age	Mean	46.8	17.5	43.5	22.5	48.7	14.1	41.9
Income	Median	Level 2		Level 1		Level 2		Level 2
Level 1 (<1000 €)	%	44.9		38.8		55.2		
Level 2 (1000–<1500€)	%	25.6		28.6		20.7		
Level 3 (1500–<2000€)	%	16.7		20.4		10.3		
Level 4 (2000–<3000€)	%	12.8		12.2		13.8		
Level 5 (above 3000€)	%	0.0		0		0		
Education level	Median	2		Level 2		Level 3		Level 2
Level 1—Primary School	%	9.0		17.2		4.1		8
Level 2—Secondary School	%	46.2		48.3		44.9		61
Level 3—Upper education	%	44.9		34.5		51.0		31
Gender								
Women	%	55.1		69.0		44.9		52
Men	%	44.9		31.0		49.0		48
Learning and nature exposure								
Learning exposure	Mean (10 points)	5.3	2.2	4.3	1.5	5.9	2.4	
Years living in the area	Mean (Years)	28.7	19.8	43.5		19.9		
Age when moving to the site (non-born in the site)	Mean (Years)	28.9	11.4	NA		28.9		
Born in the site	%	37.2		NA		NA		
Non-born in the site	%	62.8		NA		NA		
Visits to study site*	Median	5.0		5		5		
Environmental profession	% (Yes)	10.3	—	3.4		14.3		
Nature exposure	Mean (10 points)	4.9	2.0	4.7	2.3	4.9	1.9	
Urban rural gradient								
Population	Mean (Inhab.)	12768.7	18,528	20586.2	23083.2	8142.0	13572.8	
Population density	Mean (Inhab. /km^2)	112.5	115.9	147.7	133.7	91.7	100.9	
Distance to urban	Mean (km)	20.9	18.8	15.4	18.0	24.1	19.3	
Knowledge								
Local ecological knowledge	Mean (10 points)	3.7	2.1	3.1	2.0	4.0	2.1	
Scientific ecological knowledge	Mean (10 points)	5.4	2.2	4.4	1.9	6.0	2.2	
Broad values								
Wealthy	Mean (10 points)	5.2	2.0	5.8	2.0	4.9	1.9	
Authority	Mean (10 points)	4.6	1.9	5.0	2.1	4.3	1.8	
Influence	Mean (10 points)	5.7	2.4	5.7	2.6	5.7	2.3	
Equality	Mean (10 points)	8.9	1.6	8.6	1.9	9.2	1.3	
Peace	Mean (10 points)	9.5	1.1	9.4	1.4	9.6	0.9	
Justice	Mean (10 points)	9.6	0.8	9.6	0.9	9.6	0.8	
Useful	Mean (10 points)	8.5	1.5	8.6	1.5	8.4	1.5	
Pollution prevention	Mean (10 points)	9.2	1.3	8.6	1.8	9.6	0.8	

TABLE 2 (Continued)

Variable	Unit	Residents all (*n*: 78)	SD	Residents born in site (*n*: 29)	SD	Residents non-born in site (*n*: 49)	SD	Site
Respect the earth	Mean (10 points)	9.3	1.3	9.1	1.4	9.4	1.3	
Unity with nature	Mean (10 points)	8.9	1.5	8.5	1.6	9.2	1.4	
Protection of the environment	Mean (10 points)	9.4	1.1	9.1	1.5	9.6	0.8	
Values of nature (specific values)								
Stewardship, care and biodiversity conservation	Mean (10 points)	9.3	1.3	9.2	1.4	9.3	1.3	
Recreational and mental health	Mean (10 points)	8.6	2.0	8.3	2.4	8.8	1.7	
Aesthetic appreciation	Mean (10 points)	8.8	1.6	8.4	1.8	9.0	1.5	
Spiritual and religious	Mean (10 points)	6.8	2.9	5.7	3.3	7.5	2.5	
Identity and sense of place	Mean (10 points)	7.9	2.1	8.5	1.8	7.6	2.2	
Food provision	Mean (10 points)	7.4	2.2	7.7	2.3	7.3	2.1	
Raw materials provision	Mean (10 points)	8.4	1.6	8.9	1.4	8.1	1.7	
Freshwater provision	Mean (10 points)	8.9	2.0	8.8	2.0	9.0	2.0	
Ethnobotanical resources	Mean (10 points)	7.1	2.4	7.1	2.6	7.1	2.4	
Air quality	Mean (10 points)	9.6	0.8	9.7	0.7	9.6	0.9	
Climate regulation	Mean (10 points)	8.6	1.9	8.4	2.0	8.8	1.8	
Regulation of extreme weather effects	Mean (10 points)	8.5	1.8	8.6	1.4	8.5	2.0	
Erosion prevention	Mean (10 points)	8.4	2.2	8.2	2.4	8.6	2.1	
Pollination	Mean (10 points)	8.8	1.8	8.3	2.1	9.0	1.6	
Regulation of water flows	Mean (10 points)	8.7	2.0	8.0	2.3	9.0	1.7	
Pest control	Mean (10 points)	7.9	2.1	7.8	2.1	8.0	2.1	
Visions for human–nature relationships in protected areas								
Nature for itself	Mean (10 points)	8.6	1.1	8.6	1.8	8.6	2.5	
Nature despite people	Mean (10 points)	8.3	1.2	7.8	2.7	8.5	2.2	
Nature and people	Mean (10 points)	8.6	0.9	8.3	1.3	8.8	2.1	
Nature for people	Mean (10 points)	8.7	0.8	8.8	1.3	8.7	1.7	
Pro-environmental willingness and behaviour								
Pro-environmental willingness—Time	Mean (10 points)	7.3	3.74	5.4	4.3	8.4	2.9	
Pro-environmental willingness—Monetary	Mean (10 points)	4.2	4.29	2.6	3.7	5.2	4.3	
Pro-environmental behaviour—Actual contribution	% (Yes)	74.4		69.0		77.6		

Two latent variables were retained in the PLS-SEM for the specific values. We called the first latent variable: '*Ecological appreciation and caring for nature*'. This was indicated by relational values (i.e. stewardship and care), instrumental values focused on regulating functions (i.e. pollination regulation, pest regulation, erosion prevention, water flow regulation) and instrumental values focusing on the provisioning of material goods (i.e. freshwater provision, ethnobotanical value). A second latent variable, named '*Non-material relationships with nature*', was expressed entirely by indicators of non-material relational values (i.e. aesthetic value, recreation, mental health, spiritual values, stewardship and care). The provision of raw materials was retained as a single variable, while the rest of the instrumental values focused on the provisioning of material goods were not clustered with this variable. As for the next block of endogenous variables that measured specific values, results revealed a positive association of both ecological knowledge and self-transcendence on the two clusters of specific values: (i) '*Ecological appreciation and caring for nature*' ($R^2 = 0.47$; $\beta = 0.32$ and

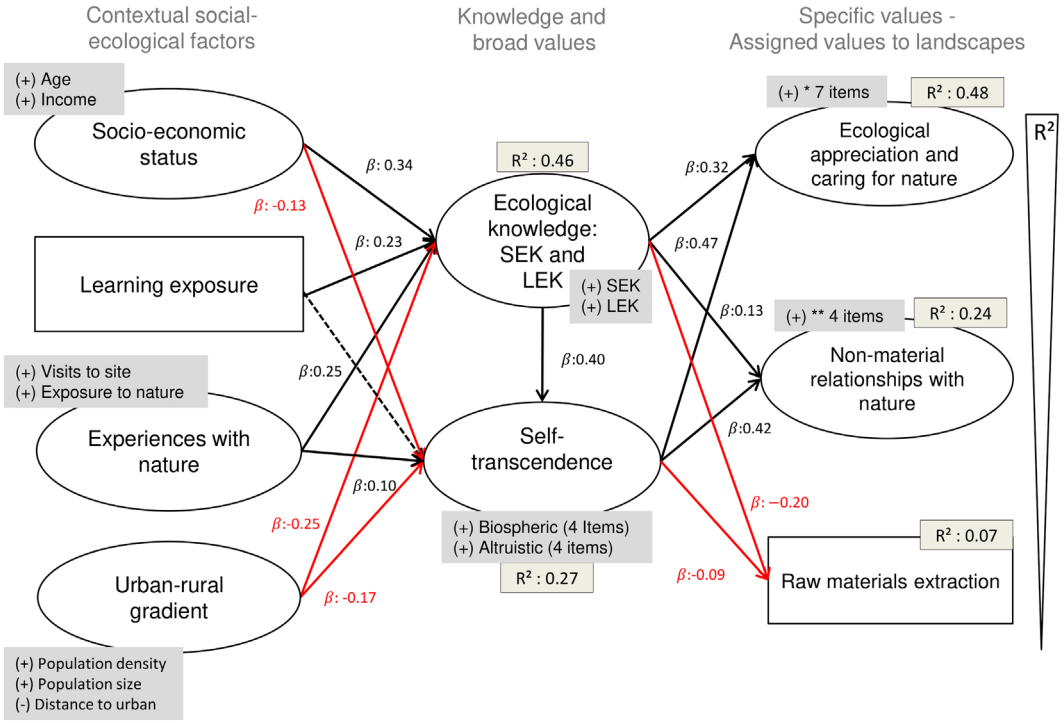

FIGURE 3 Results from an assessment of variables explaining specific values. Ovals represent latent variables, whereas rectangles represent mean value indicator variables. Positive (+) and negative (−) signs indicate positive and negative correlations of the indicator variables within the latent variables, respectively. Path values (within arrows) represent standardised beta path coefficients from partial-least squares regressions. Red-coloured paths show negative correlations, whereas black-coloured paths show positive correlations. Dashed paths represent non-significant beta values. LEK, local ecological knowledge; SEK, scientific ecological knowledge. **Ecological appreciation and caring for nature*: Latent variable built from nature stewardship and care (relational value), pollination regulation; pest regulation; erosion prevention; water flow regulation (instrumental values related to regulating functions), freshwater provision and ethnobotanical resources (instrumental values related to provisioning of goods) as indicators. ***Non-material relationships with nature*: Latent variable built from aesthetic value, recreation and mental health-related values, spiritual value and stewardship and care as indicators. Raw materials extraction (Instrumental value—provisioning).

$\beta = 0.47$, respectively) and (ii) '*Non-material relationships with nature*' ($R^2 = 0.24$; $\beta = 0.13$ and $\beta = 0.42$) (Figure 3). The model showed a negative association of both EK and self-transcendence with assigned values to raw material extraction, emphasising a lower preference for this value ($R^2 = 0.07$; $\beta = -0.20$ and $\beta = -0.09$). The variance explained was relatively low.

4.2.2 | Antecedents to visions for human–nature relationships

In the second model (Figure 4) that evaluated the antecedents to visions for human–nature relationships, higher predictive power was observed for biocentric visions rather than anthropocentric visions. The final model revealed positive direct association of EK with all the four types of visions raised by Mace (2014) ($\beta = 0.37$; $\beta = 0.0.5$; $\beta = 0.17$; $\beta = 0.08$; respectively). Self-transcendence showed varying and contrasting associations with the nature conservation visions. Only a direct positive association with *Nature despite people's* vision was found ($\beta = 0.20$); two negative direct associations with *Nature for itself* and *Nature and people* ($\beta = -0.17$ and $\beta = -0.08$, respectively), and a non-significant association with *Nature for People*.

4.2.3 | Antecedents to pro-environmental willingness and behaviour

In the third model (Figure 5) that evaluated the antecedents to pro-environmental willingness and behaviour, moderate predictive power was observed for *willingness* ($R^2 = 0.40$) and low predictive power for *behaviour* ($R^2 = 0.17$). The model revealed positive direct and indirect significant associations of EK and self-transcendence with willingness and behaviour to support nature conservation (WET: willingness to spend more time in conservation activities; WTP: willingness to pay for conservation interventions; Pro-environmental *behaviour*: scale measuring stated actual contribution for supporting the objectives of nature conservation in the landscapes of Sierra de Guadarrama). Direct associations included: EK → Willingness $\beta = 0.51$; Self-transcendence → Willingness $\beta = 0.26$ and behaviour, $\beta = 0.12$. Total association values: EK → Willingness $\beta = 0.59$ and behaviour, $\beta = 0.24$ (Figure 6).

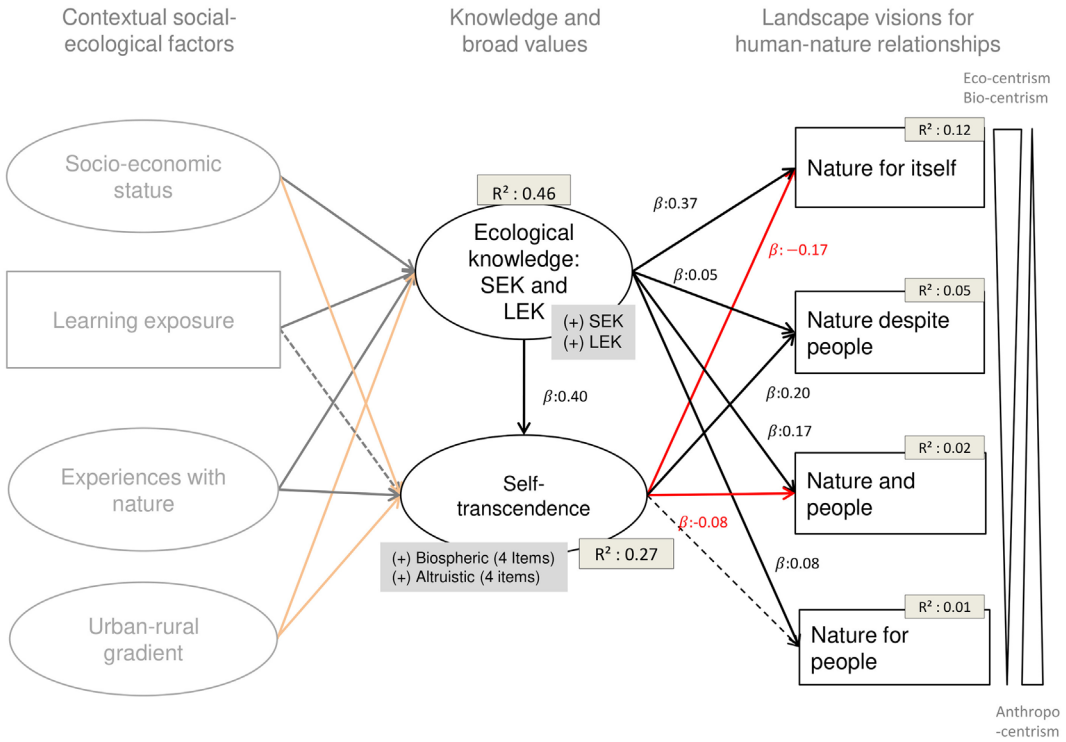

FIGURE 4 Results from an assessment of variables explaining associations with visions for human–nature relationships for the local landscape. Ovals represent latent variables and rectangles represent indicator variables. Positive (+) and negative (−) signs indicate positive or negative correlations of the indicator variables within the latent variables, respectively. Paths (within arrows) connecting variables in the model represent standardised beta path regression coefficients from partial-least squares regressions. Red-coloured paths represent negative beta values. Black-coloured paths represent positive beta values. Dashed paths represent non-significant beta values. Blurred paths represent paths previously explained in Figure 3.

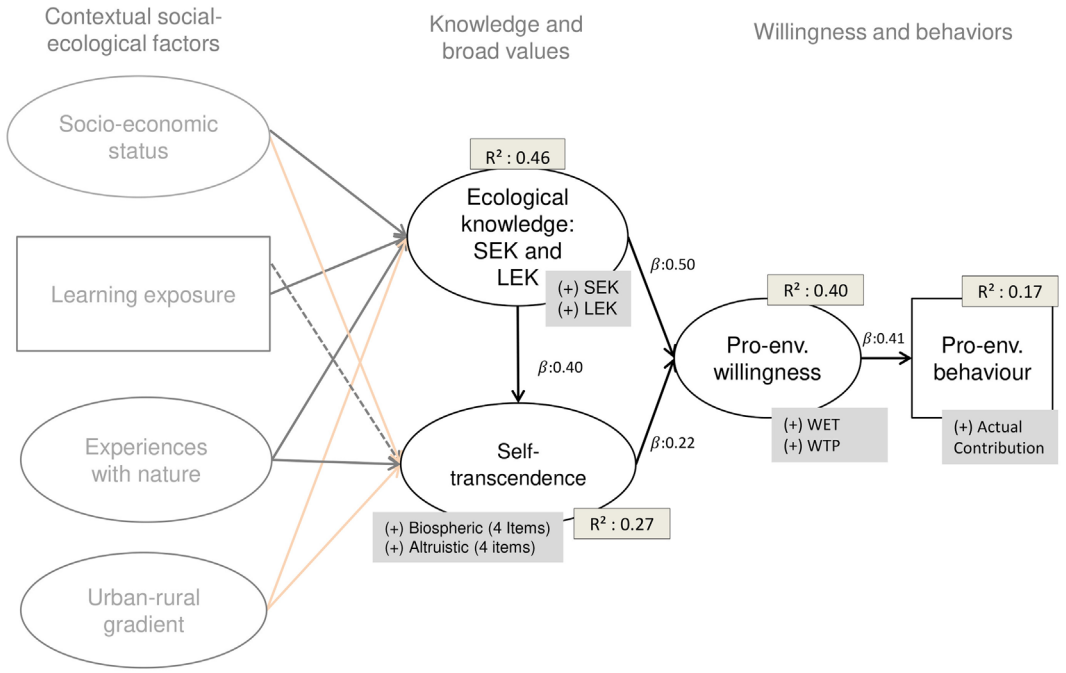

FIGURE 5 Results from an assessment of variables explaining pro-environmental willingness and behaviour. Ovals represent latent variables and rectangles represent single item indicators. Positive (+) and negative (−) signs indicate positive and negative correlations, respectively. Paths (within arrows) represent standardised beta path coefficients from partial-least squares regressions. Red-coloured paths represent negative beta values. Black-coloured paths represent positive beta values. Dashed paths represent non-significant beta values. Blurred paths represent paths previously explained in Figure 3. WET: Willingness to spend time to support nature conservation objectives. WTP: Willingness to pay for nature conservation.

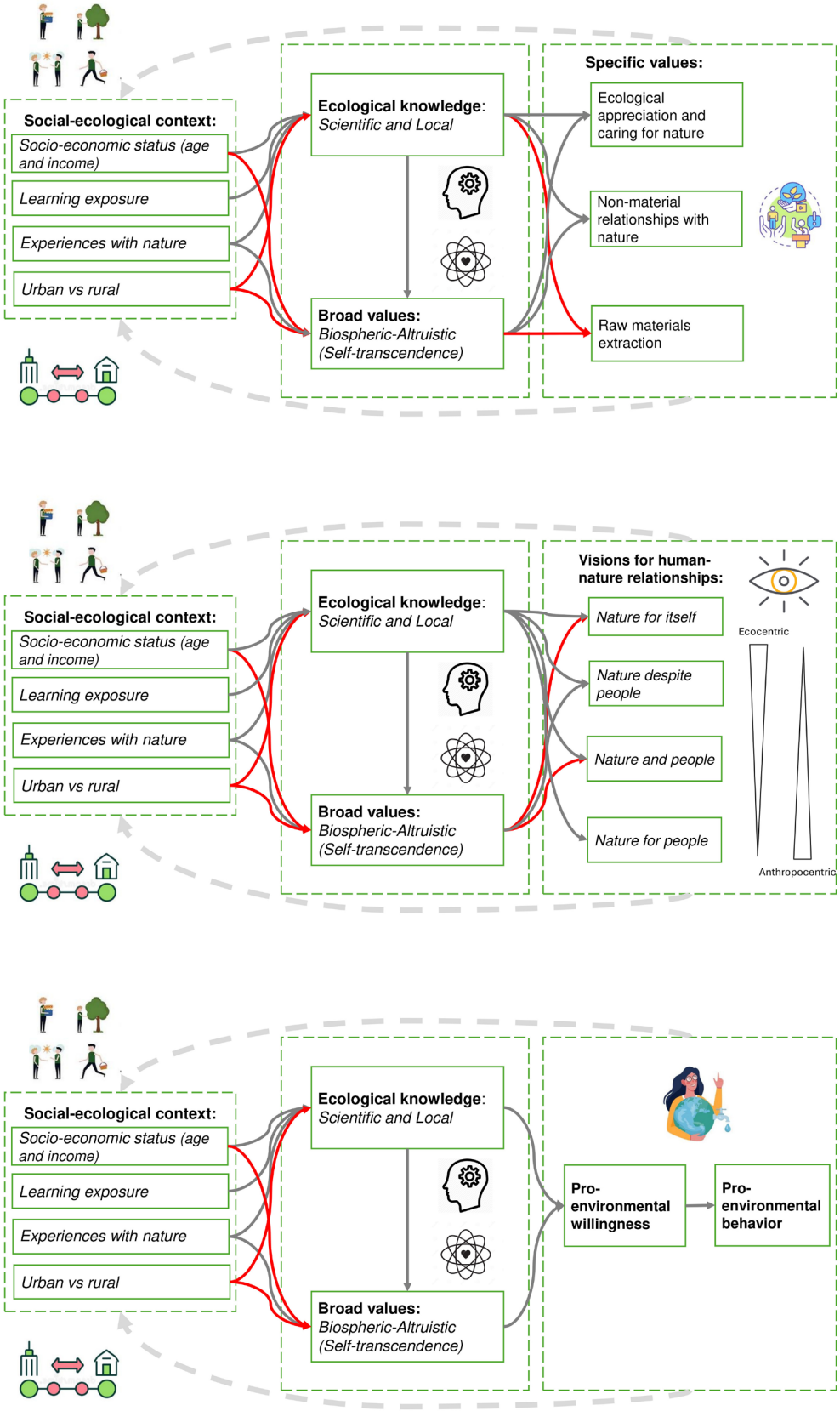

FIGURE 6 The model shows the proximate and distant drivers for specific values related to the appreciation of ecological processes, caring for nature, non-material relationships with nature, visions related to eco-centric views and pro-environmental behaviour of residents living within the social–ecological system of the Sierra de Guadarrama. The dark, grey-coloured pathways show positive relationships that emerged from our results, whereas the red-coloured pathways show negative relationships. This model is a temporal snapshot of broader, dynamic and iterative feedback loops over time. While not empirically tested here, these loops are depicted through dashed, grey-coloured pathways.

5 | DISCUSSION

In response to current calls for enlightening the diversity of values that local communities assign to nature and articulating inclusive conservation, our empirical results support theoretical conceptualisations of the interrelationships among knowledge systems, broad values and specific values of those affected by decision-making in protected areas (Cebrián-Piqueras et al., 2023; Pascual et al., 2023; Raymond et al., 2022, 2023). We also aim to expand research at the nexus of multilevel values (van Riper et al., 2018) by suggesting these relationships are rooted in distal variables that reflect social–ecological context (Kendal & Raymond, 2019), and in turn, explain visions and preferences for human–nature relationships (Chapman & Deplazes-Zemp, 2024; Mace, 2014), as well as pro-environmental willingness and behaviour (Andrade et al., 2022). Although previous literature has provided insight into how these variables may be related, to our knowledge, this study is the first to assemble empirical evidence of this expanded multilevel values nexus. In the following, we discuss (i) the relationships among social–ecological context, ecological knowledge and self-transcendence (i.e. biospheric-altruistic) values; (ii) the association of self-transcendence values and ecological knowledge with specific values, visions and pro-environmental willingness and behaviour; and finally (iii) we offer recommendations for how managers can act on our study findings (Figure 6).

5.1 | Nuanced interactions of the social–ecological context with ecological knowledge and self-transcendence values

Our results suggest that a profound understanding of surrounding ecosystems and biodiversity, expressed by the combination of local and scientific ecological knowledge, positively links to human values aligned with empathy and caring for nature (Figure 6). We suggest that concern for nature (i.e. biospheric values) but also for other human beings and society (i.e. altruism) is closely related and can be conceptualised as self-transcendent values, as shown in previous works (Schunko et al., 2021). However, we acknowledge that different socialisation and learning processes, traumatic events or group composition changes are conducive to forming values that indicate interests to advance causes beyond the self (Stern et al., 1999).

Our findings highlight an overall positive association of socio-demographics including age and income with self-transcendence values. However, this only occurred through the mediation of ecological knowledge acquisition, given that the direct association of the socio-economic status with these broad values was negative. Previous works show that greater income can also enable residents to spend more time outdoors, benefit from engaging with nature, increase ecological knowledge and trigger environmental attitudes (Brown, 2012; McLain et al., 2017). This is likely the case for the residents we surveyed because Sierra de Guadarrama is located next to heavily urbanised areas of Madrid (~6 million inhabitants) and Segovia (~50.000 inhabitants). In these areas, wealthy, elderly and educated people have relocated to the countryside in search of environmental services, a better quality of life and more relaxed lifestyles in contact with nature (Lo et al., 2022; Vías, 2014). Thus, these individuals can acquire both local and scientific ecological knowledge due to inner motivations and experiences with nature. Further research should explore the dynamic relation and hybridisation potential between multiple knowledge systems concerning long-term residents and newcomers (Agrawal, 1995).

Our study revealed that learning about landscapes and the nature of Sierra de Guadarrama was not directly associated with self-transcendence. This result highlights the need for methodologies to evaluate a process for acquiring knowledge instead of relying on survey scales that exclusively reflect self-reported or observed knowledge (van Riper et al., 2020). A deeper understanding of how values are formed and shaped by processes of learning and deliberation will also provide insight into the complex relationships among learning, nature exposure and ecological knowledge development (Andrade et al., 2023; Kenter et al., 2016). For example, personal nature experiences linked strongly to biospheric-altruistic values and ecological knowledge rather than stated learning alone. This finding underscores the crucial role of nature-based experiences and acculturation through childhood in shaping environmental values and knowledge (Rosa et al., 2018). It is in line with the work of van den Born et al. (2001), who suggested that more intense childhood experiences with nature could be associated with a later attribution of a high degree of naturalness to wild nature, and less intense experiences with a later attribution of a high degree of naturalness to arcadian nature.

Negative relationships among urbanisation, ecological knowledge and self-transcendence values are concerning as human settlements expand worldwide. Our results support the idea that degrees of urbanisation can have an important association with the broad values of residents alongside ecological knowledge (Cebrián-Piqueras et al., 2020). We found that residents living in more rural areas surrounded by protected areas embodied the guiding principles of self-transcendence represented by biospheric values and altruism. According to previous studies (Kareiva, 2008; Scopelliti et al., 2016), high levels of urbanisation and intensification may cause a disconnect between people and their natural environments, affecting not only cognition but also the emotional and empathic dimensions of their connection with nature (Riechers et al., 2020). Our results also parallel another body of literature showing how urban citizens express values associated with mutualism, empathy for wildlife and more relational values with nature (Manfredo, Berl, et al., 2021; Manfredo, Teel, et al., 2021; Wainaina et al., 2023). Our results, based on the sample of residents, support both assumptions as non-exclusive, but reinforcing, as we identify how wealthy, older, educated, probably having an urban origin, has moved during the course of their lives to be in closer contact with nature. Rurality linked to the presence of protected areas can positively affect altruistic values due to cultural, productive and lifestyle differences between cities and the rural world. Indeed, Ma et al. (2015) argued that the dominant culture in highly urbanised areas may focus on individualism, whereas

collectivism is more prevalent in rural areas. Our results support these arguments indicating that, within our sample of residents, those long-term residents living in slightly more urbanised areas displayed higher preferences for some egoistic values. Nevertheless, as our sample indicated, most respondents were not long-term residents and had moved to the landscapes of Sierra de Guadarrama at a later stage in their lives. This could highlight social migration from urban to rural natural areas (i.e. neo-rurality or second-home developments in protected areas (Cortes-Vazquez, 2014)) and might have influenced the hybrid knowledge system observed in our sample, including strong correlations among local and scientific ecological knowledge, and the identified set of broad and specific values. Our findings contribute to the growing body of literature arguing that the 'extinction of experience' may influence values as urban population numbers and their spatial footprints grow (Soga & Gaston, 2016), despite contradictory evidence found by Oh et al. (2020).

5.2 | Heart and mind for valuing, imaging and caring for nature

Our results reveal several crucial insights. We showed that psychological and cognitive factors, expressed by self-transcendence values and ecological knowledge, positively linked to a wide and rich plurality of values assigned to nature, pro-environmental willingness and behaviours and visions prioritising eco-centric human–nature relationships (Figure 6). These results support current approaches calling for transformative change by targeting diverse knowledge systems and human values as deep leverage points to pave the pathways towards sustainability and restore our capacity to care about nature (Ives & Fischer, 2017; Pascual et al., 2023). Most of the research, practice and policies in conservation tend to focus on a reduced set of goals, processes and outcomes related to biophysical properties of ecosystems or socio-economic factors, and informed by scientific knowledge (Bennett et al., 2017; Murali et al., 2024). Mistakenly, our results that expanded the multilevel values nexus can be, a priori, solely linked to a stakeholder profile that embraced a science-led and ecocentric vision for conservation. Although this so-called 'living with nature' view of human–nature relationships has been classically associated with intrinsic values and conservationism (Kenter & O'Connor, 2022; Sandbrook et al., 2019), we show that this nexus, expressed by local communities, connects with multiple and nuanced values and values' assemblages, including relational values such as spirituality, mental health, stewardship and care ascribed to protected area landscapes (Sandbrook et al., 2019). Indeed, we show that individual actions to support a holistic view of conservation can be entangled with several, though usually neglected, underpinning values and knowledge systems. For instance, altruism—striving for equal opportunities or caring for vulnerable populations—or local ecological knowledge—traditional knowledge and biocultural practices—of communities affected by or responsible for conservation connect with the 'personal sphere' that is critical for transformative change (Ives et al., 2018; Palomo et al., 2021). Nevertheless, further research should address how inclusive approaches can consider the perspectives of those long-term residents who might not always represent the mainstreamed values and discourses of those powerful elites in conservation or how the values, knowledge and visions of diverse actors and communities interact and benefit from each other. Our work suggests how traditional and local knowledge can connect locals and newcomers as a bridge or boundary object. The same might apply to relational values expressed by stewardship, aesthetic values, recreation and mental health or broad values such as justice and peace, which, according to our results, might be represented by a broad spectrum of actors and local communities. Acknowledging this plurality of values can support resilient conservation strategies that soften the classical divide between instrumental and intrinsic perspectives (Himes & Muraca, 2018).

Following Raymond et al. (2023) and Himes et al. (2024), we support the existence of fuzzy boundaries and horizontal interactions among specific value categories, as we found an intense blending or assembling of values tentatively categorised as instrumental values (e.g. ethnobotanical goods and freshwater provisioning) that were clustered with stewardship and care, but also with other instrumental values focused on ecological appreciation (regulating functions). Simultaneously, stewardship and care also clustered with other multiple relational values focused on non-material properties in a secondary cluster. These results align with previous works emphasising that relational and cultural values can be ubiquitous and absent due to often being intertwined with material benefits or intrinsic values (Chan et al., 2012, 2016; Hoelle et al., 2022). Although some instrumental values focused on provisioning, and most relational values have been largely excluded from environmental discourse (Murali et al., 2024), our results revealed that, in a protected area system, some instrumental values such as ethnobotanical resources are essential for local communities and can be ascribed relational values. These results highlight the importance of plural valuations and approaches that reveal the nuance in diverse values associated with local landscapes. Besides, we demonstrate how the fuzzy boundaries among diverse values of nature (i.e. specific values) emerge from broad values and knowledge systems as vertical interactions suggested by Raymond et al. (2023) and Himes et al. (2024). Our work also offers insights into the depiction of holistic multilevel value-based profiles of local communities and calls for inclusive approaches to conservation that explicitly consider and openly discuss a process of enhancing the resilience of the social–ecological systems within and around protected areas.

In our model, increasingly dynamic visions of human–nature relationships for the surrounding landscapes that included people had lower degrees of variation explained by the predictors' ecological knowledge and self-transcendence values. This result may reflect the pluralist undertones of complex visions for nature, represented by multiple values derived in/as/of/for/from/between nature when considering people as active components ingrained within social–ecological systems (Mace, 2014; Pascual et al., 2023). As a result, people may hold visions for people and nature based on diverse pathways not detected in our research approach. Indeed,

Mace (2014) warned that more inclusive approaches for conservation envisage a multilayered and multidimensional people–nature relationship that is difficult to conceptualise, let alone measure. We therefore call for further development of multi-item scales to measure a full range of human–nature relationships, particularly those associated with knowledge systems and values not accounted for in our model. Despite ecological knowledge positively influencing all types of visions, self-transcendence values in the context of Sierra de Guadarrama might have been influenced by visions that acknowledge the potential threat of humans to nature. That is, broader forces such as mass tourism, invasive species or residential growth that align with the current narratives of the institutional discourses about the management of protected areas (i.e. *nature despite people*) (Lo et al., 2022; López-Rodríguez et al., 2022) may influence values over time. The negative relationship of self-transcendence values with the vision of *nature for itself* may reflect an interest in avoiding a naive extreme eco-centric vision for human–nature relationships and illustrate priorities placed on humans as potential sources of threat in a protected area landscape.

5.3 | Recommendations for managers: Intervention points

Previous research has called for inclusive approaches to conservation that show understanding and the integration of values, knowledge systems and experiences of people directly affected by conservation interventions into protected area management decision-making (Cebrián-Piqueras et al., 2023; Goodson et al., 2024; Raymond et al., 2022). However, understanding and accounting for inner worlds and the social–ecological and cultural context of local communities are rare outcomes from conservation practice and policy (Ives et al., 2020). Our study highlights potential key points of intervention that can respond to knowledge of how people envision, assign diverse values or care for nature in protected areas. We call for practitioners and policymakers to co-produce inclusive conservation strategies that explicitly account for and target:

(i) the coupled social–ecological context, including the diversity of ways local communities interact with or learn about nature, the level of exposure to nature and sociocultural backgrounds and contexts. Examples include informal ways of learning and promote diverse ways of being exposed to nature for both urban and rural communities; preserve and promote biocultural diversity and practices, customary rights, practices and traditions.
(ii) the diversity of knowledge systems and worldviews informing 'peoples' relations with nature, including not only those knowledge systems held by practitioners or decision-makers but also local communities. Examples include and maintain local and traditional knowledge, along with scientific and technical knowledge in managing protected areas; seek out potential positive synergies and feedback among knowledge types.
(iii) guiding principles of life (i.e. broad values) as indicators of how people understand themselves and form viewpoints on perceived relationships with nature. Examples include value-based approaches to conservation and landscape sustainability considering, for instance, the blending of biospheric values and altruism.

5.4 | Limitations and further research

Several caveats should be considered in the interpretation of our research results. First, we cannot confirm that our sample fully represented the local communities of Sierra de Guadarrama. However, our on-site sampling procedures helped address the challenges of declining response rates (Stedman et al., 2019). Second, the number of respondents who answered all questions in our survey was relatively low, so we used a PLS path model that accommodates smaller sample sizes (Hair et al., 2011). Third, we acknowledge that our results only show correlations given our cross-sectional study design. Although structural equation modelling methodology tests predictions and implies directionality through hypothesis testing, causal conclusions cannot be drawn. Therefore, we encourage further research to validate the insights and hypotheses tested by this work. Fourth, we acknowledge the limitation of using one global single item to reflect pro-environmental behaviour, though this research approach is not unprecedented (e.g. Cheah et al., 2018) Finally, we used knowledge and perceptions of nature's contributions to people concepts as indicators of specific values assigned to the landscape and acknowledge a bias towards anthropocentric perspectives including instrumental and relational values. Broader variation of relational and intrinsic values should be pursued in future research to gain insights into other typologies connected to the IPBES Values Assessment (Hoelle et al., 2022).

6 | CONCLUSIONS

The recently launched IPBES Values Assessment calls for acknowledging the multiple ways people, including local communities, value and relate to nature, and for enabling transformative pathways to improve human–nature relationships and restore the human capacity to conserve nature. Our results show that self-transcendence values, local and scientific ecological knowledge positively relate to (i) a diversity of specific values prioritising ecological aspects, multiple non-material relationships with the landscape, as well as some material relationships with nature; (ii) visions highlighting a prominent role of nature over humans for the surrounding landscape (eco-centric); and (iii) pro-environmental willingness and behaviour related to the practice of care for nature. Contextual social–ecological factors, such as urban–rural dynamics, or people's experiences with nature were also positively linked to these relationships. We call for holistic and plural approaches considering the multiple factors that underpin human–nature relationships to enhance conservation research and

practice and better develop behavioural interventions in protected areas.

AUTHOR CONTRIBUTIONS

Miguel A. Cebrián-Piqueras conceived the idea, designed methodology, collected and analysed the data. Miguel A. Cebrián-Piqueras and Carena van Riper led the writing of the manuscript. All authors contributed critically to the drafts, edited parts of the manuscript and gave final approval for publication.

ACKNOWLEDGEMENTS

This research was funded through the 2017–2018 Belmont Forum and BiodivERsA joint call for research proposals (project ENVISION), under the BiodivScen ERA-Net COFUND programme, and with the support of national funders (German Federal Ministry of Education and Research, Grant Number: 01LC18064, National Science Foundation under Grant No. 1854767). We want to thank the valuable support of the Spanish National Centre of Environmental Education (CENEAM) staff and the local collaborators who conducted interviews with residents. Open Access funding enabled and organized by Projekt DEAL.

CONFLICT OF INTEREST STATEMENT

The authors of this manuscript declare that they have no conflicts of interest associated with this research. One of the authors, Tobias Plieninger, is an Associate Editor for *People and Nature*, but he was not involved in the peer review and decision-making process for this manuscript.

DATA AVAILABILITY STATEMENT

The anonymised interview data supporting this study's findings are deposited in ZENODO research data storage service under the licence 'Creative Commons Attribution 4.0 International' (https://doi.org/10.5281/zenodo.15488015). The dataset can be downloaded using the following link: https://doi.org/10.5281/zenodo.15488015.

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SUPPORTING INFORMATION

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

Appendix S1: Synthesis of previous research and expectations (i.e., hypotheses) tested using a structural equation model.

Appendix S2: Survey measures tested in the model (*n*: 78).

Appendix S3: Learning about and exposure to nature.

Appendix S4: Model quality assessment.

Appendix S5: Summary of the indirect and direct effects from the path models estimated in this study, including retained indicator variables, latent variables and R^2 values.

How to cite this article: Cebrián-Piqueras, M. A., van Riper, C. J., Andrade, R., Raymond, C. M., Goodson, D. J., Keller, R., & Plieninger, T. (2025). Weaving values, knowledge and context to care for human–nature relationships in protected areas. *People and Nature*, *7*, 1952–1971. https://doi.org/10.1002/pan3.70083