


Willingness of the Local Community to Support Management for the Improvement in the Quality of the Riparian Zone in North-Eastern Latvia

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Abstract: The preservation and management of riparian zones in nature protection areas are challenging due to the simultaneous demands of nature protection regulations, active nature tourism burdens, and local community needs. The local community’s willingness to participate in riparian zone management is an essential contribution to establishing successful long-term riparian zone management. This study aimed to gain insight into the perceptions of the local community, particularly landowners, on the management perspectives of riparian zones in nature protection areas. We used a questionnaire survey to gather data from three distinct localities within the North Vidzeme Biosphere Reserve (NVBR). In total, 734 respondents were interviewed, of which 40% were landowners who owned land in riparian zones. Landowners did not differ significantly from those without property rights in their willingness to undertake voluntary work to improve the quality of riparian zones. Landowners more often use riparian zones for cultural and recreational activities. Overall, the landowners had similar perceptions of riparian zone management to respondents without property rights in the NVBR.



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1. Introduction

Riparian zones are the interface between the aquatic and terrestrial environments, uniquely shaped by local bioclimatic and geomorphological conditions [1,2]. Due to its unique environmental conditions, the riparian zone provides a habitat for many specialised species of flora and fauna [3]. Riparian zones provide several essential regulating (carbon sequestration, flood protection, water purification, etc.), supporting (water and nutrient cycling, primary production), provisioning (water, food, energy, etc.), and cultural (recreation, ecotourism, aesthetic values, etc.) ecosystem services [4,5]. Due to their crucial role in providing several ecosystem services, the sustainable management of riparian areas is of fundamental importance [6,7].

The Eurobarometer, which is a European Union-implemented instrument to regularly monitor public opinion in Europe that carried out a survey in 2024 aiming to reveal the perceptions of Europeans on water-related issues, showed that respondents in Latvia think that pollution (85%) and the degradation of natural habitats (51%) are the main current water problems. Further, 68% support implementing additional measures to mitigate water problems [8]. Public opinion surveys carried out by the LIFE-IP LatViaNature project

showed that 88% of respondents supported river cleaning and around 56% supported the removal of fallen trees in rivers [9]. Similarly, most Latvian citizens are willing to pay to minimise the negative impacts, preserve biodiversity, and improve the water quality of the Baltic Sea riparian environment [10]. Studies have shown that local people's affinity with riparian zones is influenced by respondents' gender, level of education, age, distance to a waterbody, economic incentives, property rights, aesthetic aspects, and policy type (mandatory or voluntary) [11–16].

The ecological quality of freshwater is strongly shaped by the catchment area, as well as multiple social stressors that cause Eurotrification, pollution, etc. To protect freshwaters, a fixed-size buffer zone has been proposed in Latvia, where forestry and agricultural management actions are prohibited [17]. Yet, besides general regulations, additional protection instruments (Natura 2000, nature reserves or parks) have been implemented to safeguard freshwaters, which support an important biodiversity value. Local communities (LCs) living in protected areas (PAs) might experience a negative impact on the availability of recreational ecosystem services due to implemented management restrictions, as shown in studies in China [18], the USA [19], and other countries. Yet, the socioeconomic aspects of LCs living within or near PAs in the Baltic Sea region have not been studied. Studies show that reconciliation between nature conservation management and social economic issues of LCs enhances the sustainable development of the whole area [20,21]. Also, besides general similarities, LCs' perceptions of PAs have local characteristics and values [22]. Hence, this study aimed to reveal the attitude of local community living close to the rivers in protected areas about participation mode in riparian zone management. The first hypothesis is that LCs support several participation modes to improve the quality of riparian areas. The second hypothesis is that respondents with property rights in riparian zones are more likely to visit riparian zones more often and are also more willing to improve the environmental quality than respondents without property rights.

2. Materials and Methods

2.1. Description of Study Area

The North Vidzeme Biosphere Reserve (NVBR) in North-Eastern Latvia is a large protected area (457,708 ha) encompassing a unique complex of valuable terrestrial, aquatic, and coastal ecosystems. The NVBR aims to facilitate interdisciplinary approaches for the region's sustainable social and economic development [19,23]. One of the main natural values of NVBR is its rivers. The largest river is Salaca (95 km long), which is the 5th largest in Latvia, and its tributaries—Korģe (33 km), Svētupe (58 km), and Vitrupe (49 km)—exhibit high hydromorphological quality and naturalness. These rivers are crucial for salmon migration and nature-based tourism [24]. To protect the Salaca river basin, in 1977, a nature park, 'Salaca Valley', was established, which is also a part of the Natura 2000 network. Hence, several state and European Union-regulated instruments have been implemented in this region to safeguard biodiversity values. In this area, the Life+ project 'Life is Salaca' aims to develop synchronised integrated actions set by the Habitats Directive, Water Framework Directive, and European Union Biodiversity Strategy [25].

The survey was carried out in Limbaži Municipality, a territory that lies within the boundaries of NVBR. The responders were interviewed across four distinct localities within Limbaži Municipality. Two locations were rural villages: Viļķene and Liepupe, with an approximate population of 450 and 250 residents, respectively. The two other locations were Salacgrīva and Limbaži, with an approximate population of 2500 and 7000 residents.

2.2. Survey Design and Methods

A face-to-face survey mode with paper questionnaires was conducted. The structured questionnaire was designed by a Latvia University of Life Sciences and Technologies (LBTU) working group. The pre-test of the questionnaire design was conducted by the different groups of experts working at the LBTU. The interviewers were students of LBTU who were instructed and given written detailed instructions on how to approach respondents and fill out the questionnaires [26]. Before answering the questions, respondents were provided with a short introduction about riparian areas. Respondents were informed that the provided information would only be used for specific research purposes without personally identifiable details. The confidentiality of any personal information of the respondents was provided. The respondents in all the selected localities (Vilķene, Liepupe, Salacgrīva, and Limbaži) were approached at public places, such as schools, bus stops, and local shops. The representative sample size of 370 respondents was estimated using Krejcie and Morgan's (1970) guidelines [27]. In total, 734 paper questionnaires were filled out correctly and used for the further analysis.

The questionnaire was divided into two thematic parts. In the first part, the questions were designed to reveal the local community's perceptions of riparian forests; the results were summarised in the article by Saklaurs et al. (2022) [26]. The second part, which consists of questions that reveal the attitude and willingness of the local community to improve the quality of riparian zones, is analysed in this paper. The second part of the questionnaire contained 10 questions (Supplementary Materials). Most of the questionnaire questions were closed-ended (yes, no, maybe). Four demographic questions were included to reveal background information about the respondents (gender, education level, location, and land ownership rights). Respondents were asked to estimate the purpose and frequency of riparian visits (times per year). Further, they were asked to reveal their support (monetary, volunteer work) to improve riparian areas' environmental condition (reduce pollution, improve habitats for fish).

Data Analysis

We used ordinal logistic regression (OLR) as implemented in the library `ordinal` [28] of the programme R 4.4.1. [29] to analyse the impact of the predictor variable (property rights) on the response variables (answers to questions with an ordinal response scale). Analysis of variance (ANOVA) was used to analyse the influence of the predictor variables (property ownership, education level) on the response variable "The amount of money willing to pay". Quasi-Poisson generalised linear models (GLMs) were used when the response variables were expressed as the number of visits, as the number of visits is count data, and model diagnostics showed overdispersion in the data. Thus, the Poisson GLM was not an appropriate model.

3. Results

Most respondents were from Limbaži (45%), the largest populated area in our study (Figure 1). The most typical age of the respondents was 25 years and under (48%) and 36–45 years (20%). The ownership rights in riparian zones had 40% respondents. Secondary level education (45%) was the most common, followed by primary education (33%). Females (57%) made up the majority of the respondents.

According to the GLM analysis, respondents with property rights statistically significantly more often use riparian zones for recreational activities (swimming, walking, sailing) than respondents without property rights ($p = 0.034$) (Figure 2A), while the frequency of mushroom and berry picking and hunting activities did not differ between respondents with and without property rights ($p = 0.286$) (Figure 2B).

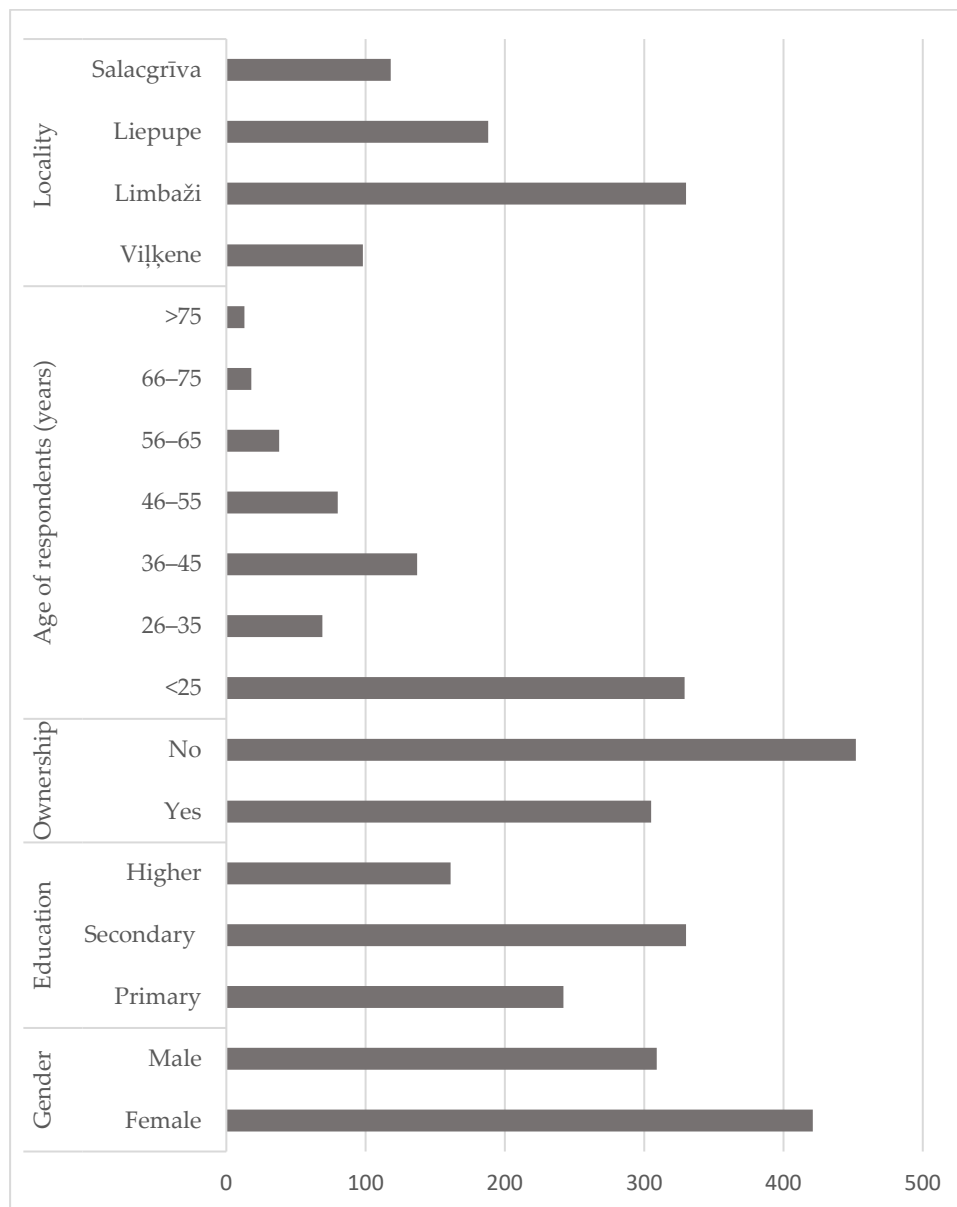


Figure 1. Summary statistics of respondents by locality, age, ownership rights, education, and gender. Question numbers in questionnaire (nr. 6, 7, 8, 9, 10).

On the second question, approximately equal proportions of respondents (45%) stated that they were willing to support activities to improve the quality of riparian zones, 44% stated ‘maybe’, and 11% were not willing (Figure 3). According to OLR, the respondents with property rights were not significantly more willing to participate in improving the quality of riparian zones ($p = 0.2445$) (Figure 4A).

On the third question, the majority (57%) of all respondents were not WTP to improve the quality of riparian zones (Figure 3). According to OLR, respondents with property rights had a statistically higher willingness to pay to improve the quality of riparian zones ($p = 0.011$) (Figure 4B). On the fourth question, the majority (63%) were willing to volunteer to improve the quality of riparian zones (Figure 3). According to OLR, there were no significant differences between respondents with and without property rights in terms of willingness to volunteer.

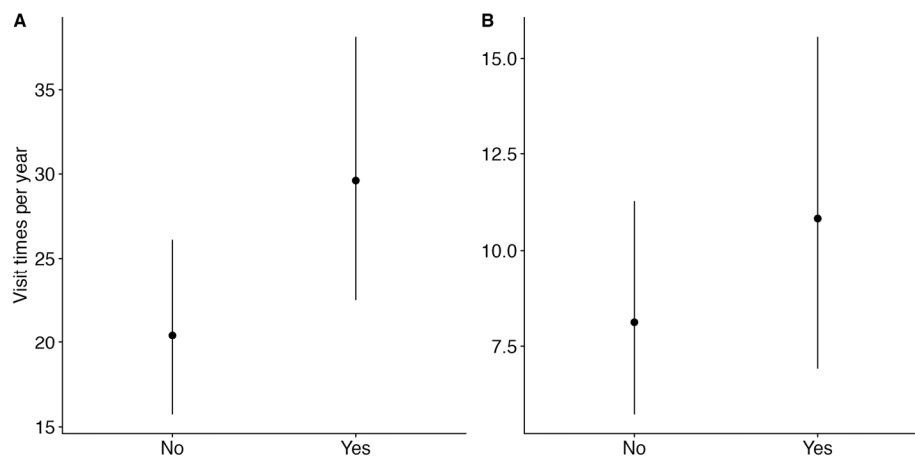


Figure 2. (A) Response to question 1 (how often do you use riparian areas for cultural ecosystem services—swimming, walking, sailing (number of times per year)?) in relation to property rights (question 6) (x-axis (yes/no)). (B) Response to question 1 (how often do you use riparian areas for provision ecosystem services—berry and mushroom picking, hunting (number of times per year)?) in relation to property rights (question 6) (x-axis (yes/no)). The black vertical lines represent 95% confidence intervals.

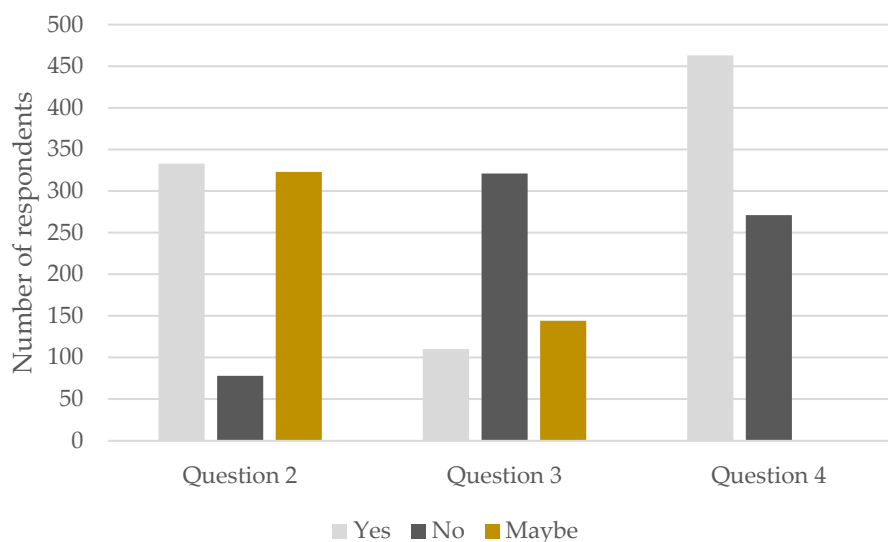


Figure 3. Response to question 2 (would you be willing to support various activities to improve the condition of rivers and riparian areas?), question 3 (would you be willing to pay for improving rivers and riparian areas?), and question 4 (would you be willing to volunteer to improve rivers and riparian areas?).

On the fifth question, the OLR analysis showed no difference in the amount of money the respondents were willing to spend to improve the quality of riparian zones between respondents with property rights and those without ($p = 0.224$) (Figure 5). The mean amount of money was \pm EUR 30 for those without property rights and \pm EUR 35 for those with property rights.

By employing GLM, we found that no property rights and education level combination had no statistically significant influence on the WTP amount ($p = 0.11$) (Figure 6).

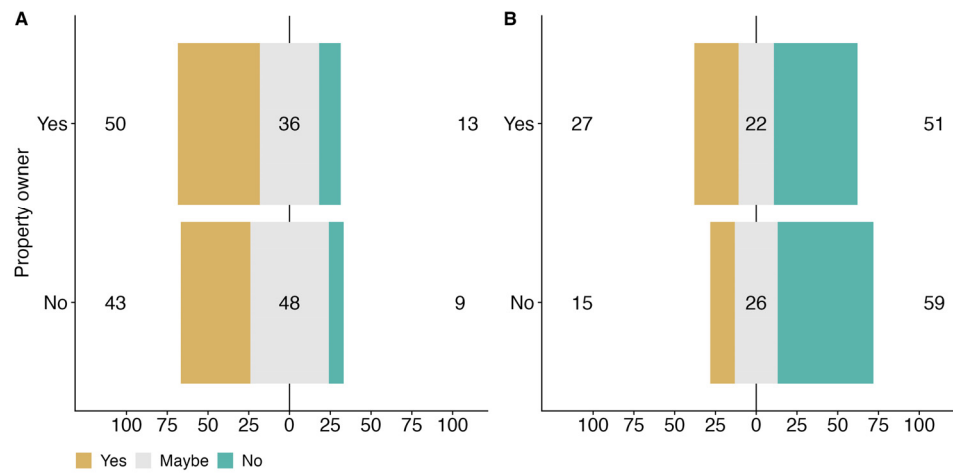


Figure 4. (A) Response to question 2 (are you willing to support activities that aim to improve the quality of riparian zones (yes/no?) in relation to property rights (x-axis). (B) Response to question 3 (are you willing to pay for activities that aim to improve the quality of riparian zones (yes/no?) in relation to property rights (x-axis); all values are percentages (%).

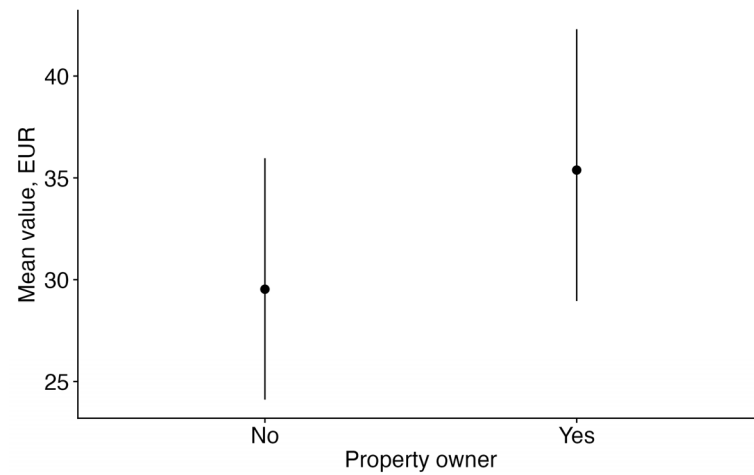


Figure 5. Response to question 5 (the amount of money (in EUR) the respondent is willing to pay to improve the quality of riparian zones) in relation to property rights. The black vertical lines represent 95% confidence intervals.

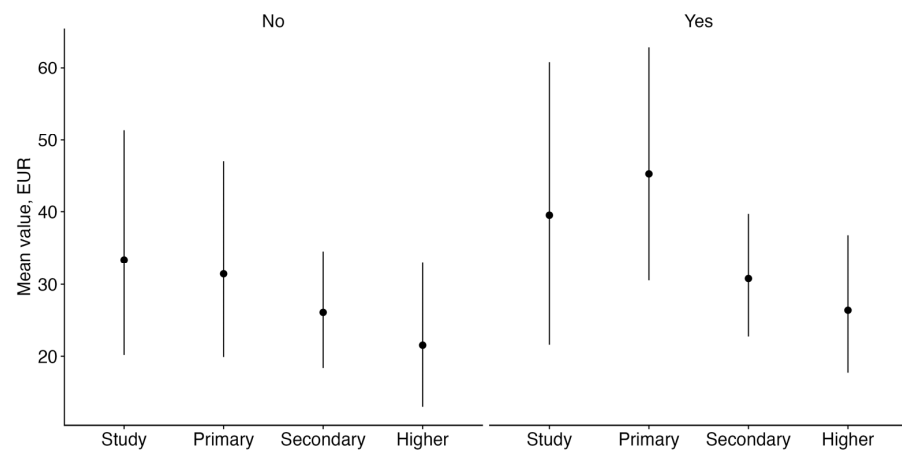


Figure 6. Response to question 5 (the amount of money (in EUR) the respondent is willing to pay for the improvement in the quality of riparian zones) in relation to property rights (yes/ no) and education level. The black vertical lines represent 95% confidence intervals.

4. Discussion

According to the study results, the stated support for the management activities aimed to improve the riparian zone in NVBR was convincing as only 11% gave a negative response. Surveys carried out on a more general sample of respondents in Latvia showed that willingness to volunteer to improve the quality of nature is considerably lower, at around 15% [9]. Our study results are aligned with other studies, which have shown that respondents living in the immediate vicinity are more interested in riverside management [12]. In our study, the respondents were local residents whose close connection to the rivers was also reflected in the frequency with which they visited riparian zones for recreation (cultural ecosystem services) and to gather berries and mushrooms (provisioning ecosystem services) (Figure 2).

In general, respondents who owned land in riparian areas did not statistically significantly differ from respondents without property rights in terms of support and willingness to volunteer to improve the quality of the riparian regions (Figure 4). However, respondents who owned land in riparian areas visited more often for cultural (swimming, walking, etc.) and provision (berry, mushroom picking, hunting) ecosystem services (Figure 2). Such a pattern could be explained by practical reasons, such as landowners visiting property to supervise it, and it is likely combined with recreational activities. In Latvia, forest owner attitudes are strongly influenced by the financial dependence on property as well as the size of forest property and education [30]. Meanwhile, financial gain from land in riparian zones could be linked to water tourism, especially in PAs [31]. The absence of significant differences between both respondents' groups (with and without land) suggests that financial gain or active business is likely not a significant factor for most landowners in NVBR.

Most respondents (75%) were not willing to pay to improve the condition of riparian zones, while the stated support and willingness to volunteer were considerably more positive (Figure 2). Similar trends have been observed in other surveys, which aim to assess the public opinion of citizens of Latvia on nature values. While most respondents agree that nature is important, they are far less likely to engage in volunteer work [9]. One of the challenges, shown by other studies, is that WTP or willingness to participate is higher than the actual involvement [31]. Although respondents with property rights stated a higher willingness to pay to improve the quality of riparian areas (Figure 3), the actual stated amount of money did not statistically significantly differ from the amount of money stated by the respondents without property rights (Figure 5). As another study in Latvia showed, when benefits of monetary support are well defined and information is provided, respondents are also willing to accept negative economic effects in order to protect nature habitats on the Baltic Sea coastline [32].

This study must address several limitations. Firstly, we mention the mode-effects of survey. Our study was based on face-to-face interviews, which might lead to "interviewer effects" in providing socially desirable answers [33]. This study uses a quantitative approach with close-ended questions describing groups and overall trends. The combination of quantitative and qualitative approaches would allow for describing relationships in more detail regarding influencing factors. This study is also limited in terms of its generalisation; this study is based on the local community in one geographical region with similar cultural and socioeconomic backgrounds. Therefore, the extrapolation of these results to other geographical regions should be carried out with caution.

5. Conclusions

The findings of this study imply that when the authorities develop management strategies for riparian areas, the local community is more likely to engage with volunteer work than provide monetary support. The obtained information could be valuable for managers who implement reach-out activities, as well as in the decision-making process of planned management activities. Providing the local community with information on the benefits for riparian areas when the volunteer work is implemented could positively influence their future engagement and willingness to participate. The findings of this study show that the management preferences of respondents who own land in riparian areas did not differ substantially from respondents without property rights, suggesting that a certain targeted approach for this group might not be needed. Future research needs to include more qualitative questions, specifying different management actions to more accurately reveal the practical aspects of the preferences of the local community.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/land14020434/s1>, File S1: The questionnaire used in this study.

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Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki and the Code of Ethics of the Latvian State Forest Research Institute “Silava”, which defines research guidelines, as well as for research involving human subjects. This study was conducted in the form of a non-interventional questionnaire.

Informed Consent Statement: Prior to the survey, verbal informed consent was obtained from the participants. The collected data do not contain any personally identifiable information.

Data Availability Statement: The dataset is available on request from the authors.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

NVBR	North Vidzeme Biosphere Reserve
WTP	Willingness to pay
GLM	Generalised linear model

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