

TOWARDS A SUSTAINABLE FUTURE: NATURE-BASED SOLUTIONS AND OUR ROLE

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Biodiversity loss and climate change pose significant environmental challenges, requiring effective solutions such as Nature-Based Solutions (NBS). This study, conducted within the Horizon Europe – eNaBIS project, examines public knowledge, perceptions, and engagement with NBS in Lithuania through an online survey of 157 respondents. Findings reveal that over 90% associate biodiversity with ecological diversity, misconceptions persist regarding NBS, with 40% uncertain or misinterpreting the concept. Although 68% recognise biodiversity loss as a local issue, awareness gaps remain. The most acknowledged NBS benefits include sustainable farming (74%) and air and water quality improvement (70%), while flood prevention (45%) and food security (25%) were less recognized. Education emerged as the most supported conservation measure (61%), while financial incentives received minimal backing (25%). Government institutions were viewed as primary conservation actors, with mixed opinions on ecological activists. The study underscores the need for enhanced public education, stakeholder collaboration, and policy integration to strengthen biodiversity conservation and NBS adoption.

Keywords: Biodiversity loss, Nature-Based Solutions, public awareness, conservation strategies.

Introduction

Biodiversity loss – the ongoing reduction in the variety of life on Earth at genetic, species, and ecosystem levels – has accelerated to unprecedented rates in recent decades (IPBES, 2019). Global assessments warn that roughly one million species are now threatened with extinction, a trend that is eroding the foundations of economies, livelihoods, food security, and human well-being worldwide (IPBES, 2019; IPCC, 2022). Protecting and restoring ecosystems is therefore not only a conservation imperative but also essential for climate adaptation and resilience. Indeed, the Intergovernmental Panel on Climate Change (IPCC) emphasizes that safeguarding biodiversity and ecosystems is fundamental to climate-resilient development (IPCC, 2022). In this context, Nature-Based Solutions (NBS) have emerged as a key strategy to address the dual crises of biodiversity loss and climate change. NBS are broadly defined as “solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience” (European Commission, 2022). By working with natural processes – for example, conserving wetlands for flood control or restoring forests for carbon sequestration – NBS leverage ecosystem services to reduce climate risks and enhance the adaptive capacity of both ecosystems and societies (Griscom et al., 2017; European Commission, 2022). In sum, NBS offer a promising framework to simultaneously halt biodiversity decline and bolster climate resilience.

Recognizing the importance of NBS, the global policy agenda has increasingly integrated nature-based approaches into its frameworks for sustainability. The landmark Kunming-Montreal Global Biodiversity Framework adopted in 2022, for instance, calls for urgent action to halt and reverse nature loss this decade, including through nature-based solutions and ecosystem-based approaches (Convention on Biological Diversity [CBD], 2022). Several targets within this framework explicitly emphasize NBS as tools for climate change mitigation, adaptation, and disaster risk reduction (CBD, 2022). Likewise, recent IPCC reports underscore that conserving and restoring nature is critical for addressing climate change, highlighting that effective and equitable conservation of 30–50% of Earth’s land and seas is needed to maintain resilient ecosystems (IPCC, 2022). This international momentum has been accompanied by United Nations initiatives such as the UN Decade on Ecosystem Restoration (2021–2030), reflecting a broad consensus that NBS are globally significant for achieving climate and biodiversity goals.

At the regional level, the European Union (EU) has made NBS a centrepiece of its environmental and climate strategies. The EU’s Biodiversity Strategy for 2030 – a core component of the European Green Deal – sets out an ambitious plan to protect nature and reverse ecosystem degradation, aiming to put Europe’s biodiversity on a path to recovery by 2030 (European Commission, 2020). This strategy explicitly links biodiversity conservation with climate mitigation and adaptation, noting that these efforts are for the benefit of people, climate, and the planet (European Commission, 2020). In line with these goals, major EU programs are investing in and implementing NBS. For example, Horizon Europe (the EU’s research and innovation framework) is funding numerous projects that harness NBS to confront climate change and biodiversity loss (European Commission, 2021). Such projects explore solutions like sustainable urban drainage, forest restoration, and agroecological farming as innovations that provide co-benefits for society (e.g., improved health, jobs) while enhancing ecosystem resilience (European Commission, 2021). Complementing the

research agenda, the EU's LIFE Programme (its dedicated funding instrument for environment and climate action) supports on-the-ground interventions in member states. The LIFE Programme's objectives include halting and reversing biodiversity loss and tackling ecosystem degradation, thereby directly facilitating NBS implementation across Europe (European Commission, 2021). Together, these policies and initiatives demonstrate a strong multilevel commitment – from global agreements to EU legislation – to mainstreaming NBS as a pathway towards sustainability and climate resilience.

Crucially, the success of Nature-Based Solutions depends not only on high-level policies but also on public engagement and education. Effective implementation of NBS requires the buy-in and active participation of local communities, stakeholders, and citizens. Research indicates that community engagement in NBS planning, and deployment is critical to ensure projects meet local needs, produce equitable benefits, and are sustained over time (Nicholas Institute for Environmental Policy Solutions, 2022). In practice, NBS that involve residents in design and decision-making tend to foster a sense of ownership and social acceptance, which can be decisive for their long-term maintenance (Kiss et al., 2022). Moreover, enhanced public participation is linked to stronger social and environmental outcomes: studies of NBS initiatives have found that deeper community involvement correlates with a heightened sense of belonging, increased ecological knowledge, and greater motivation for stewardship (Kiss et al., 2022). Education and awareness-raising are likewise key enablers of NBS. Evidence suggests that informing people about NBS and ecosystem management can significantly improve their willingness to support and co-create such solutions (Chan et al., 2022). These findings underscore that engaging the public through education, consultation, and collaborative action is not a mere supplementary aspect of NBS but rather a central component of their success. Broad public awareness can build the social license needed for NBS (such as new green infrastructure or conservation areas), while grassroots involvement can enhance the effectiveness and resilience of these interventions on the ground (Nicholas Institute for Environmental Policy Solutions, 2022; Zhu et al., 2022).

The study aimed to assess public knowledge, perceptions, and engagement with biodiversity loss and Nature-Based Solutions (NBS) in Lithuania, identifying key gaps and motivational factors for conservation efforts.

Research Methodology

An online survey was conducted to assess public knowledge, perceptions, concerns, and motivations regarding biodiversity loss and the role of NBS in climate resilience and well-being in several European countries. The study targeted a diverse range of stakeholders, including employees, students, professional organizations, NGOs, and local authorities. The questionnaire was developed using EUSurvey, an online survey platform administered by the European Commission. Although the platform provided translations into all official EU languages, it did not include Arabic, Turkish, and Ukrainian. Therefore, the survey was independently translated into these languages with the assistance of a professional translation service. The survey was conducted between 5 June 2024 and 31 August 2024, aiming to collect at least 1,000 responses. The dissemination strategy included partner networks, academic and professional institutions, and targeted communication campaigns. The survey was carefully designed in compliance with ethical principles, ensuring the protection of participants' rights. Informed consent was obtained from all respondents before participation, and they were explicitly informed of their right to withdraw at any time without consequences. The survey maintained anonymity, with all identifying information removed to protect participant confidentiality. Data storage adhered to EU Data Protection Policy requirements, and the purpose and intended use of the collected data were communicated to participants.

This study presents data collected from 157 respondents in Lithuania. The survey consisted of 29 questions, of which 11 were selected for analysis, focusing on three key themes: understanding and significance of biodiversity and its loss, nature-based solutions and public awareness, and responsibility and actions for biodiversity conservation.

The questionnaire included both quantitative and qualitative components. Quantitative analysis was applied to structured questions, including multiple-choice, Likert-scale, and binary (yes/no) questions. Thematic categorization was employed to analyse open-ended responses, enabling a deeper understanding of public perceptions and knowledge. The frequency of each response was calculated and presented as a percentage, providing insights into the predominant interpretations of biodiversity and NBS among respondents.

Results and discussion

The survey assessed public understanding of biodiversity by asking participants to select the definition that best matched their perspective. The majority (142 respondents, over 90%) associated biodiversity with the

diversity of plants, animals, and habitats, reflecting an ecological viewpoint. A smaller group (9 respondents, 5.7%) linked it to species protection in designated areas, while 4 respondents (2.5%) connected it to natural selection and evolution, and 2 respondents (1.3%) viewed it through urban greening efforts. These results highlight that most see biodiversity as an ecological system, though some interpret it through conservationist, evolutionary, or urban sustainability lenses. The low recognition of biodiversity's link to evolution suggests a need for targeted education.

Participants also shared views on local biodiversity decline. A majority (106 respondents, 68%) saw it as a problem, indicating strong awareness, while 38 respondents (24%) did not perceive it as an issue, possibly due to a lack of visible change or awareness. Another 13 respondents (8%) were uncertain, emphasizing the need for public education. The findings suggest that while many recognize biodiversity loss, a significant portion remains unaware or unsure, highlighting the importance of communication efforts to encourage conservation engagement.

To assess perceptions of the significance of biodiversity, participants were asked to select the reasons they considered most important. The most frequently cited reason was "Health of nature", chosen by 140 respondents, indicating widespread recognition of biodiversity's role in ecosystem stability. "Survival of humankind" was another dominant response (126 respondents), reinforcing the notion that biodiversity is integral to human well-being. Similarly, "Climate stability" was acknowledged by 124 respondents, demonstrating awareness of biodiversity's influence on climate regulation. Other commonly selected reasons included ethical and moral responsibility (109 respondents), economic benefits (106 respondents), and resilience against natural disasters (104 respondents). Additionally, cultural (81 respondents) and educational (89 respondents) values were acknowledged, reflecting a multifaceted appreciation of biodiversity's societal relevance. These responses suggest that biodiversity is valued for both its ecological and socio-economic contributions. The strong emphasis on ecosystem health and human survival underscores the necessity of conservation efforts that integrate ecological protection with broader societal benefits.

Participants also identified the consequences of biodiversity loss, selecting all that applied. The most frequently acknowledged impact was habitat loss and species extinction (122 respondents), followed by climate instability (106 respondents) and declining water quality (105 respondents). The risks of natural disasters (100 respondents), loss of medicinal plants (99 respondents), and reduced pollination affecting food security (96 respondents) were also widely recognized. Economic and social consequences were less frequently acknowledged. Economic losses affecting industries such as fisheries and tourism were identified by 69 respondents, while cultural disruptions were noted by 62 respondents. Only 59 participants linked biodiversity loss to potential conflicts and migration driven by resource scarcity, suggesting a need for increased public awareness regarding the socio-economic ramifications of biodiversity decline.

The survey also explored public familiarity with the term "Nature-based Solutions (NBS)". Recognition of the term was evident among 91 respondents, suggesting growing awareness, possibly influenced by increasing environmental discourse (Fig. 1). However, 49 respondents were unfamiliar with NBS, and 17 expressed uncertainties, indicating that further communication efforts are necessary to enhance public understanding of this concept. While recognition of NBS is on the rise, a considerable portion of the public remains unclear on its full implications. Simplifying communication strategies and providing real-world examples may facilitate broader comprehension and encourage the adoption of NBS principles.

Participants were further asked to identify the correct definition of NBS from a set of options. A majority (90 respondents, 60%) accurately defined NBS as "Working with nature to solve problems, such as climate change and food shortages". However, misconceptions were evident, with 23 respondents (15%) conflating NBS with biomimicry and 18 respondents (12%) associating it with general environmental actions like recycling. These misunderstandings highlight the need for clearer differentiation between NBS and other sustainability approaches. Addressing these knowledge gaps through educational initiatives and public engagement efforts could enhance understanding and support for NBS, fostering its integration into environmental policies.

To assess awareness of NBS benefits, respondents selected all applicable options (Fig. 2). "Sustainable farming" emerged as the most recognized benefit (111 respondents, 74%), followed by "Improving air and water" (104 respondents, 70%) and "Cooling cities" (99 respondents, 66%). Other frequently cited benefits included "Carbon reduction" (96 respondents, 64%) and "Creating homes for animals and green spaces" (95 respondents, 63%). However, fewer participants identified NBS benefits related to flood prevention (68 respondents, 45%) and economic sustainability (68 respondents, 45%). The least acknowledged benefit was "Food security" (38 respondents, 25%), suggesting a need for increased public education on how NBS contributes to long-term food stability.

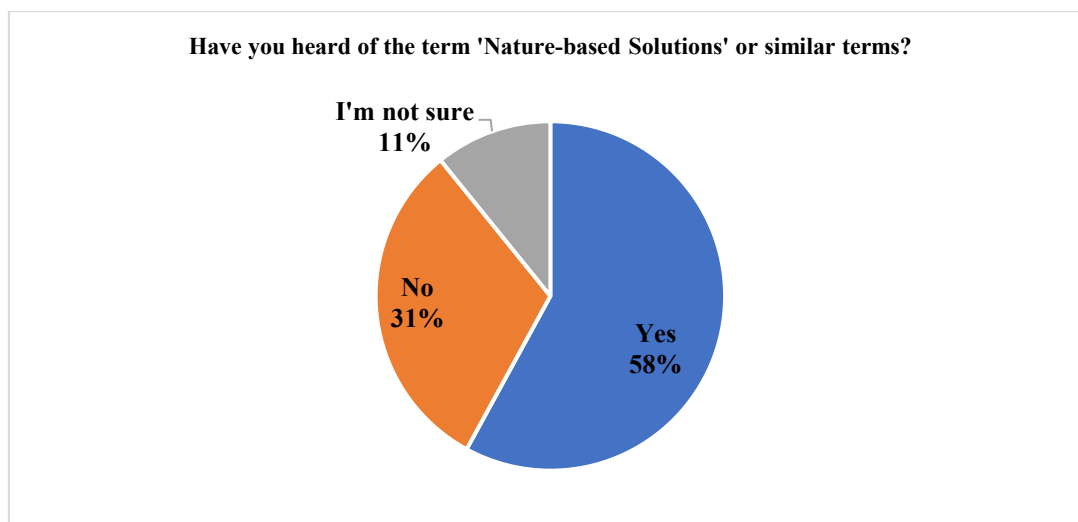


Fig. 1. Public Awareness of Nature-Based Solutions

1 pav. Visuomenės žinios apie gamta grįstus sprendimus

When asked about actions necessary to protect biodiversity, the most strongly supported measure was integrating biodiversity education into school and university curricula (96 respondents, 61.1%). Other widely endorsed actions included promoting eco-friendly farming practices (78 respondents, 49.1%) and restoring damaged natural habitats (73 respondents, 46.5%). By contrast, financial redistribution for conservation received the lowest support (39 respondents, 24.8%), alongside rewarding businesses for eco-friendly practices (47 respondents, 30.1%), reflecting scepticism regarding economic interventions. The highest level of uncertainty was observed with business incentives for biodiversity protection (40 respondents, 25.5%).

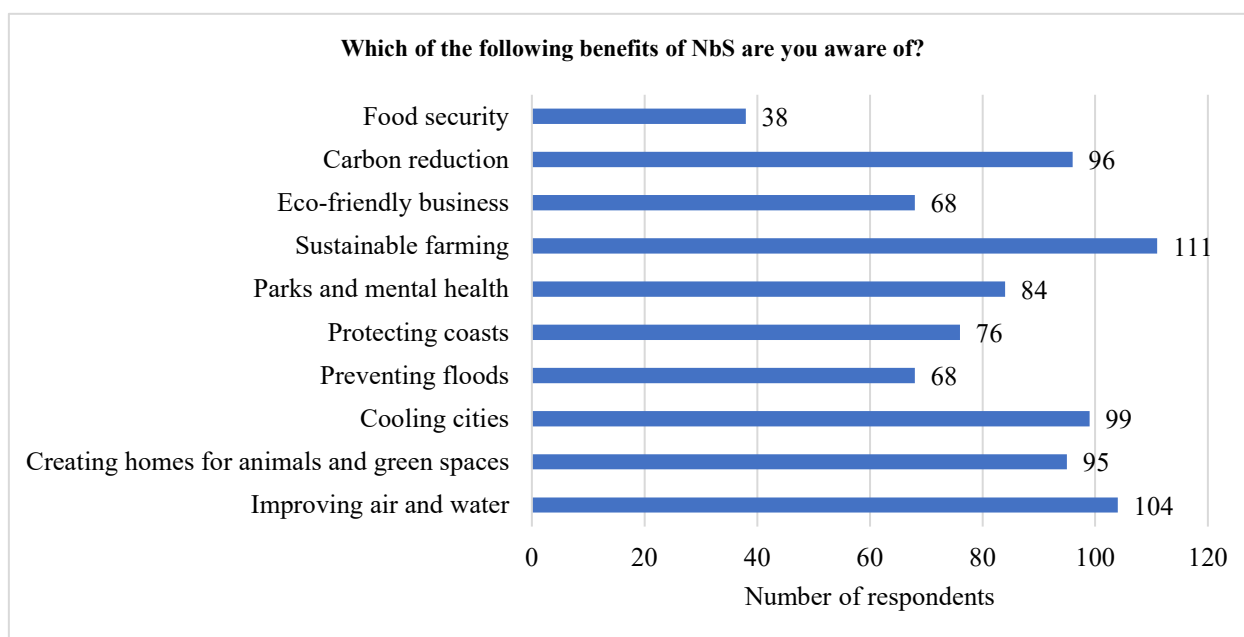


Fig. 2. Perceived Benefits of Nature-Based Solutions

2 pav. Apklaustųjų informuotumas apie gamta grįstų sprendimų naudą

To gauge perceptions of responsibility for biodiversity conservation, respondents expressed their levels of agreement with various stakeholders' roles. Government authorities received the highest level of strong agreement (73 respondents, 46.5%), signifying trust in institutional leadership. Conversely, ecological activists garnered the lowest level of strong agreement (47 respondents, 29.9%) and the highest strong disagreement (14 respondents, 8.9%), suggesting some scepticism about their effectiveness in conservation efforts. The greatest uncertainty surrounded the role of engineers (42 respondents, 26.8%), indicating a lack of clarity regarding their contributions to biodiversity protection. These findings emphasize the need for more explicit communication about the responsibilities of different stakeholders in conservation efforts.

Open-ended responses revealed common themes in individual biodiversity conservation efforts. The most frequently mentioned actions included sustainable consumption (18 mentions), waste reduction and recycling

(16 mentions), and direct biodiversity protection measures (14 mentions). Pollution prevention (8 mentions) and planting native species (7 mentions) were cited less frequently. These results indicate that individuals recognize both direct and indirect contributions to biodiversity conservation. Public awareness campaigns that promote sustainable behaviours could further encourage personal engagement in conservation efforts.

Lastly, participants were asked what would motivate them to take part in biodiversity conservation. The most effective motivators included educational programs (80 respondents, 51.0%), witnessing tangible local benefits (77 respondents, 49.0%), and receiving financial support for sustainability initiatives (74 respondents, 47.2%). The highest level of uncertainty was recorded regarding the involvement of specialists (49 respondents, 31.2%), suggesting that while expert guidance is valued, it may not be seen as a primary driver of engagement. These findings highlight the significance of education, direct benefits, and financial incentives in encouraging public participation in biodiversity conservation initiatives.

Conclusions

1. While 90% of respondents understood biodiversity as an ecological system, only 2.5% linked it to natural selection and evolution, indicating knowledge gaps in scientific literacy and biodiversity's broader implications.
2. Although 68% of participants recognized biodiversity loss as a local issue, 24% did not perceive it as a concern, and 8% were uncertain; similarly, 58% were familiar with NBS, but 27% held misconceptions, underscoring the need for improved education and communication.
3. The strongest support for conservation efforts focused on education (61.1%), sustainable farming (49.1%), and habitat restoration (46.5%), while economic incentives for businesses received the least support (30.1%), highlighting public preferences for direct engagement over financial redistribution.

Acknowledgement

The data examined in this paper originates from the Horizon Europe – Cluster 6 project Education and Nature-Based Solutions: Enabling Society to Bend the Curve for Biodiversity (eNaBIS, project 101135035). We acknowledge the contributions of all project partners in facilitating collaboration and knowledge exchange of higher education to enhance the understanding and implementation of Nature-Based Solutions (NBS). We would like to express our gratitude to the University of Hohenheim (UHOH) for its essential role in developing the questionnaire and research methodology, ensuring a scientifically rigorous approach to data collection. Their expertise and efforts were instrumental in designing the online survey used to assess public knowledge, perceptions, concerns, and motivations regarding biodiversity loss and the role of NBS in climate resilience and well-being. Additionally, we appreciate the valuable input and support provided by Julia Klawitter, Nandni Shah and Ann-Catrin Fender in refining the research framework and facilitating data collection.

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Tvarios ateities link: gamta grįsti sprendimai ir mūsų vaidmuo

Biologinės įvairovės nykimas ir klimato kaita kelia didelius aplinkosaugos iššūkius, todėl būtina taikyti veiksmingus sprendimus, tokius kaip gamta grįsti sprendimai (GGS). Šiame tyrime, atliktame pagal „Horizon Europe – eNaBIS“ projektą, analizuojamos visuomenės žinios, požiūris ir įsitraukimas į GGS Lietuvoje, remiantis 157 respondentų internetinės apklausos duomenimis. Rezultatai rodo, kad daugiau nei 90 % apklaustųjų biologinę įvairovę sieja su ekologine įvairove, tačiau GGS supratimo spragos išlieka – 40 % respondentų nebuvo tikri arba neteisingai suprato šį terminą. Nors 68 % pripažįsta biologinės įvairovės nykimą kaip vietinę problemą, vis dar pastebimas informuotumo trūkumas. Labiausiai atpažįstamos GGS naudos – darnus ūkininkavimas (74 %) ir oro bei vandens kokybės gerinimas (70 %), o mažiau pastebimos – apsauga nuo potvynių (45 %) ir maisto saugumas (25 %). Švietimas buvo laikomas svarbiausia gamtos apsaugos priemone (61 %), tuo tarpu finansinės paskatos sulaukė mažesnio palaikymo (25 %). Vyriausybės institucijos buvo laikomos pagrindinėmis atsakingomis šalimis, o ekologinių aktyvistų veikla vertinta nevienareikšmiškai. Tyrimas pabrėžia būtinybę stiprinti visuomenės švietimą, skatinti suinteresuotųjų šalių bendradarbiavimą ir integruoti GGS į politikos strategijas, siekiant veiksmingesnės biologinės įvairovės apsaugos.

Raktiniai žodžiai: biologinės įvairovės nykimas, gamta grįsti sprendimai, visuomenės informuotumas, išsaugojimo strategijos.

Gauta 2025 m. kovo mėn., atiduota spaudai 2025 m. balandžio mėn.

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