Exploring local public support for protected areas: What social factors influence stated and active support among local people?

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ABSTRACT

This paper explores local public support for nature protected areas (PAs) to identify primary social factors explaining support. The model was built and tested using survey data collected from approximately 2300 individuals living inside or near six Protected Areas in five different European countries using both face-to-face and online methods. Results show that perceived social impacts are a key and consistent predictor of the level of stated support, despite the wide range of potential impacts. Also important is the strength of a person's sense of place attachment to the PA landscapes or area, as well as institutional trust. Other factors were only significant at some sites indicating the importance of local context. Results indicated that stated support is linked with pro-environmental behaviour when using the protected area, indicating the importance of supportive public attitudes for behaviour that is supportive of ecological effectiveness. The link between stated support and volunteering was less clear indicating that this is also influenced by other factors. The model is intended to inform theoretical understanding of the factors affecting public support, but also as a step towards developing a predictive tool for practitioners taking into consideration a broader range of factors in assessing public support and highlighting problem areas for action. As new ambitious biodiversity conservation targets are set internationally, our study will be useful for practitioners and researchers regarding what future management approaches and policies need to focus on in order to maximise public support, minimize conflicts in PAs and increase pro-environmental behaviour.

1. Introduction

The lack of success of policies in protecting the world's biodiversity over past decades has led to new and more ambitious targets to protect degrading ecosystems (UN, 2021, CBD, 2021). Protected Areas (PAs) are a key strategy in biodiversity protection (Wilshusen et al., 2002; Carrus et al., 2005) and both the European Union and the United States have set ambitious goals aiming to protect 30% of land area and 30% of marine environments by 2030, creating a roadmap to add many new PAs or expand existing ones (European Commission, 2020; Executive Office of the President, 2021). This expansion of PA networks is based on key principles of protecting ecosystems, making space for nature and

addressing significant socio-economic priorities (European Commission, 2020). However, the extent of area to be designated (30%) represents a very significant proportion of national land areas and the new PAs will need to be carefully chosen and strongly justified, as will the associated impacts on local communities in and around the PA.

In order to meet these ambitious biodiversity targets through a significant expansion of PAs, significant public support may be needed from local communities living inside or near their boundaries (Vanclay, 2017; Engen et al., 2018; Bennett et al, 2019) for two reasons. Firstly and pragmatically, in many or most cases PA management is expected be less conflictive, complex and more cost-effective in a landscape where the PA has the support, both active and passive, of the local publics, being able

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to draw on local political goodwill, and practical support, through volunteering for example. Secondly, in democratic societies, it should be clear that public consent is essential (what we could term 'democratic conservation'). Whilst much research debates the relative merits of various public engagement, co-management and community management approaches, the very least the public is entitled to expect is that the PA management possess a 'social license to operate' (Vanclay, 2017) by securing local public support. Therefore, to ensure good governance and successful outcomes from PAs, the goal should be to achieve positive acceptance, that is, genuine public support, public buy-in to the PA project rather than resigned or reluctant acceptance.

Public support for a PA has two key aspects: attitude support (Schuitema and Bergstad, 2013) and active support (Stern et al., 1999). In the former case, members of the public hold positive or supportive attitudes, beliefs and views of the PA, consider it 'a good thing' and therefore believe that it should exist, expressed in surveys as 'stated support'. Stated support in surveys may or may not be evidence of active support but may be assumed to be evidence of supportive attitudes and beliefs. Holders of such supportive attitudes may or may not act upon these attitudes. This said, active support may be as simple as voting for a pro-PA politician or speaking positively of the PA in the local community, through to more overtly active support such as voluntary activity in support of PA management and responsible environmental behaviour when using the PA, or even to political activism. In this regard, the typology of active support described by Stern et al. (1999) (public support, private sphere behaviour, environmental citizenship, environmental activism) could be conceptualised as a diverse range of activity along a spectrum from private sphere behaviour to public sphere behaviour. Both, attitude support and active support are important for the effective designation and management of a PA, as high levels of attitude support can lead to reduced conflicts or resistance, while active support can assist with PA governance and management, and in minimizing damages to biodiversity, ecosystems and landscape features from people. Exploring whether attitude support leads to active support, or whether the two are at least interrelated, is also an important area of research as the effective designation and governance of PAs may require both types of support, which may be influenced by different factors (Chaigneau and Daw, 2015).

Even before considering the factors that may influence whether people become active in supporting a PA (Bennett et al., 2018), existing literature, particularly from environmental psychology and environmental policy studies has shown that public attitude support for PAs may rely on a potentially very wide range of social factors. The authors, in Jones et al. (2022), have conducted an extensive review of the factors noted in literature that may influence public support for PAs relating to individual people, governance, and relational issues between individuals and between people and governance actors.

Factors particularly relating to the individual may include those relating to personal values and environmental worldviews (Tonder and Jurvelius, 2004; Wynveen et al., 2015); individual attitudes and perceptions (Sattler and Nagel, 2010; Nastran, 2015); pro-environmental beliefs and attitudes (Carrus et al., 2005); traditions, norms and ethics (Hoelting et al., 2013); personal circumstances and demographics (Tonder and Jurvelius, 2004); and location in relation to the PA (Rentsch, 1988; Jones et al., 2020b). More relational factors then include: sense of place attachment (Tonder and Jurvelius, 2004; Cundill et al., 2017); level of trust in other people (social trust) and in management institutions (institutional trust - Jones et al., 2012, Nastran and Istenic, 2015, Bennett et al., 2019); or beliefs about the purpose of the PA and its ecological effectiveness (Hoelting et al., 2013; Bennett et al., 2019). Governance factors may include governance style (Jones et al., 2022), governance and management processes, decision-making and trade-offs (Hoelting et al., 2013; Chaigneau and Daw, 2015; Chaigneau and Brown, 2016;). In turn, many factors intrinsic and extrinsic to the individual may interact, for example, governance factors will interact with personal and relational factors such as institutional trust.

Further factors likely to influence attitude support for a PA include the hugely diverse range of possible social impacts of a PA on the many forms of human well-being (Kaplan-Hallam and Bennett, 2018). Recent studies from conservation social science studies have shown that the perception of impacts influences stated public support (Bennett et al., 2019; Ban et al., 2019) with a main assumption that higher costs lead to lower levels of support for PAs and vice versa (Hoelting et al., 2013; Matseketsa et al., 2018; Bennett et al., 2019; Ban et al., 2019). These impacts may be very diverse in nature and in turn impact on diverse aspects of human wellbeing, including mental and physical health, social wellbeing and human rights (Jones et al., 2020a) and there has been a growing literature exploring these aspects and recognising their importance (de Lange et al., 2016; Jones et al., 2017). The sheer diversity of possible impacts makes assessing this aspect alone challenging, making a comprehensive impact assessment of a new or existing PA a significant task.

The level of public attitude support and the above associated values, beliefs and attitudes may be influenced by feedback relating to the individual's level of engagement in activities in support of the PA (Gall and Rodwell, 2016; Di Franco et al., 2016). Finally, beyond attitude support, a further range of factors will affect whether people become active in supporting a PA (Chaigneau and Daw, 2015) relating to the actor themselves, their capacity to become involved and their motivations (Bennett et al., 2018).

In order to investigate the role of diverse social factors in influencing local stated and active support for PAs, we constructed a model of key factors noted in literature and in well-known models of pro-environmental behaviour to test against field survey data collected at a range of European case study PA sites. Our model is intended to inform theoretical understanding of the factors affecting public support, but also as a step towards developing a predictive tool for practitioners taking into consideration a broader range of factors in assessing public support and highlighting problem areas for action. We analyse data from 6 PAs collected via 2300 structured questionnaires distributed to people living inside or near the borders of these PAs. We explore the role of selected explanatory factors on the stated level of support (as an indicator of attitude support) while studying whether attitude support translates into active support that assists in the protection of biodiversity. We use one of the largest primary databases that currently exists on support for PAs, in a region (Europe) where studies on this topic are scarce, to identify key factors influencing public support for PAs as well as additional research needed to further develop our understanding of public support, in order to develop tools and guidance to assist practitioners in maximising public support, minimizing conflicts in PAs and increasing pro-environmental public behaviour.

2. Methods

2.1. Description of research areas and data collection

Data from 6 European PAs established in 5 European countries (Table 1 and Fig. 1) were collected via a structured questionnaire in order to explore the different aspects of support and their explanatory factors. The research areas were selected based on the following criteria: a) established PAs with clear protection designation (e.g. National Park, Natura 2000, Ramsar Wetland), b) large PAs covering over 100 km^2, c) PAs directly affecting local communities providing both benefits (positive impacts) but also having potential costs (negative impacts); d) areas with different socio-ecological characteristics in order to explore our key questions in different socio-ecological context.

A pilot study was undertaken during Summer 2019 in the Cairngorms National Park, Scotland, UK in order to test the questionnaire face-to-face with members of the public. Following this, questionnaires were distributed between Autumn 2019 and Spring 2021 to a sample of the local populations living inside or on the boundaries of the PAs. In two areas the distribution was completed face to face (FtF) by trained

Table 1

Research areas and key characteristics.

| Area & Country	Size (ha)	Year of designation	Sample size	Type of PA	Method of distribution
Prespes National Park (Greece)	32,700	2009	300	Terrestrial	FtF
Snowdonia National Park (Wales, UK)	213,400	1951	770	Terrestrial and Coastal	Online
Matsalu National Park (Estonia)	48,660	2004	98	Terrestrial and Coastal	Online
Sighisoara-Tàrnava Mare NATURA 2000 site (Romania)	89,264	2008	200	Terrestrial	FtF
Peak District National Park (England, UK)	144,000	1951	444	Terrestrial	Online
Black Forest National Park (Germany)	10,062	2014	500	Terrestrial	Online
Total	**538,086**		**2324**		

FtF = Face-to-face
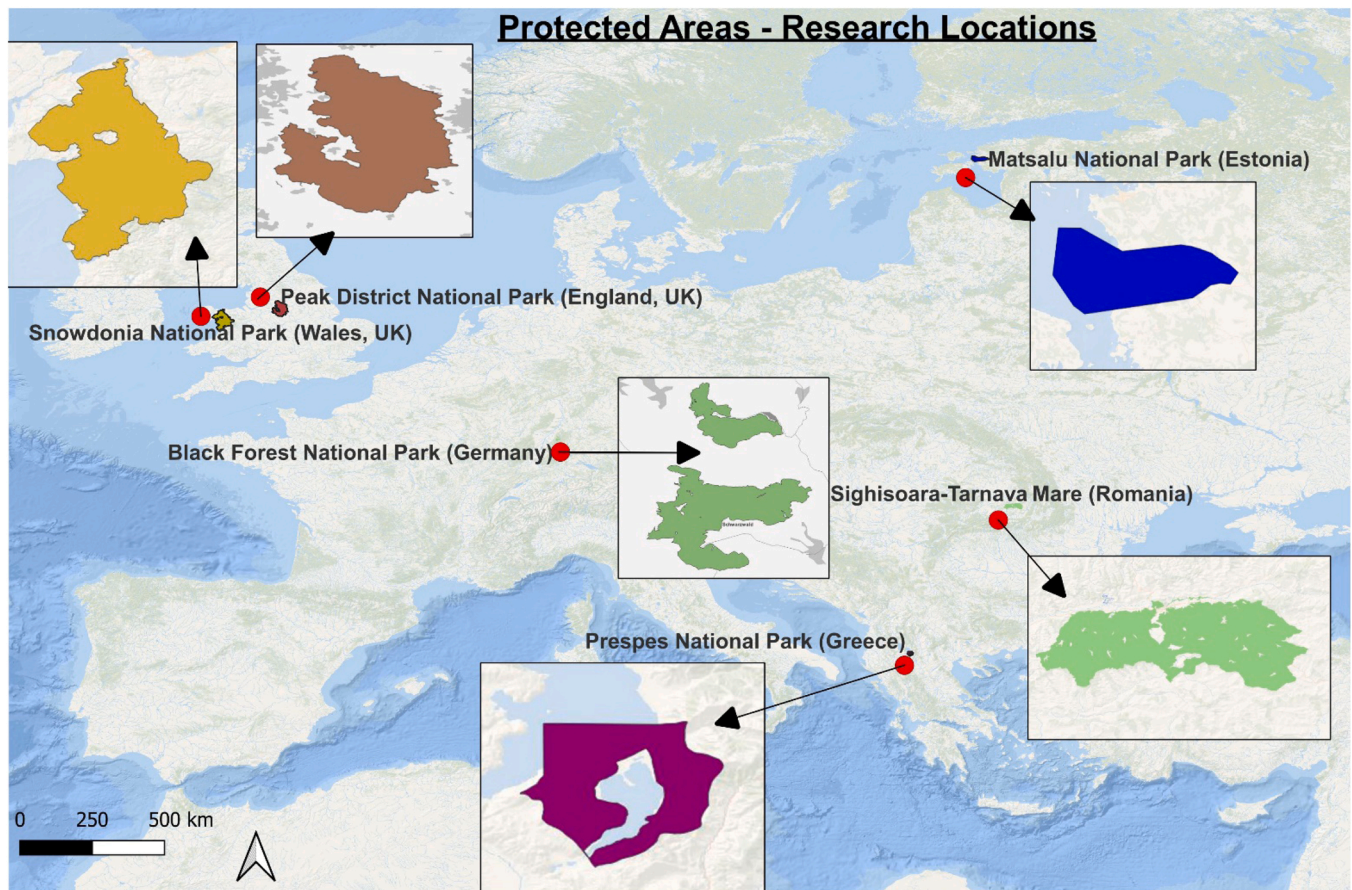
Fig. 1. Locations of the six protected areas included in this study.

researchers (Table 1). In the remaining sites the questionnaires were distributed online (using Qualtrics) due to COVID-19 restrictions. In the online surveys postcards were sent to a representative sample of the local population with the exception of Matsalu where no official list with postal addresses was available. In all cases the questionnaires were also advertised online via social media. The sampling frame in each case study was determined based on the number of communities influenced by the PA and was specified in close collaboration with the park authorities on a case-by-case basis. The final sample size was dependent on the response rate, which ranged from 5% (eg. Black Forest) to 20% (Prespes National Park).

2.2. Questionnaire description

The aim of this research was to investigate whether there are a number of key factors that influence support which are sufficiently common to all or most PAs that they should be considered at all sites and

can be used to then help build a more site-specific model with more context-specific factors that will give a good initial indication of public support. Which factors to include in this model was determined by consideration of both the literature and a range of pre-existing models of pro-environmental behaviour from environmental sociology and psychology, as reviewed by the authors in more detail in Jones et al. (2022). The main theories on which this review focussed were: the Theory of Social Capital (Bourdieu, 1986); Theory of Reasoned Action (Fishbein and Ajzen, 1980); Theory of Planned Behaviour (Ajzen, 1985); Value-Belief-Norm theory (Stern et al., 1999), and Theory of collective action (Ostrom, 2000).

For the purposes of this study both widespread active and non-active support in the local population were of interest. Therefore, as well as factors influencing active support demonstrated through pro-environmental behaviour, we were also interested in factors affecting 'attitude support' where the public hold positive beliefs about and attitudes towards the PA even if they do not act on these attitudes or

beliefs. In this regard factors were prioritised if they were considered more likely to influence a large proportion of the population through attitude support and pro-PA behaviour in the private sphere/everyday behaviour (Stern, 2000) rather than a smaller subset through activism. There is also a focus on personal and relational factors influencing values, beliefs and attitudes (e.g. Bennett et al., 2018).

The main categories of factors included in the model are presented in Fig. 2. The specific dependent (stated and active support) and independent variables included in the questionnaire and model are listed in Table S1, Supplementary Information, along with the type of scoring scale used (e.g. Likert), as well as any references used to identify any well-established standard wordings for questionnaires. Some questions, primarily those relating to PA norms and regulations were context specific, in which case, Table S1 indicates which issues related to which PA.

2.2.1. Selection of factors and indicators

Regarding the dependent variables (support), respondents were asked about the extent of their support for the PA. To measure attitude support they were asked to state their level of support for the PA (stated support). For active support, they were asked about two aspects of this: firstly active support through volunteering, and secondly through compliance with regulations and recommendations as an indicator of pro-PA general behaviour in the private sphere. Respondents were asked whether they had participated in an activity to support the PA in the past years and how often they comply with or follow specific regulations or recommendations (active support revealed through pro-environmental behaviour in the PA). In the latter category aspects of environmental behaviour were modified to match the context in each PA following consultations with representatives of the management organisations (see Table S1).

As noted above, a very wide range of factors could have been chosen and therefore any choice had to be highly selective in order to create a brief questionnaire suitable for members of the general public, and which could address a wide range of factors concisely. The implications of the choices made are explored further in the Discussion section.

As regards the independent variables included in the questionnaire, selected variables were included particularly following VBN theory (Stern et al., 1999). In VBN theory, values, social norms and

environmental worldview were considered relevant to how the PA was viewed by residents and the merit of what the PA is intended to achieve, directly influencing attitude support, which we in turn consider likely to be a key motivational factor for active support. Regarding values and environmental worldview, question wordings were taken from well-established uses of the VBN theory to predict pro-environmental behaviour regarding equality, social justice and anthropocentrism vs. altruism and biocentrism (Bouman et al., 2018). Norms were also included following the Theory of Planned Behaviour (Ajzen, 1985), where questions focussed on beliefs about how people 'should' behave, and whether they in fact do comply with rules and established social norms in the relevant contexts, using wordings following De Groot and Steg (2008).

We also chose to include place attachment (Anderson-Renaud, 2021, Steg et al., 2018), with wording focussing on affective attachment (Raymond et al., 2010). Respondents were also asked whether they lived in or near the PA as their main home or second/holiday home in order to establish their relationship to the local area. Personal contextual factors were then represented by a number of key demographic factors (age, gender, education, income).

Regarding social capital factors, questions on social trust (of other people in society) and of governance institutions were included. In particular, institutional trust was prioritised from social capital theory and was used as a broad indicator of the level of satisfaction with the quality and effectiveness of governance (Jones et al., 2012). Institutional trust was measured for a range of governance actors from the PA management authority at the lowest level, to national government at the highest.

A further set of important factors affecting support found in other researchers' findings and included in the model are social impacts (Bennett et al., 2019). Social impacts can be conceptualised in a range of ways and we have used as a starting point the definition from Jones et al. (2020a): *the intended and unintended social consequences, both positive and negative, which occur because of the designation of a PA and any social change processes invoked by a PA*. From here we have considered impacts broadly and flexibly as perceived impacts: any perceived change in any cost or benefit, advantage or disadvantage, of living in or near the PA landscape resulting from the creation of the PA.

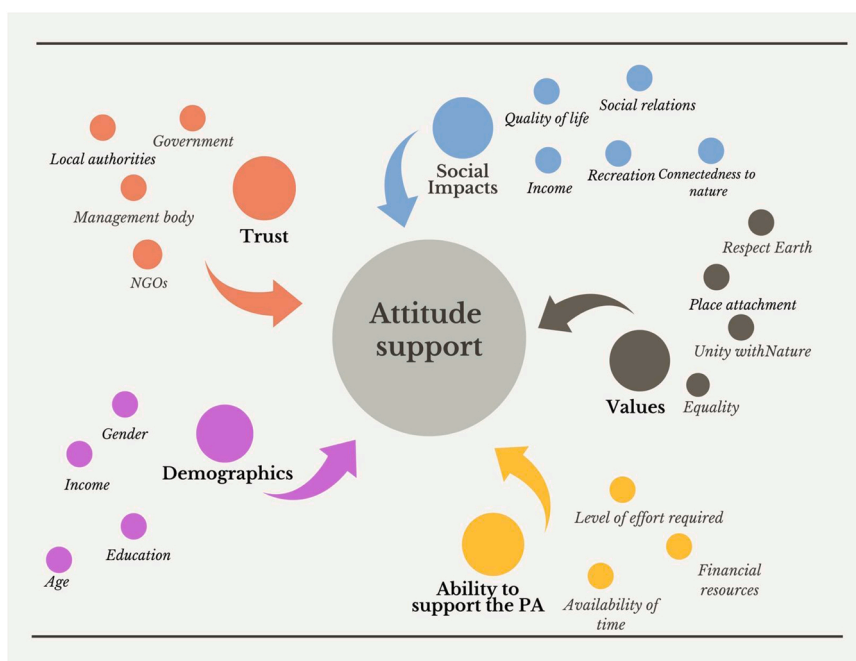As noted earlier, such impacts may be very diverse in nature and in

Fig. 2. Predictive model exploring public support for Protected Areas as a biodiversity protection policy.

turn impact on a wide range of aspects of human wellbeing (Kaplan--Hallam and Bennett, 2018), including mental and physical health, social wellbeing and human rights (Jones et al., 2020a) and may encompass the economic, social and cultural, including the affective, such as place attachment and ecosystem services (Pascual et al., 2016). Given the sheer diversity of possible impacts, and that the survey was not intended as a comprehensive social impact assessment, it was decided to focus on people's perceptions of the overall impact of the PA on a small number of broad subjective impact categories, selected in discussion with the PA authorities in question. We therefore selected a small number (5) of broad subjective well-being categories and asked respondents whether the PA had impacted (positively or negatively) on these aspects of their well-being: income, recreation, social relations, nature connectedness and an overall integrator category 'quality of life'. The last category was chosen in preference to specific questions on physical and mental health as it was considered a more instinctively easier question to answer quickly in a larger questionnaire touching on many issues. In this way the chosen impact items spanned the well-being spheres of personal health, economic and social, but also cultural (activities and practices) and governance (rights and access).

Finally, independent variables were included that might be anticipated to influence more active support such as volunteering (a dependent variable above). Following the Theory of Reasoned Action, a variable 'ability to support' was included based on respondents' belief that they had the resources (time, money, opportunity) to participate in supporting the PA. This is taken to be the case in the TRA/TPB where attitude towards a behaviour is considered a key influence on pro-environmental behaviour, along with social norms and ability to carry out the behaviour (Gall and Rodwell, 2016; Di Franco et al., 2016). This item therefore constituted a self-evaluation of possession of the necessary capital to participate actively in PA support, similar to the section 'Capacity' in the framework by Bennett et al. (2018). Whilst we did not explicitly include an item regarding actor motivation, the questionnaire did include a range of intrinsic motivation factors rooted in beliefs, attitudes and values.

2.2.2. Modelling and analysis

A two-stage structural equation modelling (SEM) approach (Bollen, 1989) was applied in order to test the impact of different factors on stated and active support. Details of the modelling procedure are provided in the Supplementary Information.

3. Results

3.1. Stated support and explanatory factors

Overall a relatively high level of stated support was noted in all PAs with high percentages of responses noted at all sites for the most positive statement (highest score on the Likert scale = 5). Highest levels of support are noted at the Peak District with 90% of respondents saying that they fully support the PA (Score = 5). At all other sites full support was below 60%. Across all sites complete lack of support was noted only by 10% or less of respondents (lowest score = 1) (Fig. 3).

The results in terms of the Cronbach's alpha (Spearman's correlation coefficient in case of two-item factors) along with the percentage of variance of the selected items explained by each of the latent factors are presented in the Supplementary material (Table S2). Results show that the utilized constructs fulfil the reliability and validity prerequisites. Also, the collected data do not suffer from common method bias, with variance explained by each construct being higher than 50%, with few minor exceptions near the borderline. Hence, the latent factors are suitable for inclusion in the SEM analysis.

The six SEM models, one each for each PA are fitted to the collected data in order to examine the relationship between the selected independent variables as influencing factors, and the dependent variable (stated support). The validity of the fitted SEM models is initially
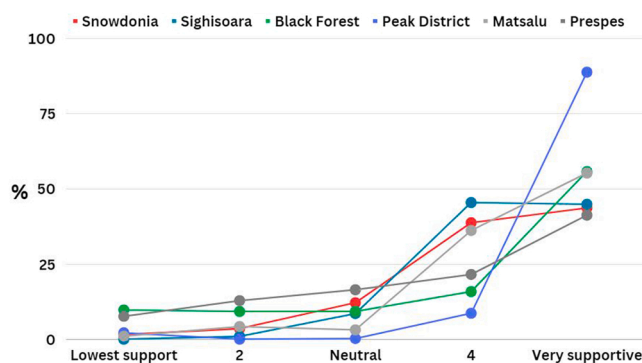

Fig. 3. Stated level of Support for Protected Areas.l

examined through the inspection of the goodness-of-fit statistics (GoF) (see Table 2).

All six models explain a significant proportion of the variability in the stated support variable. Specifically, the highest proportion (41.3%) is explained in the Matsalu SEM model, whereas the lowest proportion is found in the Black Forest model (27.8%). For the Prespes data the model explained 40% of variability in stated support, in the Peak District data the SEM model explains the 36.7%, in the Snowdonia model 33.1% is explained and finally 29.6% of the variability in stated support variable is explained by the Sighisoara Târnava Mare model.

According to the estimates of the six SEM models two main factors are seen to be the most important in explaining stated public support (Table 3, Fig. 4): social impacts and place attachment (the social impacts factor has been found to have statistically significant associations with stated support in 5 out of 6 models, whereas place attachment has significant associations with stated support in 4 out of 6 models).

In the case of social impacts, people who consider that they benefit the most from the PA appear to more strongly support it. The highest level of association was observed in the Black Forest (b=0.417; p-value<0.01). In the case of place attachment, at most sites (Snowdonia, Peak District, Târnava Mare, Black Forest) people who have a stronger sense of place attachment to the PA (stating that 'this area means a lot' to them) also appear to be more supportive of the PA. On the contrary, those who are not so strongly connected with the PA stated lower levels of support for the PA.

The remaining parameters have varying degrees of influence depending on the case studies, with a less consistent pattern across the different sites. Trust in institutions is significant in explaining the level of support in Snowdonia, Prespes and the Black Forest. The ability to support (referring to whether an individual finds it easy to behave responsibly and also whether they have the necessary resources to support it) are also determinants of support in Târnava Mare and the Black Forest, level of education at Sighisoara-Târnava Mare and Prespes, and norms at Matsalu and Black Forest. Demographics and values seemed to be the least important parameters explaining support across

Table 2
Values of goodness-of-fit measures for assessing model fit.

PA	GoF measures				
	RMR	GFI	AGFI	PGFI	RMSEA
Prespes	0.337	0.866	0.830	0.679	0.0073
Snowdonia	0.064	0.819	0.789	0.702	0.080
Matsalu	0.090	0.762	0.710	0.624	0.072
Sighisoara-Târnava Mar	0.11	0.755	0.709	0.637	0.095
Peak District	0.05	0.757	0.741	0.703	0.066
Black Forest	0.06	0.824	0.789	0.728	0.069

*RMR: Root mean square residual; GFI: Goodness-of-fit index; AGFI: Adjusted goodness-of-fit index; PGFI: Parsimony goodness-of-fit index; RMSEA: Root Mean Square Error of Approximation

Table 3
Results of SEM models in each case study and degree of statistical significance.

	PRESPES	SNOWDONIA	MATSALU	SIGHISOARA	PEAK DISTRICT	BLACK FOREST
Factors explaining stated support						
Social impacts	0.190 *	0.171 * *	0.241 *	0.131 *	n.s.	0.417 * *
Institutional trust	0.206 * **	0.334 * *	n.s.	n.s.	n.s.	0.128 *
Values	n.s.	n.s.	0.263 * *	n.s.	n.s.	n.s.
Place attachment	n.s.	0.203 * *	n.s.	0.445 * *	0.167 * *	0.679 * *
Gender	n.s.	0.125 * *	n.s.	n.s.	n.s.	n.s.
Norms	n.s.	n.s.	0.409 * *	n.s.	n.s.	0.216 *
Education	0.216 * *	n.s.	n.s.	0.192 *	n.s.	n.s.
Age	n.s.	n.s.	n.s.	n.s.	-0.104 *	n.s.
Ability to support	n.s.	n.s.	n.s.	0.140 *	n.s.	0.139 *
Stated support explaining volunteerism and pro-PA behaviour						
Stated support → volunteerism	n.s.	n.s.	0.198 *	0.233 * *	n.s.	n.s.
Stated support → pro-PA behaviour	0.172 *	0.879 * *	0.143 *	0.344 *	n.s.	0.377 * *

(*) significant at the 5% significance level; (**) significant at the 1% significance level; n.s.: non significant

all sites.

3.2. Linking stated support with active support

Table 4 presents the percentage of respondents who responded that they have volunteered in an activity that actively supports the PA and also the percentage of respondents who stated that they complied fully with specific regulations and recommendations in their PA (pro-PA behaviour). Overall high levels of volunteering are seen in Matsalu NP with over 50% of the sample stating that they have contributed to some activity that supported the PA. Regarding behaviour within the PA, keeping dogs on the leash is the behaviour which is reported to be the least consistently followed by respondents. This may be due to the fact that this is a requirement only in certain parts of the PAs. Overall higher levels of compliance are noted in the Peak District National Park compared to other sites.

As regards the associations between public stated support and the factors 'volunteering' and 'general pro-PA behaviour', the results of the fit of the SEM models revealed a positive and significant association between public stated support and general pro-PA behaviour (in 5 out of 6 SEM models), the association however between public support and volunteerism is only significant in two PAs (Sighisoara-Târnava Mare and Matsalu).

3.3. Overview

Overall, the models explained between 28% and 40% of variability in stated support for the PAs, performing best at Matsalu and at Prespes, and least well in the Black Forest. The GoF values of the six models are generally acceptable (Table 2). However, certain values are low, indicating moderate fit. This might be expected given the small sample size in certain PAs, which makes estimation of a few parameters not significant.

In summary then, the fit of the six SEM models for the selected PAs has shown robust and statistically significant associations for at least the factors of Social Impacts and Place Attachment with the Stated Support variable. In all six models, the goodness-of-fit was moderate to good as revealed by the fit statistics calculated. This was anticipated from the fact that among the various explanatory factors and items initially selected, only the Social Impacts and Place Attachment were found to explain in a consistent way a large proportion of the variability in the Stated Support, whereas other explanatory factors and variables were not as consistently important in explaining variability in public stated support across different sites.

4. Discussion

4.1. Overview

In this section we now consider the implication of the findings in terms of which factors proved significant and consistent predictors of support and which were less consistently significant, as well as the impact on model performance of factors not included. Whilst the models predict a significant proportion of variation in support, clearly much variation in support is not explained by the factors selected for the model. From this we consider how such models may be improved as well as the wider implications for research and for policy.

4.2. Factors affecting stated support

4.2.1. Social impacts

The importance of perceived social impacts as a factor influencing support for PAs is in accordance with much other research (e.g. McNeill et al., 2018; Nastran, 2015; Bennett et al., 2019). Clearly, a protected area may have a very wide range of possible social impacts across the many domains of human well-being (Vanclay et al., 2015; Kaplan-Hallam and Bennett, 2018) and these are typically not distributed evenly across all stakeholder groups and individuals, according to context and interests (McNeill et al., 2018). A significant challenge in impact assessment is therefore how to 'add up' the diverse impacts to draw conclusions about net impact and its significance (Bruce, 2006), and some researchers have suggested a range of subjective methods and a focus on perceptions (Leleu et al., 2012; Bennett and Dearden, 2014; Bennett, 2016; McNeill et al., 2018). So it is noteworthy that social impacts proved to be a consistent influencing factor on public stated support, despite the wide variety of possible impacts across the population and between sites.

Perceptions of impacts may also depend on the time passed since PA establishment, in a variant on 'shifting baseline syndrome', as some social impacts become 'normalised' and taken for granted as the status quo by local communities (Papworth et al., 2009; Jones et al., 2020c; Soga and Gaston, 2018). For example, the lack of significance of perceived social impacts at Peak District National Park, UK may result from the lack of variance in the data as a result of the very high levels of support reported in the study. These high levels of support may in part result from the fact that the Peak District is the most long-standing National Park of the 6 case studies, created in 1951, and so some social impacts of the Park may now be 'normalised' and taken for granted as the status quo by local communities.

4.2.2. Place attachment

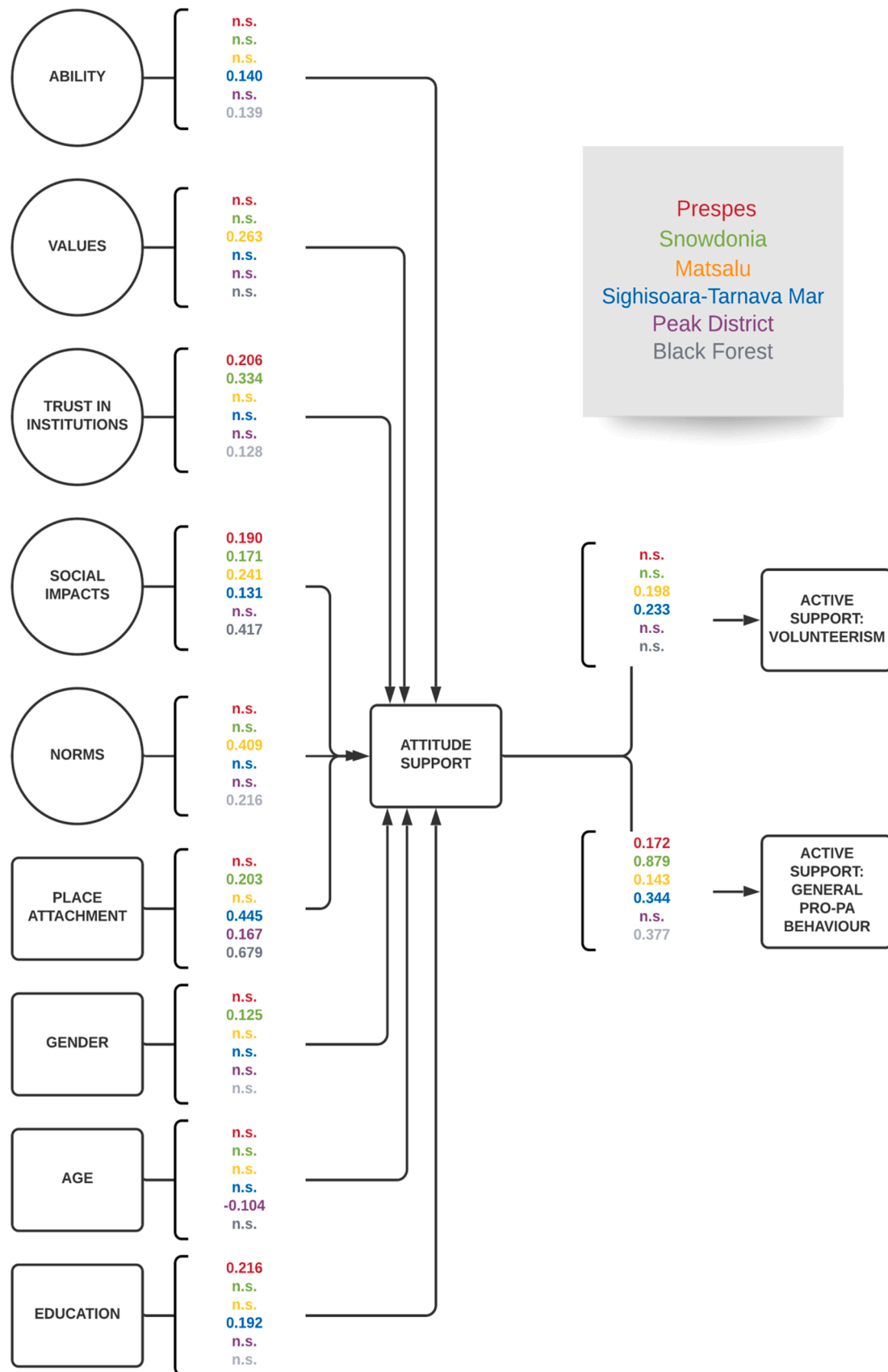Respondents' sense of place attachment was also significant for

Fig. 4. Path diagram of (standardized) parameter estimates of the six SEM models.

Table 4

Percentage of respondents stating they have volunteered in recent years in support of the PA & stating full compliance with specific regulations/recommendations of the park.

	PRESPES	SNOWDONIA	MATSALU	SIGHISOARA	PEAK DISTRICT	BLACK FOREST
Volunteered in the past years in activities supporting the PA	12.6	36.5	57.1	19.9	34.7	29
No logging, collection of plant/mushrooms, illegal disposal of waste, unpermitted fishing	74.8					
Dogs must stay on a leash		61	60.7		72.3	81.3
Do not collect flowers, Mushrooms, Berries/ harm plants and wildlife		85.8	61.1			72.5
Be considerate of other walkers		82.2	73.3			
Follow signs		59	54.0			
Stay on paths		43.6	32.9		80.4	58.9
Do not collect wood in the forest						70.1
Smoking/open fires are prohibited/only cold food				68.6	82.4	59.2
Avoid excessive noise						77.5
Close gates					98.9	
Drive with care and park in designated car parks					81.8	
No use of motorised vehicles				77.4		
No excessive use of pesticides/mowed excessively/ignored recommendations				68.6		

NOTE: specific questions asked varied from site to site in consultation with the relevant park authorities. Blank cells indicate that the question was not deemed relevant to this case study and was not asked in the questionnaire.

explaining stated support at all sites except Matsalu and Prespes. Place attachment has been found to be a significant social factor influencing a range of issues regarding support or concern for environmental aspects such as nature-based solutions and nature protected areas (Anderson and Renaud, 2021; Carrus et al., 2005; Boudet, 2019) whilst Carrus et al. (2005) also found that place attachment appears to be able to act in either direction in strengthening or weakening support. Place attachment can be conceptualised as having various dimensions including emotional attachment to a place (Steg et al., 2013), as well as representing aspects of place identity and place dependence (Brown et al., 2015; Tesfaye et al., 2012; Karki, 2013). Given that this study aimed to examine the relationship between support and a broad range of social factors, it was not possible to include multiple questionnaire items relating to place attachment. The question included therefore was intended to measure the affective bond developed by people with a place over time (Steg et al., 2013), as a factor that might amplify support. It was assumed for this work that place dependence would be revealed through the questions relating to impacts such as on economic well-being or recreational activities. Nevertheless it is possible that model performance could be improved by including a broader range of indicators of place dependence. Whilst place attachment is a complex concept with a number of dimensions, we used a widely used question wording (Raymond et al., 2010) to capture a broad sense of this affective aspect of place attachment.

4.2.3. Social capital and governance factors

Institutional trust was a significant factor at three of the six sites, with higher levels of support where trust is higher in accordance with other research (Michel et al., 2022; Brown et al., 2015). Institutional trust was included both as an indicator of social capital and also as an indicator of a positive attitude towards governance actors and belief in their efficacy and integrity. Other aspects of social capital included in the survey were social trust and social networks, the latter interrogated through questions regarding membership of organisations and volunteering (Jones et al., 2009). Diverse aspects of social capital were therefore included in the survey, but only one aspect of governance. Other aspects of governance that were not explicitly included but that may be relevant range from aspects of information flow, to extent of consultation to co-governance. As levels of support have been found to be influenced by both social capital (Jones et al., 2012) and by governance factors (Bennett et al., 2018), it is possible therefore that the model could be improved by inclusion of a wider range indicators of social capital and good governance.

4.2.4. Other factors

Other selected factors included in the model were significant at least in one site, indicating that, whilst these factors might not be of universal importance or significance across all sites, it may be so in certain contexts, where this factor is most salient. Norms and Education were significant at two (different) sites each, with Values, Age and Gender significant at one site each. This clearly demonstrates the need to take site-specific issues and local socio-cultural context into account when designating PAs (Jones et al., 2022).

Regarding values, Carrus et al. (2005) found that general attitude measures are poor predictors of more specific attitudes and behaviours. Whilst demographic factors may not have been so significant for overall support at a population or community level, they may well influence support at the level of the individual (Poortinga et al., 2003; Coad, 2008). Differential impacts within a PA's local community were not the focus of this model, but clearly are an important issue regarding social equity (Zafra-Calvo and Geldmann, 2020). Nevertheless, broad demographic tendencies are likely to influence overall support and may also play a role in relational aspects of community values (Berkes, 2009).

4.2.5. Synergistic effects and other potentially significant factors

As indicated above therefore, there are two issues which were not addressed in the modelling at this stage and which may be significant regarding public support levels. Firstly there are synergistic effects in which the various social factors defined as independent variables may interact, secondly temporal feedbacks whereby the existence of the PA and its impacts impulse change in the other social determinants.

For example, factors such as values, place attachment or trust in institutions such as a National Park management board may also in some contexts influence perceptions of some social impacts. Also, following creation of a PA, it may be expected that changes in the landscape and the associated perceived impacts will create feedbacks, thereby altering the social factors here that have been treated as independent variables. In this regard, the potential influence of social factors on perceived impacts and of temporal effects will be the focus of further work by the authors.

Clearly a wide array of potential factors may be chosen to be tested for their influence on support, with the huge diversity of social impacts especially challenging, and the authors do not claim that the model was likely to be comprehensive in scope. To improve model performance, key broad areas for which indicators of factors should focus include perceived management effectiveness (Zafra-Calvo and Geldmann, 2020) and perceived ecological effectiveness (Bennett et al., 2018), as well as a

wider range of aspects of governance (Bennett et al., 2018) such as information sharing, consultation and co-management opportunities (Borrini-Feyerabend et al., 2013).

4.3. Factors affecting active support

Regarding the relationship between stated support and more active forms of pro-PA support, the relationship with stated support was strongest with general pro-PA behaviour. This finding indicates that people who hold more supportive attitudes towards the PA are more likely to behave in a way that is positive for the landscape and biodiversity conservation, as might be predicted from environmental psychology models of pro-environmental behaviour such as the Theory of Planned Behaviour (Ajzen, 2004), and of intrinsic motivations towards environmental stewardship behaviour (Bennett et al., 2018; Larson et al., 2020; Heimann and Medvecky, 2022). Such pro-PA behaviour would thereby enable management of the protected landscape, making the job of landscape management easier for the managing authority, reducing pressure on management resources and potentially enhancing management and ecological effectiveness.

The relationship between stated support and active support through volunteering was less clear, and only significant at two sites (Sighisoara-Târnava Mare in Romania and Matsalu in Estonia) with low and high reported rates of volunteering respectively. Research indicates that in addition to intrinsic pro-environmental motivational attitudes, conservation volunteers are motivated by a wide range of factors, intrinsic and extrinsic motivations (Larson et al., 2020), both biocentric and anthropocentric (Asah and Blahna, 2012; Schuett et al., 2014), and personal resources and constraints (Schuett et al., 2014; Orchard, 2019). Therefore, some people may still volunteer, primarily motivated by other factors, for example health or social motivations, to get fit or meet other people.

Chaigneau and Daw (2015) report that personal factors relating to the individual are most important for influencing attitudes whilst other contextual factors may affect action, including having access to the resources to be able to participate actively (such as time or money), represented in this work by the factor 'Ability to Support', which was statistically significant at the Romanian site, but not the Estonian one. Sighisoara-Târnava Mare had one of the lower levels of reported volunteering and so personal resources may be a barrier here to volunteering, whereas at Matsalu, a very high level of volunteering was reported and so personal resources may not be a significant barrier at this site.

Overall, pro-PA behaviour based on everyday behaviour in the private sphere (Stern et al., 1999) may be more influenced by personal values and broader pro-environmental attitudes (e.g. Carrus et al., 2005), whilst more public-sphere behaviour such as volunteering may be more influenced by a wider range of personal and contextual factors, intrinsic and extrinsic motivations (Larson et al., 2020) and personal resources and constraints (Tonder and Jurvelius, 2004).

4.4. Limitations of the study and potential biases

Regarding biases in the research methods, the researchers originally planned the survey to be delivered face-to-face with respondents found in a range of locations determined by purposive sampling. From March 2020, face-to-face surveys were no longer possible as a result of COVID restrictions, and the survey was delivered online instead with selected households invited to participate by postcard using available sampling frame lists purchased for the purposes of this research. The only exception was Matsalu National Park, Estonia, where due to lack of sampling lists the survey was advertised via local social networks and social media. In the areas where random sampling was conducted, the response rate ranged from 5% to 10%. As in all sampling methods there is potential bias. For example in face-to-face interviews, approaching people in public places may exclude those who do not frequent the

locations selected and the less mobile who do not spend much time in public. In sampling by sending card invitations some people may decline to respond, skewing the sample towards those who are more interested in or have strong feelings about the topic of research or have access to the internet. Despite these potential biases the final samples were cross checked and compared to the local population and no large differences were found.

As regards biases in people's responses relating to the pandemic itself, questionnaires were distributed in two case studies before the pandemic (Prespes, Greece and at Sighisoara-Tarnava-Mare, Romania) and at the other four sites during the pandemic. The researchers therefore acknowledge that this may have affected some responses, particularly regarding levels of support and sense of place attachment to the protected areas as there is evidence in the literature that people's connectedness to nature improved during the pandemic (Jones et al., 2021; McGinlay et al., 2020) as their daily routines and practices were altered by COVID restrictions. It is therefore indeed possible that the pandemic will have acted as a confounding factor, altering temporarily various factors, and in particular, levels of public support, sense of place attachment and people's activities in the landscape. The extent of such effects are also likely to have varied significantly between countries as the approach to the crisis and associated restrictions varied significantly between different countries. This further justifies the decision to maintain 6 separate SEM models for the modelling and then make comparisons between the separate models.

We conducted a Kruskal-Wallis analysis comparing the cases to examine the extent to which support varied between the cases that indicated lower levels of public support for Prespes, but similar levels of support for the Romanian site to those at Snowdonia and Peak District. Whilst there are therefore some indications of an effect of the pandemic on support, the results are inconclusive and cannot be stated with high confidence. Examination of the results therefore shows that of the two sites surveyed pre-COVID may have had lower levels of support but the effect is not clear. Similarly, for the four sites at which the reported level of place attachment was found to have a significant influence on stated support, one was surveyed pre-Covid (Sighisoara-Tarnava_Mare) and the others during COVID, whilst the two sites where the relationship was not significant were surveyed pre-COVID (Prespes) and during COVID (Matsalu). Overall therefore, any possible effect of the timing of the survey relative to the COVID pandemic does not appear to have distorted significantly the relationship between the independent and dependent variables.

4.5. Wider implications for research and for policy

Finally we consider here the implications of the above findings in terms of the utility for policy, and future directions for further research.

4.5.1. Implications for further research

From an academic and theoretical perspective, we are interested in the underlying key social factors that affect public support, as well as the perceived social impacts in order to build theoretical models of public support. This work therefore constitutes a stage in the development of such a model, to which the authors will add to and refine the components and factors discussed, as well as the synergies and feedbacks considered above.

We should note at this point that a comprehensive and highly transportable model of public support covering all possible factors for all PAs is very challenging. Nevertheless, there clearly appear to be recurring major themes and factors. Each site will have context specific issues but there appear also to be headline issues that generally recur and so may be anticipated for PA planning, governance and management. A flexible model that can be adapted to local contexts is needed in which additional context-specific factors can be added to the more universal factors.

As found by other researchers (e.g. Bennett et al., 2019), perceived

social impacts are a key factor influencing public support, and a driver for the growing body of proposed methodologies for social assessment and for governance and equity assessments (e.g. Vanclay et al., 2015; Franks et al., 2018). It will be key therefore to understand the main impacts with the greatest influence on public support in the context of European PAs, the cumulative effect of multiple impacts, and how more objective aspects of impacts (such as loss of income, restrictions on public access) translate into impacts on aspects of perceived human well-being. The fact that place attachment was also an influencing factor on support demonstrates the importance of affective and emotional factors, as well as the above more pragmatic factors. Given that place attachment may influence support and itself potentially be impacted by a PA, the relationship between place attachment, social impacts and support may well be complex. Governance in this study was mainly represented by the indicator of institutional trust and was significant at some sites, but is overall a complex multi-faceted concept in itself. Governance style and efficacy (Borrini-Feyerabend et al., 2013) will be the subject of further research and a key aspect of governance not explicitly covered here is that of engagement between PA management and the public. It is likely that successful engagement will not only depend on both the resources and abilities of management staff, but also aspects of the public's resources and social capital, such as educative level, understanding of the relevant issues and ability to engage. This aspect would benefit from research into the influence of management and engagement style and quality, and also of public social capital, on public trust and support.

4.5.2. Policy implications

Whilst researchers have demonstrated that public support is not necessarily required for the ecological effectiveness of nature PAs (Holmes, 2013; Brockington, 2004), we assert here that public support is i) a moral imperative of a social license to operate in democratic societies; ii) can assist management and in turn facilitate ecological effectiveness through public respect for PA rules and norms and through active participation such as volunteering and iii) deliver benefits for local people (Borrini-Feyerabend et al., 2013; Worboys et al., 2015; Vanclay, 2017). It is therefore important for PA management authorities to understand levels of public support and the factors affecting this for their PA. By addressing such matters, ideally at foundation stage, but at any other stage in development, PAs can be planned and managed to maximise both ecological outcomes and social outcomes for local people and indeed visitors. For this, PA management authorities will need assessment tools which are appropriate for their levels of resourcing and expertise in the field of social assessment.

To date, development of management effectiveness techniques has focused much more on ecological effectiveness (success in delivering on nature conservation aims and objectives) than social effectiveness (particularly successful outcomes for local people living in and around the PA). Also, whilst the focus on social effectiveness has been growing more recently (Borrini-Feyerabend et al. (2013); Worboys et al. (2015), emphasis on assessment of such social effectiveness for local people draws much more strongly on Global South experiences and also those of indigenous peoples. Whilst this is crucial, as these are the areas in which many of the worst mistakes have been made and the worst injustices inflicted on local people in the name of nature conservation, it may also reflect a possible perception that social impacts and social equity issues are not a significant issue in Global North areas such as Europe. The social benefits of creating PAs in a region of countries deemed to be stable democracies may be somewhat taken for granted, the costs justifiable, and the risk of any significant social injustices mitigated by the democratic nature of wider governance. However, such assumptions need to be researched and tested, and the nature of governance, management and public engagement in the case study PAs will be the subject of further research.

For now we conclude that engagement between PA management authorities and the public will be key to ensuring that ecological effectiveness is matched by social effectiveness. To date, proposed methodologies for assessing social effectiveness, impacts, equity and justice in PAs are time, resource and know-how intensive, and initial indications within the FIDELIO project suggest that such assessments are rarely conducted in a European context.

For many PA management authorities, undertaking a detailed formal social impact assessment is likely to prove challenging on resources and staff expertise and often is not undertaken, or considered a priority use of scarce resources. The aim of the present model therefore is to inform development of an initial tool that provides a simplified overall view of support and key underlying causal factors. This may prove a better starting point for many PAs, from which more targeted assessment may be undertaken to focus on more acute issues and social inequalities.

5. Conclusions

Understanding public support is essential for protected area management authorities as support is not only important from the perspective of local democracy and social equity, but also in order to support management and therefore ecological effectiveness. The planned expansion of the PA network in Europe and elsewhere will require additional effort to maintain and improve public support. Furthermore, very broad policies across Europe and its nations might be ineffective without including scope for complementary and more locally focused approaches taking into consideration local characteristics, values and the findings of locally-focused social assessments.

Clearly, any model of support cannot be all-encompassing and universal. Nevertheless, both from an academic and a practitioner's point of view, it is important to understand the main key social factors that affect public support for nature protected areas at a broad high level. Such a model can then be used to develop a broad screening tool for protected area management authorities to predict public support and identify issues that weaken support. Such a screening tool can then be used as a pre-cursor to a fuller social impact assessment or, where resources do not allow this, to target resources on key problem areas.

In pursuit of this aim therefore we presented here a model of local public support for nature protected areas built and tested using survey data collected from approximately 2300 individuals living inside or near six Protected Areas in five different European countries using both face-to-face and online methods. This showed that stated support, taken as an indicator of attitude support, was significantly influenced by respondent's perceptions of the social impacts of the PA. This factor was consistently significant for support at most sites despite the huge variety of potential impacts. Also significant for stated support at most sites was respondents' sense of place attachment to the area of the PA. Institutional trust was also significant at half of the sites, indicating the importance of social capital and of governance factors. A number of other factors were of varying degrees of significance at different sites and so their importance may have been more context dependent.

A significant relationship was also found between stated support and active support for the PA through general pro-PA behaviour, whilst the relationship between stated support and volunteering may depend on other potentially context-specific factors such as personal agency and other motivations.

Overall, our model predicted a significant amount of variation in support from the factors selected. Inevitably, given the huge range of potential factors, much variation was not predicted. Further research is therefore needed to refine and improve the model by including a wider range of factors and improving the indicators chosen to represent them to improve model performance. The results suggest that model development should focus on potential additional indicators of social capital, governance and on perceptions of management and ecological effectiveness.

CRediT authorship contribution statement

NJ was the principal investigator in this research. JMcG and NJ led the writing of the paper. NJ, JMcG, VG, PGD, AK, CM, KS contributed to the research concept. NJ, JMcG, VG, PGD, AK, CM, KS, SB, KB, SK contributed to the design of the research tools. SB, KB, SK, MN, MS participated in the data collection process. NJ, CM led the data analysis. AB provided graphical illustrations. All authors provided input into the final manuscript and its revised version.

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.

Data Availability

Data will be made available on request.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.envsci.2023.04.003.

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