

PUBLIC ATTITUDES TOWARD CLIMATE CHANGE ADAPTATION MEASURES IN THE CZECH LANDSCAPE

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Abstract

This paper examines public attitudes toward climate change adaptation measures in the Czech landscape, including forests, agricultural land, water systems, and ecosystems. The analysis is based on a representative survey of 1,075 respondents conducted in 2024 and combines descriptive statistics with exploratory factor analysis. The results show generally high levels of support for nature-based and ecosystem-oriented measures, particularly those framed as collectively beneficial interventions such as wetland restoration and ecosystem recovery. In contrast, more specific or restrictive measures tend to receive more moderate support. The factor analysis identifies several cross-cutting dimensions of attitudes, including support for state-led conservation, regulatory approaches, adaptive management strategies, and forest management interventions. Additional analyses indicate modest variation across socio-demographic groups. The findings suggest that public acceptance of adaptation policies depends both on the type of measure and its perceived impact on individual behaviour. In the Czech context, policies emphasizing ecosystem benefits are likely to gain broader support, while more restrictive measures may require targeted communication and stakeholder engagement.

Keywords: landscape, adaptation measures, public attitudes

INTRODUCTION

According to Czech Hydrometeorological Institute 2025 was the third warmest year on record worldwide, and 2024 was the warmest year on record in the Czech Republic, with an average temperature exceeding ten degrees Celsius. This trend entails changes in the frequency and intensity of extreme events that are affecting our landscape in unprecedented ways, thus raising the urgent topic of landscape adaptation to the impacts of climate change. It is increasingly recognised that adaptation is critical because further warming is inevitable even if radical emission reduction policies are implemented (Howell *et al.*, 2016).

Growing body of research is devoted to understanding climate adaptation processes as they are embedded in specific local and regional (social and cultural) contexts. The local interpretation of climate change is rooted in the landscape, which gives this global phenomenon local significance (Brace and Geoghegan, 2010; Köpsel *et al.*, 2017). The Czech landscape is largely cultivated, dominated by agriculture and commercial forestry shaped by the totalitarian era, when land was nationalised and consolidated into large cooperative fields, simplifying the landscape mosaic between the 1950s and 1980s. Extensive land reclamation led to widespread drainage, loss of wetlands, and straightened waterways. Additionally, forests were



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largely converted into uniform spruce monocultures, increasing their vulnerability to climate change, particularly drought (Sklenička, 2007).

The Czech Republic's specific concerns are long-term drought, floods and flash floods, heavy rainfall, temperature increases, extremely high temperatures, extreme winds and vegetation fires. The fundamental goal with regard to the landscape is to ensure the ecological stability of agricultural landscapes, forests and aquatic ecosystems, and to provide ecosystem services, while placing emphasis on limiting soil degradation and strengthening the landscape's natural water regime, with a view to meeting the needs of human society (Strategy for Adapting to Climate Change in the Conditions of the Czech Republic 2021–2030)

Landscape adaptation measures can be public or individual in nature. Individual measures are initiated and implemented by individuals, households or private companies, and their purpose is usually to reduce the impact of climate change on the person implementing them. However, in some cases they may also have a positive impact on others (e.g. a tree planted in the garden may also provide shade to other people on the street). Public adaptation measures are initiated and implemented at all levels of government and are usually focused on collective needs, i.e. their purpose is to protect citizens and mitigate the impacts of climate change on public property and infrastructure. However, these measures can also support adaptation at the individual level, for example by incentivising certain actions (e.g. tax breaks) (Tompkins and Eakin, 2012). We also distinguish adaptation measures according to the way they are implemented, into those that change the physical environment and use certain construction procedures and modifications, and those that are more likely to support changes in behavior (e.g. laws and regulations). Construction measures can be further divided into so-called technical measures, which use technology, artificial equipment, facilities, the creation of artificial physical infrastructure, and so-called natural measures, which use and strengthen the natural functions of nature (e.g. they help retain water in the landscape). (EEA Report No. 3/2013 Adaptation in Europe; Climate change strategy in the Czech Republic, 2015).

Unlike mitigation measures, which aim to reduce sources of greenhouse gas emissions and slow down changes or warming of the planet, adaptation measures lead to reducing vulnerability to the impacts of climate conditions. To promote measures in the Czech landscape, not only political support and support from various social or professional groups, but also support from the general public is important. The aim of our research was to identify how public attitudes toward landscape-based climate change adaptation measures are structured and to determine the underlying dimensions across domains such as forests, agriculture, water management, and ecosystems and biodiversity.

MATERIALS AND METHODS

As part of the AV21 Strategy programme 'Rescue and Renewal of Landscape', a survey was conducted to assess public attitudes towards landscape adaptation measures in forest, agricultural and water ecosystems. The questionnaire survey was conducted from 17 to 28 May 2024 by the Centre for Public Opinion Research (CVVM) using a combination of CAPI (computer-assisted personal interviewing) and CAWI (computer-assisted web interviewing) methods. A representative sample of 1,075 respondents was achieved using multi-stage stratified random sampling. The data were analysed using the statistical programme SPSS.

Exploratory factor analysis (EFA) was used to examine the latent structure of all 24 attitude items related to landscape adaptation measures included in the survey (see Tab. I). These items covered four substantive areas: forest management, agricultural practices, water management, and biodiversity conservation. The aim of the analysis was to identify broader underlying dimensions of attitudes that might differ from the original thematic grouping of items and cut across these domains.

Because exploratory factor analysis requires complete information on all analysed items, respondents with at least one missing answer in this battery were excluded using listwise deletion. This reduced the effective sample size from 1,075 to 609 respondents. The results

should therefore be interpreted with some caution, as the factor solution is based on a reduced subsample rather than on the full survey sample.

The analysis was performed using principal axis factoring with oblimin rotation and Kaiser normalization, allowing the extracted factors to be correlated. Factor loadings above 0.25 were considered substantively meaningful. The number of factors was determined on the basis of eigenvalues, scree plot inspection, and the interpretability of the resulting solution.

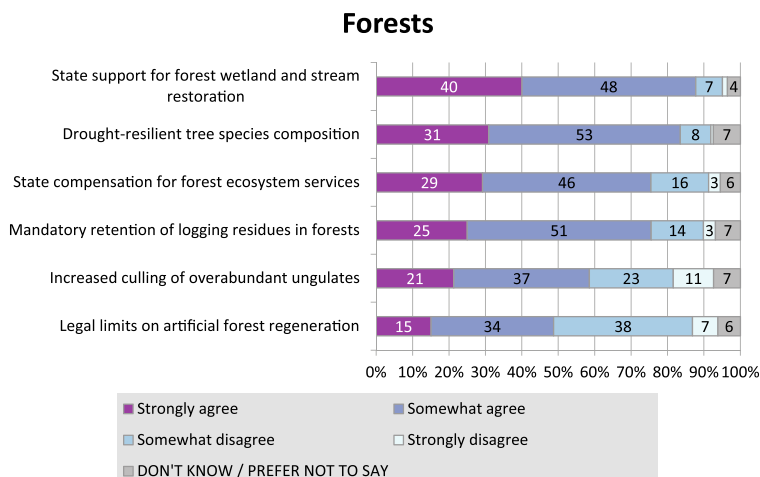
Factor scores derived from these four dimensions were subsequently computed for each respondent and used as dependent variables in ordinary least squares (OLS) regression models with age, education, and gender as predictors (see Tab. II). The results of the factor analysis and subsequent regression models are presented in the following section.

RESULTS

Previous research has shown us that the vast majority of people in the Czech Republic are aware of climate change and believe that human activity contributes significantly to it (CVVM, 2023, 2025). However, our research from 2024 showed that almost half of the respondents did not notice any signs of climate change in their local area in the past year. There may be various reasons for this, such as people not knowing the connections between certain phenomena and climate change, climate scepticism influencing how these connections are perceived, or people simply not observing signs of climate change in their area. Moreover, half of the respondents believe that the landscape can cope with the impacts of climate change on its own, without human intervention. Despite this, support for most adaptation measures included in our research is high in Czech society.

Adaptation in Forests

As can be seen from the Fig. 1, people have a positive attitude towards the restoration of wetlands in forests; 87.8% of respondents tend to or definitely agree with the state supporting their restoration. 83.5% of respondents support increasing the share of drought-resistant tree species and 75.5% support leaving logging residues to rot and state contributions to the ecosystem functions of forests. On the other hand, the long-term and fundamental problem of Czech forests – overpopulated wild ungulates – is not understood as a problem by the public so clearly: 58.5% of respondents agree with higher hunting. The smallest share of respondents (48.7%) agrees with legal restrictions on artificial planting of seedlings. A higher share of natural regeneration in forests at the expense of artificial planting is also considered by natural science experts and some foresters as a way to make Czech forests more resilient.

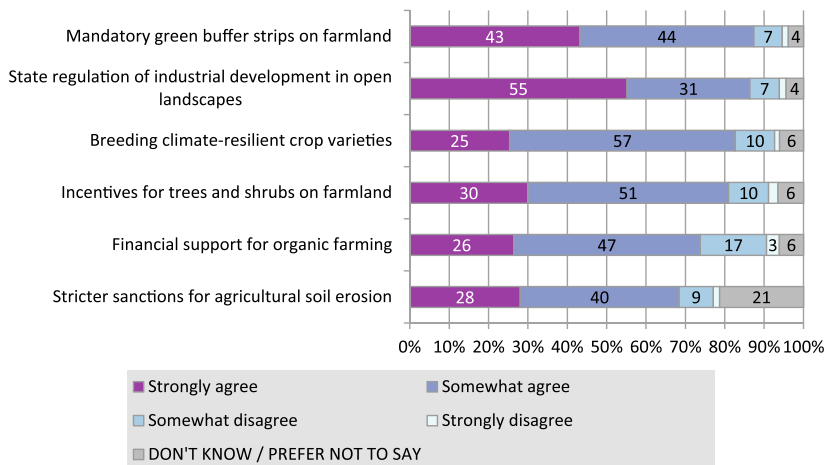


1: Public attitudes towards adaptation measures in forests

Adaptation on Agricultural Land

Adaptation measures on agricultural land are generally viewed positively. The most popular adaptation measure among respondents is the creation of green buffer strips, with 87.4% in favour of making this an obligation for owners. A similar proportion of respondents (86.4%) support limiting the construction of halls in the open countryside, with a significantly higher proportion of respondents definitely agreeing with this measure (55.2%). Similar levels of support are seen for breeding resistant varieties and planting tree rows on agricultural land (82.7% and 81%, respectively). Promoting organic farming is supported by 73.8% of respondents. Of the adaptation measures presented for agriculture, higher penalties for field erosion caused by improper management are the least popular, with only 68.4% of respondents agreeing with them. As with the overpopulation of ungulates, increasing penalties for erosion caused by improper management does not have such clear support, despite being perceived by experts as one of the most serious problems.

Aggricultural land

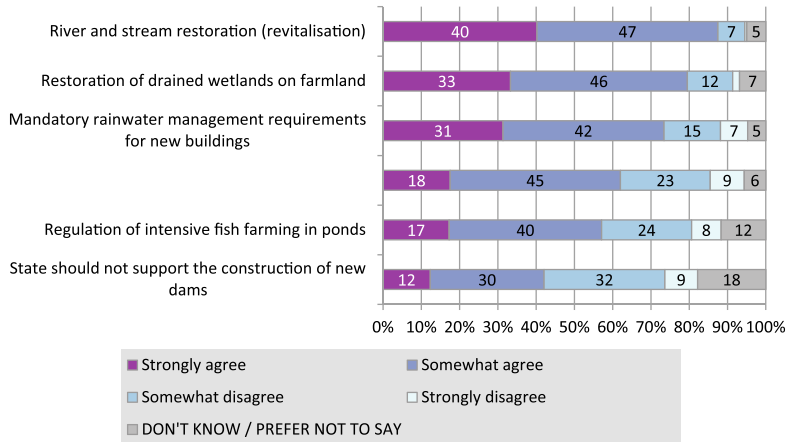


2: Public attitudes towards agricultural land adaptation

Water-related Adaptation

We have long been hearing about the need to revitalise waterways in the public media, and this measure enjoys by far the highest level of support in this group: 87.5% of respondents agree with it, 40.2% of whom definitely agree. According to the public, wetlands on agricultural land can fulfil their adaptation function, and 79.5% of respondents agree with their restoration. The legal obligation to manage rainwater for new buildings is considered necessary by 73.4% of respondents. However, only 62% of people perceive limiting drinking water consumption during the dry season as beneficial. Intensive fish farming in ponds is also not perceived with much enthusiasm, as it significantly worsens the quality of water in the landscape according to experts. 57.1% of respondents are in favour of limiting it. The Czech public is divided on the construction of dams, with 42.1% of respondents disagreeing and 40.2% in favour. The largest proportion of respondents did not know or did not want to answer this question (17.8%), which highlights the complexity of the relationship between dams construction and landscape resilience.

Water

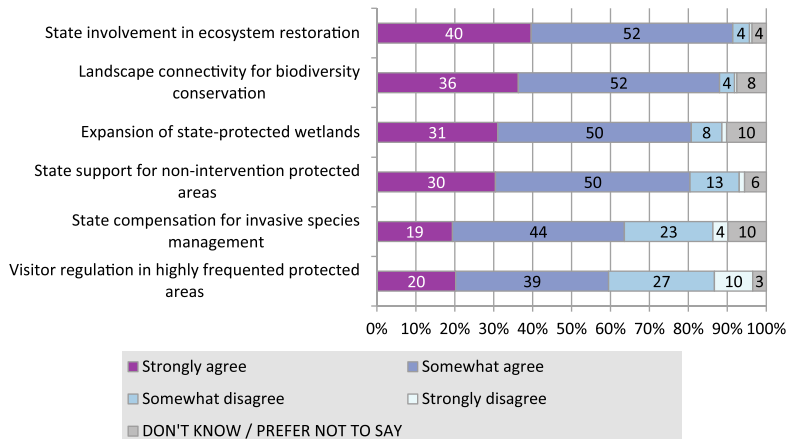


3: Public attitudes towards water-related adaptation

Ecosystem and Biodiversity Focused Adaptation

State support for the restoration of damaged ecosystems, as expected, enjoys overwhelming public support (91.4%). Connecting the landscape so that it is permeable for biological species is also supported by the majority, as is increasing the number of state-protected wetlands (88% and 80.7%). The declaration of new protected areas also enjoys significant support (80.4%). 63.6% of respondents agree with financial compensation to landowners for the clearance of invasive plant species. The least support from this group of measures is enjoyed by restricting entry to protected areas significantly affected by tourism, which is supported by 59.5% of respondents.

Ecosystems/biodiversity



4: Public attitudes toward ecosystems and biodiversity-focused adaptation

Latent Orientations Toward Adaptation Measures

Figs. 1–4 present responses to individual survey items grouped according to their substantive focus on forest, agricultural, water, and ecosystem-related adaptation measures. This categorization reflects the structure of the questionnaire and allows for a descriptive comparison of public

I: Factor loadings for 24 landscape adaptation items

Item (short label)	F1 State-led ecosystem conservation and restoration	F2 Regulation of resource use and environmental pressures	F3 Adaptive ecosystem and agricultural management	F4 Forest management regulation and intervention
State compensation for forest ecosystem services				0.395
Legal limits on artificial forest regeneration				0.470
Mandatory retention of logging residues in forests	0.330			0.394
State support for forest wetland and stream restoration	0.308			0.258
Increased culling of overabundant ungulates		0.270	0.258	
Drought-resilient tree species composition			0.449	0.352
Stricter sanctions for agricultural soil erosion	0.411			
Mandatory green buffer strips on farmland	0.623			
Financial support for organic farming	0.284			0.269
Incentives for trees and shrubs on farmland	0.341			0.314
Breeding climate-resilient crop varieties			0.460	
State regulation of industrial development in open landscapes	0.271		0.256	
River and stream restoration (revitalisation)	0.612			
Rainwater management requirements for new buildings		0.729		
Regulation of intensive fish farming in ponds		0.637		
Water-use restrictions during drought periods		0.622		
State should not support the construction of new dams				0.295
Restoration of drained wetlands on farmland	0.659			
State compensation for invasive species management		0.487		
State support for non-intervention protected areas	0.612		-0.322	0.310
Landscape connectivity for biodiversity conservation	0.520			
Expansion of state-protected wetlands	0.770			
Visitor regulation in highly frequented protected areas		0.555		
State involvement in ecosystem restoration	0.636			

support across different types of measures. However, these predefined groups do not necessarily capture the underlying structure of respondents' attitudes. To explore whether preferences are organized along alternative dimensions that cut across these domains, an exploratory factor analysis was conducted. This approach makes it possible to identify latent orientations toward adaptation measures based on response patterns rather than predefined thematic categories.

Tab. I presents the factor loadings for the four-factor solution and shows how individual survey items cluster into broader attitudinal dimensions. The pattern of loadings indicates that respondents' views are not structured simply according to the original thematic areas of the questionnaire, but rather according to more general orientations toward adaptation measures. The four-factor solution identified four cross-cutting attitudinal dimensions. These factors do not correspond directly to the four original questionnaire areas (forests, agriculture, water, and ecosystems), but instead reflect broader patterns in how respondents evaluated different adaptation measures across these areas.

The first factor captures a general preference for state-led ecosystem conservation and restoration, encompassing support for protected areas, wetland and river restoration, landscape connectivity, and public involvement in ecosystem management. This dimension reflects a holistic perspective on landscape governance, emphasizing the role of collective action and public institutions in maintaining ecological functions.

The second factor represents support for regulatory measures aimed at managing environmental pressures and resource use. It includes attitudes toward water management requirements, restrictions on resource consumption, regulation of production practices such as fish farming, and limits on access to environmentally sensitive areas. This dimension can be interpreted as reflecting a preference for demand-side regulation and institutional control of environmentally relevant behaviours.

The third factor captures adaptive ecosystem and agricultural management strategies, particularly those aimed at increasing resilience to climate variability. It includes support for drought-resistant tree species and climate-resilient crop varieties, indicating a focus on proactive adaptation within production systems. Finally, the fourth factor reflects support for specific interventions in forest management practices, including restrictions on artificial regeneration and requirements for retaining logging residues. This dimension points to more targeted, practice-oriented approaches to ecosystem management, particularly within the forestry sector.

Taken together, these results suggest that public attitudes toward landscape adaptation are structured along multiple, partly overlapping dimensions, combining general orientations toward state involvement and regulation with more specific preferences related to ecosystem management practices.

To further examine whether these attitudinal dimensions differ across social groups, the factor scores were entered into a set of OLS regression models with gender, age, and education as predictors. Tab. II summarizes the results of these models. The results indicate modest but systematic differences across groups, suggesting that support for specific types of adaptation measures varies with respondents' socio-demographic profiles.

II: *Results of four OLS regression models predicting factor scores*

Dependent var.	F1	F2	F3	F4
Predictors				
Gender	0.177 (0.076)*	0.128 (0.071)	-0.072 (0.061)	0.131 (0.067)
Age	0.006 (0.002)**	0.009 (0.002)***	0.013 (0.002)***	-0.004 (0.002)
Education	-0.006 (0.014)	0.022 (0.014)	0.037 (0.012)**	-0.030 (0.013)*
Adj. R square	0.018	0.033	0.097	0.018
Sig.	0.003	0.000	0.000	0.003

Note: Entries are unstandardized regression coefficients (B) with standard errors in parentheses. Statistical significance is indicated by p-values (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

The regression results indicate modest but statistically significant associations between socio-demographic characteristics and the identified dimensions of adaptation preferences. Age, education, and gender show varying relationships across the four factors, suggesting that support for different types of landscape adaptation measures is socially differentiated. However, the overall explanatory power of the models remains limited, indicating that socio-demographic characteristics account for only a relatively small share of variation in attitudes. These findings should therefore be interpreted as indicative rather than conclusive, pointing to the relevance of additional factors shaping preferences toward adaptation measures.

DISCUSSION

The results point to a consistently high level of public support for broadly defined nature-based and ecosystem-oriented adaptation measures, such as the restoration of wetlands and water-courses, the designation of protected areas, other ecosystem restoration, and landscape connectivity. These measures are likely perceived as generally beneficial and non-controversial, as they do not directly impose constraints on individual behaviour or economic activities. By contrast, measures that are more specific or driven by experts, such as restrictions on artificial forest regeneration, reductions in ungulate populations, regulations on intensive fish farming and the removal of invasive plant species, receive more moderate support. This suggests that measures requiring more specialised knowledge or involving trade-offs may be less readily accepted by the public. Similarly, lower levels of agreement are observed for measures that directly affect everyday practices or impose restrictions, such as limits on water consumption or access to protected areas. These findings are consistent with previous research indicating that public acceptance of environmental policies tends to decrease when perceived personal costs increase and that people prefer natural adaptation measures the most (Doganoglu *et al.*, 2026; EEA Report No 3/2013 Adaptation in Europe). As in previous research findings (Sauer and Fischer, 2010), ours also demonstrates that the influence of socio-demographic factors is unclear, variables such as age, education and gender have only a marginal effect.

A key cross-cutting issue that emerged from the analysis is the role of the state. Public support appears to be closely linked to expectations of state involvement, whether through regulatory frameworks or financial incentives. This emphasises the significance of governance structures in influencing public acceptance of adaptation measures. At the same time, the observed patterns suggest that public attitudes towards landscape adaptation are influenced not only by the type of ecosystem or sector, but also by broader attitudes towards regulation, collective action and management practices, as indicated by factor analysis.

CONCLUSION

This paper examined public attitudes towards climate change adaptation measures in the Czech landscape, including forests, agricultural land, water systems and ecosystems. The findings suggest that there is generally high support for nature-based and ecosystem-oriented measures, especially when they are presented as collective or publicly beneficial interventions. Conversely, more specific, restrictive or expert-driven measures tend to receive more moderate support, particularly when they are perceived to affect individual behaviour or economic interests.

The results also suggest that public attitudes are structured along several distinct dimensions that cut across sectoral categories, reflecting broader attitudes towards state involvement, regulatory approaches and adaptive management strategies. Socio-demographic differences in these attitudes exist, but are relatively modest, indicating that preferences are shaped by a wider set of factors beyond basic individual characteristics.

In the Czech context, these findings suggest that adaptation policies are most likely to receive strong public support if they are framed in terms of ecosystem restoration, landscape resilience and shared public benefits. Conversely, measures involving restrictions or changes to established land use practices may require more intensive communication, public

justification and stakeholder engagement. This is particularly relevant in landscapes shaped by large-scale agriculture, commercial forestry and long-term hydrological modifications, where adaptation often depends on both technical feasibility and social legitimacy. Therefore, future research should examine more closely how values, local experience and trust in public institutions influence support for specific adaptation measures.

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