NBS EduWORLD

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Nature-Based Solutions Education Network (NBS EduWORLD)

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Abstract	This report presents key insights, lessons, and actionable policy recommendations for integrating Nature-Based Solutions (NBS) into education and training systems across the European Union. It builds on 3 years of research, experimentation, and stakeholder engagement under the NBS EduWORLD project, drawing from the experiences of 15 partners working across (NBS) educational levels and European contexts. The report addresses existing gaps in policy, practice, and institutional coordination. Structured around governance levels (EU, national, municipal/local) and cross-sectoral policy domains (e.g., health, business, tourism), the report outlines how NBS education can be mainstreamed through existing frameworks and adapted to local realities. A focus is placed on enabling conditions, such as funding, teacher support, policy alignment, and community partnerships, that can drive systemic change. The recommendations are intended for policymakers, practitioners, and stakeholders working at the intersection of education, environment, urban planning, and social policy.

Keywords	Nature-based Solutions, Education, Policy recommendations, Learning for Sustainability, Environmental Education, Education policy, Urban resilience.
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Executive summary

The NBS EduWORLD project has demonstrated that Nature-based Solutions (NBS) hold significant potential as vehicles for education for sustainability, enabling learners to develop green competences while engaging directly with their environments. Over three years, the project combined research, piloting, and stakeholder dialogue to advance understanding of how NBS can be embedded in education systems and to generate practical guidance for policymakers and practitioners. This document synthesises the project's policy insights and sets out directions for strengthening the role of NBS in education across Europe.

The findings highlight both opportunities for and persistent barriers to scaling NBS education. While European frameworks, such as the European Green Deal, the EU Biodiversity Strategy, and the Council Recommendation on Learning for Sustainability provide a supportive backdrop, integration into national and local education policies remains uneven. Fragmented governance, limited long-term funding, insufficient training and resources for educators, and low public awareness continue to restrict systemic adoption. In addition, emerging challenges, including the growing prioritisation of digitalisation in education and shifting political agendas, risk diverting attention and resources away from nature-based and experiential learning, underscoring the need to secure NBS as a core component of green transition strategies.

To address these gaps, the recommendations emphasise the importance of strengthening multi-level governance, enhancing institutional capacity, and ensuring alignment across EU, national, and local levels. Policy action should prioritise embedding NBS education within curricula, teacher training, and lifelong learning strategies, while linking local experimentation with higher-level frameworks. Sustained investment and research can build a stronger evidence base, including on the long-term impacts of NBS education, cost-effectiveness, scalability, and equity across diverse contexts.

Looking forward, mainstreaming NBS education requires moving beyond isolated pilots towards systemic integration. This involves fostering policy learning and experimentation across Member States, building professional development pathways for educators and municipal staff, and ensuring that digital and green transitions are pursued in complementary ways. By embedding NBS education across multiple policy domains, from urban planning and health to tourism and the economy, learners can be equipped with the competences needed for resilient and equitable societies.

These Policy Recommendations contribute to ongoing efforts to align educational transformation with the green transition, offering a framework for action that supports policymakers, educators, and communities in making NBS education a lasting and mainstream element of Europe's sustainability agenda.

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Glossary

- **Learning for Sustainability (LfS).** An educational approach that nurtures learners' understanding of how economic, social and natural systems interconnect, and helps learners take individual and collective action for bettering these systems. LfS sets forth to develop sustainability competences across formal, non-formal, and informal education settings.
- **Living Labs (LL).** Collaborative innovation environments where schools and communities work together to co-create solutions for local challenges. In the NBS education context, Living Labs facilitate partnerships between students, teachers, NGOs, and local actors to develop both theoretical understanding and practical implementation of nature-based solutions.
- **Nature-Based Solutions (NBS).** Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. NBS brings more nature and natural features into cities, landscapes and seascapes through locally adapted and resource-efficient interventions that benefit biodiversity and support ecosystem services.
- **Whole-School Approach (WSA).** A comprehensive methodology that seeks to embed learning for environmental sustainability across the entire educational institution, adopting a systemic view of education that creates opportunities for living and learning sustainability throughout the educational environment, transforming schools into living laboratories for sustainability.

List of abbreviations

CPD	Continuous Professional Development
EC	European Commission
EU	European Union
GreenComp	The European sustainability competence framework
HE	Higher education
HEIs	Higher education institutions
ILO	International Labour Organization
LfS	Learning for environmental sustainability
MS	Member States
NBS	Nature-Based Solutions
NGO	Non-Governmental Organisation

- RPL Recognition of Prior Learning
- SDG Sustainable Development Goals
- STEAM Science, Technology, Engineering, Arts and Mathematics
- STEM Science, Technology, Engineering and Mathematics
- UN United Nations
- VET Vocational Education and Training
- WSA Whole-School Approach

1. Introduction

Nature-based Solutions (NBS) are gaining increasing recognition across Europe as essential tools for addressing biodiversity loss, climate change, and building urban resilience. For NBS to be effectively integrated into mainstream urban planning and environmental management, greater public awareness and education are vital. Equally as important is the simultaneous task of rethinking how education systems can adapt to the pressing needs of the ecological and climate crises. Learning must evolve to equip learners with the skills, values, and knowledge required to address complex challenges. In this context, NBS is the perfect tool to deliver much needed sustainability competences – linking ecological understanding with civic engagement, systems thinking, local action and the need for transformative learning. Yet, despite this potential, educational systems across Europe still struggle to meaningfully incorporate NBS into teaching (Mulvik, Stojilovska, et al., 2023).

Nature-based Solutions are…

> *"Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. Nature-based solutions must therefore benefit biodiversity and support the delivery of a range of ecosystem services."* (European Commission)

Box 1. Definition of Nature-based Solutions

This report offers policy recommendations for embedding NBS into education systems across Europe – supporting informed engagement, cross-sectoral collaboration, and long-term stewardship. It is intended for policymakers at the trans-national, national, and municipal levels who are positioned to shape educational policy, urban development strategies, and community engagement frameworks. It also speaks to educators, NBS experts, ecologists, community organisers, resource management specialists, learners, and many other actors committed to advancing a culture in which we learn *in, with,* and *for* nature.

The EU already provides a robust policy foundation to mainstream NBS education through several key frameworks that align with broader sustainability and green transition goals. Central to this effort is the **European Green Deal**, a comprehensive roadmap to make the EU's economy more sustainable by tackling climate change, conserving biodiversity, and fostering sustainable development. The **EU Biodiversity Strategy for 2030** advocates for biodiversity conservation and restoration, re-establishing ecosystems, and the need for knowledge-building and awareness, providing a critical opportunity to integrate NBS education into broader sustainability learning initiatives.

Complementing these efforts, the **Council Recommendation on Learning for the Green Transition and Sustainable Development** directly calls on EU Member States to prioritise Learning for Sustainability (LfS) across formal, non-formal, and informal education settings. Among other things, the Recommendation encourages teacher training, inclusion of the whole community in learning, and use of transformative and interdisciplinary teaching and learning, all of which offers a comprehensive policy platform for promoting NBS education. LfS provides a framework to nurture learner understanding of how economic, social and natural systems interconnect, and help learners take individual and collective action for bettering these systems (European Commission 2022). At present, not a single EU country fails to include sustainability in their national curricula (Eurydice, 2024). LfS is also no longer treated only as an appendix to other study subjects – sustainability education in most EU countries reaches students through cross-cutting approaches: either integrated as themes across different subjects, as part of transversal competences, or a horizontal approach to teaching (ibid.).

The **European Skills Agenda** further supports this alignment by fostering interdisciplinary collaboration between public, private, and educational institutions to promote lifelong learning and reskilling, offering opportunities for delivering sustainability competences. Similarly, the **EU Adaptation Strategy** recognises NBS as a key tool for climate resilience and calls for expanding knowledge and data on climate risks. Meanwhile, the **Urban Agenda for the EU**, **Nature Restoration Law**, and **Just Transition Mechanism**, offer a stark reminder that fulfilling their set objectives requires skillsets that combine ecological knowledge, technical capacities, and sustainability competences.

Research shows **NBS to be particularly well positioned to deliver competences necessary for a sustainable world** (Lekaviciute, 2023)**.** Bianchi et al. (2022) define sustainability competences as 'empowering learners to embody complex systems, in order to take or request action that restores and maintains ecosystem health and enhances justice, generating visions for sustainable futures'. To understand NBS, a learner must analyse the interconnectedness of the natural world, human activity, and economic systems. NBS projects also involve hands-on activities like designing green roofs, creating biodiversity gardens, or restoring ecosystems – all practical tasks that allow students to work directly with nature while learning valuable technical skills. **NBS education expands how and where we learn** – engaging closer with the broader community in natural environments, as well as the issues that are most relevant locally. It can also be adapted throughout all education-levels, offering complexity in teaching as learners progress.

Despite the potential of NBS education to deliver sustainability competences, and the strong EU policy foundation to mainstream it, NBS education remains underdeveloped in national and local governance. Early findings from the NBS EduWORLD project revealed that **no Member State had formalised NBS within education policy** (Mulvik, Stojilovska, et al., 2023). At the time, policy references to NBS ranged from a) EU Member States simply stating that they recognise the importance of NBS to climate change adaptation, b) explicitly referring to NBS for addressing specific hazards, or c) no national policy documents that would refer to NBS or green infrastructure.

While NBS is slowly being included as an element of sustainability education, there remains an overarching commitment to sustainability as a whole, rather than options for learning *about*

NBS, or *through* NBS specifically. Despite growing theoretical and conceptual advancements in sustainability education, concerns also persist that transformative learning agenda often remains superficial, with existing and developmental approaches failing to achieve the deep systemic changes required to deliver on both agendas' - NBS and Sustainability (Fagerholm et al., 2025) It may also often be difficult to discern if NBS is included in LfS due to the differences in nomenclature and terminology that is in the process of converging across Europe.

To date, **the most exciting wins for NBS education have taken place on the ground**. As the experience of this project shows, plenty of educators, non-governmental organisations, education institutions, and communities are innovating on how to learn *about, for,* and *through* NBS. The vast **repository of NBS education resources and materials** collected throughout the NBS EduWORLD project indicates a growing appetite for experiential, place-based, and interdisciplinary learning approaches.

These grassroots efforts demonstrate strong momentum, but they also **highlight the need for more systemic support, clearer policy direction, and sustained investment** to scale up successful practices and ensure equitable access across Europe. Educators frequently encounter challenges in implementing NBS education. Innovative pedagogies require time, training, and resources, and must be supported by clear curricula and institutional guidance. Municipalities likewise often lack the capacity or know-how to initiate or sustain NBS learning initiatives. These Policy Recommendations offer tailored strategies for transnational, national, and local actors to unlock the full potential of NBS education – ensuring it is embedded, inclusive, and accessible across Europe.

2. Methodology

These policy recommendations are the outcome of the experiences and outputs of the three-year long NBS EduWORLD project which commenced in September 2022. The contributions of 15 project partners – working across all education levels and in diverse parts of Europe – were instrumental in shaping these recommendations. Their varied perspectives and hands-on efforts to mainstream NBS education have provided rich insights into both challenges and opportunities in policy and practice.

This document reflects a synthesis of practical experience, policy analysis, and iterative stakeholder engagement. The methodology combined desk research, interviews, case studies, collaborative workshops, and policy learning sessions. As such, the recommendations are evidence-based and responsive to on-the-ground realities.

Research methods and data sources:

- **Analysis of Project Deliverables.** Analysis of the resources provided foundational data on the state of NBS education, practical implementation, and barriers to policy mainstreaming. A systematic review of all the relevant NBS EduWORLD outputs was conducted, including Deliverables:

- D2.1 State of the Art Report
- D2.2 Assessment Framework and Guidance for the Project
- D3.1 NBS Education Flipbook
- D3.2 Youth Inclusion Toolkit
- D5.1 NBS Knowledge Stream Guidelines
- D5.2 NBS Connections Stream Guidelines
- D6.1 Scenarios of Plausible Futures for NBS in Education
- D6.2 Living Labs Roadmap,
- as well as complementary tools and materials, such as the Baseline Assessment Template, project partner case studies, and the Learning Units developed for policymakers.

- **Stakeholder Consultations.** Semi-structured interviews were conducted with 12 sustainability education experts and project partners over January-February and June-July of 2025. The interviews explored stakeholder perspectives on NBS education challenges, good practices, and policy needs. The interview questionnaires are provided in the Annex.
- **Literature Review.** A targeted review of academic and grey literature, including deliverables from other EU-funded NBS projects (e.g., NetworkNature, REGREEN, euPOLIS, Nature4Cities, COOLSCHOOLS) was conducted to identify best practices and emerging approaches in NBS education, and to ensure alignment with broader European research trends and priorities.
- **Policy Learning Sessions.** A series of 3 interactive sessions were held to present draft recommendations to target audiences, including local, regional, and national policymakers. These sessions served as a feedback loop, allowing recommendations to be tested, refined, and strengthened through direct dialogue with intended end-users. Two of these sessions were organised as part of the NBS EduSummit high-level events organised by NBS EduWORLD. In total, the policy sessions reached 162 participants gathered in-person and online, who provided early feedback on draft policy recommendations and offered insights for policy through discussions over their experiences in the field. Participants included educators, policymakers, researchers, and civil society actors from Europe and beyond.
- **Experiences of NBS EduWORLD Demonstrator Sites.** The project included several partners as NBS demonstrator sites (or NBS EduSystems) with an educational dimension (Tier-1), across Europe, to support the testing and improvement of approaches and resources with NBS demonstrators with no or a limited educational dimension (Tier-2). The experiences of some of these sites were used as case studies for the development of the recommendations. Data was drawn from interviews with

stakeholders of the demonstrators, public presentations and workshops, and internal project communication and outputs from project milestones.

The recommendations in this report are structured according to governance level – EU-level (**3.1**), national (□), and local policymaking (**3.3**), with an additional chapter (Error! Reference source not found.) that cuts across governance levels and presents thematic recommendations (e.g. relating to health, tourism, and other). Within each section, the recommendation title corresponds to "***What?"*** the recommended action is, and follows with answering the question of "***Why?***" the suggested approach is beneficial, and "***How?***" it can be implemented. Some of the sections are illustrated with "***Examples***" as well.

Each chapter concludes with a set of tools and resources tailored to the target audience, providing concrete starting points for implementation or continued learning on the related topic. The reader will find links to existing EU frameworks, funding mechanisms, partner-generated outputs, and learning materials.

3. Policy Recommendations

The visual map below presents the connections between policy actions for NBS education, which form the basis of these Policy recommendations. By illustrating how actions at different levels of governance reinforce one another, the visual highlights the importance of coordination between EU, national, and local authorities, as well as the need for cross-sectoral integration. It reflects a systemic approach, recognising that effective NBS education depends not only on education policy, but also on planning, funding, and delivering sustainability transitions across sectors.

The following chapters unpack the policy recommendations in greater detail. The first focuses on the role of **EU-level policymaking** in setting strategic direction, offering funding, and ensuring coherence across Member States. The second turns to **national-level action**, particularly how countries can align education and environment policy goals. The third chapter zooms in on **municipal and local efforts**, where implementation happens most directly. Finally, the fourth explores how NBS education can be **mainstreamed across other policy domains**, ensuring it is embedded in a wide array of societal priorities.

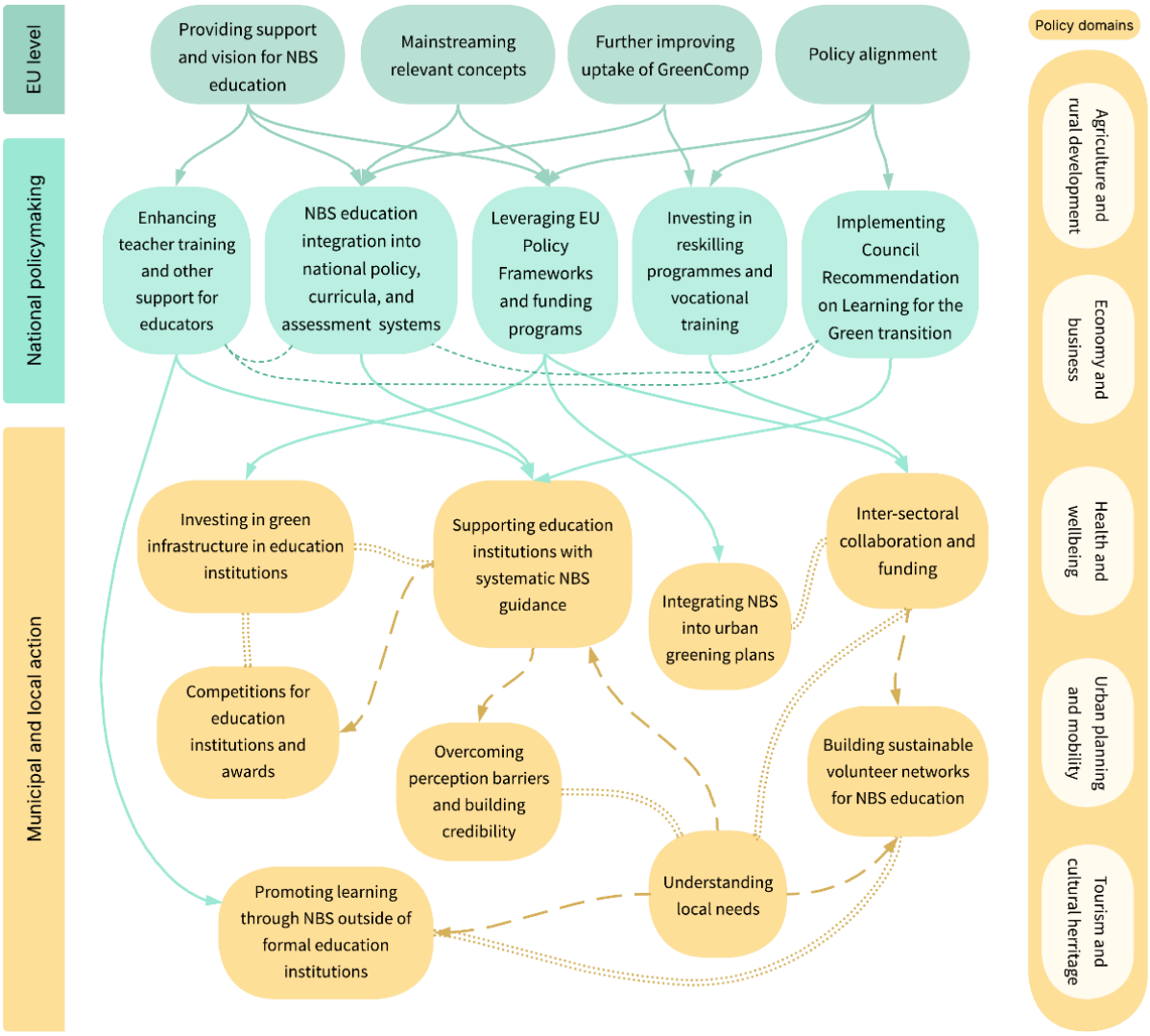

Figure 1. NBS policy action linkages. Source: NBS EduWORLD (2025).

3.1. EU-level policymaking and transnational action

This section focuses on the strategic role of the EU in shaping the overarching framework for NBS education. It contextualises NBS education in the Learning for Sustainability agenda and offers ways to further promote uptake across the EU: harmonising educational policies across Member States, leveraging EU-level funding mechanisms, and aligning NBS education with broader European initiatives like the Green Deal and Biodiversity Strategy 2030.

Table 1. Most relevant policies and programmes for NBS education, based on NBS EduWORLD research (2025)

Policy/ Programme	Main Contribution to NBS Education	Relevance to NBS Education
European Green Deal	Sets sustainability and climate as EU-wide problems	Provides overarching policy basis for NBS integration in education
EU Biodiversity Strategy for 2030	Promotes awareness, restoration, and explicit NBS targets	Supports biodiversity and NBS-related learning and public engagement
Council Recommendation on Learning for the Green Transition (2022)	Calls for systemic integration of sustainability in education	Directly mandates sustainability in curricula, supports teacher training
GreenComp Framework	Defines sustainability competences for learners and educators	Supports curriculum development and NBS-aligned teaching methods
Erasmus+	Funds cross-border school and educator projects with green themes	Enables hands-on NBS education projects and partnerships
EU Life Programme	Funds NBS demonstration and pilot projects	Provides real-lie NBS cases usable for teaching and learning
Horizon Europe	Supports NBS education research (e.g., NBS EduWORLD project, etc.)	Advances pedagogy, innovation, and teachers resources on NBS
EU Climate Adaptation Strategy (2021)	Positions NBS as key tools for adaptation and resilience	Encourages integration of climate-NBS topics into education and planning
European Education Area (EEA)	Aims to embed sustainability in all education systems by 2030	Drives national alignment on sustainability education, including NBS

3.1.1. Mainstreaming and integrating relevant concepts

- ***Why?*** A common reflection among NBS experts is that communicating NBS can be challenging at times, as the general public is not familiar with the specific terminology. Although the essence of what NBS are and accomplish is closely familiar to most people – such as creating parks, restoring rivers, or planting trees to cool cities – the academic and policy language are less widespread. Terms like "ecosystem-based adaptation", "green infrastructure", "nature-positive solutions", or "urban nature-based interventions" may be used interchangeably or in slightly different ways across environmental, climate, health, or urban planning sectors. Similarly, policy documents may refer to "blue–green infrastructure", or "biodiversity-enhancing interventions" without clarifying their relationship to NBS. The interchangeable use of related concepts makes it difficult for practitioners to communicate effectively with diverse audiences, including educators, policymakers, or local communities, and can hinder wider understanding and uptake of NBS.

- ***How?*** A pathway to mainstreaming the NBS concept at the EU level is through digital literacy and pushing for the green and digital twin transition. Another key area is to leverage and mainstream already existing concepts and frameworks related to NBS through transformative education. Instead of proposing new concepts and frameworks, it is essential to converge on the language and promote the use of already existing terms, including NBS, LfS or Education for Sustainable Development (ESD), and build synergies.

Figure 2. Terms relating to NBS education. Source: NBS EduWORLD (2025)

3.1.2. Policy alignment

- ***Why?*** Disparities and a lack of policy alignment on NBS between Member States hinder successful mainstreaming and implementation of NBS education. Although various initiatives related to LfS, NBS, biodiversity or digital education exist, enhanced policy alignment and references can provide better clarity and interrelations between various concepts. Aligning the policies can help to overcome limited capacity to design, facilitate and assess transformative learning experiences to foster NBS education. NBS education integrated into existing frameworks can allow joint work, collaborative initiatives and synergies.

- ***How?*** One mechanism to promote NBS is to highlight the twin green & digital transition to boost both topics and skills in education, as they are transversal. However, there is a strong argument for strengthening the connections between the two from an EU perspective. This could be translated into EU funding opportunities: they could be aligned and find synergies between the use of technology and sustainability. Currently, digital literacy has been given more spotlight and resources (forthcoming: PPMI evaluation of EEA evaluation). Successful stories point to initiatives, such as the

Education for Climate Coalition or the Researchers at Schools initiative. One of the best vehicles to promote NBS education across all levels is STEM, as it offers a holistic approach through interdisciplinary education. More EU funding and efforts targeting training and time allocation, for teachers, schools and institutions to be able to deploy STEM learning is essential.

3.1.3. Providing support and vision for NBS education

- ***Why?*** The EU provides guidance documents and creates opportunities for sharing knowledge, experiences, and mutual learning on sustainability topics, contributing to the convergence of policies between the Member States. Several EU policy documents emphasise education and training in citizen engagement in environmentally sustainable actions and their empowerment with skills and knowledge essential for green transition. Also, the EC have published several expert reports with NBS focus, highlighting NBS benefits to biodiversity restoration or climate change adaptation. These expert reports also highlight raising awareness, public engagement, and education about the role of NBS in promoting environmental sustainability.

- ***How?*** Providing EU reference documents (resolutions, recommendations) to prioritise NBS education can offer guidance and contribute to the convergence of policies between Member States. By demonstrating EU-level commitment, this approach helps overcome situations where governments may not be initially interested in environmental topics, advocates for referencing established priorities, and creates momentum for national adoption.

  Policymakers can also support creating and maintaining comprehensive compendia that serve as central repositories for NBS education resources, best practices, and case studies. They can also help develop national platforms to monitor initiatives and disseminate best practices at the European level through structured documentation and national encounters that facilitate knowledge transfer and policy learning. Providing support for the translation of educational resources and project reports as well as strengthening incentives for school to participate in projects and other European initiatives seems as valuable. Establishing structured opportunities for knowledge exchange through online cascading training programmes can improve competences of educators, municipal officers, and community stakeholders on NBS education. Facilitation of regular thematic ministerial council meetings or peer learning activities supported by experts and senior advisors on NBS education, and continued support programmes like Erasmus+ can enable teachers and practitioners to share knowledge, good practice, and experiences across Europe.

  Finally, policymakers can implement multi-annual financing mechanisms through EU programmes such as Erasmus+ or the DEAR Programme, which provide long-term project support (3-year cycles rather than single-year national funding). Strengthened measures that enhance articulation between partner entities for joint financing and continue co-financing projects can promote opportunities for sharing mutual learning between experts and organisations. The funding mechanisms can help secure finances and plan a better strategic and long-term outlook for the NBS education activities.

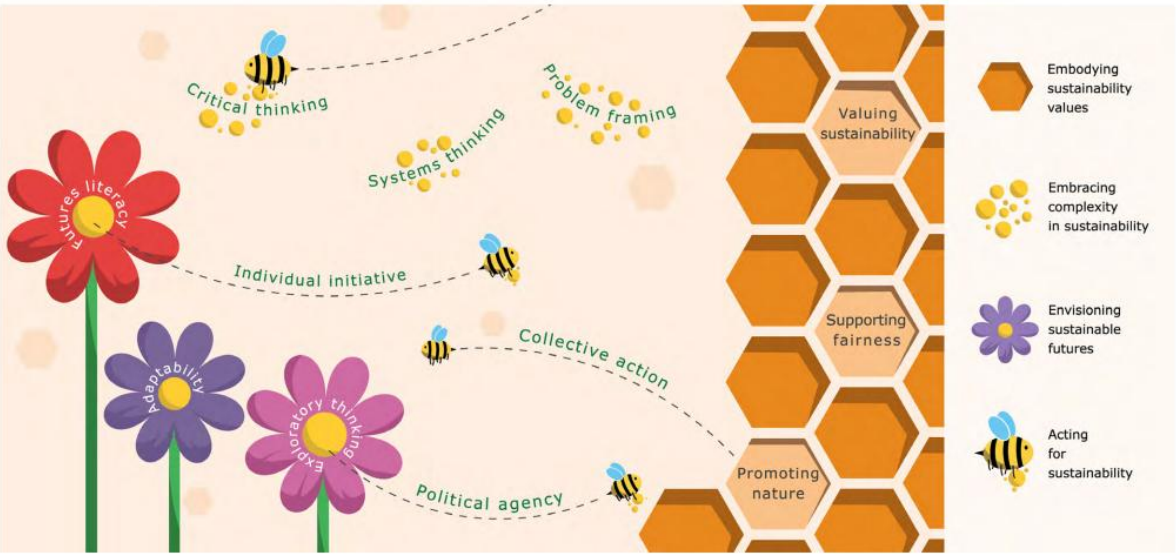

Figure 3. Visualisation of GreenComp. Source: Bianchi, Pisiotis, and Cabrera (2022)

3.1.4. Further improving uptake and adoption of GreenComp

- ***Why?*** One crucial hurdle contributing to the challenge of improving uptake and adoption of GreenComp is the lack of practical integration into the education sector. Although many stakeholders are knowledgeable about the framework, translating the competences into everyday realities of classrooms, curricula, training programmes and assessment is challenging. While some stakeholders are familiar with the framework, the capacity to effectively apply it remains limited. However, examples of initiatives that have embraced and successfully applied the framework in various contexts exist. There is an opportunity to introduce and guide a more systematic approach to further the uptake and adoption of GreenComp in the education sector. For example, European funding sources, such as Erasmus+ or Horizon 2020, have offered funding opportunities for projects focused on improving green skills or competences, and many of these used GreenComp as the guiding framework. Improving the uptake of GreenComp on the EU level can help Member States to gauge how they are doing and to identify and motivate best practice. At the same time, the EU can also communicate more clearly the importance of NBS to all education and training stakeholders across the EU.

- ***How?*** Supporting practical application of the GreenComp framework in the education sector is essential as it can foster a significant systemic change in addressing complex socio- ecological-technological challenges towards which sustainability education is aimed. The main recommendations for future developments and application of the GreenComp framework encompass five key areas. First, there is an emphasis on supporting the translation of GreenComp into practical application by providing comprehensive guidance, creating user-friendly materials or toolkits, and organising training for teachers to showcase examples of its successful implementation. Second,

enhancing dissemination efforts, leveraging targeted communication strategies and collaborating with stakeholders (national, regional or educational networks) is crucial to raise awareness about GreenComp among the education sector. Third, providing dedicated funding mechanisms for projects that implement GreenComp with teachers in specific contexts, including NBS, to drive further interlinkages and build upon existing successful examples toward systemic GreenComp implementation in educational practice. Fourth, supporting the uptake through cases studies, good practices, and Communities of Practice is vital for facilitating the sharing of experiences and exchanging the knowledge, while fostering collaboration among various stakeholders. Finally, maintaining the 'Living Document Nature' of GreenComp is essential, ensuring its dynamic and responsive nature through regular updates and feedback mechanisms to sustain its relevance and applicability over time.

Useful tools and resources:

- GreenComp: the European sustainability competence framework provides a common ground to learners and guidance to educators, advancing a consensual definition of what sustainability as a competence entails
- GreenComp in practice explores case studies on the use of the European sustainability competence framework
- Council Recommendation of 16 June 2022 on learning for the green transition and sustainable development (available in 24 languages) provides guidance to Member States on how to implement Learning for Sustainability.
- Monitoring learning for sustainability (Developing a cross-EU approach: final report) presents a conceptual framework and opportunities for EU level monitoring
- Working Group Schools: Learning for Sustainability promotes learning and exchange, including key messages and input papers summarising discussions on sustainability education in schools

Box 2. Useful tools and resources

3.2. National policymaking

National governments play a key role in translating EU directives into localised actions. Member states could embed NBS education into national curricula, train educators to deliver interdisciplinary lessons, and ensure equitable access to resources. Essential to NBS education mainstreaming are budget allocations for NBS initiatives, establishing national centres for innovation in NBS education, and the need for tailored programmes that address specific environmental and socio-economic conditions within each country.

3.2.1. Implementing Council recommendation on Learning for the green transition and sustainable development

- ***Why?*** The adopted Council Recommendation (2022) recognises a lack of a systemic approach to environmental sustainability in education across the EU. Educator professional development has been identified as one significant enabler for bringing innovation and sustainability into education systems (Mulà and Tilbury, 2023). Furthermore, educators need such targeted support as the incorporation of green transition principles into national curricula. Without curriculum recognition, teachers may feel unprepared, unsupported, or unable to justify allocating time and resources to such content. The Council Recommendation provides the essential framework for addressing this gap by formally calling for Learning for Sustainability to become a key priority area in education policies and programmes and for support to be given to educators through training and professional development. Further, the recommendation proposes to encourage and enable transformative and interdisciplinary teaching and learning using hands-on learning, the STEAM approach, hackathons, service learning and pedagogical approaches that align naturally with NBS education's interdisciplinary nature and reliance on hands-on, project-based learning methods.

- ***How?*** The Council Recommendation can be implemented through coordinated action across multiple levels of the education system. Ministries of Education could integrate Learning for Sustainability as a priority area in national education policies and strategic frameworks, mandate the inclusion of green transition principles in curriculum development processes, and establish sustainability competency requirements for teacher certification and professional development. Teacher training institutions and programmes need to develop targeted professional development modules on NBS and sustainability education, provide educators with practical tools and methodologies for interdisciplinary, hands-on sustainability learning, and create certification pathways for sustainability education competencies. These competencies could align with existing frameworks like GreenComp, positioning NBS as an integrated component of sustainability education rather than a separate entity, thus avoiding fragmentation and ensuring coherent implementation across educational systems.

  Curriculum development bodies could formally integrate NBS content into educational curricula across subjects and promote adopting the Whole School Approach (WSA), which "seeks to embed learning for environmental sustainability across the institution, adopting a systemic view of education creating opportunities for living and learning sustainability across the education environment" (Tilbury and Galvin, 2022). They could also promote interdisciplinary learning approaches that connect NBS to STEAM (Science, Technology, Engineering, Arts, Mathematics) subjects where the Arts component supports the interdisciplinary and creative approaches central to the Whole School Approach. School leadership would then have clear guidance on how to implement whole-school sustainability policies that support NBS education initiatives, facilitate partnerships with local communities, NGOs, and environmental organisations, and could allocate resources and time for sustainability-focused project-based learning.

The NBS EduWORLD report on Scenarios of Plausible Futures for NBS in Education discusses how the uptake of WSA is most effective when both the top-down and bottom-up approaches "cross paths" in the form of supportive policies, teachers' engagement, innovation in schools, and collaborative action. In such a scenario, "NBS expert teachers and principals take the lead in transforming their schools into NBS Living Labs, following various initiatives, policies, and frameworks, investing in the continuous training and capacity building of all staff" (Katikas, Tsaknia, and Sotiriou, 2023). Thoughtful guidance can empower and multiply actions already taking place on the ground. The visual below demonstrates how under this scenario the different elements of WSA flourish and interact to bring about the transformative potential of schools as living NBS laboratories.

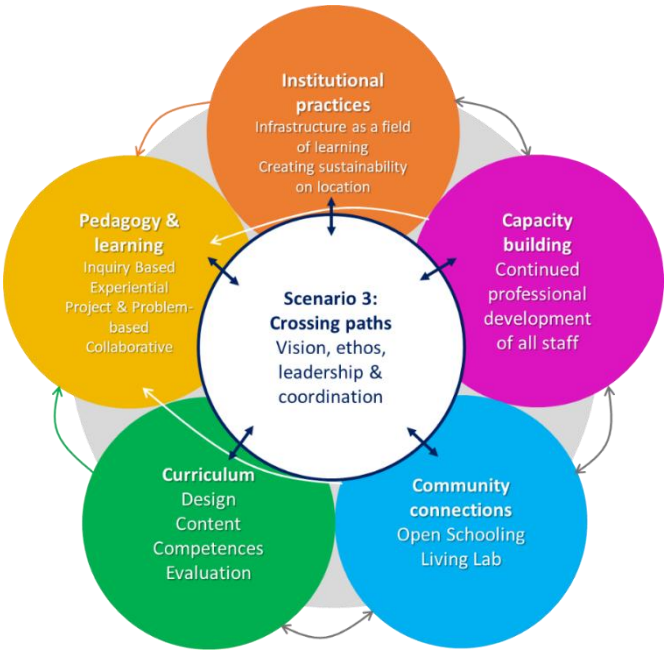

Figure 4. The WSA-activated pillars in the "Crossing Paths" scenario. Source: NBS EduWORLD (2023)

- ***Example.*** The alignment between NBS education and the Council Recommendation is demonstrated at various NBS EduWORLD demonstrator sites. For example, in Moldova (see Box 3), schools engage in environmental action on international awareness days as a practical extension of NBS learning, exemplifying the "learning by doing" approach. At another demonstrator site in Serbia, educators have used creative tools like card games and collaborative drawing to introduce NBS concepts, which have helped students visualise greening schoolyards and linking biodiversity to their daily lives.

Demonstrator site: Chișinău, Moldova

Verde e Moldova, an environmental association in Chișinău (Moldova) has developed a holistic approach to NBS education by establishing strategic partnerships at multiple levels. Working as national coordinator for NBS education activities, the organisation has created a network spanning from government ministries to local schools.

The organisation's core strategy follows a "learning by doing" philosophy, engaging schools through practical activities on international environmental days such as the International Day of Forests, National Day of Environment, and World Environment Day. They established a partnership with the Ministry of Education, which includes experts from UNESCO, and created a network of 12 schools in their pilot area. These celebration days serve as practical lessons where schools, teachers, and students work together on environmental activities.

The organisation advocates for more flexible curriculum policies, noting that curriculum is treated as untouchable in Moldova. They suggest pilot schools to demonstrate NBS education approaches before attempting national changes, recognising that systemic curriculum reform faces significant institutional resistance.

Image 1. "School visit in Chișinău"[1], within Box 3. NBS EduWORLD Demonstrator site: Chișinău, Moldova

3.2.2. Leveraging EU policy frameworks and funding programmes

- ***Why?*** The implementation of NBS across all landscapes is considered key in achieving the objectives of major EU policy priorities, in particular, the EU Biodiversity Strategy for 2030 and the EU Adaptation Strategy (Davis, Mederake, and Knoblauch, 2018). Aligning educational content with NBS goals becomes critical, as incorporating targets from these policies into national curricula would prepare students to meet broader EU-

[1] Image 1, photographed by Anatolie Risina. Reproduced with permission and explicit approval from the author.

wide sustainability goals, making NBS education a clear pathway to achieving these targets. NBS education can also be integrated into national plans called for by the EU Nature Restoration Law. Experiences from NBS EduWORLD demonstrator sites show that European project funding is often the only mechanism that enables NBS education initiatives to move beyond planning to implementation, particularly when domestic budgets are insufficient.

- ***How?*** National governments could begin by aligning education and sustainability policies with EU funding programme criteria, like those of Erasmus+, the EU Life Program, and Horizon Europe to increase educational institution eligibility. For example, this could entail ensuring that national education and sustainability strategies explicitly reference or incorporate NBS, biodiversity, climate adaptation, or green skills – terms and themes emphasised in mentioned programmes. This could also include making sure that national policies allow for co-financing, pre-financing, and long-term commitments, which are often required or expected in EU calls. Member States could establish centralised platforms and capacity-building workshops to help local actors navigate application processes, while creating national matching funds or co-financing mechanisms to bridge financial gaps. National policymakers could develop long-term funding models that support the continuous development of NBS education beyond initial grants, building on the EU's investment of more than 200 million euros in NBS research.

3.2.3. NBS education integration to national level education policy documents, curricula and assessment systems

- ***Why?*** While some EU members states already integrate NBS into climate change adaptation or hazard prevention policy, it is still rare for strategic documents on education to include NBS either as method or subject of teaching (Mulvik, Stojilovska, et al., 2023). This creates a systemic problem, since curriculum and assessment systems are linked: what gets assessed gets prioritised. Traditional testing cannot measure sustainability competences such as system thinking, critical thinking, collaboration, and problem-solving. Thus, to fully realise the potential of NBS education for preparing green workforce, there must be a clear system for evaluating and recognising the skills gained, including Recognition of Prior Learning (RPL). However, insights from the NBS EduWORLD demonstrator site in Moldova (Box 3) suggest that curriculum reform faces institutional resistance, with stakeholders describing curricula as "untouchable" and NBS lacking formal recognition in textbooks or standards. To address this gap, localised policy development could incorporate sustainable skills into national qualification systems and competency standards to formalise them across sectors. Additionally, integrating competences into student assessment and monitoring systems validates their importance and provides evidence of tangible benefits.

- ***How?*** As mentioned earlier (see section **3.1.4.**), NBS education could be linked to the sustainability competence framework *GreenComp*, which outlines the specific knowledge, skills, and values that students need to develop for the green economy. An alternative approach involves creating flexible pathways for curricula integration. This could include optional modules, elective content, or cross-curricular standards that

allow schools to adopt NBS themes without the need for structural overhaul. Such flexibility empowers schools to adapt NBS education to local contexts while aligning with national goals. Curricula updates need to be tied to innovations in the assessment systems as well. To support NBS education, schools could transition from traditional testing toward assessment methods that prioritise real-world application through project-based learning, experientials, peer assessment, RPL, and self-reflection.

- ***Example.*** The Moldova case shows this flexibility by establishing a 12-school network in their pilot area through collaboration with the Ministry of Education. Schools in this network participate in practical NBS activities on international environmental days using a "learning by doing" strategy. This partnership between an NGO and the Ministry creates a framework for piloting NBS education within existing schools, to which they provide regular updates and training for participating.

3.2.4. Investing in reskilling programmes and vocational training

- ***Why?*** The transition to green industries presents both an urgent challenge and a significant economic opportunity. Research predicts that the European Green Deal will create 2.5 million additional jobs by 2030 (CEDEFOP, 2022). The strongest growth is expected in sectors with high greening potential: water supply and sewage management, waste management and recycling, planning, construction and renovation. These sectors will need workers skilled in sustainable practices, circular economy principles, NBS, and environmental technologies. However, 94% of companies report not having the talent needed to implement their environmental sustainability plans (ibid.). Vocational education and training (VET) and Continuous Professional Development (CPD) are uniquely positioned to close this gap by providing targeted, practical skills aligned with specific green job requirements (CEDEFOP, 2025)

- ***How?*** National policymakers could promote and fund programmes to help workers transition from traditional sectors to green industries. Reskilling programmes could integrate NBS education into vocational training or lifelong learning frameworks. To be effective, they require collaboration between employers and institutions that offer CPD and VET. National governments could coordinate regional partnerships where employers contribute to designing and funding NBS-related training programs, guaranteeing that courses are relevant to industry needs and that there is a clear pathway from education to employment. There is also an identified need to ensure that there is adequate access and support for CPD, for educators, trainers and professionals that need to reskill or upgrade skill sets. Without support in this area, there is a likelihood of a gap developing in educational programmes needed for transitioning to a nature-based sustainable economy. Support programmes could promote sustainability innovation and entrepreneurship by strengthening higher education and VET institutions to establish or reinforce sustainability hubs that will strengthen innovation and entrepreneurship for the green transition, sustainable development, circular economy and biodiversity.

- ***Example.*** In Germany, companies actively participate in curriculum design and provide training, resulting in graduates finding it relatively easy to be recruited by companies in

their skill area (Li, 2022). In another case, France's "France Relance" recovery plan (2020-2022) allocated €15 billion of its €100 billion budget specifically for vocational training. The plan increased workforce training availability by 400,000 people, focusing on sectors like building renovation and energy management. The government incentivised employer partnerships through on-the-job training contracts, where companies participated directly in designing training programs aligned with green transition needs. In this way, national governments could close the skills gap by working directly with employers and educators to reshape training systems around the demands of the green economy.

3.2.5. Enhancing teacher training and other support for educators

- ***Why?*** Teacher competences are a key determinant of student outcomes. Research shows that pedagogical content knowledge, self-efficacy, and teaching enthusiasm are positively related to students' interest and student achievement (Brandt et al., 2019). To deliver NBS education effectively, educators need both the knowledge and resources to bring it to life. However, a lack of coherence between training, attitudes, and teaching practices remains a challenge. Many teachers report feeling more comfortable teaching cognitive skills than facilitating social, emotional and behavioural learning required for sustainability (Lozano et al., 2019). Without adequate training, educators may struggle to implement interdisciplinary, hands-on approaches.

- ***How?*** Ministries of Education and teacher training institutions could integrate NBS education within standard teacher qualification programmes – not just as elective modules or extracurricular activities. Funding for pre-service and in-service teacher training on NBS theory and practices and interdisciplinary lesson materials can guarantee that educators are well-prepared to teach sustainability in and outside of the classroom. Rather than being limited to content, the training could also focus on *how* to engage students through emotional, hands-on experiential learning and place-based pedagogies. In other words, educators could be prepared to not only teach on NBS in theory but be ready to teach, for example, in a school garden while integrating the learning process into the already existing curricula. Teachers can benefit from being cognisant of the need to address both inner and outer transformation in thinking, skilling and worldviews (Eliyawati et al., 2023). One additional way, in which this skill gap could be addressed, is through standardised CPD requirements that incorporate principles from UNESCO's International Commission on the Futures of Education (2021), which emphasises transformative pedagogies for sustainability.

  To support educators further, national policymakers could offer progressive incentive structures, such as certification schemes, labels, and awards. These can incentivise education institutions and teachers to excel in NBS education, creating a skilled and motivated teaching workforce to prepare the next generation for NBS jobs. They also work as opportunities to promote good practice in the professional community. For example, educators could be formally incentivised to participate in skill recognition and development programmes, such as the **NBS School Expertise** on the Scientix® STEM School Label platform. Co-organised with NBS EduWORLD, the Expertise offers recognition for schools who demonstrate a strong commitment to NBS education,

providing further peer-learning, knowledge and experience exchange opportunities for teachers, in addition to joining an exclusive community committed to NBS education. Ensuring educators are systematically rewarded, rather than punished for participation in activities outside of the curricula, could support their motivation and lead to faster development of much needed teaching competences.

Useful tools and resources:

- State of the Art Report provides an overview and detailed analysis of the current state of NBS education across the European region and at different education levels. The report was developed by NBS EduWORLD.
- Scenarios of Plausible Futures for NBS in Education. A detailed and insightful guide on the transformation of schools into NBS Living Labs through the Whole School Approach, developed by NBS EduWORLD.
- 50 Learning Units on NBS. Developed by NBS EduWORLD, this educational material includes several units specifically designed for policymakers interested in promoting and mainstreaming NBS.
- Guidelines on Implementation of NBS Activities in Education for Starters aim to address the requirements of educators with little to no prior knowledge of NBS. Developed by NBS EduWORLD.
- Guidelines on Implementation of NBS Activities in Education for Advanced Educators aim to empower confident educators to expand the topic of NBS in learning settings. Developed by NBS EduWORLD.
- **Study on School Learning Environments for Sustainability in EU Member States – final report, case studies, and compendium of good practice –** explores how education infrastructure and learning environments can be more sustainable and supportive of student health, well-being and learning across the EU.
- TEAM#UP is an Erasmus+ initiative that focuses on integrating ecological restoration into Vocational Education and Training (VET)

Box 4. Useful tools and resources

3.3. Municipal and local action

NBS education initiatives emerge through collaborative efforts between municipalities, schools, NGOs, and community organisations, with local authorities playing a crucial coordinating and enabling role. Local strategies for integrating NBS education are essential for creating tangible and long-lasting community-led solutions that address environmental and educational challenges. NBS education has been shown to be an inclusion-building educational activity with high outreach potential, encouraging outdoor activities, citizen science, and community engagement. Well-being and mental health are likewise promoted through outdoor activities, nature-based learning, and inter-generational engagement in informal and non-formal education settings. This section outlines how local authorities can integrate NBS into school programs, invest in green infrastructure, form partnerships with local organisations to foster learning opportunities and offer technical support for local projects.

3.3.1. Integrating NBS into urban greening plans

- ***Why?*** Long-term commitment is essential to establishing NBS credibility and achieving successful implementation outcomes. Research indicates that the main barriers to NBS effective integration are insufficient political will and inadequate long-term commitment frameworks (Corgo et al., 2024). Urban planning systems possess substantial capacity to address this by integrating NBS strategically and ensuring it meets temporal, spatial, and functional needs (Bush and Doyon, 2019). Implementation failures commonly result from ad hoc approaches that conceptualise NBS as isolated interventions rather than integrated long-term strategies (Mahajan, 2025). Successful mainstreaming requires positioning NBS projects within broader policy frameworks to secure sustained political support and institutional integration (Hölscher et al., 2023). Critically, these long-term planning frameworks must incorporate educational components to build public understanding and professional capacity. Without dedicated education strategies, even well-designed NBS projects fail to generate the knowledge transfer and skill development necessary for widespread adoption.

- ***How?*** Municipal planning could incorporate multi-year timelines that support the sustained engagement necessary to build community confidence in NBS effectiveness. Projects require consistent maintenance and visible progress to prevent communities from reverting to traditional infrastructure preferences. Urban planning systems can offer a practical route by formally integrating NBS into urban planning documents, which provides a regulatory basis for implementation and guaranteeing that NBS are considered within the broader development strategy. Urban greening plans could mandate educational components including partnerships with local schools and universities to use NBS sites as living laboratories; public awareness campaigns that explain NBS functions and benefits throughout project lifecycles; or professional development requirements for municipal staff and contractors working on NBS projects. This educational infrastructure guarantees that knowledge accumulates alongside physical infrastructure.

- ***Example.*** The NBS EduWORLD demonstrator site in Offaly County (Box 5) shows how national climate action policies can directly influence local governance, with municipal

policy frameworks developed to require the integration of NBS in all capital projects and third-party development approvals. A second demonstrator site in Genova, Italy shows how planners have formally included NBS in urban planning policies, making their integration into projects easier and more consistent.

Demonstrator site: Offaly County, Ireland

Offaly County Council operates as both an implementer and regulator of nature-based-solutions across the county, incorporating NBS into their own capital projects and serving as the planning authority that reviews and encourages NBS integration in third-party developments across the county. The council integrated NBS education directly into their Climate Action Plan (2024-2029), requiring annual training for all 500+ staff. The Climate Action Coordinator puts it simply "If we can educate our 500 staff about NBS, they're all out there implementing projects and working with communities. That knowledge spreads naturally to everyone else."

The Council runs tailored training sessions. Engineers and planners get technical instruction on building NBS projects and navigating regulations, while other staff learn basic concepts and how their work connects to environmental goals. Over 125 people (20% of staff) participated in the first year, often partnering with Engineers Ireland for outside expertise. The training produces visible results on the ground, with small NBS projects happening as a result training. The County now requires all internal projects and external developments to consider nature-based solutions. The Council wants to expand training beyond staff to work with schools and the public, recognising that stronger national policy support would allow more ambitious programs.

Image 2. "Bog at Offaly County"[2], within Box 5. NBS EduWORLD demonstrator site: Offaly County, Ireland

3.3.2. Investing in green infrastructure in educational institutions

- ***Why?*** Research demonstrates that school greenness correlates with improved academic performance and well-being (Jimenez et al., 2023). Students in sustainably

[2] Image 2, photographed by Eleonora Lekaviciute. Reproduced with permission and explicit approval from the author.

designed schools also tend to exhibit stronger ecological understanding and are more likely to adopt environmentally responsible behaviour than peers in conventional schools (Green and Rayner, 2022). Participation in hands-on environmental programs, such as tending school gardens or participating in outdoor learning activities, strengthened problem-solving skills and a deeper sense of ecological responsibility (Papadopoulou, Kazana, and Armakolas, 2020). However, budget constraints frequently prevent action, as many NBS EduWORLD demonstrator sites report lacking dedicated funding for educational activities and are unable to provide concrete support that schools and communities request. Additionally, schools often express interest but lack systematic support for implementation, with success depending on individual teacher and administrator commitment.

- ***How?*** Municipalities could offer funding for greening education institution campuses. Green roofs, walls, and gardens can serve as living classrooms for NBS education, while also improving the educational institution environment and student well-being. Additionally, municipalities could issue guidelines and technical resources for urban planners on how to design and maintain such infrastructure. Such investment could be supported through resources for schools on how to make use of these NBS in their teaching to strengthen community's buy-in and commitment to maintain these spaces.

- ***Example.*** Luxembourg's Ministry of the Environment, Climate and Sustainable Development launched the "More Nature in Our School Yards" initiative to transform paved school grounds into green spaces by planting trees and bushes. Aimed at enhancing biodiversity and improving learners' well-being, the programme also supports municipalities in addressing climate challenges like drought and flooding (Ministère de l'Environnement, du Climat et de la Biodiversité, 2023).

3.3.3. Understanding local needs

- ***Why?*** NBS education should reflect the unique ecosystems, environmental challenges, and societal needs of different regions across rural, coastal, or urban areas to create meaningful learning experiences. Place-based education emphasises the connection between learning processes and physical places where teachers and students are located, incorporating local environments as foundations for improved student engagement, learning outcomes, and community impact. (Hernandez Gonzalez, 2023). Studies show that place-based approaches are particularly effective for environmental instruction because they feature local and observable effects, which in turn connects human behaviour with environmental consequences in tangible ways (Khadka et al., 2021). Thus, a tailored approach helps communities connect with local issues and feel ownership, making environmental challenges personally relevant and actionable.

- ***How?*** Programmes could reflect local ecosystems, environmental challenges, and regulatory contexts. Demonstration of measurable impact is essential for building credibility through visible results, regular public reporting and community meetings. Local economic benefits could be documented and communicated strategically. Communication strategies could connect NBS to locally accepted concepts and terminology that resonate with specific communities. Further, municipalities could work

with ecologists and educators to create localised content and offer professional development programmes focused on specific ecosystem types or environmental challenges. National policy could support these pilots by funding cross-regional exchanges where schools from different ecosystems share best practices, creating a network of NBS educators and practitioners across the country.

- ***Examples.*** The NBS EduWORLD demonstrator site in Almada (Box 6) partnered with a local university to provide data showing dune growth and coastal protection benefits, creating evidence that convinced local communities and shifted perceptions from NBS scepticism to advocacy. Restaurant owners became advocates after experiencing direct economic benefits from improved coastal protection, which illustrates the importance of documenting local economic impacts. Further, in Almada they found that calling an intervention "natural engineering" made the concept feel more credible and helped gain wider acceptance compared to the term NBS. Meanwhile, the demonstrator site in Moldova (Box 3) emphasises connecting NBS to accepted terms like sustainability and climate change for effective communication with their local context.

3.3.4. Overcoming perception barriers and building credibility through partnerships

- ***Why?*** Overcoming perception barriers is critical for NBS education because public scepticism directly undermines both educational initiatives and their practical implementation outcomes. When communities view NBS as unreliable compared to traditional engineering solutions, they resist policy investment and community support necessary for successful projects. Research identifies three primary perception barriers: concerns over NBS reliability and cost-effectiveness compared to engineered alternatives, with challenges in measuring effectiveness leading to high uncertainty (Seddon et al., 2020; Coles et al stakeholder scepticism regarding profitability and validation of effectiveness, particularly the time needed for NBS to demonstrate results (Lupp et al., 2021); and widespread public demand for evidence of NBS effectiveness before accepting them as viable solutions (Anderson et al., 2021). These perception barriers create a negative feedback loop for education: without public credibility, schools and educators hesitate to invest in NBS curricula, which reduces student exposure to NBS concepts, perpetuating public unfamiliarity and scepticism.

- ***How?*** Municipalities could partner with education institutions to generate credible evidence that supports both NBS implementation and educational content. Universities could establish monitoring partnerships that provide data for educational case studies while building public credibility. These partnerships create dual benefits: students gain hands-on research experience with measurable NBS outcomes, while communities receive scientific validation of NBS effectiveness. Municipalities could fund educational programmes that emphasise evidence-based learning by incorporating monitoring data, impact assessments, and success metrics into curricula. This approach prepares students from STEM backgrounds to address public scepticism with concrete evidence while building their capacity to design and evaluate NBS projects. In partnership with institutions, municipalities could organise community outreach programmes where students present NBS research findings to local stakeholders, creating direct pathways

for knowledge transfer from education to public understanding. Communication strategies could make NBS results visible and accessible to educators, students, and the broader public through social media, news outlets, and community engagement activities. Educational institutions could serve as messengers, helping translate technical research into accessible formats that build public support for both NBS projects and educational investment.

- ***Examples.*** In the NBS EduWORLD demonstrator site in Almada (6), collaboration with a local university demonstrates this educational-credibility feedback loop. The partnership provided precise measurements of dune growth and coastal protection benefits, creating data that clearly showed the effectiveness of NBS to local communities. Students were able to use the dunes for research activities. The results were communicated through social media, news outlets, and community engagement activities, with success stories including restaurant owners becoming strong advocates of NBS after experiencing direct economic benefits from improved coastal protection. Thus, credibility boosts increased community support for NBS learning initiatives.

3.3.5. Supporting education institutions with systematic NBS guidance

- ***Why?*** Schools often show interest in NBS projects but face challenges due to the absence of clear implementation pathways and consistent support. The success of these initiatives frequently depends on the motivation of individual teachers and school leaders, leading to uneven implementation across educational institutions. Research demonstrates that insufficient understanding of educational reforms creates significant implementation barriers, with teachers becoming overwhelmed when schools lack adequate guidelines, leading to reform failure (Aldridge and McLure, 2024). The primary barrier for teacher participation in professional development is lack of time. Further, teachers report time constraints as more significant barriers than topic complexity (Ennes et al., 2021). Without coordinated municipal support, schools encounter administrative barriers and resource limitations that prevent them from turning ideas into action.

- ***How?*** Municipalities could begin by mapping existing school-based NBS initiatives to assess current capacity and identify schools with varying levels of need. This mapping could include existing SDG projects and sustainability education programs, as NBS elements may already be integrated but not explicitly recognised as such. This approach helps tailor support and avoid duplicating efforts. Guidance materials could outline requirements, procedures, available support systems, and practical implementation aspects. Support for teachers could recognise that many contribute to NBS projects as unpaid volunteers. Professional development could focus on equipping teachers with actionable strategies directly applicable in classroom settings. Training programs could demonstrate how to connect NBS themes to existing disciplines, such as mathematics, biology, or chemistry, to facilitate broad curriculum integration. Where sustainability programs already exist, these could serve as transitioning platforms or opportunities for adoption strategies when limited funds, resources, or educator training are constraints. Impact measurement could extend

beyond participation metrics to include learning and conceptual change indicators that provide evidence of meaningful educational shifts.

Demonstrator site: Almada, Portugal

Almada Municipality's REDUNA project represents 10 years of ecological restoration along Portugal's Costa de Caparica coastline. What began as emergency response to storm damage has evolved into a holistic nature-based solution that combines coastal protection with community education.

REDUNA was initially funded through national emergency grants following coastal storm damage. At the moment, the project operates primarily through municipal investment with indirect support from EU programs like Erasmus+ that bring international volunteers. The municipality coordinates monthly volunteer activities for ongoing maintenance and expansion.

REDUNA focuses on informal education through hands-on volunteer activities. The project engagesregular volunteers from local communities, NGOs, sports clubs, and international summer programs. University partnerships provide monitoring showing dunes have grown 15 meters seaward and up to 6 meters in height.

Recent surveys reveal local residents now prefer NBS over traditional hard infrastructure. REDUNA demonstrates how sustained commitment and measurable results can transform public perception of NBS effectiveness.

Images 3 and 4. "REDUNA project at Almada"[3] , within Box 6. NBS EduWORLD demonstrator site: Almada, Portugal

- ***Example.*** The NBS EduWORLD demonstrator site in Genova, Italy successfully mapped existing school-based initiatives to assess current capacity and tailor support

[3] Images 3 and 4, photographed by Mário Estevens. Reproduced with permission and explicit approval from the author.

accordingly. Another demonstrator site, in Belgrade, Serbia found it effective to offer NBS resources as a "gift" rather than mandatory requirements, preventing additional workload stress for already busy educators while still facilitating voluntary participation. Belgrade's training experiences demonstrate that the potential for broad curriculum integration increases significantly when teachers understand how to connect NBS themes to disciplines such as mathematics, biology, or chemistry. Further, the NBS demonstrator site in Belgrade innovatively used student drawings to provide visual evidence of meaningful shifts: initial drawings of playgrounds evolved into more complex representations of gardens with animals after NBS education, reflecting a transformed understanding of nature and green space.

3.3.6. Building sustainable volunteer networks for NBS education

- ***Why?*** Environmental volunteering delivers multiple benefits, including hands-on learning, community connection, and environmental stewardship. Environmental volunteers report benefits on mental health, community connection, and environmental impact (Nuuttila, 2023). For instance, research shows that retired people find purpose, socialisation opportunities, and increased self-esteem through environmental volunteering (Chen et al., 2022), while nature therapy programs provide healing benefits for participants (Buckley and Brough, 2017; Joschko et al., 2023; O'Brien et al., 2011). However, over-reliance on volunteering creates significant sustainability challenges. The ILO (2022) warns that much NBS work occurs in informal settings heavily reliant on volunteering, which creates financial precarity that deters environmental professionals. Thus, the current systemic reliance on informal volunteering threatens NBS project viability and perpetuates inequitable access to environmental work. When projects depend entirely on unpaid labour, they become vulnerable to volunteer burnout and lack the consistent support needed for long-term success. Instead, volunteering could be approached as a learning opportunity and community engagement tool alongside adequate funding and professional support.

- ***How?*** Municipalities play a central role in making NBS volunteering meaningful and sustainable. They could establish regular volunteer activities with dedicated municipal staff for coordination, promotion, and safety. Successful volunteer management involves recognition, training, clear communication, role flexibility, and inclusive leadership. Activities could be adapted to different skill levels and community capacities. Additionally, municipalities could partner with universities to offer service-learning credits, internships, or research opportunities for students' professional development. Similarly, local policymakers could collaborate with mental health organisations to integrate environmental volunteering as a therapeutic intervention, as nature therapy programs provide healing benefits for participants (Buckley and Brough, 2017; Joschko et al., 2023; O'Brien et al., 2011). Finally, municipalities could create

pathways from volunteering to environmental employment and ensure that programs complement, rather than replace, adequate funding.

- ***Example.*** The NBS EduWORLD demonstrator site in Almada (Box 6) demonstrates this integrated approach by combining volunteer roles with professional coordination, external funding, and strategic partnerships. They adapt engagement to different age groups, with younger children focusing on planting, while older students handle protective infrastructure installation. The project leverages Erasmus+ partnerships for international volunteer exchange and maintains university collaborations for research-based activities, including field research in dunes that provides both scientific data and hands-on learning opportunities for students. This approach combines volunteer participation with professional coordination and adequate funding, creating a sustainable model where volunteering strengthens, rather than substitutes, proper resource allocation.

3.3.7. Competitions for education institutions and awards

- ***Why?*** Competitions create a participatory approach that transforms schools from passive recipients into active participants. This approach invites schools to articulate their specific needs and develop concrete implementation strategies. Research demonstrates that competitions increase student motivation and learning by engaging in experiential learning activities that develop soft skills beyond formal curriculum (Konak et al., 2025).

- ***How?*** Competition frameworks could require schools to specify not only desired NBS solutions but also curriculum integration plans and educational utilisation strategies. Municipalities or Ministries of Education could draw inspiration from innovative recognition initiatives like the **NBS School Expertise** by NBS EduWORLD in partnership with the **Scientix® STEM School Label**, which recognises schools' efforts in NBS and STEM education, but also promotes futures thinking, WSA, institutional change, stakeholder engagement, and cross-curriculum integration, among other. Operating on evidence-based submissions, the NBS School Expertise invites schools to share their good practices in NBS and STEM that illustrate their commitment to NBS education. To support this, local authorities could launch annual contests for biodiversity gardens or pollinator habitats across all education levels. Winning projects could receive implementation funding, allowing students to see their ideas realised on campuses. These projects could then act as model sites, inspiring other institutions to replicate successful initiatives. Award criteria for community-led NBS projects could include educational opportunities as mandatory components to guarantee that infrastructure investments also deliver learning outcomes. All of these initiatives can also be carried out on the national level.

- ***Examples.*** One NBS EduWORLD demonstrator site, Belgrade (Serbia), used a competition process requiring schools to describe what NBS they wanted in their schoolyards, how they envisioned using them, and how they would integrate them into their curriculum. This led to thoughtful proposals and stronger implementation commitment from participating institutions. In this context, NGOs facilitate workshops with primary schools using creative educational tools, then coordinate with private

companies and foundations to implement small-scale NBS interventions like insect hotels and community gardens based on student input.

3.3.8. Inter-sectoral collaboration and funding

- ***Why?*** Effective NBS education requires coordination between multiple municipal departments, but municipalities often struggle with cross-sectoral collaboration essential for implementing NBS. Research demonstrates that NBS implementation demands novel governance paradigms that allow cross-sectoral coordination and engagement of stakeholders beyond formal organisational structures (Mercado et al., 2024). The challenge is compounded because NBS requires interdisciplinary collaboration between diverse professionals to conduct effective implementation trials (Dunlop et al., 2024). Internal knowledge gaps create barriers to cross-departmental collaboration essential for NBS education success. Large municipalities particularly struggle to map existing environmental expertise within their organisation, leading to missed coordination opportunities.

- ***How?*** Municipalities could foster inter-sectoral partnerships by identifying and mapping relevant stakeholders who have a stake in NBS education outcomes. Engagement could be participatory, inclusive and tailored to each stakeholder group, with clear communication about shared goals, vision, and values. Successful partnerships require selecting appropriate and committed partners, ensuring adequate resources, and creating clear leadership and operational structures. The private sector could be engaged through an emphasis on mutual benefits, with industry stakeholders motivated to contribute through corporate sustainability strategies. Municipalities could proactively identify businesses likely to benefit from NBS outcomes and engage them as both beneficiaries and active contributors to educational efforts. Civil society organisations could provide community connections and volunteer networks, while universities offer research capacity and student engagement opportunities. Co-creation approaches guarantee all partners have a sense of ownership and accountability in educational initiatives, while regular monitoring and evaluation of partnership effectiveness, along with stakeholder feedback, helps maintain engagement and adapt strategies as needed.

- ***Example.*** The NBS EduWORLD demonstrator site in Almada (Box 6) demonstrates effective multi-sectoral partnership through its REDUNA coastal dune restoration project, which brought together public, private, and civil society sectors over a 10-year period. The municipality coordinated the initiative while establishing partnerships with local universities that provided scientific research and monitoring expertise. Students conducted field studies on dune growth and coastal protection effectiveness, generating credible data that validated project benefits. The project leveraged Erasmus+ funding for international volunteer exchanges and built broader European networks around coastal NBS education. Private sector engagement evolved as businesses experienced direct benefits from improved coastal protection. Restaurant owners became strong advocates after witnessing increased property values and enhanced business performance, while tourism businesses integrated environmental volunteer activities into their service offerings.

3.3.9. Promoting learning through NBS in non-formal education

- ***Why?*** NBS education should not rely solely on formal educational institutions, as this creates bottlenecks and leads to missed opportunities for broader community engagement. Research demonstrates that environmental education programs documenting direct impacts require collaboration with scientists, resource managers, and community organisations rather than operating in isolation (Ardoin, Bowers, and Gaillard, 2020). Community-based learning initiatives provide opportunities for raising environmental awareness and behavioural change (Oe, Yamaoka, and Ochiai, 2022). Nature-based learning encompasses knowledge acquisition across informal, non-formal, and formal settings, occurring with varying degrees of guidance across diverse environments (Jordan and Chawla, 2019). However, there is some recognition that there are identified overlaps between the three modes of formality, with non-formal learning often exhibited as a blend formal and informal learning characteristics (Johnson and Majewska, 2023). Though they are different methodologies non-formal and informal learning are often treated as interchangeable. The experience of Offaly County (Box 5) demonstrates how municipal staff training creates powerful multiplier effects, as the systematic training of 500 municipal employees led to knowledge transfer to broader populations through their regular work activities. Additionally, as several NBS EduWORLD demonstrator sites reported, teachers often work as unpaid volunteers when engaging in NBS activities beyond regular curriculum requirements, which highlights the need for alternative educational pathways to reduce this burden.

- ***How?*** Municipalities could begin by investing in diverse educational actors beyond schools, recognising that systematic internal capacity building creates sustainable knowledge transfer. Tailored training to different professional audiences proves effective: technical sessions for engineers and architects could focus on implementation details and regulatory requirements, providing specific tools they could apply in projects. Broader awareness sessions for general municipal staff could cover basic NBS concepts and departmental contributions to environmental goals. This differentiated approach could result in trained employees who become knowledge multipliers within their networks. Municipalities could also build collaborative networks that avoid resource duplication and enable synergistic learning opportunities by establishing formal agreements between universities, NGOs, and schools with designated roles. NBS projects could serve as living labs for peer-to-peer municipal learning through educational visits that host delegations from other municipalities, provide technical tours, implementation workshops, and access to monitoring data.

- ***Example.*** The NBS EduWORLD demonstrator site Offaly County demonstrates how systematic training of 500 municipal employees led to knowledge transfer to broader populations through their regular work activities. The NBS EduWORLD demonstrator site in Genova, Italy established formal agreements between universities, NGOs, and schools with designated roles: universities provide scientific expertise and monitoring, NGOs contribute community engagement experience, and schools offer educational programming and youth participation. The REDUNA coastal restoration project in Almada (Box 6), hosts educational visits from other coastal municipalities, providing technical tours, implementation workshops, and access to monitoring data for peer-to-peer municipal learning.

Useful tools and resources:

- Youth Inclusion Toolkit, developed by the NBS EduWORLD, offers practical tools and case studies for local governments to engage youth in Nature-based Solutions
- Education for Climate Coalition is an online European participatory community to support teaching and learning for the green transition and sustainable development. Users can create content and start discussions, join groups, follow news, and enrol and participate in events.
- Schools as Innovation Hubs for the Green Transition Transforming schools into NBS Living Labs. This booklet provides a simplified introduction to the Whole-School Approach for integrating NBS into schools, transforming them into living labs.
- Scenarios of Plausible Futures for NBS in Education outlines the different pathways for the transformation of the schools into NBS Living Labs through the WSA. The scenarios record and highlight key drivers, uncertainties, baselines, constraints, and opportunities for nurturing NBS in education.
- NBS EduWORLD Learning Scenarios support teachers in introducing students to the benefits of NBS. The scenarios were developed during NBS EduWORLD's participation in the Scientix® STEM Discovery Campaigns 2023-2025, which encouraged educators to create innovative STEM-related activities and share best practices with the global NBS and Scientix communities.
- Study on School Learning Environments for Sustainability in EU Member States – toolkit – provides practical guidance on how to make education infrastructure and learning environments more sustainable and supportive of the development of sustainability competences, student health, well-being and learning.
- NBS Learning activities for non-formal educators is an online booklet that has been designed to help educators, instructors, and trainers in non-formal education context to bring the topic of NBS to children and youth through structured and engaging approaches.

Box 7. Useful tools and resources

3.4. Mainstreaming NBS across policy domains

While education, biodiversity and ecosystem restoration policies are the most direct avenues for advancing NBS education, the transformative potential of NBS extends beyond these fields. Embedding NBS education across a wider range of policy domains could significantly enhance public understanding, workforce readiness, and cross-sectoral collaboration in tackling climate and ecological challenges. This chapter explores how government policies could support other sectors to act as entry points for scaling up NBS education, helping to normalise sustainability and green competences across society. Mainstreaming through these additional domains both reinforces the relevance of NBS to everyday life and opens pathways to systemic change. Below are outlined policy domains relevant for advancing NBS education and further integrating NBS in these sectors to provide a consistent message, along with practical recommendations.

3.4.1. Integrating NBS education in urban planning and mobility

- ***Why?*** NBS play a significant role in urban transformation, regeneration, and green space management. NBS education in urban planning could promote behavioural change, such as altering mobility patterns and how citizens move through the city, and fostering pro-environmental behaviours. NBS education could evolve from merely built green spaces in the city to creating green areas that offer active benefits to citizens. This not only passively enhances health but also improves how citizens interact with their environment, fosters a sense of community, and develops sustainability competences. Furthermore, integrating NBS education in urban environments can help counter the common misconception that cities are artificial spaces isolated from nature. Instead, it can demonstrate that how urban areas can function as integrated socio-ecological landscapes (Kabisch, Frantzeskaki, and Hansen, 2022). Providing educational information about ecological benefits of NBS-infrastructure in cities can enhance public understanding of sustainable urban planning and mobility and create valuable nature experiences.

  Introducing NBS education into urban mobility and planning can transform cities into nature-integrated environments that foster environmental stewardship and community well-being while normalising sustainable urban living. Research shows that NBS integration can reconnect residents with nature, while promoting pro-environmental behaviours and sustainability awareness in daily urban life, which correlates with improved well-being, happiness, and social cohesion (Buijs and Jacobs, 2021). This “nature-based thinking” approach through experiential learning creates pathways for sustainable urban development by mainstreaming natural infrastructure as the standard for planning and mobility design (Randrup et al., 2020). Successful implementation requires thoughtful design elements that signal intentionality and care, helping residents recognise the purposeful benefits of nature-integrated mobility infrastructure even when it differs from traditional aesthetics, ultimately fostering community attachment and appreciation for urban ecological systems (Kabisch, Frantzeskaki, and Hansen, 2022).

- ***How?*** Active and participatory knowledge creation through transdisciplinary citizen engagement is essential for successful NBS integration in urban transitions. Active

citizen participation can include urban experimentation in living labs, city-to-city knowledge exchanges, citizen science projects, collaborative walks and field excursions, and interactive workshops fostering dialogue and awareness (Kabisch, Frantzeskaki, and Hansen, 2022). Planning and implementation processes must prioritise mutual and inclusive learning approaches, incorporating citizens' concerns, preferences, and cultural values. This allows communities to actively shape NBS design, by expressing their aesthetic and functional visions, while planners simultaneously expand their understanding of local needs. It also requires balancing subjective community values, uses, and beliefs, ensuring that NBS education becomes a collaborative, culturally sensitive practice that empowers citizens as active participants in creating sustainable urban environments (Beumer and Martens, 2015). For NBS to be mainstreamed in cities, infrastructure students and professionals from engineering, architecture, or planning who are co-leading the transition need to have received appropriate training (Davies and Lafortezza, 2019).

Another strategy is to move beyond traditional urban planning to a comprehensive urban nature planning, embracing a broader focus on biodiversity and NBS. Furthermore, local policymakers could offer incentives for partnerships between protected area managers, local schools, and community organisations or NGOs to develop place-specific curricula that combine NBS science with local cultural heritage, environmental history, and traditional knowledge systems, ensuring that urban communities become both guardians and beneficiaries of the urban landscape's natural and cultural capital. Green infrastructure in transport, such as green corridors and vegetated noise barriers, could become unique learning opportunities that could then be integrated into awareness campaigns or urban mobility strategies. While most of the discussion focuses on urban areas, a specific focus is needed for coastal areas.

- ***Example.*** The REGreen project successfully deployed Interactive Walkable Floor Maps (IWFs) in three European cities to enhance nature-based solutions education in urban mobility and planning contexts. Large-scale tactile maps were offered to local government departments as dialogue platforms, bringing together policymakers from environmental, planning, education and social work sectors, children, teachers, and stakeholders to explore NBS opportunities and implementation challenges collaboratively. During educational and policy workshops, the IWFs enabled participants to walk on high-resolution urban maps physically, pinpointing mobility constraints and green infrastructure opportunities while fostering cross-sectoral dialogue that traditional tools cannot achieve. The visual-kinaesthetic learning approach allowed stakeholders to spatially contextualise discussions about urban mobility solutions, identify connectivity barriers, and explore multi-functional NBS interventions. This innovative method proved particularly effective in breaking down policy silos, integrating perspectives of young people, and stimulating "outside the box" thinking about sustainable urban futures (Elze et al., n.d.).

3.4.2. Mainstreaming NBS education in agriculture, fisheries and rural development

- ***Why?*** Agriculture, Forestry, and Other Land Use (AFOLU) accounts for 18,4% of global greenhouse gas emissions directly, with the food system as a whole accounting for

around one-quarter of global emissions when including processing, packaging, transport, and retail (FAO, 2024). NBS in agriculture are cost-effective and long-term approaches improving biodiversity, land and water management, enhancing resilience, and mitigating climate change (Miralles-Wilhelm, 2023). At the same time, NBS offer nature restoration benefits as well as benefits to health, quality of soil and food security (Simelton et al., 2021). Promoting NBS education can help to adopt more sustainable, and nature focussed practices in agriculture. Effective NBS outreach initiatives can be tailored to local contexts by identifying influential community leaders, understanding diverse stakeholder motivations, and utilising established communication networks (Naumann et al., 2023). Successful NBS education campaigns engage multiple audiences, from individual consumers and agricultural producers to large-scale agribusiness operations through targeted messaging emphasising collective environmental benefits and individual economic advantages, including enhanced productivity and profit potential from nature-based solution adoption (Iseman and Miralles-Wilhelm, 2021).

Similarly, in the fisheries sector, the sustainable management of coastal and inland ecosystems is central to long-term food security and marine biodiversity. Mangrove restoration, marine protected areas, and sustainable aquaculture techniques provide co-benefits for fish populations, carbon sequestration, and coastal protection (Mekonen, Taddese, and Mingist, 2025). Educating fishers and aquaculture practitioners in ecosystem-based fisheries management, low-impact harvesting, and habitat restoration is essential to realising the full value of NBS in the blue economy.

- ***How?*** In 2020, 17 million people worked in the agriculture sector. Regarding training, 72% of farm managers solely have practical experience, with just 10% having completed training (2-year courses or universities) (Eurostat, 2022). The demand for reduced environmental footprint, animal welfare and social aspects along with the shortage of skills is one of the major challenges for agriculture (OECD, 2023). NBS education could address these environmental demands and could be integrated into agricultural curricula through modules on agroecology, regenerative farming, contextualised natural resource management, and landscape restoration, ensuring students are equipped to address food security, climate resilience, water management and ecosystem preservation. Agricultural education programs could test and demonstrate transformative solutions for increasing the climate resilience of the agriculture and forestry sectors. Vocational training in rural areas could focus on ecosystem services, sustainable land management, and nature-based approaches to pest control and soil health. Extension services can incorporate NBS demonstration sites that serve as outdoor classrooms for farmers and agricultural students, helping to avoid potential flood and drought damage to agricultural crops and forests through practical NBS education and knowledge generation. In addition, a survey among agriculture stakeholders identified their need for digital skills, soft skills and business skills (Ramalho Ribeiro et al., 2023).

  In parallel, vocational and higher education institutions in coastal and freshwater regions could introduce NBS-related modules into fisheries and marine science programmes. Knowledge and skills in topics, such as sustainable aquaculture design,

ecosystem-based fisheries management, seaweed cultivation, and restoration of blue carbon habitats (e.g. seagrass beds, oyster reefs), could strengthen local economies, while enhancing biodiversity and climate resilience.

To integrate NBS education into agriculture, comprehensive financial support mechanisms can be established to address the initial investment barriers farmers face, particularly smallholders. Limited access to financial capital may hinder the adoption of more sustainable practices. At the same time, NBS practices – such as precision farming, regenerative, agriculture, agroforestry, aquaculture or cover cropping – require technical skills, access to technology and specialised knowledge. Hence, this integration requires creating targeted funding programs, a constructive regulatory environment, guarantees, subsidies, and de-risked accessible credit schemes designed explicitly for NBS implementation (Brasil-leigh et al., 2024). These schemes should be coupled with training that equips farmers with the specialised knowledge needed to manage ecological systems effectively, notably in rural areas. Similarly, funding mechanisms could be extended to support small-scale fisheries and aquaculture enterprises in transitioning to nature-based models, including incentives for habitat restoration, sustainable gear use, and participation in community-based marine conservation efforts.

Policy frameworks can mandate the development of farmer education centres and extension services that provide ongoing support for sustainable practices, while investing in rural technological infrastructure that enables the adoption of precision agriculture tools, drones, and data analytics systems. Furthermore, policies could facilitate the adaptation of emerging technologies to local agricultural contexts through research and development programs, ensuring that NBS education encompasses both traditional ecological knowledge and modern technological solutions. In the fisheries context, this includes investing in marine monitoring technologies, local knowledge-sharing systems, and cooperative governance structures that enhance ecosystem stewardship.

This integrated approach requires cross-sectoral coordination and collaboration between agricultural, economics & industry, environmental, science & technology, and education ministries to create enabling conditions that maximise ecological and socio-economic outcomes, ultimately fostering sustainable farming systems that contribute to long-term resilience (Nassary, 2025). Including fisheries Ministries and blue economy strategies in these efforts would ensure that marine and freshwater NBS receive equal attention in green and blue transition planning.

To leverage NBS education for rural development in agriculture and nature sites (i.e. parks, gardens, reserves), policymakers could create comprehensive place-based learning frameworks that transform protected or restored areas, and Natura 2000 sites into living laboratories for community education and economic development. This integration requires creating educational infrastructure within these potential demonstration sites that showcase local ecological restoration projects, traditional land management practices, and contemporary NBS implementations, alongside innovative agricultural practices and potential technological advances. Presenting alternative farming practice and innovative land and ecosystem management practices that could

be adopted or adapted to traditional regional agricultural systems providing both an educational and practical experiential opportunity. Similarly, coastal and inland aquatic areas, such as restored wetlands, estuaries, or marine parks, could become blue NBS demonstration sites, offering opportunities for experiential education on integrated land-sea management, sustainable aquaculture, and habitat conservation.

Creating policy-initiated education programs that train farmers as NBS educators and guides can provide local 'champions' and sustainable off-farm employment opportunities. Similar to cultural routes, regional NBS rural learning networks could be established for communities and farmers to share knowledge about local ecosystem management, traditional ecological and integrative farming practices, and innovative restoration techniques through mobile learning platforms or interactive interpretation points. These networks could be expanded to include fishers and aquaculture workers, promoting intersectoral knowledge exchange across land and sea and enhancing coastal resilience. This approach could enable knowledge exchange while strengthening local identity and economic resilience through government initiatives and locally supported NBS-informed rural development strategies.

3.4.3. Aligning NBS education with the economy and business

- ***Why?*** The economic dimension of Nature-Based Solutions (NBS) has gained growing attention in recent years, particularly regarding their contribution to local development, employment, and business innovation, along with a better understanding of their economic potential and return on investment (González-García et al., 2025). However, despite their potential, NBS remain under-valued in conventional economic frameworks, in part because their benefits – such as ecosystem restoration, mental health gains, or flood mitigation – are not easily monetised (Konijnendijk, Di Cagno, and Borelli, 2023; Brasil-leigh et al., 2024; Somarakis, Stagakis, and Chrysoulakis, 2019). This also extends to the labour behind NBS. As the International Labour Organization (2022) highlights, much of the work in NBS currently takes place in informal or voluntary settings, often lacking proper contracts, stable income, or long-term prospects. This reality can make NBS careers appear financially precarious, outside financial and investment markets and deter students from pursuing studies or professional training related to green and blue infrastructure, ecological restoration, or sustainable land management.

  Additionally, Nature-Based Enterprises (NBEs), which are businesses that plan, implement, or maintain NBS, hold significant promise for job creation and local economic resilience. These enterprises include design firms, nurseries, landscape companies, or social cooperatives involved in urban greening, wetland restoration, or agroecological projects. However, further development of NBEs depends not only on demand, regulation and supportive government policies, but also on education and awareness. Many aspiring entrepreneurs and students remain unaware of these opportunities or lack the skills needed to develop successful business models around NBS. Promoting NBS education in both vocational and higher education settings is essential to equip future professionals and innovators with the skills, knowledge, and mindset needed to lead in this growing field.

- ***How?*** Further development of NBEs depends on increased awareness and integrating NBS into relevant policies or economic instruments, such as green public procurement, ecosystem services payments, and tax incentives for green infrastructure investments. Networking, university collaborations, education and training are all shown to be enabling factors to successfully uptake NBEs (McQuaid et al., 2021). Investing in teams, educating investors, piloting new approaches to blended finance, and fostering entrepreneurial skills could all be supported through nature-based innovation incubators and hackathons in higher education institutions. By combining ecological knowledge with business development skills, these initiatives could accelerate the wider adoption and implementation of NBS.

  Strengthening the economic value of NBS requires targeted economic and employment policies that formalise and support the sector. Integrating NBS into green jobs strategies, national employment plans, and just transition frameworks could help recognise and professionalise NBS-related work. Establishing standardised job classifications and certification schemes for NBS-related roles (e.g. ecological restoration, green infrastructure maintenance) would improve visibility, working conditions, and access to training. Green career guidance could be developed through materials and platforms that inform students and jobseekers about opportunities in the NBS sector, from NBEs to roles in municipal greening projects or nature-based tourism.

  Public authorities could further stimulate demand by embedding NBS into green public procurement criteria and providing tax incentives, subsidies, or performance-based payments for enterprises delivering measurable environmental benefits. Lastly, including NBS in labour market forecasting and skills intelligence systems could ensure training pathways align with future employment needs, helping to unlock job creation and economic resilience through nature-positive investment.

  Finally, NBS education could be embedded into economic and workforce development strategies, and Member States could help professionalise the NBS sector, improve the quality and security of green jobs, and expand the pool of skilled practitioners ready to lead Europe's green transition. For further guidance on how to achieve these goals and link higher education and industry, please refer to the **NBS EduWORLD Higher Education and Entrepreneurship Architecture Report.**

3.4.4. NBS education through promotion of health and wellbeing

- ***Why?*** Research shows that NBS contribute to human health and wellbeing in a number of ways: they protect the basic necessities of life (such as fresh water), prevent healthy populations from disease (e.g., ensuring sustainable agriculture), address issues for people exposed to specific risks (e.g., such climate risks as floods or heatwaves), and help treat health conditions (such as through nature-based therapy programmes) (WHO, 2025). There is strong evidence for the capacity of NBS to decrease stress and promote faster recovery from psychological events, as well encourage greater physical activity, all contributing to community well-being (Kolokotsa et al., 2020). Although public health professionals and medics are very well positioned to advocate for NBS, they are often ill-equipped to do so. A global survey of health professionals showed that almost ¾ of them think that the *current general education of students/researchers*

on climate change and health in their country is **not** *sufficient to lead to lasting behavioural changes* (Filho et al., 2024). In addition, even when the NBS benefits to health and wellbeing are well understood, the disconnect between public policy and health departments can pose significant barriers to change occurring on the ground. Research has shown that bureaucracies and different levels of government may function as a barrier to NBS integration with health departments – if it functions on the national level, it may be challenging to integrate its work within the municipal NBS policies (Kauark-Fontes, Marchetti, and Salbitano, 2023).

- ***How?*** Education and training could bridge the gap between environmental sustainability and public health practice. This includes rethinking how NBS are integrated into medical and public health education, and how health-related institutions and professionals are equipped to advocate for and implement nature-based approaches. One promising pathway is mainstreaming NBS awareness and training into health professional curricula, not only for medical students, but also for nurses, social workers, urban health planners, and public health officials. Modules on the health co-benefits of green infrastructure, exposure to biodiversity, and climate adaptation strategies (e.g., heat-mitigating green spaces) could be integrated into both undergraduate and continuing professional education.

  Another key strategy is to engage health sector institutions (hospitals, clinics, health insurers) as direct users and champions of NBS. This could involve health organisations supporting local NBS projects (e.g., hospital gardens, green prescriptions), co-financing green urban infrastructure, or collaborating with municipalities to develop therapeutic landscapes accessible to vulnerable populations. Educational campaigns co-delivered by local health providers and environmental actors could also help build trust and awareness of the benefits of nature exposure, especially in low-income or marginalised communities.

  At the community level, public health campaigns and local wellbeing programmes provide a powerful channel for NBS education. Public engagement tools, such as participatory mapping of healing landscapes, co-creation of green walking routes, or guided nature therapy sessions, could also serve dual purposes: improving public health and building ecological awareness.

  Finally, evidence-based advocacy and cross-sector policy learning are essential. Including health authorities in urban greening and climate adaptation planning processes is critical to ensure NBS are recognised as part of mainstream preventive and mental health strategies, not just environmental or planning interventions. Similarly, engaging medical professionals in urban planning processes and related research could inform the way NBS are designed and used to increase their benefits.

- **Examples**. One successful Higher Education case is the Charité - Universitätsmedizin Berlin, which was the first to ever establish a Professorship for Climate Change and Health in any German medical school (Charité – Universitätsmedizin Berlin, 2019). This programme piloted sustainability and planetary health modules that explore the role of green spaces and ecosystem restoration in improving mental and physical health outcomes, effectively preparing future medical professionals to be advocates of NBS.

Another good example of the intersection of NBS, education and health is the UK's Toolkit for Green Social Prescribing, developed by the National Health Service (NHS). It provides systemic guidance to health professionals, institutions, and policymakers on how to support people to engage in nature-based interventions and activities to improve their mental health.

3.4.5. Mainstreaming NBS education through tourism and cultural heritage

- ***Why?*** Cultural tourism could transform heritage sites into powerful classrooms for NBS education. Most heritage sites have the potential to build environmental competences among their millions of annual visitors. Research demonstrates that narrative-based learning in historical contexts significantly increases retention of environmental concepts (Ardoin, Bowers, and Gaillard, 2020). Heritage sites already excel at place-based pedagogy, since they anchor abstract concepts in tangible, local example. Despite heritage interpretation traditionally focusing on historical narratives, there are diverse opportunities to connect these stories with contemporary sustainability education. This aligns with UNESCO's call for heritage sites to contribute to SDG implementation. Heritage professionals possess storytelling expertise that could provide environmental educators with accessible entry points for diverse learners. However, limited coordination between tourism and education Ministries can leave heritage sites without the resources needed to develop NBS learning programs

- **How?** This could be supported through joint heritage-education funding streams that incentivise NBS learning integration at cultural sites. Ministries of Culture and Education could create "Heritage Learning Labs" where school groups use historic sites to meet curriculum requirements in science, history, and sustainability. For instance, students studying water cycles could conduct field investigations at Roman aqueduct sites, measuring flow rates and mapping watershed connections to learn how ancient engineers worked with natural systems. Assessment could include portfolio projects where students design modern NBS inspired by historical examples. This approach could simultaneously address teachers' need for curriculum-aligned field trip destinations and help heritage sites diversify revenue through alternative educational programming.

  "Living Heritage Demonstration Sites" can allow visitors to participate in maintaining historic NBS systems. For example, agricultural heritage sites could offer hands-on workshops in traditional terracing techniques that prevent erosion and support biodiversity. Participants would learn by doing, through rebuilding dry stone walls, managing traditional irrigation channels, or maintaining historic orchards. These programs could issue micro-credentials recognized by vocational training systems, allowing tourists to gain practical NBS skills during holidays. Revenue from these educational experiences could fund ongoing conservation work, creating self-sustaining education-conservation cycles.

  NBS learning could also be integrated into existing cultural routes and networks. The Council of Europe's Cultural Routes (like the Camino de Santiago or Via Francigena) could add NBS education modules to their accreditation criteria. Pilgrims and hikers would encounter interpretation points explaining how medieval hospitals managed

waste water, how monastery forests provided ecosystem services, or how traditional agricultural practices maintained soil health. Mobile apps could offer self-guided NBS learning challenges with badges for completing educational activities at different sites. This gamified approach could strongly appeal to younger travellers and create informal learning networks across borders.

- ***Examples.*** The Ataria Interpretation Centre at the Salburua Wetlands in Vitoria-Gasteiz, Spain, demonstrates successful integration of heritage conservation and NBS education (Vitoria Gasteiz, 2025). The centre welcomed approximately 100,000 visitors in its first year, including many school groups who learn how restored wetland ecosystems provide urban cooling, support biodiversity, and improve water management. Students participate in guided tours and hands-on activities such as wildlife observation and ecosystem monitoring. Educator feedback indicates increased student engagement and understanding of wetland conservation compared to traditional classroom instruction. The programme's funding through public grants and visitor admissions supports ongoing habitat restoration and full-time educational staff.

4. Conclusions

The NBS EduWORLD project has demonstrated that Nature-based Solutions (NBS) can serve as powerful vehicles for sustainability education, connecting learners with their environments while fostering competences for a green transition. Over three years, the project combined research, experimentation, and stakeholder engagement to generate practical tools and policy insights. This chapter brings together the project's key policy takeaways: it first identifies persistent challenges to scaling NBS education across Europe, before outlining strategic directions for future action. The aim is to support policymakers and practitioners in embedding NBS more deeply into education systems, helping ensure that nature-based learning is not an exception but a norm in building more sustainable, resilient, and equitable societies.

4.1. Present and future challenges for scaling NBS

Despite increasing momentum and the successful outputs of NBS EduWORLD, project partners and interested stakeholders – such as workshop and event participants, benefactors and users of project outputs (including educators, policymakers, and NBS experts) – have consistently identified similar barriers and challenges to advancing NBS education across Europe. Among these are:

- **Policy gaps and inconsistencies.** While the EU policy landscape, particularly through the European Green Deal, the EU's Biodiversity Strategy, and the Council Recommendation on Learning for Sustainability, provide an enabling framework, the integration of NBS into national education systems remains fragmented. Although Member States demonstrate an overarching commitment to the SDGs and sustainability as a whole, the delivery of specific NBS options or an explicit link between NBS and education in national or regional strategies is lacking. Nor did our research identify successful examples of multi-level governance in relation to NBS education. Most cases of policy initiatives were emerging at the local level, often as a result of

bottom-up approaches supported by civil society actors rather than a coordinated effort from above.

- **Funding constraints.** Local actors, particularly schools and municipalities, struggle to secure the resources needed to develop and maintain NBS-based educational initiatives. Time-limited project funding is often insufficient to embed NBS education in a lasting, systemic way, therefore, many successful initiatives end with the funding cycle. Implementation of demonstration projects and educational NBS schemes can be limited due to the time necessary for natural solutions to reach maturity.

- **Capacity and know-how.** Educators often express strong interest in teaching through NBS but lack the training, tools, or support to do so effectively. Institutions are also likewise unable to provide either time, expertise or funding to support the transition to NBS education while adopting transformative educational models. As learning shifts to more interdisciplinary, outdoor, and place-based formats, traditional teaching models, school structures and educator training are slow to adapt. This also applies to municipality-run efforts – the project experience shows that even when NBS initiatives are desired, a common challenge is either a lack of in-house expertise to design or manage projects (such as ecologists, green procurement experts), or lack of external expertise to fund, build and maintain NBS.

- **Low public awareness.** While NBS are increasingly visible in policy and planning discussions, the term “NBS” and its practices remain unfamiliar to much of the wider public. Without broader understanding, the ability of communities to engage with or support NBS education is limited.

These are not isolated issues; rather, they form an interconnected web of challenges that require coordinated, cross-sectoral responses. The policy recommendations offered in this report aim to address this through enhancing institutional capacity, improving coherence between EU and national frameworks, promoting lifelong learning, and supporting educators delivering sustainability education on the ground.

While the NBS education field continues to develop, new challenges are already reshaping the policy landscape. Among them, two stand out:

- **Digital and technological focus.** In EU discourse and funding priorities, a growing emphasis on artificial intelligence, digital transformation, and education technology risks diverting attention and funding from nature-based and experiential education. While digital tools can complement and enhance sustainability learning, there is a risk that **over-emphasis on technology** may sideline place-based, hands-on approaches like NBS education. The digital transition must not replace the green transition but rather be integrated with it in ways that reinforce ecological literacy and local agency. **NBS education is not a counterpoint to digitalisation, but a necessary complement**, offering low-tech, relational learning experiences that digital tools cannot replace.

- **Shifting political priorities.** The European Commission’s priorities for the 2024-2029 institutional cycle focus more strongly on economic competitiveness, security, and

crisis preparedness. Political analysts and climate change experts have raised concerns over what is being perceived as sidelining of the Green Deal (Moore and Härtner, 2024), with examples of funding cuts to environmental programmes (Gros and Cater, 2025) and relaxation of green rules to illustrate this trend (Gros, Guillot, and Verhelst, 2025). To some extent, terms like Green Deal and net-zero are taking on negative connotations for parts of European populations. **In the context of the "greenlash", attention to biodiversity and NBS may decline**. To maintain the relevance of NBS, the communication of their benefits will need to be tailored to correspond to these emerging priorities – e.g., NBS promotes competitiveness by building green skills and supporting innovation in sustainable urban and regional development. Similarly, NBS contribute to crisis preparedness by enhancing community resilience, health and well-being and adaptive capacity through local engagement and ecological awareness.

A key task going forward will be ensuring that NBS remains embedded in cross-sectoral strategies, particularly within educational policy and green transition agendas. Policy should anticipate these emerging tensions, **not by defending NBS in isolation, but by embedding them within broader social, economic, and educational strategies**.

4.2. From recommendations to action – what comes next

Despite progress, scaling NBS education across Europe requires continued investment, robust policy frameworks, and the political will to embed ecological learning at the heart of educational and territorial development strategies. Several areas call for further development:

- **Strengthening multi-level governance.** As visualised by the Policy Action Linkages map (**Error! Reference source not found.**), implementing NBS education effectively requires **coordinated action across all levels of governance.** EU institutions provide strategic direction, funding mechanisms, and shared frameworks; national governments adapt and integrate these into education systems; and local authorities play a critical role in implementation, partnerships, and community engagement. To move from recommendation to action, stakeholders at each level must recognise their interdependence and actively push for vertical alignment. This includes establishing **feedback loops** between local experimentation and higher-level policy, **co-creating policy with stakeholders** across levels, and **ensuring that funding, guidance, and accountability are distributed** in a way that enables sustained innovation relevant to each locale.

- **Addressing research gaps.** The research conducted for NBS EduWORLD offered some first-time insights into NBS education. For example, the Assessment Framework report (2023) offers the first overview of its kind on what competences NBS education could deliver, and how such competences may be assessed. The State-of-the-Art Report (2023) likewise delivered novel insights to the extent of NBS education across Europe. However, **expanding the evidence base could support more effective policymaking and resource allocation** in the future. For example, more evidence is needed on:

- **Longitudinal Impact Studies.** There is limited evidence on the long-term effects of NBS education on learners' sustainability competences and behaviours, career pathways, and community engagement. Longitudinal studies tracking cohorts over time would help assess both individual and systemic outcomes.
- **Evaluation of Pedagogical Methods.** While pilots demonstrate the value of living labs, outdoor projects, and interdisciplinary learning, comparative research is needed to clarify which modalities are most effective at different education levels and in differing contexts.
- **Scalability and systemic integration**. Research into institutional models and governance mechanisms that enable wider adoption across education systems and municipalities/national governments.
- **Cost Benefit and Economic Evaluation.** While the value of NBS is becoming increasingly recognised, few studies quantify the educational or economic returns of NBS-based learning, such as including nature enterprises, green jobs, or savings from ecosystem service delivery. Identifying cost-effective models will support arguments for sustainable funding.
- **Inclusion and equity**. Current knowledge is unevenly distributed, as there is much less insight into NBS education practices in coastal, rural or underserved communities. Mapping and comparing these contexts would highlight challenges and inform equitable and scalable models.
- **Comparative policy studies.** Better understanding of how national curricula, teacher training, and outdoor learning policies intersect with NBS frameworks.

➢ **Policy experimentation and learning.** As countries advance diverse approaches to Learning for Sustainability and NBS-related education, the next phase should prioritise structured **policy learning and experimentation**. This means going beyond pilot projects to systematically compare outcomes, costs, and transferability across contexts. Employing such adaptive governance could keep NBS education relevant and scalable. The EU and Member States could:

- Support **transnational peer-learning networks** for education policymakers and practitioners.
- Fund **experimental policy instruments** through Horizon Europe or Erasmus+ to test NBS education across education levels, geographies, and governance systems.
- Establish a **European observatory on NBS education**, tasked with monitoring progress, evaluating outcomes, and feeding learning into future EU policy updates (e.g. GreenComp revisions or Council Recommendations).

➢ **Capacity building and professional development.** Expanding NBS education will only be as effective as the capabilities of those delivering it. Yet, as discussed in the

chapter above, across Europe, **educators, municipal staff, and informal educators face systemic barriers**: limited time, inadequate training, and scarce opportunities for peer learning. To address this, Ministries of Education, teacher training institutions, and municipalities should co-develop **structured and funded professional development pathways**. This includes:

- **Mandatory inclusion of NBS topics** in initial teacher education and principal training programmes.
- **CPD schemes** that focus on both subject knowledge (e.g. ecosystem services, climate resilience) and pedagogical strategies for experiential, place-based learning Recognition of Prior Learning (RPL) frameworks that validate community educators' and NGO workers' experience in NBS engagement.
- **Municipal staff training modules**, so planners, green space managers, and public health officials could actively partner with educators.

Future efforts call for a culture of policy learning, experimentation, and iterative adaptation. Success will depend not only on national strategies or EU frameworks, but on how local educators, planners, and institutions are empowered to translate vision into practice. Mainstreaming NBS education is not a singular initiative, but rather a process that should remain responsive to emerging knowledge, shifting policy priorities, and the lived realities of learners and communities. The next phase will focus on embedding what works, challenging what does not, and ensuring that NBS education supports a just transition.

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Annex 1. Interview questionnaires

Local governance

Context	1. Can you describe your role in the municipality/project and how it relates to NBS? 2. How has the project promoted NBS education? How important is the education aspect to the overall project? 3. What strategies have you used to engage local communities in NBS educational activities? 4. Have you faced challenges in getting communities to participate in these activities? 5. Do you rely on grants, partnerships, or other mechanisms to support educational initiatives?
Stakeholders	6. Who are the key stakeholders involved in NBS education (e.g., schools, NGOs, businesses)? How about different departments/other public institutions? 7. What strategies were used to involve them? 8. How do you ensure effective collaboration between these stakeholders? 9. Have there been any challenges in ensuring their continuous involvement?
Challenges	10. What are the main obstacles you've encountered when trying to implement or promote NBS education? 11. How have you worked to overcome these challenges?
Monitoring	12. How do you currently measure the success of NBS educational initiatives? Can you provide examples of measured impact? 13. What would success look like for NBS education in your community? 14. How do you gather feedback from the community or participants regarding NBS education programs? 15. Have you adapted or changed any approaches based on this feedback?
Policy gaps and opportunities	16. Which policy areas / frameworks have been most aligned with your goals for NBS Education? (E.g., Urban nature pact) 17. Are there any specific policy gaps that hinder the integration of NBS education in your projects? 18. What kind of support or changes at the national or local level would help promote NBS education more effectively? 19. What advice would you give policymakers to better support NBS education? Are there any successful models or best practices you think could be scaled or replicated?

Future direction	20. Are there any approaches you've seen other projects or municipalities employ that you would like to try? 21. What do you think could be done to make NBS education more impactful in your community? 22. How do you envision the role of NBS education evolving in the next five to ten years?

National / EU-level governance

Context	1. Can you describe your role in shaping policies related to NBS, environmental education, or sustainability at the national/EU level? 2. How has your institution been involved in promoting or supporting NBS education? 3. What existing national/EU policies or frameworks currently support NBS education? 4. How do these policies align with broader sustainability and biodiversity goals?
Policy gaps and Challenges	5. What gaps (if any) do you see in existing national/EU policies regarding NBS education? 6. Are there missing legal, financial, or institutional mechanisms that should be addressed? 7. What are the main obstacles to mainstreaming NBS education at national/EU levels? 8. Do you see any barriers related to funding, governance, coordination, or public engagement?
Opportunities	9. What concrete policy measures do you think should be taken to strengthen NBS education at national/EU levels? 10. Should NBS education be integrated into existing frameworks (e.g., climate adaptation, urban planning, biodiversity policies), or should new policies be created? 11. Which policy areas could NBS education be integrated in? E.g., agriculture, health, economy, or urban planning? Do you see opportunities there? 12. Do you know of any examples of cross-sectoral collaboration that has successfully advanced NBS education? 13. Are there opportunities for embedding NBS education into national curricula or professional training programs?
Funding	14. What funding sources (e.g., national budgets, EU programs, private sector) could better support NBS education initiatives? 15. What policy actions could ensure stable and long-term funding for NBS education? 16. What role should national/EU institutions play in training educators, municipal officers, and community stakeholders on NBS education? 17. Are there specific capacity-building initiatives that you think should be prioritized?

Monitoring	18. What indicators should be used to assess the success of NBS education policies? 19. How can the effectiveness of NBS education initiatives be tracked and reported at the national/EU level?
Future direction	20. How can local-level experiences and best practices inform national/EU policies on NBS education? 21. How can national policies align with EU-level strategies to create a more cohesive approach to NBS education? 22. What EU-level initiatives or directives could better support national efforts in NBS education? 23. How can policymakers work together across borders to enhance NBS education efforts? 24. If you could recommend one policy change to strengthen NBS education, what would it be? 25. Is there anything else you'd like to add about how national and EU policies can better support NBS education?

Project partners

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