PIISA

Piloting Innovative Insurance Solutions for Adaptation

From Awareness to Action: European Citizens' Perceptions, on Climate Adaptation and NBS. A key focus on green roof

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Summary

This report presents the research conducted within the PIISA project, funded by the Horizon Europe programme and supporting the Mission on Adaption to Climate Change by co-developing climate resilient insurance portfolios, as well as develop solutions for sharing climate-related risk and losses data. It constitutes an additional dissemination effort for results that were not included in the project's formal deliverables, with the objective of making the work publicly accessible.

This report translates survey evidence from 951 citizens in six European cities into actionable insights on the adoption of Nature-Based Solutions (NBS), with a spotlight on green roofs.

The research shows that climate adaptation remains only partially understood, barely half of respondents recognise the term, and even fewer can describe its practical dimensions. Nature-Based Solutions, including Green Roofs, are better known in principle than in practice as two citizens out of three say they are familiar with green roofs, yet only 6% have installed one. The gap is explained less by cost or lack of information than by structural hurdles (pitched roofs, uncertain load capacity), and by a sense that the measure is not personally relevant. When asked which incentives might encourage them, respondents show no clear hierarchy among grants, tax breaks, insurance discounts or recognition schemes, a flatness that suggests most have never seriously explored the retrofit. The report concludes that moving from awareness to adoption will require visible demonstration projects, upfront technical support and layered financial incentives, and it highlights how PIISA is already addressing these needs.

Keywords

Climate adaptation, NBS, Green Roof, European Citizens, Survey, Insurance

Abbreviations and acronyms

Acronym	Description
PIISA	Piloting Innovative Insurance Solutions for Adaptation
NBS	Nature Based Solutions

The Research within the PIISA Horizon Europe Project

This publication is part of the Dissemination activities of PIISA (www.piisa-project.eu), Horizon Europe Project. It broadens the perspective offered in Deliverable D1.4 Focused Market Reviews in WP3 Pilot [1]Areas, taking a closer, vertical look at **NBS as tools to address climate adaptation** and particularly to **Green Roof**, an important NBS due to its benefits in addressing both urban environmental and socio-economic challenges.

The objective of this report is to synthesize climate-adaptation survey evidence from six European cities into actionable insights, showing how awareness, perceived barriers and incentive may influence citizens in adopting NBS, especially green roofs, thereby advancing the goals of the PIISA project and informing future efforts to strengthen climate adaptation.

PIISA project, indeed, aims to support households, firms, and public authorities to set up adaptation and create adaptation promoting conditions. **Climate adaptation** means adjusting to both actual and expected effects of climate change. By adapting to the consequences of climate change, such as extreme weather events, wildfires and floods, it is possible to protect ourselves and our communities from further damages and benefit from possible opportunities.

Methodology

To gauge public awareness of NBS among European citizens, a survey was conducted using an online questionnaire (CAWI survey) targeting a sample of adult citizens residents in six European cities that mirror the project's pilot regions: Helsinki (Finland), Paris (France), Berlin (Germany), Milan (Italy), Amsterdam (the Netherlands) and Barcelona (Spain). The choice of these locations secures a broad geographic spread and to the different type of climate among Europe regions while reflecting the strategic footprint of the PIISA project.

In total, 951 completed questionnaires were collected. This selection ensures wide geographical representation across key regions of Europe and key regions for the development of the PIISA project, allowing so for cross-country comparisons.

The sample was proportionally distributed across the six nations, and it was representative of the general population in terms of gender and age. Data was collected anonymously over a specified period, with participation being voluntary. Respondents were informed of the survey's purpose, their rights, and assured that their responses would remain confidential. No personally identifiable information was collected.

[1] PIISA, D1.4 Focused market reviews in WP3 pilot sectors/areas: https://piisa-project.eu/assets/deliverables/D1.4_Focused%20market%20reviews%20in%20WP3%20pilot%20sectors%20areas.pdf

Climate adaptation – still an unfamiliar concept

Despite its importance, only about **half of the European citizens in our survey reported they are familiar with the term climate adaptation**.

In practice, climate adaptation encompasses strategies that can lower the vulnerability of human and natural systems to climate impacts. These measures are usually grouped into three families (Figure 1), that are NBS, Grey Infrastructure, and Hybrid solutions.

Among them **NBS**, including green roofs, are gaining traction as they are **recognized as vital for climate adaptation** due to their multifaceted benefits to directly address natural hazards such as flood risks, or heat island effects and while also having the ability to address various environmental and socio-economic challenges. Among the others they provide:

- environmental benefits, as they help mitigate climate change impacts, and improve biodiversity,
- economic benefits, as they can reduce adaptation costs by leveraging natural processes,
- social benefits, since they may improve human wellbeing.

NBS

Refer to strategic approaches that utilize natural processes to mitigate climate impacts and enhance resilience. NBS harness ecosystems to absorb and store carbon dioxide, regulate local climates, and reduce vulnerability to extreme weather events, such as floods, heatwaves, and hurricanes.

For example: plant deep-rooted vegetation on riverbank slopes to prevent flooding; use bacteria to promote plant growth and prevent drought; green roof to reduce heat and improve house temperature

Grey Infrastructure

Refers to constructions designed to manage or manipulate natural resources and environmental conditions, providing immediate solutions to environmental challenges. These structures, often made from materials like concrete and steel, are designed for water management, flood control, and transportation.

For example: concrete breakwaters, and seawalls against coastal erosion; artificial dams and artificial river drain to prevent flooding

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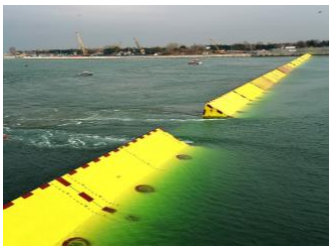

Hybrid solutions

Refer to approaches that combine NBS and Grey Infrastructure to enhance climate resilience and adaptability, merging engineered structures with natural elements to protect against climate impacts while supporting ecosystem health.

For example: mobile sea walls naturally activated to prevent floods; desalination of water to prevent drought

Figure 1: Description of NBS, Grey Infrastructures and Hybrid solutions. Source Deliverable D1.4 of PIISA Project.

NBS are pivotal for climate adaptation, and **already half of the citizens in our sample is familiar with this concept**.

Alongside this figure, the survey also uncovers a strong willingness for learning on NBS. The **72% of respondents say they want to deepen their understanding of NBS as tools for tackling climate change**. As Figure 2 illustrates, four main information pathways stand out:

i) 53% of those interested in NBS would like a greater involvement from government and public bodies to increase awareness on these solutions, declaring that they would like to receive information on the concept of NBS through government websites, public service announcements, or educational programs.

ii) Another 53% would like to receive information within digital platforms or social media, provided the content comes from reputable environmental organisations. Surely a high figure, but it is worthy to highlight that social-media algorithms mostly serve what users already like. If climate issues are not part of someone's feed, the information never appears. In short, citizens must actively seek out climate pages, or institutions must push NBS content into mainstream streams. Otherwise, the good intentions remain purely hypothetical.

iii) A smaller, yet relevant, 30% would subscribe to newsletters or e-mails from trusted organization or research groups. Surely an inexpensive channel, but one that still relies on voluntary sign-ups. Newsletters still demand an initial commitment. Citizens have to research which newsletter to trust and then subscribe. Today, some newsletters exist, what's often missing is that first act of signing up. Here too, citizens must make an effort, at least initially, to inform themselves and choose the most suitable newsletter.

iv) Eventually, almost one fourth of those interested in receiving additional information on NBS, would like to attend dedicated events such as workshops, seminars, or conferences specifically focused on climate change solutions. However, experience tells a different story: competing priorities, fatigue and time

constraints mean that, in practice, many never show up, even when the purpose is clearly worthwhile.

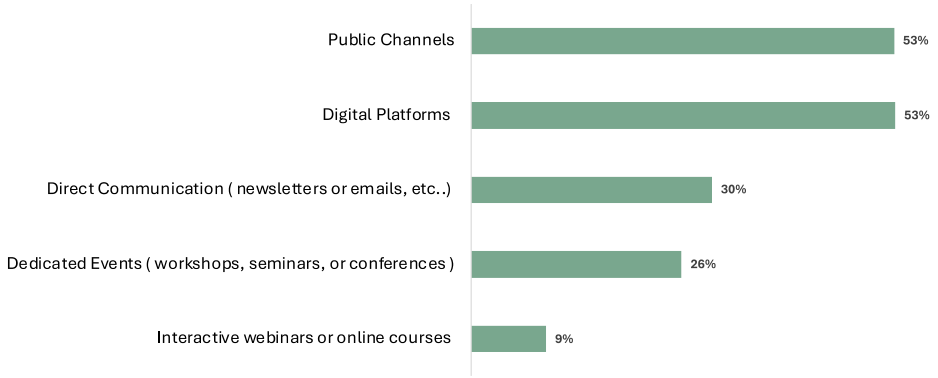

Figure 2: Preferred channels through which European citizens would like to receive information on NBS (multiple answers were possible). Source: proprietary data on 951 European citizens.

Another telling findings of the survey concerns financial commitment. More than one citizen in two **(53%) declares a general interest in investing**, that is contributing personal funds, **to finance the implementation of NBS**, motivated by the idea of mitigating the effects or losses that climate change could otherwise inflict on society and, indirectly, on themselves.

Yet that headline enthusiasm quickly becomes conditional when we probe the details, as Figure 3 illustrates. Indeed 50% of interested individuals state they would participate only if the expenditure were partially covered by national or local public authorities. In other words, they see NBS as a public-interest good that must first be validated and co-financed by government. Similarly, 44% would invest only provided that the European Commission also co-funds the project. Here citizens demand for supranational legitimacy to feel the investment as safer. Additionally, 41% would contribute solely when neighbours, fellow citizens or the wider community also invest. This speaks to a deeply social logic that underscore the importance of collective effort. Eventually, 34% are willing to invest if a private company leads and co-finances the initiative, evidence that citizens can also trust market actors, provided those actors have real interest in the green initiative.

Taken together, these numbers reveal a pattern that mirrors what we saw with information channels: expressed willingness collides with an activation barrier. **The implication for policy makers is clear: if public authorities want to unlock household investment in green roofs or other NBS, they must first signal commitment through co-funding schemes, clear governance frameworks and community-level mobilisation**. Otherwise, the well-intentioned 50% risks remaining an unfulfilled promise, much like the social-media feeds that never show climate content unless we actively go looking for it.

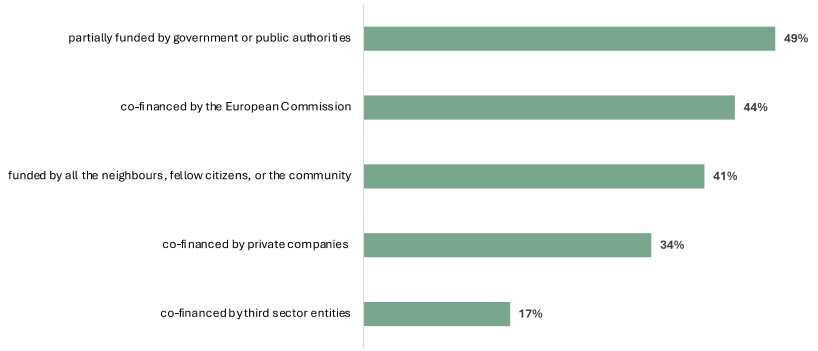

Figure 3: Type of co-financing methods European citizens would follow to invest in NBS (multiple answers were possible). Source: proprietary data on 951 European citizens.

Commitment is not just a matter of principle, but it is also shaped by rewards. In this perspective, a big portion of the sample states there are concrete incentives that may enhance their willingness to co-finance Nature Based Solutions. **60% of respondents acknowledge that specific incentives would influence their willingness to finance NBS projects**. Unsurprisingly, the levers they find most compelling are economic. More than half of those open to investing (52%) say that grants, subsidies or tax deductions would strongly and positively influence their decision. One in three citizens places significant value on the prospect of discounts from insurers in return for helping reduce climate-related risk. All other incentive categories, tangible environmental benefits, increased awareness and direct benefits from NBSs are far behind, as Figure 4 shows.

The message is consistent with the earlier findings on co-funding: people are ready to act, but they expect a concrete signal that society values their effort. **For policymakers, that means pairing the moral case for NBS with finely tuned financial incentives**.

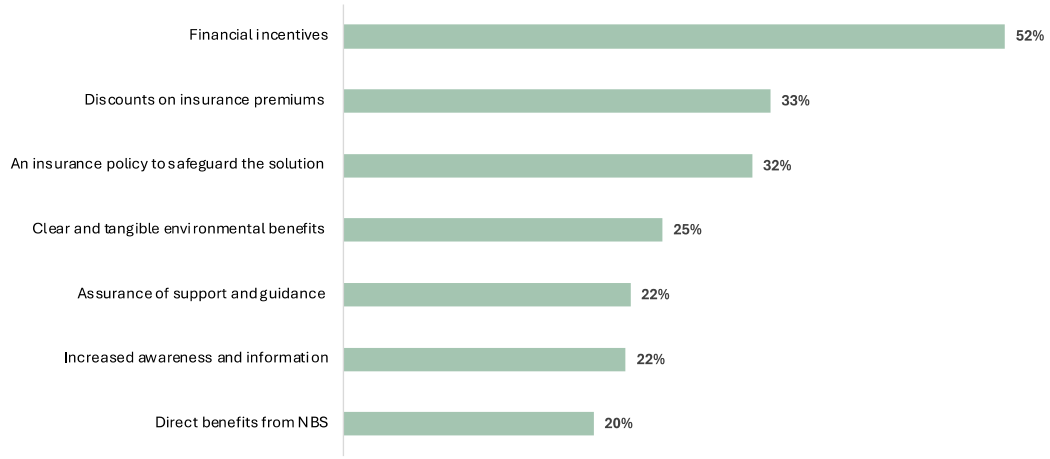

Figure 4: Incentives that enhance the willingness to finance NBS among European citizens (multiple answers were possible). Source: proprietary data on 951 European citizens.

Green roofs – roof solutions for tomorrow's cities

Among the NBSs, the solution on which we focus our attention in this report is green roofs, installations that integrate vegetation on top or on the side of buildings, recognized for their multiple benefits in addressing urban environmental and socio-economic challenges. Indeed, relevance of green roofs for climate change adaptation in urban environments has been increasingly emphasized, particularly given the limited space available for adaptation measures in cities since they present a viable opportunity to implement adaptation solutions without necessitating the use of scarce urban land.

As deeply reported within deliverable D3.3 of PIISA project, *Plan for evaluating barriers and enablers for green roof insurances in the Netherlands*[2], green roofs offer numerous benefits to both their owners and cities. They provide risk protection benefits, such as reduced flood risk from rainwater storage and weather damage protection, as well as thermal insulation for buildings, which contributes towards energy savings for both summer cooling and winter heating expenses. They cool urban areas by replacing heat-absorbing surfaces with plants purifying the surrounding air while promoting biodiversity and they can also provide habitats for urban biodiversity.

But what about European citizen awareness? This solution seems to be already familiar to many Europeans citizens: about **65% of the sample** (roughly two citizens out of three), **declares to know what a *green roof* is**. Even so, and in line with patterns that will emerge in the next sections, that familiarity appears largely conceptual rather than evidence based. Most respondents surely know about vegetation on rooftops, however, far fewer can list the multiple benefits outlined above. Focusing on country level, declared knowledge peaks in Finland and Germany, where the 75% of respondents claim to know the concept, while it sinks to about 45% in Spain and France. Italy and the Netherlands remain on the European average, mirroring the overall 65% figure, equally distributed by gender.

Although the concept of the green roof is broadly familiar to European citizens, actual adoption remains minimal. **6% of respondents report having installed a green roof on their own house**. In terms of territorial differences, as Figure 5 shows, the Netherlands tops the list with a 10% penetration, while the remaining countries cluster around the continental average. That headline figure should, however, be read with caution. First, the questionnaire was filled in on a voluntary basis, which is likely to have attracted citizens already nature-based solutions. Second, the survey was concentrated on major cities, where urbanization and thus green roof installation tend to be higher than in smaller towns or rural regions. Recent administrative data for the Netherlands, for instance, suggest that about 0.5 % of the national roof is green, an order of magnitude lower than our survey result. Taken

[2] PIISA, D3.3 Plan for evaluating barriers and enablers for green roof insurances in the Netherlands: https://piisa-project.eu/assets/deliverables/D3.3_Plan%20for%20evaluating%20barriers%20and%20enablers%20for%20green%20roof%20insurances%20in%20the%20Netherlands.pdf

together, these factors indicate that the 6 % figure is best interpreted as an upper-bound estimate rather than a sector-wide benchmark.

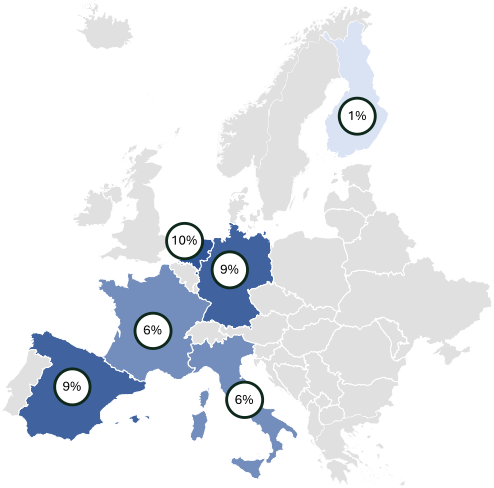

Figure 5: Green roof diffusion among European citizens. Source: proprietary data on 951 European citizens.

Looking ahead, the outlook improves as one citizen in three (34%) declare to be willing to consider adding a green roof to their home. The figure, however, quickly diminishes once costs are made explicit. After learning that typical installation prices range from €160 to €540 per m², the share falls to 23%. The pattern is broadly consistent across the six countries, with two clear outliers:

- In Italy the willingness declines steeply: only 15% would consider the measure, and a mere 11% remain interested after the price is disclosed.
- Spain shows the opposite trend: Spanish citizens in our sample emerge as the keenest investors, with 62% initially enthusiastic and 45% still positive once costs are known.

Such divergence between Spain's enthusiasm and Italy's hesitation lies beyond the explanatory power of this analysis and will require closer scrutiny among citizens.

Knowledge of the solution does not automatically translate into action. Indeed, a proportion of respondents who understand green roofs, and even express interest in installing one, still have not taken the next step in installing them. To clarify this gap, we examined the barriers to adoption (Figure 6). Roughly one third of respondents who have not installed a green roof (33%) declare that they are simply not interested in doing so. Beyond this attitudinal barrier, the data highlight three further obstacles, structural, informational and financial. The most common barrier is the structural feasibility as the 24% of the sample report that their roof is not flat, making installation difficult or outright impossible. Lack of knowledge follows at some distance since 9% were unaware that a green roof could be fitted to a private dwelling at all, and another 6% feel they do not have sufficient guidance on installation and maintenance of these solutions. Cost, by contrast, is cited far less often than might be

expected. Only 6% point to the absence of local incentives or to high up-front expenses as decisive barrier. Price typically tops the list of barriers in sustainable decisions. Its limited weight here suggests that the deeper issue is still inadequate understanding of the solution, and, consequently, a muted inclination to invest.

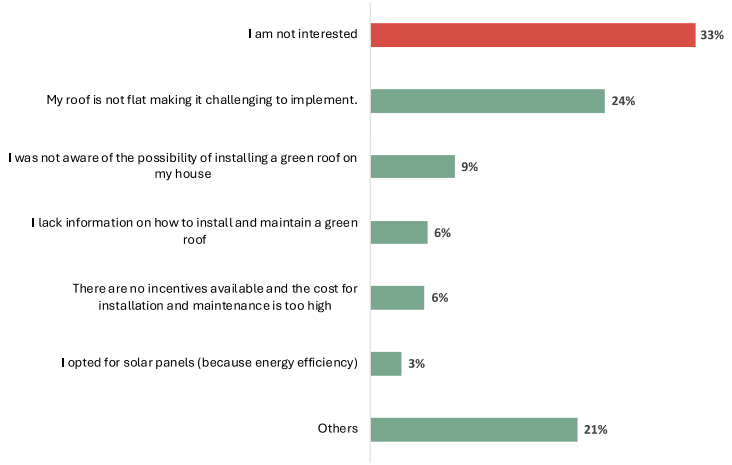

Figure 6: Barriers limiting the green roof diffusion among European citizens. Source: proprietary data on 891 European citizens.

Conclusion

The evidence gathered for this report points to a recurrent pattern: **awareness and declared interest have not yet crystallise into widespread action**. *Climate adaptation* remains a half-known term while *green roofs* are recognised in name, but their multiple benefits are poorly internalised.

Focusing on green roofs, our analysis suggests two main reasons for this disconnection. First, a majority of citizens, 57%, do not regard the solution as personally relevant: some lack personal interest, while others face structural constraints that would make installation impossible. Second, when asked which incentives might persuade them to invest, respondents express no clear preference. Financial subsidies, tax incentives, insurance discounts, public-recognition schemes, all score almost identically (Figure 7). This very flatness is revealing, it implies that most people have never seriously examined a green-roof retrofit. Had they really done so, clearer and more differentiated patterns would likely have emerged, pinpointing exactly what forms of financial, technical or regulatory support they require to install green roofs. In short, it seems the discussion is still taking place in the abstract and it has yet to reach the practical ground on which real decisions are made.

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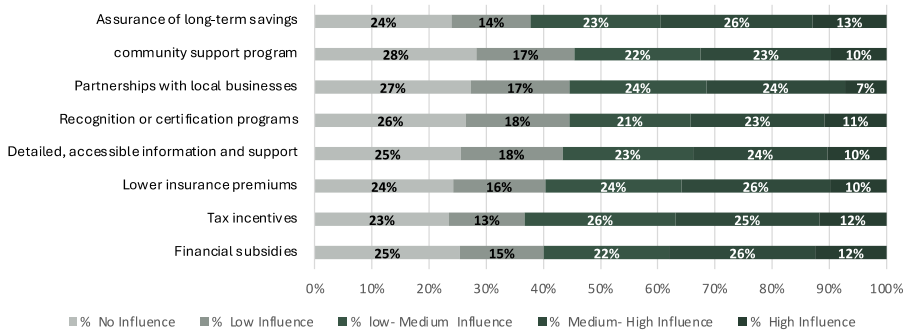

Figure 7: Incentives that may promote green roof diffusion among European citizens. Source: proprietary data on 951 European citizens.

This report offers a European picture of public awareness and market penetration of Nature-Based Solutions, with a particular focus on green roofs. One of PIISA's core objectives is precisely to move from concept to implementation, demonstrating how insurance can stimulate the uptake of urban NBS and green roofs above all.

To that end, PIISA is already active on several, mutually reinforcing fronts. In its first pilot loop in the Netherlands, partners IVM[3] and CAS[4] are testing insurance-based incentives that make rooftop vegetation both financially attractive and socially visible. In parallel, the consortium is translating research into accessible communication tools, most notably the Info Card series[5], which sets out what NBS are, why they matter, and how they often outperform grey alternatives. Finally, the project maintains an open dialogue with practitioners to capture their perspectives on scaling up NBS deployment.

Together, these efforts position PIISA not merely as an observer of the adaptation gap, but as an active catalyst turning evidence into concrete instruments that can bring Nature-Based Solutions to Europe's rooftops.

[3] Incentivizing Green Roof adoption through insurance: https://piisa-project.eu/blog3
[4] Dutch Insurers: Enablers and Barriers of Nature-based Solutions: https://piisa-project.eu/assets/deliverables/publications/PIISA%20-%20Enablers%20and%20Barriers%20of%20Nature-based%20Solutions%20-%20Final.pdf
[5] Nature Based Solutions in the Center of Climate Adaptation: https://piisa-project.eu/assets/deliverables/publications/PIISA_Info%20Card%20Layout%2020240913-compressed.pdf