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Co-creation of economic value in peri-urban protected areas: Insights from nature conservation and nature-based recreation

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ABSTRACT

The co-creation has proven to be an effective approach for enhancing the quality of decisions through a process of deliberation and collaborative management for protected areas. This approach has the potential to bridge the knowledge gap that often exists between the stakeholders, academic and administrative realms. This work proposes to use a co-creation process to determine the economic value of peri-urban protected areas, one of the most outstanding natural areas where the most drastic land-use changes tend to occur. The growing demand for conserving and visiting peri-urban natural protected areas is leading decision-makers to improve their knowledge of the socioeconomic values of these spaces. To this end, the Sierra Espuña Regional Park (SE-Spain) is employed as a case study to enable the implementation of a three-step process, whereby the social demand for nature conservation and nature-based recreation, and the key challenges and potentials of this peri-urban protected area are identified. The methodology employed was based on a contingent valuation survey and the travel cost method, in addition to a focus group where a SWOT (strengths, weaknesses, opportunities and threats) analysis was conducted. The results demonstrated the usefulness of the co-creation process to improve the knowledge of: the social preference for nature conservation, with a total economic value of 11,301,112 €/year; the recreational activities in nature, with a benefit of 4,921,840 €/year; and the main challenges and potentials of peri-urban areas, highlighting the bureaucracy to carry out the actions and the demand for ecotourism-related services. It therefore justifies the suitability of applying this type of collaborative approach between the academic, stakeholders and decision-makers realms as a preliminary step towards the formulation of more sustainable management measures for the achievement of urban social well-being.

1. Introduction

Peri-urban protected areas are designated for the long-term conservation of biodiversity and the promotion of social benefits, both direct and indirect, (Zabala et al., 2022), helping to facilitate contact with nature for citizens in urban centres and improve their quality of life. These areas encompass a variety of land uses, including parks and nature reserves, wetlands and natural agricultural areas that support nature conservation (Aggestam et al., 2020), which may be defined as the care and protection of natural resources (raw materials, food or medicinal and genetic resources) for current and future generations (Jones-Walters & Čivić, 2013). This conservation allows protected areas to continue contributing to climate regulation, the moderation of extreme phenomena, and the stimulation of recreation, among other services (Albaladejo-García et al., 2021).

There is a growing interest, both from the academic community and policy makers, in establishing a link between nature conservation in peri-urban natural areas and the recreational services they provide (Madrigal-Martínez et al., 2025; Rocchi et al., 2020). This is because one of the principal types of indirect economic incentives in these kinds of natural areas are their recreational services, and more specifically, nature-based recreation (Whitelaw et al., 2014). This type of recreation is defined as recreation activities in which the primary attraction for visitors is interaction with the natural environment (Wolf et al., 2017). Decision-makers in peri-urban areas have sought to understand the economic value derived from the implementation of conservation measures (Alcon et al., 2019) and the expenditure incurred by visitors to these areas (Da Mota & Pickering, 2020).

Thus, on the one hand, policy makers try to attract visitors in order to gain government support and financial resources that can be invested in peri-urban areas to protect it from any form of pressure or impact (Li et al., 2015; Talukdar et al., 2024). On the other hand, visitors seek to

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have an enriching experience with the nature during their travels (Mayer & Woltering, 2018). A positive experience in the nature will result in future visits or recommendations to others, which in turn will generate more financial income and consolidate the nature into a concrete tourism site that can be used to support conservation efforts (Wolf et al., 2019). It should be noted that the more attractive a place is, the more likely it is to degrade, potentially diminishing the quality of the experience and thus visitor satisfaction (Albaladejo-García et al., 2023a).

The development of an assessment framework that can determine the importance of the economic value of peri-urban protected areas requires the collaboration of multiple perspectives (Maczka et al., 2021). These include the experts who set policy and the managers who must translate policy into practice by considering people's preferences (Zabala et al., 2022).

Decision-making requires deeper integration that considers people's preferences and diverse political knowledge and experience (Nguyen et al., 2024). This integration is frequently achieved using methodologies that facilitate the collaborative formulation of agendas and the delivery of social outcomes (Moallemi et al., 2023). Such processes that link the diverse preferences that people wish to promote with the knowledge needed to do so are referred to as co-creation (Jones, 2018). Co-creation enhances the quality of decisions through deliberation and collaborative management, thereby facilitating the development of viable, fair, and inclusive options and solutions (Hakkarainen et al., 2022). Several recent contributions to the literature have provided guidance on the involvement of diverse decision-making actors in scientific work (Galan et al., 2023; John & Supramaniam, 2024; Moallemi et al., 2023; Norström et al., 2020). These advances have established co-creation as a fundamental aspect of human-natural systems management. Its significance in the context of social and political change is widely acknowledged (Wyborn et al., 2019).

Despite significant efforts in domains such as sustainable development (Chambers et al., 2021), rural areas (Soini et al., 2023), urban landscapes (Puskás et al., 2021), climate change (Bremer & Meisch, 2017), tourist experiences (Campos et al., 2018) and ecosystem services (Hinson et al., 2022), there has been so far hardly any economic and management analysis of nature conservation and nature-based recreation in the co-creation context (Nguyen et al., 2024). Nor have these analyses been applied in peri-urban protected areas (Simončič et al., 2024), which are undoubtedly one of the most significant natural and forestry areas (Cheung & Hui, 2018). The role of peri-urban natural protected areas in enhancing urban environments in the context of global climate change is of paramount importance (Zhang & Brack, 2021; Šafářová et al., 2021), due peri-urban ecosystems are highly pressured, often leading to conflicting management situations (Madrigal-Martínez et al., 2025; Rajendran et al., 2024). Consequently, they have become an indispensable component of green city strategies (Phelan et al., 2019) and understanding how communities think about urban nature can lead to better policies (Ordóñez et al., 2024).

While it is true that there are studies that individually apply economic valuation methods such as contingent valuation (Albaladejo-García et al., 2023b) or travel cost method (Alessandro et al., 2023), or even SWOT (strengths, weaknesses, opportunities, and threats) analysis (Scolozzi et al., 2014), there is no study that integrates nature conservation and nature-based recreation in a co-creation process for peri-urban protected areas.

In this paper we provide through a case study a process of how can carry out a co-creation process with decision-makers based on providing information on the economic value of nature conservation and nature-based recreation in peri-urban protected areas. The contingent valuation method, the travel cost method and a SWOT analysis are combined in a three-step process. The peri-urban natural protected area of Sierra Espuña (SE-Spain), a paradigmatic case in which policy decision is necessary due to recent anthropic pressures that have increased the interest in conservation measures is employed as the case study.

We examine the extent to how can create a co-creation of economic value in peri-urban protected areas, to answer the following research questions: (RQ1) Is there a social preference for nature conservation? (RQ2) Is there a social preference for nature-based recreation? (RQ3) What are the key challenges and potentials?

2. Materials and methods

This section outlines the methodology used for the co-creation of economic value in a peri-urban protected area (see Fig. 1). To address the three research questions (RQ) presented in the introduction, a mixed methodology strategy was employed which combines two survey-based techniques with a qualitative elicitation technique for decision-makers. This results in a three-step process, starting with exploratory research and concluding with definitive research. This process integrates the diverse preferences of society with the judgements of decision-makers through collaborative deliberation and management (Hakkarainen et al., 2022). Interviews were then used as the instrument of data collection. Three interview types/techniques were used: informant/unstructured interviews for policymakers and stakeholders, and two respondent/structured interviews (using questionnaires) for households, one using the revealed preferences approach and one using the stated preferences approach.

At each step, feedback was provided by decision-makers.

- RQ1. A social perception questionnaire was used where the central valuation technique is based on the contingent valuation method (Perni et al., 2021), which is one of the most widely academically supported stated preference methods (Bateman & Turner, 1993, pp. 120–191). The survey population is asked to express their willingness to pay (WTP) for the implementation of a set of management and conservation measures in the peri-urban natural area. The data thus obtained permit the determination of the total economic value of nature conservation in the peri-urban natural area in addition to, among others, the use of area. The factors influencing WTP and public use were also obtained by modelling with *logit* and *tobit* estimations.
- RQ2. A second independent questionnaire on the travel cost method (Lamhamedi et al., 2021) of visitors to the peri-urban protected area was used, which is one of the most widely academically supported revealed preference methods (Bockstael & McConnell, 2007). In this survey, respondents are requested to disclose all expenses incurred during their visit to the site. The data thus obtained allows the economic value of nature-based recreation in the peri-urban protected area. The factors influencing the number of visits were also obtained by modelling with *poisson* estimations.
- RQ3. A focus group (Hennink, 2013) was convened with the objective of applying a SWOT analysis (Scolozzi et al., 2014). A preliminary review of the relevant literature and social perceptions enabled the identification of a range of strengths, weaknesses, opportunities and threats of the peri-urban area. These were subsequently presented to the decision-makers and stakeholders for final selection. The data permit the formulation of more qualitative conclusions regarding the main challenges and potentials of the peri-urban area.

2.1. Case study of Sierra Espuña Regional Park for the co-creation process

To illustrate the co-creation process of the economic value of peri-urban protected areas, the Regional Park of Sierra Espuña in Region of Murcia (SE-Spain) was selected (Fig. 2). The peri-urban protected area encompasses an area of approximately 18,000 ha. Its immediate surroundings are home to 700,000 inhabitants, resulting in a population density of approximately 138.94 inhabitant/Km^2, which is considerably

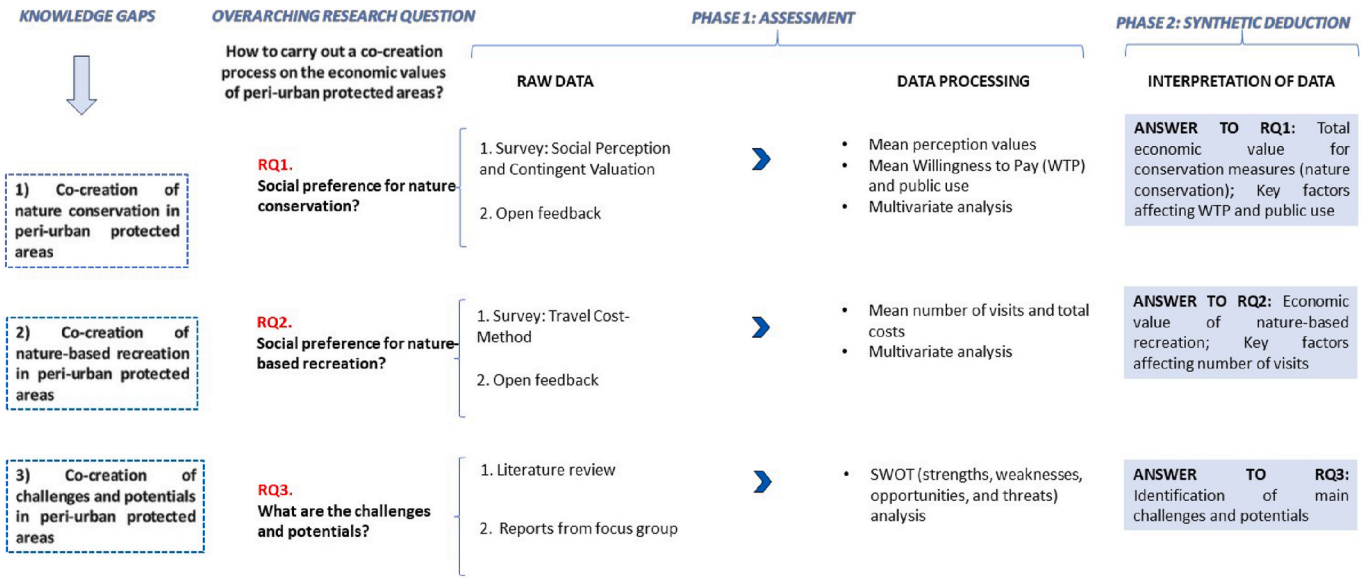

Fig. 1. Research methods applied.

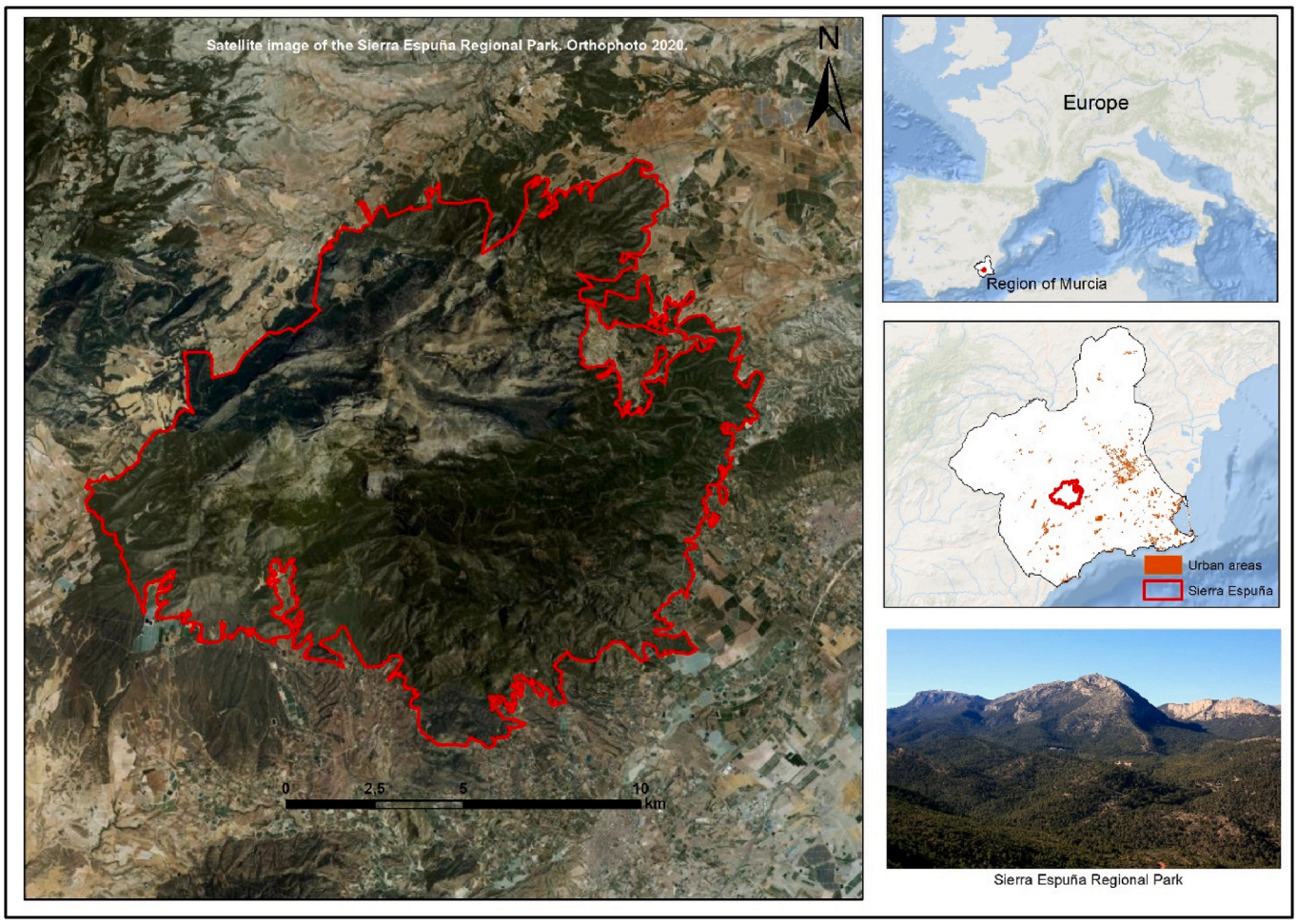

Fig. 2. Study area.

higher than the national average (93.74 inhabitant/Km^2), and the region boasts an average household income of 28,618 €/year. The unemployment rate in the area is 9.2 %, which is slightly below the regional and national average. The main economic activities are centered on the service and agricultural sectors, with 19,145 and 8,679 employees respectively, with industry and construction being less important (CREM, 2025 It is located 48 km from the downtown of Murcia, the main city of the region. Public transportation is only

available between the towns closest to the Regional Park such as Alhama de Murcia, Librilla or Mula, with no direct connection to the main cities, such as Murcia or Cartagena. It is noteworthy that this region comprises 3.88 % of the total built-up area and 6.02 % of protected green spaces, being also this peri-urban protected area the largest representative of the Mediterranean forest in the Iberian Southeast. It holds around 1,000 different species of flora with a very important pine forest with species such as the *Pinus halepensis, Pinus pinaster* and *Pinus nigra*, among others (López, 2021). This peri-urban protected area is home to a considerable biodiversity of fauna species and a multitude of natural resources. In this context, public use compatible with protection strategies is being encouraged in this peri-urban protected area.

However, this peri-urban protected area is not free from anthropic pressures due to urbanisation processes in the vicinity of the area and the degradation of natural resources caused by a combination of various factors, and political and management decisions are now required. These include the transformation of the forest into crops and pastures, the exploitation of timber, arson, overgrazing, overuse and improper recreational practices in some areas (such as climbing in non-permitted areas or the use of motorized vehicles on trails), etc (Águila, 2018). This degradation has resulted in a reduction of the most environmentally beneficial ecosystem services, including those that regulate and provide cultural benefits.

Given the predominantly recreational value of this peri-urban protected area, which attracts visitors in search of outdoor activities such as hiking, climbing and birdwatching, it is of great interest to examine the management and conservation of the natural area with a view to promoting recreational services. Following the inclusion in 2012 of the Sierra Espuña Regional Park in the European Charter for Sustainable Tourism in Protected Areas (EUROPARC, 2010), decision-makers have identified the potential for nature-based recreation. This type of recreation allows companies certified by the Ecotourism Club in Spain to engage in activities such as bird watching and photography, environmental education activities, hiking routes, and interpretation workshops. Thus, the objective is to demonstrate the commitment of all stakeholders to sustainable development, to promote the ecotourism destination of this area and to encourage the consumption of local products under the quality brand "Territorio Sierra Espuña" (Albaladejo-García et al., 2025a). This territorial brand has also been linked to traditional rainfed agriculture (27,488 ha), irrigated agriculture (23,238 ha) and livestock activities (97 livestock farms), especially with the cultivation of olive, table grapes, and almond trees, allowing for products such as honey and extra virgin olive oil.

2.2. Data collection from the co-creation process

The data obtained from the co-creation process is derived from interviews and surveys conducted with a distinct target population in each instance. First, the co-creation process started with collaborative interviews process with 10 decision-makers (technicians and public administration employees) and 12 stakeholders (entrepreneurs, farmers, local population …) to concretize the information to be obtained on the economic value of nature-conservation, the nature-base recreation and SWOT process.

With this information, a first survey was designed, tested with a pilot survey of 20 individuals, and conducted in person during April 2022 to a random sample of the 532,820 households in the Region of Murcia. The target population in this survey is constituted by all households located within the Region of Murcia, given the regional park character of the study area. A total of 443 surveys were obtained, which, for a dichotomous variable (such as binary willingness to pay) and a confidence level of 95 %, yields a sampling error of 4.7 % in the case of intermediate proportions and 2.8 % for extreme proportions. These values ensure the population representativeness of the results.

The survey is made up of 25 questions grouped into three blocks, focusing, among others, on quantifying the willingness to pay (WTP) for implementing conservation and management measures in the peri-urban protected area and the reasons why respondents would not be willing to contribute. The payment vehicle selected in the pilot survey from several proposed options is an annual contribution to a local association (*e.g.* land stewardship association). The binary WTP question (WTPB) was therefore formulated as follows: *Would you be willing to make an annual contribution to a local association (e.g. land stewardship association) to* support *the financing of the management and conservation measures in the Sierra Espuña Regional Park?*

Following this dichotomous question, the maximum willingness to pay (WTPT) was asked if the answer was positive (WTPB = 1). For this purpose, a mixed format of an open bidding question was used; first the respondent was randomly asked one of the four starting points (10, 20, 30 and 40 €/household/year) obtained in the pilot survey and then, whether the answer was positive or negative, the maximum amount (WTPT) they would be willing to spend for the conservation of the valued protected area was asked. Respondents are then asked about the meaning of their WTPB response. In the case of a WTPB = 0, the motivations for categorising these responses as protest and non-protest were identified. In the case of WTPB = 1, respondents were asked which conservation measures they would like to see improved by this contribution.

After this first survey, a second survey was carrying out, focusing on the recreational services offered by the Sierra Espuña Regional Park. Thus, as proposed by the decision-makers and stakeholders, travel cost method was implemented in this case. The target population is all visitors to the Regional Park, regardless of their origin. After conducting a pilot survey of 10 visitors who validated the method used, a survey of 152 visitors to the peri-urban protected area was carried out during May and June 2022, which coincided with the average number of visitors to the "visitor centre" in the area, thus ensuring that the number of visitors in other months was neither overestimated nor underestimated. For a dichotomous variable and a confidence level of 95 %, the survey yields a sampling error of 8 % in the case of intermediate proportions and 4.8 % for extreme proportions due the target population of 136,000 annual visitors to the space (CARM, 2022), which ensure the representativeness of the results.

The survey is made up of 24 questions grouped into three blocks, focusing, among others, on the costs incurred during the visit to the Regional Park. This information will allow 4 types of costs to be obtained.

- Travel costs. The costs associated with visitors travelling from their home to the Sierra Espuña Regional Park (return trip) are included. In this study, only the costs perceived by the visitor have been taken into account, because when a consumer makes the decision to travel, the costs that are really evaluated are the marginal costs, i.e. the fuel in the case of travelling in one's own vehicle, or the price of the ticket or trip in the case of travelling by bus or in an organised tour. The types of private vehicles considered are diesel, petrol, electric vehicles and motorcycles.
- On-site costs. It includes the costs incurred by the visitor in the area associated with accommodation, food, adventure tourism activities and the purchase of Territorio Sierra Espuña branded products.
- Opportunity costs (travel). This is the value that visitors lose when they choose between one or more alternatives in their travel journey. It is assumed that the opportunity cost of time can be approximated by a wage rate ratio and the travel time that respondents spend until they reach the natural area (Amoako-Tuffour & Martínez-Espiñeira, 2012).
- Opportunity costs (stay). This is the value that visitors lose when they choose between one or more alternatives in their stay in the destination. It is assumed that the opportunity cost of stay can be approximated by a wage rate ratio and the number of hours that respondents stay during the visit (Amoako-Tuffour & Martínez-Espiñeira, 2012).

Finally, the third step of the co-creation process ended with a SWOT analysis. To conduct a SWOT analysis, basic steps must be followed based on (Benzaghta et al., 2021): (1) the formation of a focus group; (2) the establishment of an objective for the SWOT analysis; (3) the compilation of a list of strengths, weaknesses, opportunities and threats; (4) the refinement, organisation and prioritisation of the ideas in each category; and (5) the creation of an action plan to address the priorities of the SWOT analysis. In this work, a focus group was held in April 2023 with 53 stakeholders (10 from the agrarian sector, 10 from the ecological sector, 18 from the service sector and 15 from the technical sector) to analyse and discuss the results obtained and carry out the SWOT. Based on a literature review of the main strengths, weaknesses, opportunities and threats of peri-urban protected areas and the results of the initial collaborative interviews process, a SWOT analysis was carried out considering the opinions of the focus group. All statements to be selected in the SWOT analysis were based on the main economic sectors of the peri-urban protected area. These results allowed us to obtain the main challenges and potentials of the Sierra Espuña Regional Park from a socioeconomic perspective.

2.3. Descriptive analysis of the surveys data

The descriptive data from the first survey identifies the profile of the average respondent as an individual aged 45, with a university education (completed or in progress) and who is an active worker in 45 % of the cases. The most common household size is three, with an average monthly family income of 1,928 € (Supplementary Table 1). The characteristics of the surveys are found to be largely consistent with the census values for the target population (CREM, 2022), thereby confirming the representativeness of the sample and its suitability for population analysis and inference. It was also noted that 55.38 % of the respondents were users of the Regional Park, due they having visited it in the last two years. Furthermore, spatial variables have been employed. The distance (in km) of the respondents to the Sierra Espuña Regional Park and other substitute natural areas in the Region of Murcia was calculated from the distance from the centroid of the postcode of their usual residence to the area of the protected area considered (Martínez-Paz et al., 2021). The mean distance between respondents' residences and the area under study was 35 km. In terms of the nearest substitute natural areas, the mean distance from respondents' residences to the peri-urban protected area of Sierra de Carrascoy is less than 20 km, while the mean distance to the remaining protected areas, including Calblanque, San Pedro del Pinatar, Sierra de la Pila and Sierra del Carche, is greater than 35 km (Supplementary Table 1).

The descriptive data from the second survey, based on the travel cost method, are presented in Supplementary Table 2. In this sample, 94.11 % of visitors came from the Region of Murcia, the rest being from other regions and/or countries, which explains the difference in the basic statistics compared to the first survey. In the second survey the spatial variables were also obtained from the distance (in km) from the centroid of the postcode of usual residence of respondents to the Sierra Espuña Regional Park and the perceived distance (in km) to other substitute protected areas. The mean distance taken by respondents to reach the Sierra Espuña Regional Park was 54 km, greater than the distances of the first survey given that there are respondents coming from outside the Region of Murcia. In contrast, the mean distance perceived by respondents to other similar protected areas was 21 km (Supplementary Table 2).

The population shows in both surveys a high affective ecological commitment (I would like to) a medium verbal ecological commitment (I intend to) and a lower real ecological commitment (I do), with a consistent average gradation between the three levels, as is the presence of a positive and significant linear correlation between the three commitments (Supplementary Tables 1 and 2).

3. Results

3.1. Nature conservation assessment

The initial assessment of the facilities within the Sierra Espuña Regional Park is presented in Table 1.

Respondents believe that access to the Regional Park by public transport should be increased and access by motorized vehicles should be limited. Also, respondents believe that there should be more infrastructure to the park. In the rest of the statements the respondents show a more neutral opinion.

Supplementary Table 3 shows the assessment of the main impacts and pressures perceived by the respondents in the peri-urban protected area. Damage to biodiversity (8.41), forest fires (8.25) and the effects of climate change (8.13) were the most important. On the other hand, the non-regulation of recreational activities (5.87) seems not to be of great importance for the respondents. Respondents also assessed the importance that should be given to the criteria of each stakeholder group in the management of the Sierra Espuña Regional Park (Supplementary Table 4). The criteria of all the four-stakeholder group were positively assessed by respondents, with an average score of 7.17 out of 10. Respondents stated that researchers and scientists (8.68) followed by environmental associations (7.86) should have the most influence on the management of the peri-urban protected area, while the landowners of the area (6.27) should have the least influence.

From the response analysis of the contingent valuation exercise, it was found that 46.28 % of the sample (205 individuals) showed a WTPB>0, while the remaining 53.72 % (238 individuals) would not be willing to pay for the measures (WTPB = 0). Among the arguments of WTPB = 0, those that were justified with the reasons "Improvement and maintenance should be borne by public budgets" and "Local population and users should contribute" were considered as protest zeros. Thus, 179 of the 238 zeros correspond to protests, resulting in 59 real zeros. Protest zeros have been excluded from the final analysis to avoid conceptual inconsistencies and underestimation of the WTPT (Barreiro-Hurle et al., 2018). Thus, the hypothetical market was configured considering the 205 respondents with positive WTPB and real zeros, which is finally composed of 264 individuals.

The mean WTPT for implementing management and conservation measures in the peri-urban protected area is 21.21 €/household/year (Table 2). Users offered a WTPT of 24.42 €/household/year while non-users' contribution is 16.19 €/household/year, which are statistically different values (Table 2). Aggregating the mean individual WTPT for the whole population would yield the social benefit (Bateman & Turner, 1993, pp. 120–191) derived from the improvement of the nature conservation of the Sierra Espuña Regional Park, which considering the size of the target population (532,820 households) yields a total economic value of 11,301,112 euros/year.

Respondents who were WTP for management measures were asked to prioritise them on a scale of 0–10 (Supplementary Table 5). The measures set were proposed by stakeholders and decision-makers technicians in the initial meeting and by the proposals received in the pilot survey conducted prior to this survey. The average score of the set of 12 proposed measures is high (6.89). The highest scoring measures are those related to biodiversity conservation (9.16) and forest management of the natural area (8.89). Respondents consider the support to the management and creation of rural accommodation, the agro-ecological revitalisation and collaboration with private farms, and hunting exploitation to be of medium priority.

Multivariate analyses of the WTPB and WTPT have been performed, being measured by socio-economic (Supplementary Table 1), spatial (Supplementary Table 1), and environmental (Supplementary Table 2) variables.

The factors explaining WTPB have been identified from a *logit* model (Table 3), where WTPB takes value 1 if the individual shows a WTP>0 and 0 if it is a real zero. The model presents a good fit (78.8 % Correct

Table 1
Frequency (%) of responses for the facilities in the peri-urban protected area: 1 (maximum disagreement) 5 (maximum agreement).

Facilities	1	2	3	4	5
Access by public transport should be increased	5.83	8.59	20.86	33.74	30.98
There are a sufficient number of parking spaces	8.28	12.27	34.05	27.30	18.10
Motor vehicle access should be limited	11.04	15.03	26.69	23.93	23.31
The number of recreational areas, viewpoints, etc. should be increased	13.50	16.26	24.23	21.17	24.85
The urban furniture (signage, railings, benches...) is insufficient	12.92	20.00	32.62	21.85	12.62
Mobile network coverage should be improved	19.33	20.25	22.70	20.25	17.48
The number and condition of paths and routes is insufficient	16.31	21.23	28.31	24.31	9.85
There are sufficient infrastructures for people with reduced mobility	25.62	33.33	26.85	8.64	5.56

Light blue shading = lower values; dark blue shading = higher values.

Table 2
Descriptive statistics of willingness to pay (€/household/year).

Variable	n	Mean	SD	Min	Max
WTPT	264	21.21	27.78	0	250
User's WTPT	161	24.42	26.65		
Non-User's WTPT	103	16.19	28.88		

t-test difference Users vs Non-Users WTPT: 5.607, with a P. value < 0.05.

Table 3
Results from WTPB *logit* model.

Variables	Coefficients	Marginal effects
Constant	−1.007 (1.218)	
Users	0.988 (0.325) ***	0.159
Distance to Sierra Espuña	−0.031 (0.012) **	−0.005
Distance to Carrascoy	0.269 (0.012) **	0.004
Affective Ecological Index	0.766 (0.242) ***	0.115
Family size	−0.246 (0.134) *	−0.037
n	264	
Log-likelihood	−122.322	
CPC	78.8 %	
VIF	1.11	

*, ** and *** indicate p-value at 0.1, 0.05, and 0.01 significance levels, respectively.

Classification) and shows no collinearity problems (VIF <10).

Table 3 shows that five variables are significant in explaining the higher probability of WTP. Given their marginal effects, it is observed that the probability of WTP>0 increases by 15.9 % for being users of the peri-urban protected area. With respect to the spatial variables, it is observed that a 1-km increase in the distance to the study area decreases the probability of WTP by 0.5 %, while a 1-km increase to the substitute natural area of Sierra de Carrascoy increases the probability of WTP for implementing conservation measures in Sierra Espuña by 0.4 %, demonstrating the influence of other substitutes on demand as is well documented in other studies (Albaladejo-García & Martínez-Paz, 2025b). It is also observed that each additional point of affective ecological commitment of the respondent increases the probability of WTP by 11.5 %, while family size has a negative effect, decreasing the probability by 3.7 %.

Next, the willingness to pay (WTPT) is modelled using a 0-censored *tobit* specification (Table 4). In this model, the same variables are significant in explaining the amount of WTP. Thus, given the marginal effects evaluated at the sample mean, being a user increases WTPT by 4.8 €/household/year. Each km of distance to the study area reduces WTPT by 0.99 €/household/year, while each km of distance to the substitute of Sierra de Carrascoy increases WTPT by 0.30 €/household/year. Furthermore, each additional point of affective ecological commitment increases WTPT by 6.27 €/household/year, reducing the payment by 1.86 €/household/year for each family member of the household, which indicates that large families may have reduced financial capacity to contribute to environmental protection measures.

Table 4
Results from WTPT *tobit* model.

Variables	Coefficients	Marginal effects
Constant	21.462 (14.750)	
Users	6.875 (3.684) *	4.845
Distance to Sierra Espuña	−1.380 (0.135) ***	−0.986
Distance to Carrascoy	0.418 (0.116) ***	0.299
Affective Ecological Index	8.767 (2.828) ***	6.266
Family size	−2.606 (1.432) *	−1.863
n	264	
Log-likelihood	−970.203	
Chi-square statistic (p-value)	28.994 (0.000)	
VIF	1.12	

* and *** indicate p-value at 0.1 and 0.01 significance levels, respectively.

Given the influence of being a user in both WTP modelling, a *logit* modelling of the Users variable is performed below to better understand the behaviour of these respondents (Table 5). This variable takes the value of 1 if the respondent visited the Sierra Espuña Regional Park in the last two years, taking a value of 0 if he/she did not visit it.

The model has a good fit (61.2 % Correct Classification) and shows no collinearity problems (VIF <10). Three variables explain the user condition. The marginal effect, valued at the mean, indicates that a one km increase in the distance to the study area decreases the probability of being a user by 2.1 %. Unlike the WTP models, there is no influence of spatial substitution variables. If there is an increase in verbal ecological commitment the probability of being a user increases by 28.1 %, owning a property in the study area increases the probability of being a user by 30.4 %.

3.2. Nature-based recreation assessment

An on-site survey of 152 visitors to the Sierra Espuña Regional Park was carried out using the individual travel cost method. The Supplementary Table 6 contains all the information on the visits to the peri-

Table 5
Results from Users *logit* model.

Variables	Coefficients	Marginal effects
Constant	−0.091 (0.427)	
Distance to Sierra Espuña	−0.021 (0.008) ***	−0.021
Verbal Ecological Index	0.281 (0.089) ***	0.281
Residential property in the study area	1.524 (0.577) ***	0.304
n	443	
Log-likelihood	−291.701	
CPC	61.2 %	
VIF	1.04	

*** indicate p-value at 0.01 significance levels.

urban protected area. The mean number of visits per year made by visitors to the Sierra Espuña Regional Park was 13, while the mean number of activities was 2. The most repeated motives of visitors were 'to contemplate landscape and nature' and 'to practise sport' (mainly hiking or mountain biking). 57.24 % of visitors stated that they knew of a natural area near their usual place of residence with similar characteristics to the Sierra Espuña Regional Park where they could carry out similar activities, therefore considering it as a substitute for the area visited. The mean distance to the perceived substitute was 20.56 km (Supplementary Table 1). Of the 13.82 % of respondents who spent the night away from home, 38.10 % chose a second home and/or camping site for their accommodation. The rest of the visitors who spent the night away from home during their visit to the protected area stayed in a hotel/hostel or rural house. Most visitors (53.95 %) used the diesel car as a means of transport to access the Regional Park, followed by the petrol car (24.34 %). The individuals were accompanied on average by another person in the same vehicle. The average time visitors took to reach the natural area, without considering stops, was 49 min 32.24 % did eat in a local restaurant in the area.

Table 6 shows a description of each type of cost incurred by visitors to the protected area.

The average total cost of visitors to the Sierra Espuña Regional Park is 36.19 €/visit, with the opportunity costs of staying in the protected area (17.07 €/visit) and the on-site costs (13.86 €/visit) being the main budget allocations for visitors. Considering that the annual mean number of visits is 136,000, it has been shown that the benefit obtained by the nature-based recreation of the Sierra Espuña Regional Park amounts to 4,921,840 €/year if the total costs are considered.

A *poisson* model was carried out using the number of visits as the dependent variable (Table 7).

The *poisson* model has a significant fit (p.value Chi-square <0.01) and there are no collinearity problems (VIF <10). The explanatory variables included are those listed in Supplementary Tables 1 and 6, and the variable Total Costs in Table 7, corresponding to the second survey carried out.

Thus, users will visit the Sierra Espuña Regional Park more often when they are closer to the study area, further away from other substitute natural areas, have a university education, a higher level of satisfaction with their visit, a higher personal income, and a greater affective ecological commitment. The marginal effects on the mean value of the sample indicate that the number of visits to the Regional Park is reduced by one unit for every 12.5 € of additional total costs or every 8 km of additional distance. An additional visit is made for every 7.35 km of distance to a substitute, for every additional 250 € of monthly personal income, for every 0.79 additional affective ecological commitment points or for every 0.68 additional points in the level of satisfaction with the visit. Conversely, having university studies is associated with an increase in the number of visits in a year by 3.59.

3.3. SWOT analysis

Finally, the SWOT analysis yielded the results shown in Table 8, which presents the items selected with a high valuation (>7/10) within each SWOT category. The challenges and potentialities identified (Fig. 3) were based on Table 8, as well as on more qualitative aspects based on the conclusions provided by the 53 decision-makers during the focus group. Additionally, the conservation measures valued by the population in the initial survey processes were considered.

Among the results obtained in this SWOT analysis, a lack of coordination between the public administration and private stakeholders was identified. To address this challenge, it was proposed to create greater transparency between the two groups, allowing for greater feedback in the deliberation of opinions. Regarding the agrarian sector, the main limitations (both physical and human) to develop sustainable agriculture and livestock farming in the peri-urban protected area were highlighted. To this end, it was proposed, among others, to promote local products such as those of the Territorio Sierra Espuña brand and initiatives to revitalise this sector. Finally, about tourism, the current deterioration of the cultural and natural heritage of Sierra Espuña was discussed. In this sense, it is necessary to promote the modernisation of rural tourism and services related to ecotourism.

Table 6
Descriptive statistics of total costs (€/visit).

Total cost type	Mean	SD	Min	Max
Travel costs	3.74	3.71	0	25
On-site costs (food, accommodation, etc.)	13.86	41.07	0	400
Opportunity cost (travel)	3.13	1.98	0.09	11.15
Opportunity cost (stay)	17.07	13.18	0	71.38
Total Cost	36.19	40.76	2.63	442.44

Table 7
Results from number of visits *poisson* model.

Variables	Coefficients	Marginal effects
Constant	−0.430 (0.390)	
Total Costs	−0.011 (0.002) ***	−0.080
Distance to Sierra Espuña	−0.017 (0.002) ***	−0.125
Distance to substitutes	0.018 (0.002) ***	0.136
University studies	0.513 (0.091) ***	3.587
Satisfaction level	0.194 (0.041) ***	1.464
Personal income	0.001 (0.000) ***	0.004
Affective Ecological Index	0.168 (0.031) ***	1.265
n	152	
Log-likelihood	−548.127	
Chi-square statistic (p-value)	15.211 (0.000)	
VIF	1.28	

*** indicate p-value at 0.01 significance levels.

Table 8
SWOT item valuation. 1 (maximum disagreement) 10 (maximum agreement).

Item	Mean	SD	Min	Max
Strengths				
Territorio Sierra Espuña brand as a symbol of identity and quality	7.83	2.46	1	10
Involvement in the maintenance and conservation of heritage	7.04	2.14	2	10
Existence of successful tourism/restoration initiatives	7.10	2.11	2	10
Existence of untapped business opportunities	7.14	2.22	1	10
Weaknesses				
Bureaucracy to carry out actions	7.44	2.05	1	10
Lack of coordination of different public administrations	7.16	2.21	1	10
Deterioration of the landscape (abandonment of farms, urbanisation, etc.)	7.40	2.08	3	10
Seasonality of tourist demand (weekends and summer)	7.78	1.65	4	10
Opportunities				
Social appreciation of ecological agriculture and extensive livestock	7.08	2.25	1	10
Growing demand for ecotourism-related services	7.24	2.16	1	10
Growing demand for differentiated activities specific to the Park	7.13	2.26	1	10
Institutional support for the modernisation of rural tourism	7.02	2.24	2	10
Threats				
Lack of generational replacement in the agrarian sector	8.51	1.73	1	10
Lack of adequate management of the Barbary sheep	7.68	2.51	1	10
Lack of public funding for ecotourism initiatives	7.24	2.10	3	10
Murcia is not socially perceived as a nature tourism destination	7.63	2.43	1	10
Effects of climate change	8.27	1.63	4	10

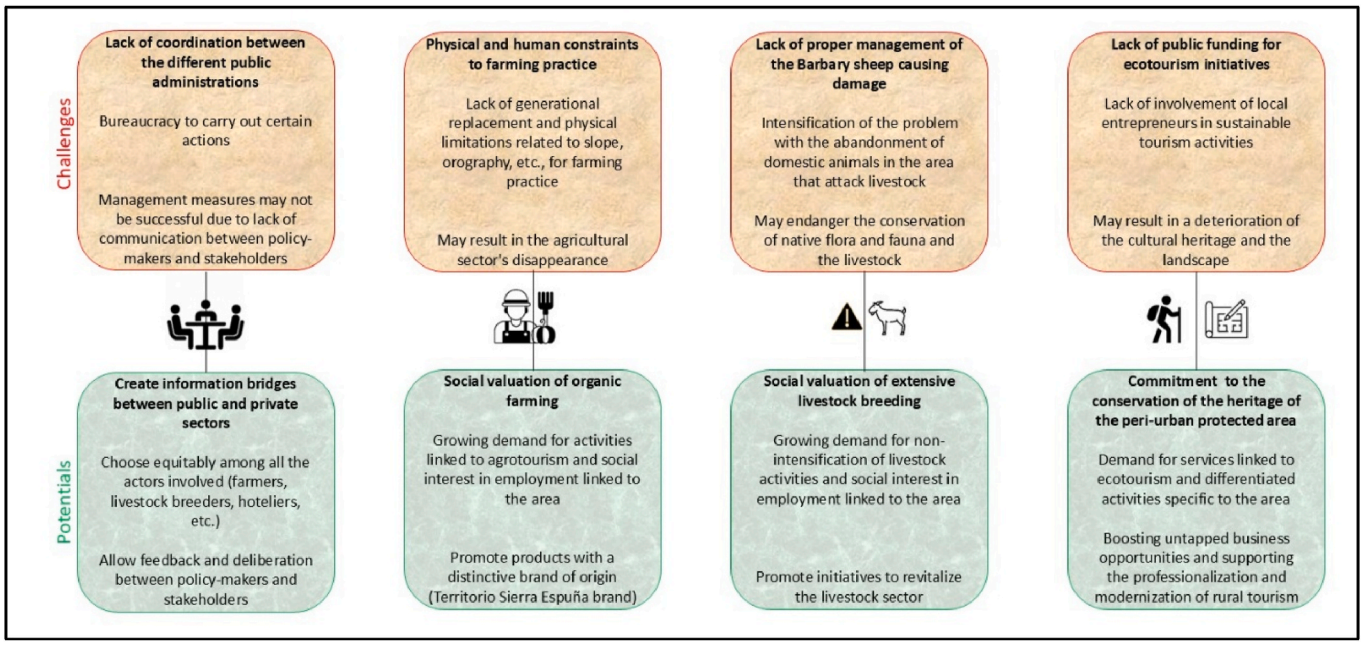

Fig. 3. Challenges and potentials in co-creation process of peri-urban protected areas.

4. Discussion

Despite the growing recognition that co-creation can have positive effects on decision-making processes across a range of disciplines (Chambers et al., 2021; Puskás et al., 2021; Soini et al., 2023), there remains a paucity of understanding regarding the economic support that co-creation can provide to the management and conservation of peri-urban protected areas, as well as its potential to enhance recreational values of natural areas. This work has presented an example of how to approach a co-creation process of the economic value of peri-urban protected areas based on nature conservation and nature-based recreation. Using one of the best-known peri-urban protected areas in SE-Spain, the Sierra Espuña Regional Park, the gap in the literature has been filled by demonstrating that it is possible to achieve knowledge co-creation between stakeholders, decision-makers, academia, and the population's preferences. In this way, a three-step process based on contingent valuation method, travel cost method and SWOT analysis with constant feedback from the stakeholders has been carried out to answer the three research questions formulated in this work.

(1) Is there a social preference for nature conservation?

The results of the contingent valuation survey indicate a social preference for the implementation of measures to improve the nature conservation of the Sierra Espuña Regional Park. The social benefit of 11 million € per year derived from the implementation of management and conservation measures in the Sierra Espuña Regional Park substantiates its status as a socioeconomic asset within the region. The results indicate that the population exhibits a greater proclivity to allocate their monetary contribution to management measures aimed at averting biodiversity damage and enhancing forest management. This assessment is consistent with the views of stakeholders and decision-makers regarding the heightened anthropogenic impact on the natural environment and the necessity for the implementation of more sustainable management strategies. Furthermore, the population's inclination to accord greater weight to the perspectives of researchers and scientists in the planning and management of Sierra Espuña prompted the decision-makers to advocate for a more prominent role for the academic-university stakeholders in the formulation of management strategies.

Social preference is clearly modulated by the socioeconomic and spatial characteristics of the population and by the substitutive effects of other natural areas. The positive influence of being a user of the peri-urban protected area or having a greater environmental commitment has been demonstrated, results consistent with those reflected in the literature (Albaladejo-García et al., 2023b; Žlender & Gemin, 2020). The negative effect of distance from the peri-urban protected area studied has been demonstrated, which confirms and complements the results of other studies on the importance of distance decay in having a positive WTP for the management of these peri-urban protected areas (Olsen et al., 2020) or for visiting areas of natural and environmental interest (Schindler et al., 2022). Likewise, there is a positive influence on the distance to substitute natural areas, in line with previous studies that demonstrated this influence in other types of natural spaces (Martínez-Paz et al., 2021). It is a novel result to be able to quantify and compare these effects in the two aspects of willingness to pay: while in terms of probability the effect of the distance to the good and its substitute is very similar, in terms of the amount of this willingness to pay the effect is on the order of three times greater for proximity to the protected area than for distance to its substitute (Albaladejo-García & Martínez-Paz, 2025b).

The results of this work are in line with the growing social demand for improving nature conservation in other peri-urban protected areas (Alcon et al., 2019; Halkos et al., 2020) and serve as a reference point to encourage the design and implementation of more environmentally friendly policies.

(2) Is there a social preference for nature-based recreation?

The results of the travel cost survey carried out among visitors to the Sierra Espuña Regional Park show the social preference for nature-based recreation in this protected area. The benefit of 4,921,840 €/year obtained from the entire population that visits this peri-urban protected area allows us to affirm the importance of recreational services in Sierra Espuña, representing approximately 43.55 % of the total economic value. This benefit is even greater than the budgeted funding (around 200,000 € in 2022) (CARM, 2022) in this protected area to improve facilities and public use, so the decision-makers considered that there may be a budget increase towards improving public and tourist services.

This appreciation is consistent with the recent tourist boom in many

peri-urban protected areas (Yoon et al., 2024), thanks to the search for more natural spaces motivated by the pandemic (Pouso et al., 2021) and the loss of urban sustainability in cities, which is understood as urbanisation processes that damage the environment and do not guarantee the well-being of the population (Wu et al., 2024). Therefore, the growing anthropic pressure resulting from new tourist activities and urbanisation processes should not be overlooked, which may reduce the social interest (Albaladejo-García et al., 2023c) in visiting this peri-urban protected area.

The results of the modelling of the number of visits have also revealed, among others, the negative effect of the distance decay towards the study area and the positive effect of substitute protected areas on the social demand for nature-based recreation. Thus, it confirms the arguments given in the literature (Cullinan, 2011; Hensher & Stopher, 2021) for a more detailed examination of the spatial aspects of individuals' travel costs.

These results are undoubtedly a tool to improve decision making at the stakeholders and administrative levels regarding the improvement of peri-urban protected areas with a high social demand such as the one studied. In such cases, public participation should be an integral component in the design of recreational activities (De'Arman, 2020).

(3) What are the key challenges and potentials?

To generate more valuable and comprehensive knowledge, a SWOT analysis was employed to identify a range of challenges and potentials associated with the peri-urban protected area. The lack of coordination between administrations, the existing restrictions in the agrarian sector, and the lack of investment in recreational activities which respect the nature revealed a tendency towards disconnection between research and political practice. The proposals shown by the population in the surveys, together with those expressed by stakeholders and decision-makers in the focus group, highlighted the potential of the Sierra Espuña Regional Park to promote the sale of local products to avoid a deterioration of the agricultural sector, to promote sustainable livestock activities, and to encourage rural tourism, which has been increasingly in demand in recent years (Corsi et al., 2023; Grădinaru et al., 2018). Being more specific, rural tourism in Sierra Espuña should follow current trends that not only focus on nature, but also on heritage or gastronomy, and being deeply linked to the integral development of rural communities. The sale of local products such as olive oil or honey (Albaladejo-García et al., 2025a) are good examples of how to apply rural development strategies to foster local economies and avoid the abandonment of agriculture in peri-urban protected areas. All the results of these process have finally been summarized in a dossier, agreed upon with the stakeholders, which has been presented to the administration technicians and decision makers in order to design a consensual action plan for the natural protected area, consistent with the global environmental policy.

The findings of this work reinforce those of other studies (Jones, 2018; Spyra et al., 2025) on the exercise of overcoming the gap between academia and governance to promote more practical policies based on building bridges between research, society, stakeholders and administration. These results provide a foundation for the development of policies that are more socially and academically acceptable, offering a potentially more productive approach for decision-makers to address complex issues related to the peri-urban protected areas management.

While this work marks a significant advancement in the co-creation of economic value in peri-urban protected areas, it is essential to further develop this approach by incorporating additional evaluation stages in collaboration with decision-makers. It is therefore proposed that the Delphi method (Linstone, 1985) be employed to consult experts with a view to reaching a greater consensus on the challenges and potentials of the protected area. Furthermore, it is recommended that specific questionnaires be developed to ascertain the social demand for local products associated with the Territorio Sierra Espuña brand, such as honey or olive oil. This would facilitate the formulation of a strategy to promote the economic activities of the peri-urban area and enhance the profitability of small agrarian and artisan productions.

5. Conclusions

This work has demonstrated that it is feasible to engage in a co-creation process of economic value for natural areas, exemplified in a peri-urban protected area. The high social demand for nature conservation and nature-based recreation has led decision-makers to take much more into account sustainable conservation policies with the area. Furthermore, the co-creation process, structured in three steps, has enabled the identification of key challenges, namely the lack of coordination between administrative bodies and the physical and human limitations of the agrarian and tourism sectors. Additionally, it has facilitated the identification of significant potentials, including the promotion of a distinctive brand that favours activities related to sustainable agriculture and livestock farming, among others.

These findings are useful for decision-makers to adopt measures that have a wider social and academic acceptance in peri-urban protected areas, demonstrating that the co-creation process is an appropriate way to increase social well-being and fill the knowledge gap that exists between the academic, governance and society spheres. Considering the significant socioeconomic conflict arising from the management of water resources in this semi-arid area, where different stakeholders mainly related to the agrarian sector (development of livestock and intensive irrigated agriculture) and tourism (creation of golf courses, second homes, hotels, etc.) compete for the uses of increasingly scarce water, decision-makers are demanding a similar process of co-creation for the formulation of agro-environmental and water allocation policies that consider the economic value and social perception of water use.

CRediT authorship contribution statement

José A. Albaladejo-García: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Federico Martínez-Carrasco Pleite:** Writing - review & editing, Validation, Project administration. **José M. Martínez-Paz:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization.

Declaration of competing interest

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 paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.habitatint.2025.103462.

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