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Exploring forest owners' intentions for public participation in forest management planning: a case study in the Czech Republic

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Participatory forest management constitutes an important pathway toward sustainable and inclusive forest governance, mediated by local social, cultural, and institutional dynamics. This study presented pioneering research that applied the theory of planned behavior (TPB) to investigate the intentions of non-state forest owners in the Czech Republic to involve the public in forest management planning. Data were obtained from 92 valid responses and analyzed using covariance-based structural equation modeling (CB-SEM). The results showed that attitudes, subjective norms, and perceived behavioral control had a positive influence on behavioral intention. However, only subjective norms had a statistically significant effect ($\beta = 0.61$, $p = 0.021$), while the effects of attitudes ($\beta = 0.10$, $p = 0.515$) and perceived behavioral control ($\beta = 0.26$, $p = 0.277$) were not significant. The model explained 86.31% of the variance in behavioral intention, demonstrating strong explanatory power despite the modest sample size. These findings provide preliminary evidence that social expectations from professional peers, local communities, and family networks play a dominant role in shaping forest owners' willingness to adopt participatory planning approaches. Theoretically, this study extends the TPB framework by showing that normative influence predominates when attitudes and perceived control are already favorable, underscoring the importance of social legitimacy in structured institutional contexts. From a policy perspective, the results highlight the need to strengthen collective norms and institutional support through forest owner associations, peer learning, and transparent governance mechanisms. Such strategies can enhance social legitimacy and foster broader, more sustainable public participation in forest management planning.

KEYWORDS

participatory forest management, theory of planned behavior, forest owners, behavioral intention, structural equation modeling, Czech Republic

1 Introduction

Participatory forest management (PFM) is a framework that seeks to foster collaborative relationships among diverse stakeholder groups to achieve sustainable forest management (Engida and Teshoma, 2012). It adopts a bottom-up approach designed to strengthen community ownership and engagement in forest decision-making (Winberg, 2010). Through PFM, stakeholders are involved in planning, evaluating, and implementing forest management activities while also contributing to the formulation of policies and strategies intended to improve forest governance (Maire et al., 2018). Such participatory approaches can enhance both ecological sustainability and social development. However, practical implementation

often faces significant challenges, including inconsistent outcomes and limited community benefits (Méndez-López et al., 2015; Fox and Cundill, 2018).

In Europe, both private and communal ownership structures are integral to forest management. These ownership systems strongly influence the willingness and capacity of forest owners to engage with the public, which serve as key determinants of participatory outcomes. Forest owners play a central role in biodiversity conservation and the provision of ecosystem services; however, their motivations for collaboration and openness to public participation remain insufficiently explored and understood (Mayer, 2019; Sorice et al., 2013).

Across the European Union, approximately 16 million private forest owners collectively manage over half of the continent's forests, while approximately 40% of forest land remains under public ownership (European Commission, 2021). Within this broader European framework, forest management in the Czech Republic is guided by a national forestry program that promotes sustainable management principles (Krejzar, 2011). Forest management plans, prepared on 10-year cycles, describe current forest conditions, outline planned silvicultural operations, and project expected yields (Ministry of Agriculture of the Czech Republic, 2021). These plans, developed by both state and non-state entities, require approval from regional authorities to ensure compliance with national sustainability standards (Krejzar, 2011; Ministry of Agriculture of the Czech Republic, 2021). Although state ownership remains dominant and is administered primarily by the national forestry enterprise Lesy České Republiky, s.p., a considerable share of forest land is held by municipalities, private individuals, churches, and corporate entities, reflecting a diverse ownership structure (Ministry of Agriculture of the Czech Republic, 2021). Forest ownership in Czechia is highly fragmented, with approximately 300,000 individual owners, each holding less than 50 hectares (Janová et al., 2022).

Despite formalized management planning, public participation is neither mandated by law nor institutionally supported. While landowners and nature protection authorities are typically involved, local communities and civil society groups remain largely excluded. Consequently, forest owners' attitudes and management objectives significantly influence forest management outcomes (Nordlund and Westin, 2011; Sorice et al., 2013). While Czech forestry institutions and ownership patterns are well-described, the behavioral factors influencing forest owners' participation remain largely unexplored. Evidence from other European countries offers useful insights into how attitudes, social norms, and perceived control shape participation in forest management.

In Finland, Karppinen and Berghäll (2015) applied the theory of planned behavior (TPB) to analyze timber stand improvement intentions, suggesting that subjective norms were the most influential determinant, while attitudes were weaker and perceived behavioral control acted as an inhibiting factor. Deuffic et al. (2018) emphasized that forest owners' decisions are shaped by structural (e.g., policy and market conditions), demographic (e.g., age and education), and personal (e.g., goals and values) influences. In Sweden, Ouvrard et al. (2019) found that perceived behavioral control and environmental attitudes strongly predicted willingness to pay for wood ash recycling, underscoring the role of psychological constructs. Ikonen et al. (2023) similarly found that willingness to engage in collaborative biodiversity management was more influenced by professional and family

networks than by neighbor interactions, highlighting the social dimension of participation. Koskela and Karppinen (2024) showed that perceived control was the strongest predictor of intentions to safeguard biodiversity, while Häyriäinen et al. (2025) highlighted the role of cooperation and collective management among Finnish forest owners. Stare et al. (2025) identified distinct behavioral typologies among Slovenian owners after disturbance events, illustrating the heterogeneity of responses across European forestry systems.

Beyond Europe, behavioral approaches have also been extensively applied to explain participatory and conservation-oriented decision-making. Studies in Asia demonstrate that participation in forestry and agroforestry programs depends not only on technical knowledge but also on psychological and institutional factors, such as social pressure, perceived benefits, and policy support (Huang et al., 2023; Liu et al., 2025). Research using the theory of planned behavior (TPB) has shown strong explanatory power across various environmental domains, including community forest management (Apipoonyanon et al., 2020), watershed protection (Empidi and Emang, 2021), carbon sequestration programs (Yang et al., 2021), bamboo forest management (Huang et al., 2023), and forest-based ecotourism (Zhang et al., 2022; Latifinia et al., 2025). Other studies have applied TPB to local forest protection (Musthafa and Yc, 2022; Savari and Khaleghi, 2023), agroforestry adoption (Amare and Darr, 2022), peri-urban forest management (Maleknia and ChamCham, 2024), willingness to pay for forest ecosystem services (Maleknia, 2024), urban forest conservation for climate change mitigation (Maleknia and Salehi, 2024; Maleknia and Svobodova, 2025), environmental and social justice perceptions in urban forest engagement (Maleknia, 2025), subjective norms in pro-environmental behavior (Maleknia et al., 2025b), and consumer intentions toward sustainable forest product purchases (Maleknia and Hälälîşan, 2025). Additionally, ecotourism-linked conservation behaviors have been explored through TPB in protected forest contexts (Maleknia et al., 2025a).

Despite the growing body of international evidence on participatory behavior in forestry, no study has examined forest owners' intentions toward public participation in forest management planning in the Czech Republic. This research gap is particularly significant given their central decision-making role and the absence of legally mandated participation mechanisms. Mohammadi et al. (2024) recently applied the theory of planned behavior (TPB) to assess citizens' willingness to participate in forest management planning in the Czech Republic. Their findings revealed that attitudes, subjective norms, and perceived behavioral control all significantly predicted participation intentions. However, forest owners were excluded from the analysis, despite being key decision makers with distinct legal and financial responsibilities.

The present study constitutes pioneering research that addresses this gap by analyzing the behavioral factors influencing forest owners' participation intentions. Forest owners occupy a dual role as both resource managers and local stakeholders whose decisions directly influence policy implementation. Moreover, the Czech institutional context, where participation is not legally mandated, offers a unique opportunity to explore how attitudes, social norms, and perceived behavioral control interact to shape participatory intentions. This study applied the TPB framework to identify the psychological factors shaping forest owners' willingness to involve the public in decision-making. By extending behavioral research to the Czech Republic, an underexplored Central European context, this research contributes

both theoretically and practically by testing the robustness of the TPB framework under distinct governance conditions and providing evidence-based insights for developing more inclusive and socially legitimate forest governance policies in the Czech Republic and beyond.

1.1 Theoretical framework

The TPB is an important framework for explaining and predicting forest owners' participation in forest management planning. The theory proposed by Ajzen (1991) posits that human behavior results from deliberate intention and is shaped by three key constructs: attitude (the individual's positive or negative evaluation of the behavior), subjective norms (beliefs influenced by social pressures), and perceived behavioral control (beliefs about the ease or difficulty of performing the behavior).

Formally, TPB can be expressed as:

$$IN = w_{AT}AT + w_{SN}SN + w_{PBC}PBC$$

where AT is attitude, SN is subjective norms, and PBC is perceived behavioral control. w_{AT} , w_{SN} , and w_{PBC} are empirically derived coefficients estimated from the structural model.

AT represents an individual's positive or negative assessment of engaging in a specific behavior (Ajzen and Fishbein, 1975) and serves as a central predictor within the TPB (Ajzen, 1991). Within this framework, AT reflects a person's overall assessment of engaging in the target behavior and directly influences the strength of their behavioral intentions (Zhong et al., 2019). In the context of forest management, AT toward sustainable practices is crucial in shaping landowners' intentions and decisions. Empirical evidence accumulated over several decades consistently supports this relationship. For instance, Karpinen and Berghäll (2015) found that positive AT toward stand improvement practices significantly influenced Finnish forest owners' management intentions. Holt et al. (2021) reported that AT toward harvesting trees threatened by invasive insects was a key determinant of U. S. landowners' behavioral intentions, explaining a substantial portion of variance alongside perceived behavioral control. Similarly, Lima and Bastos (2020) demonstrated that Brazilian landowners with a positive attitude toward ecological restoration were more willing to restore native vegetation. Building on this evidence, Savari and Khaleghi (2023) emphasized the pivotal role of pro-environmental AT in shaping IN toward sustainable forest behaviors. Recent studies among European forest owners further corroborate these findings (Koskela and Karpinen, 2024; Häyrynen et al., 2025). Overall, the literature consistently confirms that AT toward the behavior is a central determinant of IN across diverse forest ownership and cultural contexts. Positive evaluations of sustainable forest management practices reliably translate into stronger behavioral intentions, reinforcing the theoretical assumptions of the TPB in forestry and natural resource decision-making.

SN plays a crucial role in shaping individuals' behaviors by defining what is perceived as socially appropriate or acceptable within a given context (Wenzel and Woodyatt, 2025). This construct captures the extent to which an individual's intention to perform a behavior is influenced by the approval or disapproval of significant others or relevant social groups (Ajzen, 1991). Individuals often act according

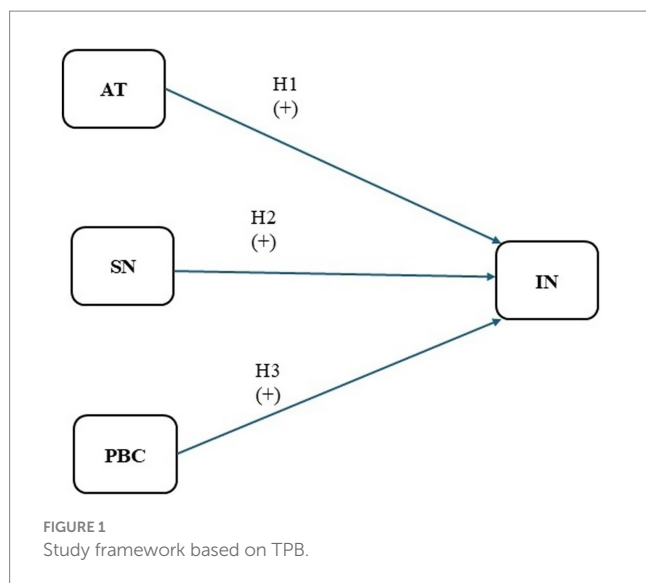
to their perceptions of others' expectations, and their intentions are strongly guided by the opinions of those they consider important. SN represents a powerful form of social influence, as it reflects collective expectations and reinforces dominant practices while discouraging alternatives (Mortensen et al., 2019). Empirical research shows that appeals to social norms can effectively foster sustainable and pro-environmental behaviors by aligning personal decisions with perceived collective expectations (Schorn, 2024). Within the TPB, behavioral intentions are shaped by SN arising from the perceived expectations of significant referents such as family members, peers, or professional networks (Ajzen and Fishbein, 1975). In the context of forest management, multiple studies confirm that social norms are a key determinant of landowners' intentions. For example, Koskela and Karpinen (2024) found that peer pressure influenced Finnish forest owners' willingness to protect biodiversity, while Holt et al. (2021) showed that U. S. landowners were guided by professional networks when responding to invasive pests. Similarly, Lima and Bastos (2020) and Ma et al. (2012) demonstrated that community and institutional expectations significantly shaped landowners' decisions, underscoring the central role of social norms in driving forest-related behavior.

Perceived behavioral control (PBC) refers to an individual's perception of the ease or difficulty of performing a particular behavior, reflecting the extent of control they believe they possess over engaging in that behavior (Ajzen, 2002). It encompasses both internal factors, such as knowledge, skills, and self-confidence, and external factors, including access to resources, institutional support, and environmental constraints (Armitage and Conner, 1999). In the context of forest management, PBC captures the extent to which individuals or communities believe they have the ability and opportunity to engage in sustainable forest practices, including reforestation, selective logging, forest monitoring, and compliance with conservation regulations. When individuals perceive a high level of control resulting from adequate technical knowledge, sufficient resources, or supportive governance structures, they are more likely to develop strong intentions to manage forests sustainably (Yadav and Pathak, 2017). However, when individuals perceive substantial external barriers, such as insecure land tenure, limited financial capital, or weak institutional support, their perceived control declines, thereby constraining sustainable behavioral intentions (Tseng et al., 2021). Koskela and Karpinen (2024) identified perceived control as the most significant predictor of Finnish forest owners' intention to protect biodiversity. Similarly, Greiner and Gregg (2011) demonstrated that Australian landholders' willingness to participate in conservation programs was strongly shaped by their perceived ability to fulfill program requirements.

Building on the reviewed theoretical and empirical foundations, the three constructs of the theory of planned behavior (AT, SN, and PBC) are expected to jointly influence forest owners' participatory intentions. To empirically test this framework among non-state forest owners in the Czech Republic, the following hypotheses were formulated (Figure 1):

H1: AT has a statistically significant positive impact on the intention of forest owners in the Czech Republic to engage the public in participatory forest management planning.

H2: SN significantly and positively influences the intention of forest owners in the Czech Republic to engage the public in participatory forest management planning.



H3: PBC has a statistically significant positive impact on the intention of forest owners in the Czech Republic to engage the public in participatory forest management planning.

2 Materials and methods

2.1 Study area

The Czech Republic, located in Central Europe, covers 78,866 km² and is divided into 14 administrative regions that broadly correspond to the historical territories of Bohemia, Moravia, and Silesia (Forest Europe, 2020). Approximately one-third of the country is forested, with regional variations in forest composition: Bohemia is dominated by spruce–pine stands, Moravia features mixed oak–beech–spruce forests with strong municipal management, and Silesia combines Beskid Mountain woodlands with industrial lowlands undergoing ecological restoration (Šišák et al., 2016). The nation's vegetation includes beech–fir forests at mid elevations, broad-leaved oak woodlands in lowlands, and coniferous spruce forests at higher altitudes (Figure 2). The Czech Republic experiences a temperate climate influenced by both oceanic and continental patterns, shaped by prevailing westerly winds and frequent cyclonic activity. Summers are generally mild and dry, averaging 20 °C, while winters are wetter with temperatures approximately 0 °C; relative humidity typically ranges from 60 to 80% (Tolasz et al., 2007). The average elevation is approximately 430 m above sea level, with the highest point being Sněžka (1,603 m) and the lowest near Hřensko (115 m) (Chytrý, 2017).

2.2 Participants and sampling

To determine the minimum sample size required for hypothesis testing within the TPB framework, a statistical power analysis was conducted using G*Power 3.1.9.7 (Faul et al., 2007; Faul et al., 2009). Based on Cohen's (1988) conventions for behavioral sciences, a medium effect size ($f^2 = 0.15$, indicating explained variance in multiple regression) was assumed, consistent with prior TPB applications

(Armitage and Conner, 2001). The analysis incorporated three predictors: AT, SN, and PBC. The significance level was set at $\alpha = 0.05$, and statistical power at $1 - \beta = 0.80$. Under these parameters, the minimum required sample size was calculated to be 77. Participant recruitment was subsequently conducted through the Association of Municipal, Private, and Church Forest Owners of the Czech Republic (SVOL), a nationally recognized umbrella organization representing a broad spectrum of non-state forest ownership across the country (SVOL, 2025). The questionnaire was distributed digitally via Microsoft Forms to SVOL's registered members. Data collection took place between February and April 2025, resulting in 92 valid responses. Participation was voluntary and anonymous. Although the sample encompassed the full national membership base, its size remained modest. Accordingly, the study was framed as a pioneering empirical investigation into behavioral intentions and the applicability of TPB in the context of participatory forest management among Czech non-state forest owners.

2.3 Data collection

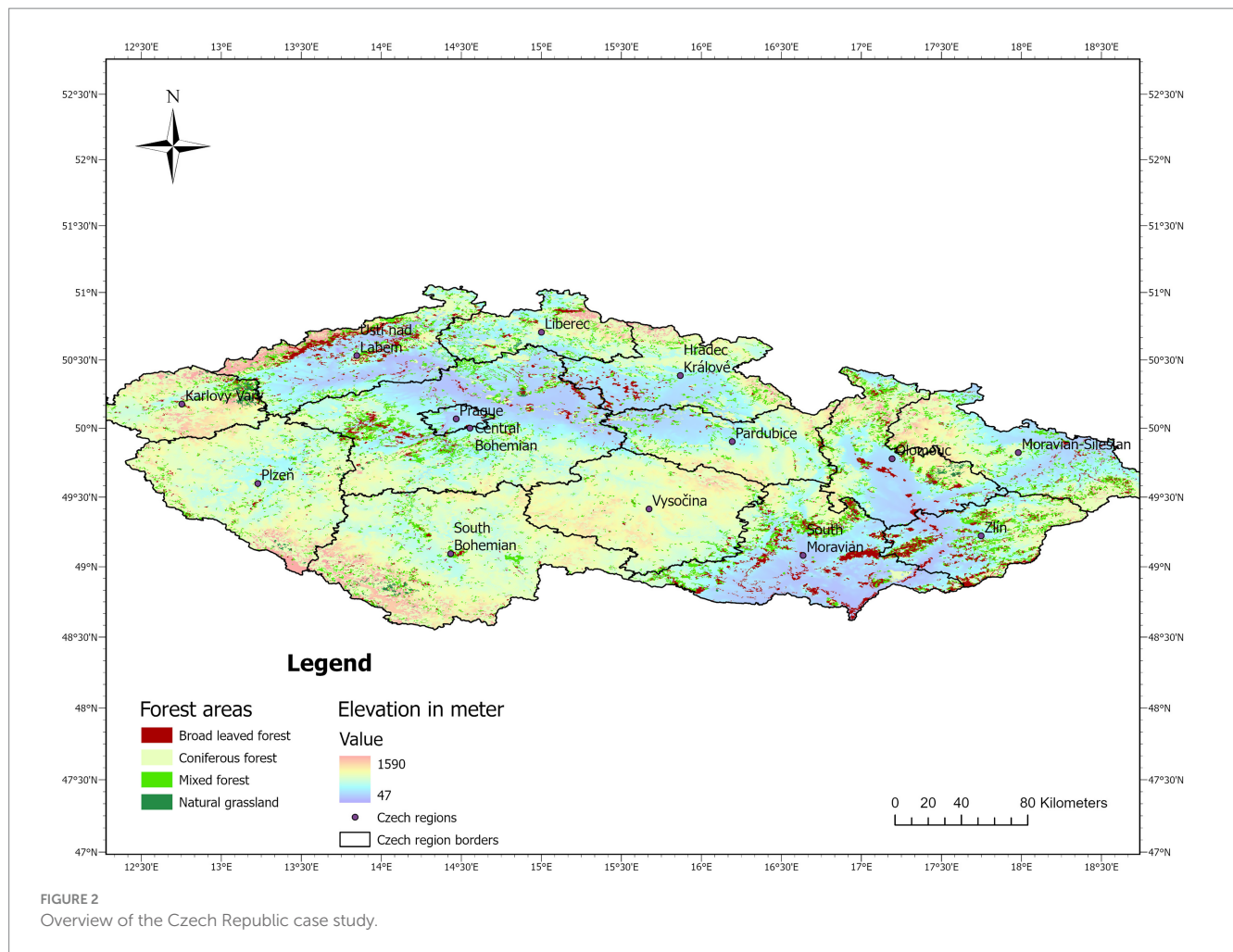
The questionnaire was designed within the framework of the TPB (Ajzen, 1991) to examine non-state forest owners' intentions toward participatory forest management planning. It consisted of two main parts. The first section gathered demographic information, including age, gender, education, forestry education, number of workdays spent in the forest, forest size, ownership type, and origin of ownership. The second part measured the four TPB constructs: AT, SN, PBC, and IN (Table 1). Each item was rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree, or equivalent wording depending on the item). In the present study, items were adapted to reflect the forest owners' perspective and refined through expert consultation to ensure contextual relevance and conceptual clarity. Following Ajzen's (1991) expectancy–value model, AT, SN, and PBC were measured indirectly by multiplying belief strength items by their corresponding evaluations (outcome evaluations, motivation to comply, or perceived power). The resulting products were summed to generate composite scores for each construct. IN was measured directly using four evaluative items.

2.4 Data analysis

2.4.1 Validity and reliability of items

The initial set of items was developed in collaboration with forestry experts and adapted from relevant literature to ensure contextual accuracy. Expert input was used to validate item clarity and relevance to participatory forest management planning. The items were conceptually modified rather than directly copied from previous studies. The final questionnaire was administered in Czech, with clear instructions provided to minimize ambiguity and enhance response reliability. The item pool was inspired by Mohammadi et al. (2024), who applied TPB to assess citizens' willingness to participate in forest management planning in the Czech Republic.

A pilot test was then conducted with 10 non-state forest owners. Their feedback helped identify unclear wording and improve the overall clarity and structure of the questionnaire. The pilot test results indicated satisfactory internal consistency, with Cronbach's alpha value exceeding 0.70. After the main data were collected, the quality



of the questionnaire was further tested statistically. Construct validity was evaluated using composite reliability (CR) and average variance extracted (AVE). CR values above 0.70 indicate that the items in each construct are consistent with one another, while AVE values above 0.50 suggest that most of the variance in the items is explained by the construct. The reliability of the questionnaire was also evaluated using Cronbach's alpha, which measures the internal consistency of each construct. All constructs demonstrated alpha values higher than 0.70, confirming that the items were reliable and measured the same underlying concept.

2.5 The structural model and hypothesis testing

Structural equation modeling (SEM) was applied to evaluate the interrelationships among the TPB constructs. Item-level descriptive statistics were computed to assess normality, including skewness and kurtosis. Although Shapiro–Wilk tests indicated significant deviations from normality for the majority of items, the robust maximum likelihood estimator (MLR) was applied in subsequent SEM analyses to account for non-normality (Mishra, 2020; Bean and Bowen, 2021).

Model adequacy was evaluated using several standard fit indices. Comparative fit index (CFI) and Tucker–Lewis index (TLI) values $\geq$

0.95 indicated good fit, and their values ≥ 0.90 indicated acceptable fit. Root mean square error of approximation (RMSEA), with 90% confidence intervals and p-close, indicated close fit at ≤ 0.06 and acceptable fit at 0.06–0.08. Standardized root mean square residual (SRMR) was considered acceptable at ≤ 0.08 (Kline, 2023a; West et al., 2023; Maydeu-Olivares et al., 2024).

A baseline covariance-based structural equation model (CB-SEM) was specified, incorporating the three core TPB constructs (AT, SN, and PBC) as predictors of intention (IN). Structural equation analyses were performed in R (v. 3.6.3) using the lavaan package (Rosseel, 2012).

3 Results

3.1 Respondent characteristics

The respondents were predominantly male (90%) and middle-aged (58% between 40 and 60 years). The majority of the respondents held a university degree (74%) and had formal forestry education (76%). The majority of the respondents reported being actively engaged in forest work, with nearly 60% spending more than 3 days per week in the forest. Forest ownership was diverse, with small holdings (<99 ha; 39%) and very large holdings (>3,000 ha; 24%) being the most common. Municipality (46%) and personal

TABLE 1 Overview of TPB constructs and measurement items.

Variables	Item	Explanation	Sources
AT			Lacerda et al. (2012), Sagala et al. (2018), Arce (2019), Savari and Khaleghi (2023), and Mohammadi et al. (2024)
	AT1	Public participatory forest management planning will contribute to societal benefits.	
	AT2	Public participatory forest management planning will positively impact the environment.	
	AT3	Public participatory forest management planning will support nature conservation.	
	AT4	Public participatory forest management planning can lead to positive economic outcomes, such as new job creation and local economic development.	
SN			Takahashi et al. (2022), Häyrynen et al. (2025), Karppinen and Berghäll (2015), and Mohammadi et al. (2024)
	SN1	I believe that professional forestry organizations promote public participation in forest management plans as the right thing to do.	
	SN2	I believe that my family supports opening my forest management plan for public participation.	
	SN3	I believe that my friends think public participation in the forest management plan is good.	
	SN4	I believe that other forest owners think participation in forest management plans is good.	
PBC			Nathan and Boon (2012), Sarvašová et al. (2014), Apipoonyanon et al. (2020), and Mohammadi et al. (2024)
	PBC1	I have the knowledge needed for public participation in forest management planning.	
	PBC2	I have the resources (time, money) for public participation in forest management planning.	
	PBC3	I have the support of local authorities for public participation in forest management planning.	
	PBC4	I have access to information on forest management practices.	
IN	IN1	I intend to actively promote public participation into the forest management plan in my forest property.	Takahashi et al. (2022), Häyrynen et al. (2025), and Koskela and Karppinen (2024)
	IN2	I intend to conserve and protect my forest through including public participation into forest management plan.	
	IN3	I intend to improve my income through including public participation into forest management plan.	
	IN4	I intend to share the benefits of public participation in forest management planning.	

ownership (41%) represented the dominant ownership types. Regarding origin, restitution (27%), market purchase (21%), and inheritance (16%) were the leading forms of acquisition. This diverse profile provided a solid foundation for analyzing forest owners' intentions toward public participation in management planning (Table 2).

3.2 Reliability and validity of constructs

To assess the internal consistency of the measurement scales, Cronbach's alpha was calculated for each construct. The results showed high reliability across all constructs: AT ($\alpha = 0.83$), SN ($\alpha = 0.96$), PBC ($\alpha = 0.90$), and IN ($\alpha = 0.84$). The CR values were also satisfactory (>0.70), and the AVE exceeded the recommended threshold of 0.50, indicating good convergent validity (Table 3).

3.3 Descriptive statistics of measures

Descriptive statistics for all measurement items are presented in Table 4. The data showed moderate skewness and kurtosis, with some items (e.g., AT4, PBC2) displaying substantial deviations from normality. Shapiro–Wilk tests confirmed significant departures from normality for all items (all $p < 0.01$). To address this, robust MLR was used for SEM analyses, which provides robust standard errors and scaled fit indices under non-normal conditions.

3.4 Structural model and hypothesis testing

The model fit was assessed using several key indices to evaluate the adequacy of the CB-SEM model. The chi-square statistic was $\chi^2(98) = 179.36$ with $p < 0.001$. The CFI was 0.93 and the TLI was 0.92,

TABLE 2 Summary of respondents' demographic and background information.

Variable	Level/category	Number	Percentage
Age			
	<40	15	16.304
	40–60	53	57.608
	>60	24	26.086
Gender			
	Male	83	90.217
	Female	9	9.782
	I do not want to provide	1	1.086
Education			
	Basic school level	1	1.09
	Apprenticeship level	5	5.43
	High school level	18	19.57
	University level	68	73.91
Forestry education			
	Yes	70	76.09
	No	22	23.91
Workdays in the forest			
	1–2 days per week	21	22.83
	More than 3 days per week	55	59.78
	1–3 month	10	10.87
	Seldom	4	4.35
	I cannot determine	2	2.17
Size of forest ownership			
	Less than 99	36	39.13
	100–299	5	5.43
	300–999	22	23.91
	1,000–2,999	13	14.13
	More than 3,000	22	23.91
Ownership type			
	Municipality ownership	42	45.65
	Legal entities	3	3.26
	Church ownership	4	4.35
	Personal ownership	38	41.3
	Forest cooperatives and companies	3	3.26
	Other properties	2	2.17
Origin of forest ownership			
	Inheritance	15	16.3
	Gift	6	6.52
	Division of property from spouse	0	0
	Cohabitant	0	0
	Purchased from spouse/partner	0	0
	Purchased from family or friends	2	2.17
	Bought on the open market	19	20.65
	I have planted the forest myself/the forest has grown by itself	0	0
	Restitution	25	27.17
	Other	22	23.91
	I do not know	3	3.26

both exceeding the commonly accepted threshold of 0.90, indicating a good model fit. The RMSEA was 0.10, with a 90% confidence interval of 0.07–0.12, which is above the ideal cutoff of 0.06 but still within a tolerable range for complex models. The SRMR was 0.06, which is below the recommended cutoff of 0.08, further supporting the model's adequacy. Collectively, these indices suggest that the proposed model provides an acceptable representation of the data (Table 5).

The results of the SEM are presented in Table 6 and illustrated in Figure 2. All three TPB constructs (AT, SN, and PBC) showed positive standardized path coefficients toward forest owners' intention (IN) to engage the public in forest management planning. However, only SN demonstrated a statistically significant effect ($\beta = 0.61$, $p = 0.021$), supporting H2. In contrast, the effects of AT ($\beta = 0.10$, $p = 0.515$) and PBC ($\beta = 0.26$, $p = 0.277$) were positive but not statistically significant, leading to the rejection of H1 and H3, respectively. The z-value, obtained by dividing each path coefficient by its standard error, indicates how strong a relationship is relative to its variability. In SEM, a z-value greater than 1.96 corresponds to statistical significance at the 0.05 level, meaning that the relationship is unlikely to have occurred by chance. These results suggest that SN exerts a stronger influence on IN than AT or PBC.

TABLE 3 Reliability and convergent validity of TPB constructs.

Construct	Std. loadings (min–max)	Cronbach's α	CR	AVE
AT	0.604–0.842	0.83	0.83	0.578
SN	0.885–0.965	0.96	0.962	0.854
PBC	0.802–0.919	0.90	0.902	0.706
IN	0.509–0.888	0.84	0.762	0.523

TABLE 4 Descriptive statistics and normality indices of measurement items.

Item	Mean	SD	Skewness	Kurtosis
AT1	5.28	4.21	1.56	3.82
AT2	7.70	4.99	0.77	−0.25
AT3	6.76	5.20	0.80	−0.28
AT4	5.39	4.37	2.17	6.71
SN1	5.07	4.66	1.41	1.34
SN2	5.14	4.91	1.24	0.62
SN3	4.96	4.24	1.09	0.14
SN4	4.99	4.17	1.16	0.95
PBC1	6.18	3.34	0.52	−0.42
PBC2	4.51	3.84	1.46	2.45
PBC3	6.03	4.00	0.75	0.25
PBC4	8.53	4.46	0.79	−0.23
IN1	1.61	0.86	1.23	0.51
IN2	2.02	1.14	1.15	0.55
IN3	1.89	0.97	0.72	−0.63
IN4	2.10	1.06	0.52	−0.80

Figure 3 displays the standardized factor loadings for all observed indicators, which ranged from 0.51 to 0.97 and were statistically significant ($p < 0.001$). These results confirmed that the observed indicators reliably represented their corresponding latent constructs. Collectively, the model explained 86.31% of the variance in behavioral intention, indicating strong explanatory power and supporting the applicability of the TPB framework in analyzing participatory behavior among Czech non-state forest owners.

4 Discussion

This study applied the TPB as a pioneering framework to examine Czech non-state forest owners' intentions to involve the public in forest management planning. The model explained 86.31% of the variance in behavioral intention, indicating strong explanatory power. To contextualize these results, it is important to consider the methodological characteristics of the study. The reliability and stability of structural equation models depend not only on sample size but also on model complexity, construct reliability, and measurement validity (Hair et al., 2019; Kline, 2023b). Although the final sample ($n = 92$) exceeded the minimum threshold established through power analysis (Faul et al., 2007; Faul et al., 2009), the exploratory nature of the research and the relatively modest sample size may have contributed to minor deviations in fit indices. These factors should be taken into account when assessing the generalizability and replicability of the findings.

Moreover, the demographic structure of the sample, predominantly male and professionally trained forest owners, closely reflects the actual profile of non-state forest ownership in the Czech Republic, where forest management remains technically oriented and largely male-dominated. While this enhances the contextual validity of the findings, it may also limit their generalizability to less experienced, unaffiliated, or more diverse ownership groups. Our findings align with those of Hrib et al. (2024), who also reported a clear predominance of male forest owners (45 men vs. 6 women) in their sample of small-scale forest owners in the Czech Republic. Similarly, Fem4Forest (2021) found that the share of women who own forests in Austria, Bavaria, the Czech Republic, and Slovenia ranges between 23 and 35%, with the majority of Czech female owners holding parcels smaller than 1 hectare. These patterns highlight that forest ownership remains a male-dominated domain, both in ownership prevalence and in land area, reflecting historical restitution processes, traditional inheritance systems, and the aging demographic of the forest owner population.

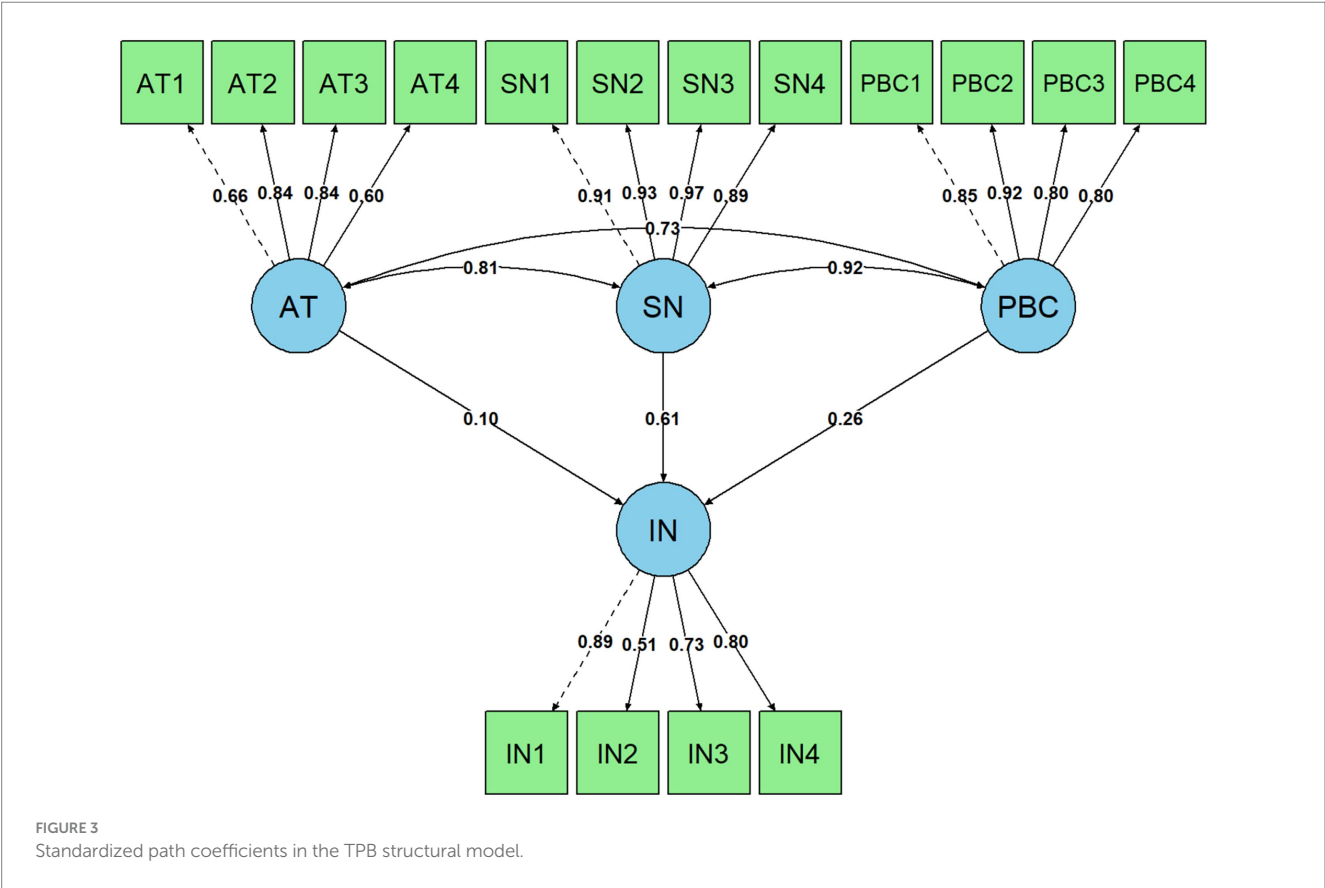
Despite these considerations, the analysis revealed that AT did not have a statistically significant effect on IN ($p = 0.515$; $\beta = 0.10$), thereby

TABLE 5 Model fit indices.

Fit measure	Value
χ^2 (df)	179.36 (98)
p-value	< 0.001
CFI	0.93
TLI	0.92
RMSEA [90% CI]	0.10 [0.07–0.12]
SRMR	0.06

TABLE 6 SEM results for hypothesis testing of TPB construct.

Hypotheses	Path	Std. β	Std. error	z-value	p-value	Result
H1	AT→IN	0.098	0.042	0.65	0.515	Rejected
H2	SN→IN	0.608	0.047	2.31	0.021	Supported
H3	PBC→IN	0.256	0.063	1.09	0.277	Rejected



leading to the rejection of H1. This result did not align with much of the existing literature, which has consistently identified AT as one of the strongest predictors of IN in forestry contexts (Holt et al., 2021; Lima and Bastos, 2020; Savari and Khaleghi, 2023; Häyrynen et al., 2025). The absence of a significant relationship in this case may be explained by a ceiling effect, as respondents expressed uniformly favorable views toward participatory forest management. When attitudinal endorsement is nearly universal, the lack of variability reduces its statistical power within the model. A similar pattern has been reported in Finland, where Karpinen and Berghäll (2015) observed that AT played a minor role compared to the dominant influence of SN in shaping forest management intentions. Koskela and Karpinen (2024) further demonstrated that while attitudes toward biodiversity conservation were generally positive among Finnish forest owners, SN and PBC were more decisive in predicting IN. In the realm of forest health tourism, Zhao et al. (2025) found that AT functioned more as a moderating variable than as a direct predictor, suggesting that its influence may be contingent on other motivational factors. Within the Czech context, this outcome likely reflects normative alignment rather than attitudinal indifference: majority of forest owners conceptually support participatory principles but do not

perceive them as decisive behavioral motivators. Moreover, the absence of institutional requirements for participation may limit the translation of positive attitudes into actual engagement. Erfanian et al. (2024) applied social cognitive theory to ecotourism behaviors and similarly found that environmental intention was shaped more by perceived outcomes and social reinforcement than by personal attitudes alone.

While AT showed limited explanatory power, SN demonstrated a statistically significant and positive effect on IN ($p = 0.021$; $\beta = 0.61$) (H2). This highlighted the central role of perceived social expectations in shaping participatory behavior, indicating that forest owners' willingness to engage in participatory planning was primarily influenced by peer recognition, social approval, and professional legitimacy rather than by personal attitudes or perceived control. This finding aligned with the core premise of the TPB, in which Ajzen (1991) emphasized that normative pressures are particularly influential in collective decision-making contexts. It also corresponded with the Czech study by Mohammadi et al. (2024), who found that SN significantly predicted citizens' intentions to participate in forest management planning. Individuals who perceived stronger social support and expectations from peers and communities were more

likely to express a willingness to engage in participatory processes. Similarly, Purwestri et al. (2023) demonstrated that Czech citizens placed a high value on forest ecosystem services, which may have translated into societal pressure on forest owners to adopt participatory and transparent management practices. Further evidence from Mohammadi et al. (2025) supported this interpretation: their investigation of forest ownership revealed that individuals with direct or family experience in forestry displayed stronger and more coherent TPB relationships. Familiarity with forest management increased internal motivation, perceived capacity to engage, and sensitivity to normative expectations within their communities. This suggested that experiential proximity to forestry reinforced the influence of social norms, as those embedded in forest-related networks were more attuned to collective expectations and professional standards. The prominence of SN in this study was consistent with international patterns observed in other forestry contexts. Karppinen and Berghäll (2015) found that subjective norms were the strongest predictor of stand improvement decisions among Finnish forest owners, while Holt et al. (2021) reported that normative pressures outweighed attitudes and perceived control among family forest owners in the United States. Similarly, Koskela and Karppinen (2024) concluded that social norms strengthen behavioral intention by linking social approval to environmental and cultural values. Taken together, these results underscore that in the Czech Republic, where participatory management is not legally mandated, social legitimacy and professional culture act as decisive motivational forces. Forest owners appear more inclined to engage in participatory planning when such behavior aligns with collective expectations and accepted professional norms. These findings confirmed the argument introduced earlier that collective social influences, rather than individual attitudes, are the primary drivers of pro-participatory intentions in semi-formal governance systems.

Our analysis showed that PBC did not have a statistically significant effect on IN ($p = 0.277$; $\beta = 0.26$) (H3). Although forest owners generally perceived themselves as capable of engaging in participatory planning, their sense of control did not translate into a stronger intention to involve the public in forest management decision-making. This result contrasted with several previous studies in which PBC emerged as a key determinant of pro-environmental and participatory behaviors (e.g., Kotyza et al., 2024; Koskela and Karppinen, 2024). Nevertheless, the present finding was consistent with research by Karppinen and Berghäll (2015), Holt et al. (2021), Häyrinen et al. (2025), and Rodrigo et al. (2025), who observed that PBC exerted limited influence in contexts constrained by institutional, procedural, or regulatory barriers. Within the Czech forestry sector, this result may be attributable to the absence of formal participatory mechanisms and limited institutional support for inclusive decision-making. Even when forest owners possess the necessary technical competence and managerial autonomy, they may lack the procedural avenues through which such control can be effectively exercised. A further explanation concerns the homogeneity of the respondent group. The sample consisted mainly of experienced and professionally trained forest owners, many of whom share comparable levels of expertise and confidence in management-related activities. This restricted variation in perceived control may have attenuated its statistical influence. In such professionalized environments, PBC may

function as a baseline condition rather than a distinct motivational driver, while SN and collective legitimacy assume greater importance in shaping IN. Overall, these findings suggested that enhancing PBC among forest owners requires interventions beyond individual capacity building. Strengthening institutional frameworks for participation, clarifying procedural roles, and fostering collaborative support networks could make perceived control more behaviorally salient in future participatory forestry initiatives.

In addition to these behavioral insights, it is important to note that while the reliability and validity results were generally satisfactory, some indices such as AVE, CR, and RMSEA were close to recommended threshold values. This suggests that the structural model should be interpreted with some caution, as minor deviations likely reflect the modest sample size and exploratory nature of the study. Nevertheless, these indices remained within acceptable ranges reported in comparable TPB-based research, indicating that the model retains adequate reliability and theoretical coherence.

4.1 Theoretical and practical implications

This study advanced the understanding of participatory behavior in forest governance by demonstrating that the TPB effectively explains the intentions of non-state forest owners to involve the public in management planning. The predominance of subjective norms over attitudes and perceived behavioral control underscores the importance of social expectations and professional culture in shaping behavioral intentions within structured institutional environments. This finding suggests that individual cognition alone is insufficient to explain participatory behavior in contexts where collective legitimacy and peer influence are strong determinants. From a practical perspective, the results indicate that initiatives aimed at fostering public participation should emphasize the creation of supportive social environments rather than focusing exclusively on individual motivation. Policies that strengthen forest owner associations, encourage peer learning, and embed participatory standards in professional practice are likely to be more effective. Strengthening collaboration between local authorities, professional bodies, and community organizations can further enhance the social legitimacy of participatory forest management and support its integration into long-term governance strategies.

5 Recommendations and limitations

This study was conducted among members of the Association of Municipal, Private, and Church Forest Owners of the Czech Republic (SVOL), which represents a broad yet specific segment of non-state forest owners. While this provided valuable access to active and professionally engaged stakeholders, it also limited participation to registered members of the association. Cultural factors and topic-related sensitivities, including reluctance to share management information or engage in discussions about public participation, may have further constrained the response rate and resulted in a modest sample size ($n = 92$). Although this limits the generalizability of the findings, the achieved sample exceeded the statistically required minimum ($n = 77$) determined through power analysis and was

therefore adequate for model testing. Importantly, this study constitutes pioneering research applying the TPB to non-state forest owners in the Czech Republic, providing a valuable empirical foundation for future investigations. Subsequent research should build on these findings by engaging a more diverse range of ownership categories, including unaffiliated private owners, and by employing participatory methods such as group discussions, roundtables, and stakeholder panels to foster greater trust and inclusivity. While the number of responses was sufficient to identify key relationships within the theoretical framework, the results should be interpreted with caution due to potential limits in representativeness and precision. The demographic profile of respondents, predominantly male, professionally trained, and actively involved in management, reflects the core decision-making group of Czech non-state forest owners but may not capture the perspectives of less experienced or more isolated individuals. Finally, although the TPB provided a useful analytical lens, it may not fully encompass the complexity of forest owners' decision-making. Future studies could integrate complementary constructs such as institutional trust, environmental values, and perceived fairness to capture broader motivational influences. Longitudinal and mixed-method approaches are also recommended to explore how intentions evolve and translate into actual participatory practices across different governance contexts.

6 Conclusion

This study examined the behavioral intentions of non-state forest owners in the Czech Republic to involve the public in forest management planning using the TPB framework. The analysis revealed that SN was the dominant predictor of IN, suggesting that participatory engagement is shaped more by collective expectations and social legitimacy than by individual AT or PBC. The results extend the theoretical reach of the TPB by illustrating that normative influence becomes dominant in professionalized decision-making environments where AT and PBC are already favorable. They also provide practical insights for strengthening participatory governance: fostering collaboration within forest owner associations, enhancing peer recognition of participatory practices, and embedding social norms of transparency and inclusiveness within forestry institutions. As one of the pioneering empirical investigations in the Czech Republic, this study establishes a foundational understanding of the social dynamics that shape participatory approaches to forest management. The findings offer valuable guidance for the development of policies and engagement strategies that strengthen institutional legitimacy while responding to evolving societal expectations. Beyond the national context, these insights hold broader relevance for European forestry systems seeking to advance sustainable and socially inclusive models of forest governance.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague (CZU). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

ZM: Conceptualization, Investigation, Methodology, Validation, Writing – original draft. JK: Conceptualization, Funding acquisition, Project administration, Resources, Supervision, Writing – review & editing. MT: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

- Ajzen, I. (1991). The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* 50, 179–211. doi: 10.1016/0749-5978(91)90020-T
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *J. Appl. Soc. Psychol.* 32, 665–683. doi: 10.1111/j.1559-1816.2002.tb00236.x
- Ajzen, I., and Fishbein, M. (1975). A bayesian analysis of attribution processes. *Psychol. Bull.* 82, 261–277. doi: 10.1037/h0076477
- Amare, D., and Darr, D. (2022). Farmers' intentions toward sustained agroforestry adoption: an application of the theory of planned behavior. *J. Sustain. For.* 42, 869–886. doi: 10.1080/10549811.2022.2123358
- Apipoonyanon, C., Szabo, S., Kuwornu, J. K., and Ahmad, M. M. (2020). Local participation in community forest management using theory of planned behaviour: evidence from Udon Thani Province, Thailand. *Eur. J. Dev. Res.* 32, 1–27. doi: 10.1057/s41287-019-00219-1
- Arce, J. J. C. (2019). *Forests, inclusive and sustainable economic growth and employment. In background study prepared for the fourteenth session of the United Nations forum on Forest (UNFF), forests and SDG8.*
- Armitage, C. J., and Conner, M. (1999). The theory of planned behaviour: assessment of predictive validity and 'perceived control'. *Br. J. Soc. Psychol.* 38, 35–54. doi: 10.1348/014466699164022
- Armitage, C. J., and Conner, M. (2001). Efficacy of the theory of planned behaviour: a meta-analytic review. *Br. J. Soc. Psychol.* 40, 471–499. doi: 10.1348/014466601164939
- Bean, G. J., and Bowen, N. K. (2021). Item response theory and confirmatory factor analysis: complementary approaches for scale development. *J. Evid.-Based Soc. Work.* 18, 597–618. doi: 10.1080/26408066.2021.1906813
- Chytrý, M. (2017). Current vegetation of the Czech Republic. Berlin: Springer International Publishing, 229–337.
- Cohen, J. (1988). Statistical power analysis for the behavioral sciences. 2nd Edn. New York: Routledge.
- Deuff, P., Sotirov, M., and Arts, B. (2018). "Your policy, my rationale": how individual and structural drivers influence European forest owners' decisions. *Land Use Policy* 79, 1024–1038. doi: 10.1016/j.landusepol.2016.09.021
- Empidi, A. V. A., and Emang, D. (2021). Understanding public intentions to participate in protection initiatives for forested watershed areas using the theory of planned behavior: a case study of Cameron Highlands in Pahang, Malaysia. *Sustainability* 13:4399. doi: 10.3390/su13084399
- Engida, T. G., and Teshoma, A. J. (2012). The socio economic effects of community forest management: evidence from Dendi District, Ethiopia. *Int. Aff. Glob. Strat.* 4, 15–22.
- Erfanian, S., Maleknia, R., and Halalisan, A. F. (2024). Application of social cognitive theory to determine shaping factors of environmental intention and behaviors of ecotourist in forest areas. *Front. For. Glob. Change* 7:1489170. doi: 10.3389/ffgc.2024.1489170
- European Commission (2021). Communication from the commission to the European Parliament, the council, the European economic and social committee and the Committee of the Regions. Brussels: European Commission.
- Faul, F., Erdfelder, E., Buchner, A., and Lang, A.-G. (2009). Statistical power analyses using G*power 3.1: tests for correlation and regression analyses. *Behav. Res. Methods* 41, 1149–1160. doi: 10.3758/BRM.41.4.1149
- Faul, F., Erdfelder, E., Lang, A.-G., and Buchner, A. (2007). G*power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav. Res. Methods* 39, 175–191. doi: 10.3758/BF03193146
- Fem4Forest. (2021). *Facts and figures regarding women in forestry in the Danube region. Forests in Women's Hands/Interreg Danube Transnational Programme.* Available online at: <https://www.interreg-danube.eu/approved-projects/fem4forest>.
- Forest Europe. (2020). *State of Europe's forests 2020. Ministerial conference on the protection of forests in Europe.*
- Fox, H., and Cundill, G. (2018). Towards increased community-engaged ecological restoration: a review of current practice and future directions. *Ecol. Restor.* 36, 208–218. doi: 10.3368/er.36.3.208
- Greiner, R., and Gregg, D. (2011). Farmers' intrinsic motivations, barriers to the adoption of conservation practices and effectiveness of policy instruments: empirical evidence from northern Australia. *Land Use Policy* 28, 257–265. doi: 10.1016/j.landusepol.2010.06.006
- Hair, J. F., Black, W. C., Babin, B. J., and Anderson, R. E. (2019). *Multivariate data analysis. 8th Edn.* Boston, MA: Cengage Learning.
- Häyriäinen, L., Kaseva, J., and Pouta, E. (2025). Finnish forest owners' intentions to participate in cooperative forest management. *Forest Policy Econ.* 172:103420. doi: 10.1016/j.forpol.2024.103420
- Holt, J. R., Butler, B. J., Borsuk, M. E., Markowski-Lindsay, M., MacLean, M. G., and Thompson, J. R. (2021). Using the theory of planned behavior to understand family forest owners' intended responses to invasive forest insects. *Soc. Nat. Resour.* 34, 1001–1018. doi: 10.1080/08941920.2021.1924330
- Hrib, M., Hruška, L., and Jarkovská, M. (2024). The potential of small-scale owners' associations for sustainable forest management: the case of the Czech Republic. *Scand. J. For. Res.* 39, 328–343. doi: 10.1080/02827581.2024.2409111
- Huang, Y., Hou, Y., Ren, J., Yang, J., and Wen, Y. (2023). How to promote sustainable bamboo forest management: an empirical study from small-scale farmers in China. *Forests* 15:12. doi: 10.3390/f15010012
- Ikonen, P., Miettinen, J., Luoma, M., Pellikka, J., and Pappinen, A. (2023). Beliefs of forest owners toward cooperative capercaillie lekking site management operations: a pilot study. *Hum. Dimens. Wildlife* 28, 620–634. doi: 10.1080/10871209.2022.2146814
- Janová, J., Hampel, D., Kadlec, J., and Vrška, T. (2022). Motivations behind the forest managers' decision making about mixed forests in the Czech Republic. *Forest Policy Econ.* 144:102841. doi: 10.1016/j.forpol.2022.102841
- Karppinen, H., and Berghäll, S. (2015). Forest owners' stand improvement decisions: applying the theory of planned behavior. *Forest Policy Econ.* 50, 275–284. doi: 10.1016/j.forpol.2014.09.009
- Kline, R. B. (2023a). "Assumptions in structural equation modeling" in *Handbook of structural equation modeling*. ed. R. H. Hoyle. 2nd ed (New York: Guilford Press), 128–144.
- Kline, R. B. (2023b). "Structural equation modeling in neuropsychology research" in *APA handbook of neuropsychology: Neuroscience and neuromethods*. eds. G. G. Brown, B. Crosson, K. Y. Haaland and T. Z. King (Washington, DC: American Psychological Association), 681–698.
- Koskela, T., and Karppinen, H. (2024). Forest owners' intention to safeguard forest biodiversity: an application of the theory of planned behavior. *For. Sci.* 70, 64–79. doi: 10.1093/forsci/xfad044
- Kotzya, P., Cabelkova, I., Pierański, B., Malec, K., Borusiak, B., Smutka, L., et al. (2024). The predictive power of environmental concern, perceived behavioral control and social norms in shaping pro-environmental intentions: a multicountry study. *Front. Ecol. Evol.* 12:1289139. doi: 10.3389/fevo.2024.1289139
- Krejzar, P. (2011). Sustainable Management of Forests in the Czech Republic and its Consequences for Wood Availability and Supply. Joensuu, Finland: European Forest Institute.
- Lacerda, A. E. B., Figueiredo Filho, A., Kellermann, B., Nimmo, E. R., Rosot, M. A. D., Radomski, M. I., et al. (2012). Sustainable forest management in rural southern Brazil: exploring participatory forest management planning. London: INTECH Open Access Publisher.
- Latifinia, A., Maleknia, R., Rahimian, M., and Almeida-Garcia, F. (2025). Studying participatory behaviors of local communities in ecotourism-based natural resources conservation: using the theory of planned behavior in Zagros Mountains, Iran. *J. Rangel. Sci.* 15:14. doi: 10.57647/j.jrs.2025.1502.14
- Lima, F. P., and Bastos, R. P. (2020). Understanding landowners' intention to restore native areas: the role of ecosystem services. *Ecosyst. Serv.* 44:101121. doi: 10.1016/j.ecoser.2020.101121
- Liu, Z., Yan, Q., Zhang, Y., and Qu, M. (2025). The key factors that influence farmers' participating behavior in forest management plan formulation based on 1752 households in China. *Forests* 16:73. doi: 10.3390/f16010073
- Ma, Z., Butler, B. J., Kittredge, D. B., and Catanzaro, P. (2012). Factors associated with landowner involvement in forest conservation programs in the U.S.: implications for policy design and outreach. *Land Use Policy* 29, 53–61. doi: 10.1016/j.landusepol.2011.05.004
- Maire, M., Qarro, M., Segur, M., Robert, N., Gouriveau, F., Malvar, M. E., et al. (2018). Participation: a pillar of sustainable forest management in the Mediterranean. State of Mediterranean forest 2018. Rome: FAO, 196–215.
- Maleknia, R. (2024). Psychological determinants of citizens' willingness to pay for ecosystem services in urban forests. *Glob. Ecol. Conserv.* 54:e03052. doi: 10.1016/j.gecco.2024.e03052

- Maleknia, R. (2025). How perception of environmental and social justice drive citizens' satisfaction and intention to engage with urban forest management. *Heliyon* 11:e41274. doi: 10.1016/j.heliyon.2024.e41274
- Maleknia, R., and ChamCham, J. (2024). Participatory intention and behavior towards riparian peri-urban forests management; an extended theory of planned behavior application. *Front. Psychol.* 15:1372354. doi: 10.3389/fpsyg.2024.1372354
- Maleknia, R., and Hälälisan, A. F. (2025). Purchasing certified forest products to participate in sustainable forest management: unveiling the drivers of consumers' intention. *Forest Policy Econ.* 178:103592. doi: 10.1016/j.forpol.2025.103592
- Maleknia, R., Hälälisan, A. F., and Maleknia, K. (2025b). Who shapes what we should do in urban green spaces? An investigation of subjective norms in pro-environmental behavior in Tehran. *Forests* 16:1273. doi: 10.3390/f16081273
- Maleknia, R., Hälälisan, A. F., Popa, B., and Pakravan-Charvadeh, M. R. (2025a). Consumption for conservation: determinants of purchasing local products by ecotourists to conserve protected forests. *J. Outdoor Recreat. Tourism.* 51:100935. doi: 10.1016/j.jort.2025.100935
- Maleknia, R., and Salehi, T. (2024). Exploring the drivers behind women's intentions towards climate change mitigation through urban forest conservation. *Urban For. Urban Green.* 97:128395. doi: 10.1016/j.ufug.2024.128395
- Maleknia, R., and Svobodova, K. (2025). Predictors of female students' intentions toward urban forest conservation for climate change mitigation in Iran. *Sci. Rep.* 15:24260. doi: 10.1038/s41598-025-10109-8
- Maydeu-Olivares, A., Ximénez, C., and Revuelta, J. (2024). Percentage of variance accounted for in structural equation models: the rediscovery of the goodness of fit index. *Psychol. Methods* 2:680. doi: 10.1037/met0000680
- Mayer, A. L. (2019). Family forest owners and landscape-scale interactions: a review. *Landsc. Urban Plan.* 188, 4–18. doi: 10.1016/j.landurbplan.2018.10.017
- Méndez-López, M. E., García-Frapolli, E., Ruiz-Mallén, I., Porter-Bolland, L., and Reyes-García, V. (2015). From paper to forest: local motives for participation in different conservation initiatives. Case studies in southeastern Mexico. *Environ. Manag.* 56, 695–708. doi: 10.1007/s00267-015-0522-0
- Ministry of Agriculture of the Czech Republic. (2021). *Information on forests and forestry in the Czech Republic by 2020. Prague, Czech Republic*, p. 20.
- Mishra, S. S. (2020). Testing the antecedents to e-democracy towards citizens' happiness: a structural equation modelling approach to 'MyGov' initiative, India. *Int. J. Public Adm.* 43, 1293–1303. doi: 10.1080/01900692.2019.1669051
- Mohammadi, Z., Kašpar, J., and Tahri, M. (2025). The role of demographics in citizens' behavioral intentions for participatory forest management planning. *Front. For. Glob. Change* 8:1692320. doi: 10.3389/ffgc.2025.1692320
- Mohammadi, Z., Kašpar, J., Tahri, M., and Sherstiuik, M. (2024). Assessing citizens' willingness for participatory forest management planning: a case study in the Czech Republic. *Forest Policy Econ.* 169:103345. doi: 10.1016/j.forpol.2024.103345
- Mortensen, C. R., Neel, R., Cialdini, R. B., Jaeger, C. M., Jacobson, R. P., and Ringel, M. M. (2019). Trending norms: a lever for encouraging behaviors performed by the minority. *Soc. Psychol. Personal. Sci.* 10, 201–210. doi: 10.1177/1948550617734615
- Musthafa, I. Z. F., and Yc, Y. (2022). Motivation and factors affecting indigenous people's willingness to participate in future REDD+ project activities: the case of Tagal Hutan in Sabah, Malaysia. *Int. For. Rev.* 24, 411–425. doi: 10.1505/146554822835941904
- Nathan, I., and Boon, T. E. (2012). Constraints and options in local forest management in Cambodia: is decentralization a solution? *J. Sustain. For.* 31, 396–420. doi: 10.1080/10549811.2011.588479
- Nordlund, A., and Westin, K. (2011). Forest values and forest management attitudes among private forest owners in Sweden. *Forests* 2, 30–50. doi: 10.3390/f2010030
- Ouvrad, B., Abildtrup, J., Bostedt, G., and Stenger, A. (2019). Determinants of forest owners attitudes towards wood ash recycling in Sweden—can the nutrient cycle be closed? *Ecol. Econ.* 164:106293. doi: 10.1016/j.ecolecon.2019.04.005
- Purwestri, R. C., Palátová, P., Hájek, M., Dudík, R., and Jarský, V. (2023). Public perception of the performance of Czech forest ecosystem services. *Environ. Sci. Eur.* 35:89. doi: 10.1186/s12302-023-00802-8
- Rodrigo, C., Joshi, O., Poudyal, N. C., Russell, A., and Susaeta, A. (2025). Exploring private landowners' behavioral intent toward active forest management in the cross-timbers region. *Soc. Nat. Resour.* 1, 1–19. doi: 10.1080/08941920.2025.2562404
- Rosseel, Y. (2012). Lavaan: an R package for structural equation modeling. *J. Stat. Softw.* 48, 1–36. doi: 10.18637/jss.v048.i02
- Sagala, S., Rosyidie, A., Sasongko, M. A., and Syahbid, M. M. (2018). *Who gets the benefits of geopark establishment? A study of Batur Geopark area, Bali Province, Indonesia*. In IOP conference series: Earth and environmental science, No. 158. IOP Publishing, p. 012034.
- Sarvašová, Z., Dobšínská, Z., and Šálka, J. (2014). Public participation in sustainable forestry: the case of forest planning in Slovakia. *iForest Biogeosci. For.* 7, 414–422. doi: 10.3832/ifor1174-007
- Savari, M., and Khaleghi, B. (2023). Application of the extended theory of planned behavior in predicting the behavioral intentions of Iranian local communities toward forest conservation. *Front. Psychol.* 14:1121396. doi: 10.3389/fpsyg.2023.1121396
- Schorn, A. (2024). Why should I when no one else does? A review of social norm appeals to promote sustainable minority behavior. *Front. Psychol.* 15:1415529. doi: 10.3389/fpsyg.2024.1415529
- Šišák, L., Šálka, J., and Dudík, R. (2016). Non-market non-timber forest products in the Czech Republic—their socio-economic effects and trends in forest land use. *Land Use Policy* 50, 390–398. doi: 10.1016/j.landusepol.2015.10.006
- Sorice, M. G., Oh, C.-O., Gartner, T., Snieckus, M., Johnson, R., and Donlan, C. J. (2013). Increasing participation in incentive programs for biodiversity conservation. *Ecol. Appl.* 23, 1146–1155. doi: 10.1890/12-1878.1
- Stare, D., Uhan, Z., Triplat, M., Ščap, Š., Krajnc, N., and Pezdevšek Malovrh, Š. (2025). Private forest owner typology based on post-disturbance behaviour in Slovenia. *Forests* 16:949. doi: 10.3390/f16060949
- SVOL. (2025). *Membership and organizational structure of the Association of Municipal, private and church Forest owners of the Czech Republic*. Available online at: <https://svol.cz/kdo-j sme/clenstvi> (Accessed September 11, 2025).
- Takahashi, T., Tsuge, T., and Shibata, S. (2022). Innovativeness of Japanese forest owners regarding the monetization of forest ecosystem services. *Sustainability* 14:2119. doi: 10.3390/su14042119
- Tolasz, R., Brzdil, R., Bulir, O., Dobrovolný, P., Dubrovský, M., Hájková, L., et al. (2007). *Atlas podnebí Česka: Climate atlas of Czechia*. Praha, Czechia: Czech Hydrometeorological Institute, 255.
- Tseng, T. W. J., Robinson, B. E., Bellemare, M. F., BenYishay, A., Blackman, A., Boucher, T., et al. (2021). Influence of land tenure interventions on human well-being and environmental outcomes. *Nat. Sustain.* 4, 242–251. doi: 10.1038/s41893-020-00648-5
- Wenzel, M., and Woodyatt, L. (2025). The power and pitfalls of social norms. *Annu. Rev. Psychol.* 76, 583–606. doi: 10.1146/annurev-psych-020124-120310
- West, S. G., Wu, W., McNeish, D., and Savord, A. (2023). "Model fit in structural equation modeling" in *Handbook of structural equation modeling*, ed. S. G. West, vol. 2 (New York: The Guilford Press), 184–205.
- Winberg, E. (2010). *Participatory Forest Management in Ethiopia, practices and experiences*. Addis Ababa: Food and Agriculture Organization, Sub-regional office for Eastern Africa (SFE). Available online at: <http://www.fao.org/forestry/24514043adbe564e803444b40d3e18987b434d.pdf>.
- Yadav, R., and Pathak, G. S. (2017). Determinants of consumers' green purchase behavior in a developing nation: applying and extending the theory of planned behavior. *Ecol. Econ.* 134, 114–122. doi: 10.1016/j.ecolecon.2016.12.019
- Yang, F., Jiang, Y., and Paudel, K. P. (2021). Farmers' willingness to participate in forest management for carbon sequestration on the sloping land conservation program in China. *Int. Forest. Rev.* 23, 244–261. doi: 10.1505/146554821832952799
- Zhang, Q., Popa, A., Sun, H., Guo, W., and Meng, F. (2022). Tourists' intention of undertaking environmentally responsible behavior in national forest trails: a comparative study. *Sustainability* 14:5542. doi: 10.3390/su14095542
- Zhao, Y., Yang, J., Song, J., and Lu, Y. (2025). The effects of tourism motivation and perceived value on tourists' behavioral intention toward forest health tourism: the moderating role of attitude. *Sustainability* 17:713. doi: 10.3390/su17020713
- Zhong, F., Li, L., Guo, A., Song, X., Cheng, Q., Zhang, Y., et al. (2019). Quantifying the influence path of water conservation awareness on water-saving irrigation behavior based on the theory of planned behavior and structural equation modeling: a case study from Northwest China. *Sustainability* 11:4967. doi: 10.3390/su11184967