



THE COOLSCHOOLS GUIDELINES FOR SCHOOLS: HOW TO TURN YOUR SCHOOLYARD INTO A NATURE-BASED CLIMATE SHELTER



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101003758, the Spanish Research Agency (AEI), Innoviris (Brussels Capital Region), Dutch Research Council (NWO), The Research Foundation – Flanders (FWO), and Agence Nationale de la Recherche (ANR).



This publication corresponds to Deliverable D6.1 “COOLSCHOOLS Guidelines for Schools with the Core Steps to Start the Process of Becoming a Climate Shelter” from the COOLSCHOOLS project (<https://coolschools.eu/>), funded by the European Commission, the Spanish Research Agency (AEI), Innoviris (Brussels Capital Region), Dutch Research Council (NWO), The Research

Foundation – Flanders (FWO), and Agence Nationale de la Recherche (ANR). The project is coordinated by Fundació per a la Universitat Oberta de Catalunya (UOC) and co-coordinated by Vrije Universiteit Brussel (VUB). The COOLSCHOOLS project examines the transformative potential of nature-based solutions (NBS) to support the creation of nature-based climate shelters in European school environments. It assesses how nature-based climate shelters can drive social-ecological transformations towards urban sustainability, climate resilience, social justice, and quality education at multiple urban scales (from schools to metropolitan region) and translate them into practical building capacity for school communities and beyond. European Schoolnet (EUN) is the network of 30+ European Ministries of Education, based in Brussels. As a non-profit international organization, EUN aims to bring innovation in teaching and learning to its key stakeholders: Ministries of Education, schools, teachers, researchers, and industry partners. EUN is driven by its mission to support education stakeholders in Europe in the transformation of education processes for 21st century digitalized societies.

Publisher: European Schoolnet (EUN Partnership AISBL), Rue de Trèves, 61, 1040 Brussels, Belgium

Please cite this publication as: Grand-Meyer, E et al (2024) “The COOLSCHOOLS Guidelines for schools: how to turn your schoolyard into a nature-based climate shelter”, February 2024, European Schoolnet, Brussels.

Keywords: nature-based solutions, nature-based climate shelters, sustainability education, schools, green schoolyards, school transformations, greenifying, climate resilience, early childhood education, primary education, secondary education.

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EXECUTIVE SUMMARY

These Guidelines help School leaders, teachers, and community members such as parents, understand the practical steps and considerations to plan and design the transformation of the schoolyard into a nature-based climate shelter. The advice provided is based on the experience of four case-study cities (Barcelona, Brussels, Paris, Rotterdam), where municipalities have undertaken the transformation of a large number of schoolyards as part of their climate resilience strategy.

Nature-based climate shelters align with the climate adaptation and education goals of the European Union and the United Nations, and maximise the utilising of nature-based solutions (NBS), which make use of natural ecosystem services and green features to improve sustainability and living conditions in the city. The co-benefits of a nature-based climate shelter are multiple: a healthier environment for students, an enhanced learning space; a more inclusive socialisation space; support for biodiversity and strengthening climate resilience, and education benefits for understanding and enabling a sustainable future.

Planning and designing a nature-based climate shelter in a school is a co-creation activity that should include the views of all key stakeholders (school administration, students, teachers, parents, and the wider community). These Guidelines offer a range of examples, provided by the case studies, of green features and schools that have already undertaken the transformation to nature-based climate shelters. The guide offers practical recommendations for the planning and design of the green shelter, troubleshooting suggestions for tackling the common difficulties observed in the case studies, and general advice on maximising the use of the nature-based climate shelters for pedagogical purposes.



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INTRODUCTION

These Guidelines, designed for schools, are intended to help you understand the process, by which your school can be transformed into a nature-based climate shelter.

A nature-based climate shelter is a green space in a school (more specifically, its schoolyard), accessible to both students and the community, that offers shelter from the impacts of climate change, mitigation of some urban impacts of climate change, a healthier environment for the students on a daily basis, and an enhanced learning space for students to develop their cognitive skills and sustainability knowledge. Naturally, while we imagine that the opening up of the schoolyard to the community (e.g., when the school is not in session) remains the prerogative of each school, the value of providing such a space for the community during a heatwave cannot be understated.

Such transformation, initiated by the school through its leadership and administrative team, by teachers, or even by other member of the community, such as parents, is a meaningful climate adaptation that will have a long-term impact on the school and the students. The adaptation of the schoolyard will help your school and community withstand the daily impacts of climate change, improve the wellbeing and cognitive development of the students, all the while creating an enhanced learning and socialisation space.

As a transdisciplinary applied-research project, COOLSCHOOLS¹ aims to analyze the multiple co-benefits of implementing nature-based solutions (NBS) for climate adaptation, or what we call *nature-based climate shelters in school environments*. We will explore how these interventions can act as drivers of transformation at larger urban scales through an approach that puts at the centre the needs and views of children and youth.

The climate shelters envisioned and supported by the COOLSCHOOLS project utilise green transformations (the use of natural features like green spaces and trees) rather than other building transformations (such as the addition of air conditioning, or artificial shading structures, also known as “grey” transformations). This approach leverages the multiple co-benefits of nature-based solutions (NBS), in order to achieve enhanced community health and well-being. We study the different capacities and impacts resulting from the implementation of nature-based climate shelters in school environments from the perspectives of social justice, biodiversity conservation, public health, safety, inclusive governance, and quality education from schools to the metropolitan region.

COOLSCHOOLS’ practices and results aim to generate opportunities for city uptake of the nature-based climate shelters approach by other schools, neighbourhoods, and cities.

Drawing on COOLSCHOOLS’ practices and Consortium expertise, we will produce and share new evidence, tools and insights on the critical capacities that enable nature-based and inclusive transformation among local school communities, urban planners, policy makers, interested researchers, and the general public.

PURPOSE OF THE GUIDELINES AND METHODOLOGY

Design of the Guidelines

Audience

Intended to support schools in the transformation of their schoolyard into a nature-based school climate shelter, this document directly addresses **school leadership** (Heads of School, Boards of Directors, Principals, or Vice principals, Head teachers, etc.) with information and guidance about the process, key considerations and practical steps involved in the transformation of their school. The document can, however, be of use to anyone within the

¹ <https://coolschools.eu/>

school community (teacher, parent, etc.) wanting to initiate such a transformation. Nevertheless, it should be noted that the process of designing a green schoolyard will require mobilising funds and staff, along with substantial possible disruption in the use of the school playground, and therefore requires the support of the school administration.

Focus and objectives

The focus of these Guidelines is on the **planning and preparatory steps of the design process of a green schoolyard**. Therefore, the Guidelines primarily cover the steps between the *inception* of the idea of a climate shelter transformation and *the final proposal/plan* of a climate shelter.

For the following steps, that include the implementation, use, and maintenance of the climate shelter (which are unique to every case), we offer suggestions and guidance on the sustainability and maintenance of the green schoolyard, along with suggestions on possible pedagogical uses for the green space in the long term.

Content and structure

In the guidelines, you will find practical steps and information supported by scientific evidence and the experience of case studies (see section 3.2). These Guidelines are divided as follows:

Understanding Nature-based climate shelters in schools (pp. 8 to 15). What are climate shelters and what are their benefits? Why should schools endeavour to *greenify* their schoolyards? This section introduces the key health, cognitive and social benefits for students, along with the ecosystem and biodiversity benefits for nature and animals. It also introduces the potential benefits of climate shelters for local communities.

Practical steps for the planning of a green shelter, up to the writing of the final proposal for the green schoolyard (pp. 15 to 21). This includes a synthesis of the core steps and stakeholders to include in the process of planning and designing a green schoolyard. It also includes recommendations and advice on overcoming the possible challenges to creating a climate shelter, based on the testimonies of schools that have participated in the case studies and other examples across the world. To help you overcome possible challenges, we finally offer some general troubleshooting recommendations for schools.

Next steps in the process: use and maintenance of the green shelter (pp. 21 to 23). This section includes recommendations for pedagogical activities and possible uses of nature-based climate shelters for learning purposes, in addition to some key considerations and advice for the maintenance of the green space in the long term.

Sources for Content

The case studies and project research

The COOLSCHOOLS project builds and expands on the experience of four pioneer European projects² in the implementation of NBS for climate change adaptation in school environments (primary and secondary education):

- Brussels Ose le vert (2016-2023), Opération Ré-création (2021-2024)
- Barcelona Climate Shelters in schools (2018-2021), Transformem els patis (2021-onwards)
- Paris Oasis (2018-onwards)

² You can learn more about the different case studies on the COOLSCHOOLS website: <https://coolschools.eu/case-studies/>

- Rotterdam Groenblauwe Schoolpleinen (2019-onwards).

The guidance and advice provided to schools and educators in particular, is based on the experience and best practice of these four case studies, where municipalities have undertaken the transformation of a large number of schoolyards into nature-based climate shelters. The four initiatives were implemented by local governments in schools as a result of the widespread development of sustainability policies aiming to adapt cities to the future impact of climate change.

These strategies emphasise the importance of providing citizens (and in particular children) with access to urban green spaces, in line with the United Nations' Sustainable Development Goal (UN SDG) #11.7, which envisions “by 2030, to provide universal access to safe, inclusive and accessible green and public spaces, in particular for women and children, older persons and persons with disabilities” (United Nations, 2015)

External resources

To expand the knowledge built from the case studies and our project's research, the team behind the Guidelines also reviewed online materials and grey literature, exploring research databases, educational blogs, Ministries of Education websites, and other sources as to provide an understanding of nature-based climate shelters and their value for students and the communities. The additional materials reviewed provided, among other things, the possibility to explore other instances of schoolyard transformations outside of the European Union. In addition to supplying a diversity of views on nature-based climate shelters, the additional sources offer perspectives for schools outside of the urban environment.

BACKGROUND: UNDERSTANDING NATURE-BASED CLIMATE SHELTERS AND THEIR BENEFITS

In this section, we describe what nature-based climate shelters are, their benefits for the different stakeholders (e.g. students, educators, staff, community, etc.), and we discuss the reasons for school leaders and school administration to consider “greening” their schoolyards.

A Brief Introduction to Nature-based Climate Shelters and Green Transformations in Schools

As defined in the introduction of these guidelines, a nature-based climate shelter is a green space in a school (more specifically, its schoolyard) accessible to both students and the community, that offers shelter from the impacts of climate change, mitigation of some urban impacts of climate change, a healthier environment for the students on a daily basis, and an enhanced learning space for students to develop. This school transformation maximises the use of nature-based solutions in the school urban environment to support climate resilience, improved well-being and cognitive development.

NBS are defined by the European Union as: “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 service” and NBS are considered an umbrella concept covering other concepts, such as ecosystem services and green / blue infrastructure (European Commission, 2022).

Building on the definition presented above, nature-based climate shelters in schools use the ecosystem services of green features to transform schoolyards into climate-resilient environments and offer a sustainable and resilient strategy in the long term. Indeed, the resulting nature-based climate shelters in schools are co-created enabling environments for responding to climate change that ensure wellbeing, social equity, learning and inclusivity for schoolchildren, other school community members and the wider neighbourhood community of actors around school centres.



Figure 1. Example of green transformation in Parisian pre-school (C) CAUE Paris

In a very intuitive manner, introducing nature-based solutions in the urban school environment means creating green space using trees, vegetal surfaces, and soil to create shade and allow water to drain, while avoiding the absorption of heat. But it is also essential that the transformations include the creation of sensory playgrounds and environments, new socialising, and physical activity spaces. Indeed, nature-based climate shelters will only reach their full potential if they allow all students to actively engage with the schoolyard and its new features.

Putting an emphasis on education on NBS and bringing NBS to the general public, a number of projects³ from the EC have been funded in recent years that work in this field, establishing networks between various stakeholders and communities of practice for schools, organisations, initiatives, etc.



Figure 2. Example of green transformation in Rotterdam school (C) IKC the Children's Garden

³ Learn more about the range of projects on NBS here: https://rea.ec.europa.eu/funding-and-grants/horizon-europe-cluster-6-food-bioeconomy-natural-resources-agriculture-and-environment/nature-based-solutions_en

BOX 1. THE KEY DESIGN COMPONENTS OF A NATURE-BASED CLIMATE SHELTER IN SCHOOL

As we are about to see, a nature-based climate shelter in school aims to offer adaptation and mitigation of climate change on the students' environment, along with a plethora of health or cognitive benefits. It also aims to provide a new learning environment, new spaces for socialisation, and spaces for physical activity that are accessible to all students. There are some core elements that make a nature-based climate shelter in school and these elements should underpin the design principles of any schoolyard transformation.

Nature is central to the schoolyard to support wellbeing and climate change mitigation. There should be abundant vegetation and trees to create shade and cool the ground. In addition, vegetal surfaces offer new sensory experiences for the students. Water should be readily available (fountains for example) and managed carefully to help mitigate the impacts of climate change. Porous surfaces that let water permeate into the ground, or natural storage areas like temporary ponds, will help limit the risk of flooding from high precipitation. As much as possible, the solutions should be picked to prepare for both heavy rain and extreme drought.

The diversification of the areas of the schoolyard is crucial for all students to engage with the new space. The schoolyard needs to offer diverse material, facilities, educational and recreational activities, ensuring that all students feel at ease, whether they are adventurous or quiet, younger, or older, want to engage in sports or socialise, etc. It is important to keep in mind that the choice of green solution will enable different activities, for example, "school forests", where trees merge into the playground promote active play, while school gardens nurture collaboration among students.

The climate shelter promotes environmental awareness. To respect the environment and promote sustainable living, climate shelters in schools encourage low-tech solutions, such as reusing and upcycling, simple structures sourced from eco-materials, sourcing from local and participative manufacturing. The new space should aim to be a learning space for students to be in close contact with nature. Consequently, it is also important to implement solutions that will support and enhance biodiversity and let students experience the natural environment. Some examples include insect hotels, flowers that support pollinators, or fruit trees that provide food and habitat for birds and bats, etc.

Check the links below for examples of nature-based solutions for schoolyard transformations:

- Examples of measures by the *Groenblauwe Schoolpleinen* project (Rotterdam): <https://www.groenblauweschoolpleinen.nl/inspiratie-voor-maatregelen/>
- Key considerations and advice for transforming schoolyards by the *Cours Oasis* project (Paris): <https://www.caue75.fr/content/cahier-de-recommandations-oasis>
- Examples of Green-Blue-Grey measures in the *Refugis Climàtics* project (Barcelona): https://www.barcelona.cat/barcelona-pel-clima/sites/default/files/documents/mesures_escoles-refugi_v5.pdf
- Practical solutions and advice for improving schoolyards by the coordinators of the *Opération Ré-creation* project (Brussels): https://environnement.brussels/sites/default/files/user_files/guide_repenser_la_cour_de_recreation.pdf

Nature-based climate shelters in schools also align with the ambitions of the United Nations (UN), which, through its United Nations Educational, Scientific and Cultural Organisation (UNESCO) has established the Greening

Education Partnership⁴, with “greening schools” as one of the four pillars of its initiative for transformative education with the vision of working together “*From early childhood through adult education, (...) to ensure that all schools achieve green school accreditation, including teacher training and higher education institutions.*”

The Health and Cognitive Benefits of Nature-based Climate Shelters

Nature-based climate shelters play a vital role in enhancing students’ overall health and well-being by providing them with a conducive environment for learning and growth. There is no shortage of scientific evidence demonstrating the health benefits associated with the presence of nature in the daily life of individuals, and in particular children.

As elaborated in Gallez et al (under review)⁵, “exposure to NBS can lead to stress reduction (Chawla et al., 2014; Squillacioti et al., 2022; Vanaken & Danckaerts, 2018), reduced hyperactivity (Thygesen et al., 2020; Zare Sakhvidi et al., 2022), and improved concentration levels (Faber Taylor & Kuo, 2009), cognitive development (Amicone et al., 2018; Dadvand et al., 2015; de Keijzer et al., 2016; Jarvis et al., 2022; Markevych et al., 2019), and socioemotional wellbeing (Flouri et al., 2014; Pérez-del-Pulgar et al., 2021; Ward et al., 2016).”

Summarising the key benefits of students in the area of health, wellbeing, and cognitive development in the project research, we can establish that by integrating nature into school environments, nature-based climate shelters contribute to:

Improved Health and Well-being: The presence of green spaces has been linked to reduced stress levels, improved mental health, and overall well-being among students. Nature-based climate shelters offer a sanctuary where students can escape the pressures of school life and connect with nature, fostering a sense of calm and relaxation.

Encouraging Physical Activity: Nature-based climate shelters encourage physical activity and outdoor play, promoting a healthy and active lifestyle.

Supporting Cognitive Development: Exposure to natural environments has been shown to enhance cognitive functions, such as attention, concentration, and creativity. Nature-based climate shelters provide opportunities for experiential learning and exploration, stimulating students’ curiosity and critical thinking skills.

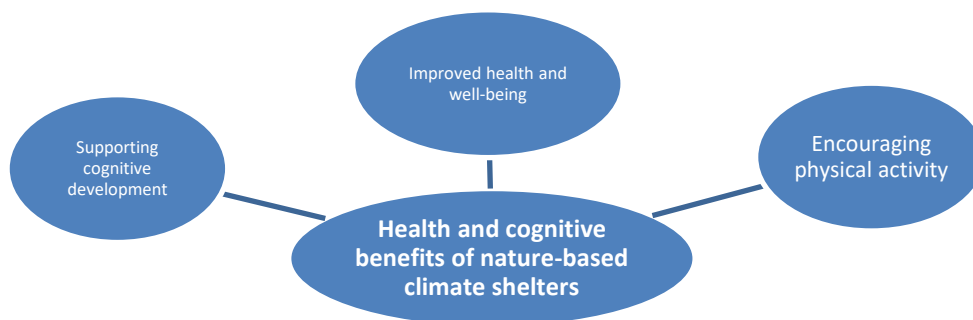


Figure 2. Health and cognitive benefits of climate shelters.

⁴ UNESCO’s Greening Education Partnership: <https://www.unesco.org/en/sustainable-development/education/greening-future>

⁵ This publication currently under review corresponds to the COOLSCHOOLS’ project Deliverable 1.1

The Environmental and Biodiversity Benefits of Nature-based Climate Shelters

The importance of urban NBS components for the environment and biodiversity has as well been highlighted in Gallez et al (under review)⁶, where it is stated that:

Urban NBS components such as green spaces in schools deliver a wide range of natural ecosystem services that regulate the urban environment. Air purification (Baró et al., 2014; Nowak et al., 2018) and urban temperature regulation (Bowler et al., 2010; Skelhorn et al., 2014) are examples of such regulating ecosystem services. Urban green spaces can mitigate water runoff during heavy rains, purify the air through pollutant uptake or deposition, and deliver aesthetic benefits as well as possibilities for recreation to urban residents (Gómez-Baggethun et al., 2013).

It can therefore be concluded that nature-based climate shelters contribute to the preservation and enhancement of the natural environment through the following key aspects:

Supporting Biodiversity: Nature-based climate shelters serve as havens for native flora and fauna, supporting biodiversity within urban ecosystems. These green spaces provide habitats for various species, contributing to the conservation of local biodiversity.

Acting as Green Connectors: Nature-based climate shelters serve as green connectors within urban landscapes, linking fragmented habitats and facilitating the movement of wildlife. By providing interconnected green spaces, nature-based climate shelters contribute to the resilience and sustainability of urban ecosystems.

Supporting Climate Resilience and Adaptation: Nature-based climate shelters play a crucial role in climate resilience by mitigating the impacts of climate change. These green spaces help regulate temperatures, reduce heat island effects⁷, and mitigate urban heat stress⁷, creating more resilient and adaptive urban environments.

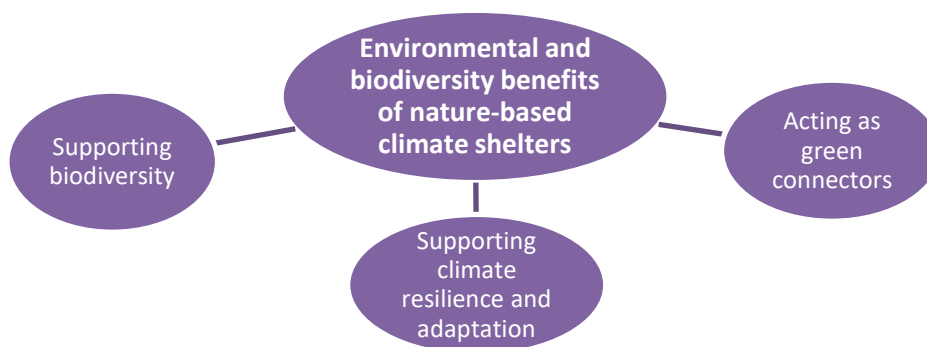


Figure 3: Environmental and biodiversity benefits of nature-based climate shelters.

The Social Benefits of Nature-based Climate Shelters

In addition to the benefits outlined above, green spaces in schools foster socialisation, social equity, and inclusion

⁶ This publication currently under review corresponds to the COOLSCHOOLS' project Deliverable 1.1

⁷ "Urban heat island effect" is the phenomenon by which temperatures are higher in urban environments compared with the surrounding rural areas. This is due to the fact the construction materials of urban structures stock and radiate heat to a higher extent than natural surfaces. This is combined with "waste heat", resulting from the increased activity in the city (industrial activities, human daily activities, etc.).

by promoting gender equality and equal access, addressing socio-economic disparities.

Gallez et al. (under review)⁸ with relation to societal benefits underscore that, “among other things, NBS can foster more frequent, diverse, and non-competitive physical activity among children (Akpınar, 2017; Dymont & Bell, 2008; Fernández-Barrés et al., 2022)”. Additionally, Sekulova & Ruiz-Mallén⁹ (in press) also emphasise that NBS encourage “social cohesion and diversified physical activity (Raney et al. 2019, Bohnert et al. 2021, Mårtensson et al. 2014, Mårtensson et al. 2014). They are also found to offer more equitable play opportunities in a way that encourages creativity (Van Dijk-Wesselius et al. 2022, Lucas and Dymont 2010).”

With this in mind, it can be understood that nature-based climate shelters contribute to social equity and inclusion by:

Encouraging Socialization: Nature-based climate shelters serve as communal gathering spaces where students can interact with their peers, fostering social bonds and collaboration.

Promoting Gender Equality and Equal Access: Nature-based climate shelters provide inclusive environments where all students, regardless of gender, can participate in outdoor activities and recreational opportunities. By breaking down gender stereotypes and barriers to access, nature-based climate shelters promote gender equality and social inclusion.

Addressing Socio-economic Disparities: Nature-based climate shelters offer equal access to green spaces for children from disadvantaged socio-economic backgrounds, providing them with opportunities for outdoor learning and recreation. By reducing barriers to access, nature-based climate shelters help bridge the socio-economic gap and promote equitable opportunities for all students.

Community Access and Social Cohesion: A common feature of nature-based climate shelters in the case studies' cities is their accessibility to the community. By opening up these green spaces to the public, nature-based climate shelters promote community engagement and social cohesion. They provide opportunities for people of all ages and backgrounds to connect with nature, fostering a sense of belonging and collective stewardship of the environment.

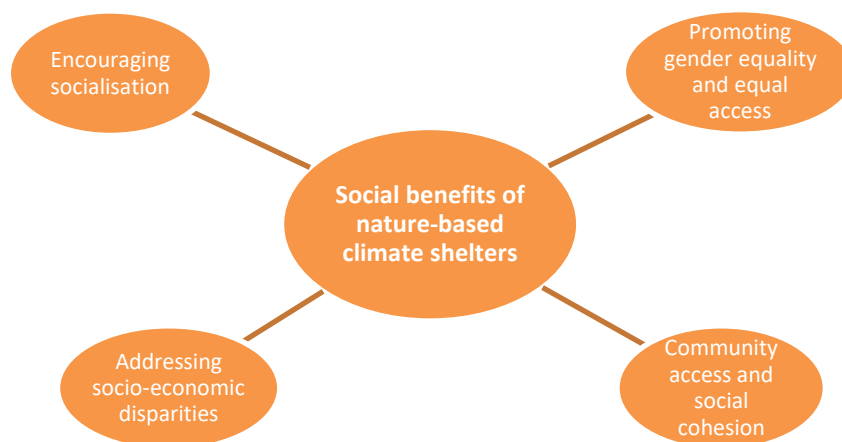


Figure 4. Social benefits of nature-based climate shelters.

⁸ This publication currently under review corresponds to the COOLSCHOOLS' project Deliverable 1.1

⁹ This publication currently under review corresponds to the COOLSCHOOLS' project Deliverable 5.1

The Education benefits of Nature-based Climate Shelters

Nature-based climate shelters offer a range of pedagogical benefits, both during the design phase and in the long-term use of green spaces.

Firstly, involving the students in the design of the nature-based climate shelter helps them understand the benefits of green features in the urban landscape, the technological and natural solutions to climate change. In addition, getting the students to contribute to the design of the green space also enables them to collaborate on a common project, discuss, empathize, and express their thoughts and reasoning.

Furthermore, NBS as a topic in itself presents the opportunity to be integrated in a variety of school subjects, such as: science, technology, engineering, mathematics, arts, etc., as well as in any cross-curriculum education programme, furthering collaboration among the different subjects as well. To date, many projects exist that explore the integration of NBS into education, using a variety of approaches and methods, which would be supported by outdoor activities, such as the planning, designing and creation of nature-based climate shelters.

In the long term, providing students and teachers/educators with direct access to urban green spaces creates learning spaces to foster quality education on climate change in thematic areas such as wellbeing, safety, biodiversity conservation, inclusive decision making and other attributes. Such green spaces can become an experimental field for outdoor education, helping students develop a range of green competences, as defined in GreenComp: The European Sustainability Competence framework.¹⁰



BOX 2. THE COOLSCHOOLS ONLINE COURSE FOR TEACHERS

To help teachers learn how to implement nature-based climate shelter interventions in the classroom with a design-thinking approach, COOLSCHOOLS has developed the online course “Nature-based Climate Shelters in Schools: Empowering Teachers for Sustainable Education”, tailored for educators interested in student-centered learning and climate change adaptation. The MOOC explores concepts like NBS, nature-based climate shelters and urban nature-based solutions and enables participants to collaborate on developing innovative classroom strategies, while also designing an action plan and peer-reviewing three others.

Explore the course here:

<https://www.europeanschoolnetacademy.eu/courses/course-v1:COOLSCHOOLS+GreenSchools+2024/about>

Figure 5. COOLSCHOOLS MOOC – Registration open.

¹⁰ https://joint-research-centre.ec.europa.eu/greencomp-european-sustainability-competence-framework_en

PRACTICAL STEPS FOR STARTING THE PROCESS OF BECOMING A NATURE-BASED CLIMATE SHELTER

The key stages of the transformation of a school into a nature-based climate shelter can be divided in three stages: **Initiation** (planning, design, troubleshooting), **Implementation**, and **Maintenance**. The main focus of these Guidelines is on the initiation phase, which is the topic of this section. The next section introduces considerations for the implementation and long-term maintenance of the green space.

These Guidelines were developed by synthesising the information contained in the guidelines, booklets, and

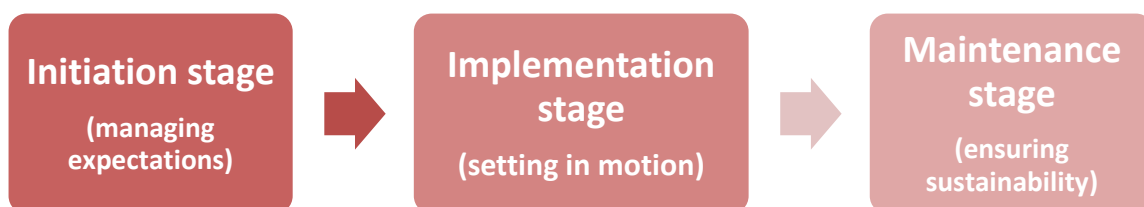


Figure 6. Stages of a school's transformation into a nature-based climate shelter

manuals produced by the case studies included in the COOLSCHOOLS project from Rotterdam (Netherlands), Paris (France), Brussels (Belgium) and Barcelona (Spain). You can explore these documents in more details if you wish to learn more about the specific greening initiatives. These documents also include information about the types of green features that can be included, about water management, and about schoolyard design¹¹.

We outline below some of the key guides and resources:

The OASIS SCHOOLYARDS Recommendation booklet for transforming schoolyards: <https://www.caue75.fr/content/cahier-de-recommandations-oasis> (Available in French, English, Spanish)

The step-by-step guide create by Springzaad (NL) following the experiences of the GREENBLUE SCHOOLYARDS initiative: <https://www.springzaad.nl/groeneschoolpleinen/stappenplan/> (Available in Dutch and English – other languages depending on web browser)

The guidelines for the construction of a green schoolyard, produced by the Institute of Infancia & Adolescencia de Barcelona, connected to the REFUGIS CLIMÀTICS A LES ESCOLES project: https://institutinfancia.cat/wp-content/uploads/2021/10/20210930_guia_cocreacio_transformem_patis.pdf (Available in Catalan only)

The manual on “Rethinking the Schoolyard”, created by the coordinators of the OSE LE VERT and OPERATION RECREATION initiatives (Brussels) : https://perspective.brussels/sites/default/files/2021-repenser_la_cour_de_recreation_cahier_feuilleroute_a4.pdf (Available in Dutch and French only)

¹¹ Some resources may not be available in English.

BOX 3. GREEN, BLUE, OR GREY TRANSFORMATIONS FOR YOUR SCHOOL?

The primary focus of the COOLSCHOOLS Guidelines is on **NBS and green transformations**, as these also maximise the environmental, pedagogical, and health gains of climate shelters, along with blue transformations, which include water features and water management considerations.

The case studies included also showcase other forms of adaptations, such as the use of innovative materials, shading structures, structures for rainwater management and recycling, air conditioning, and other structural transformations known **grey** transformations. These transformations can be of value for schools where maintaining thicker vegetation can be challenging (in hotter and more arid conditions for example).

Each of the four initiatives included in the COOLSCHOOLS project had a specific process that resulted from the initiative being led by the City councils and involving a variety of urban planners, project managers and city officials. We can easily identify the core components in the process of setting up a green transformation in a school (the last of which – “Transformation starts”, touches upon the implementation stage). These steps are outlined below:

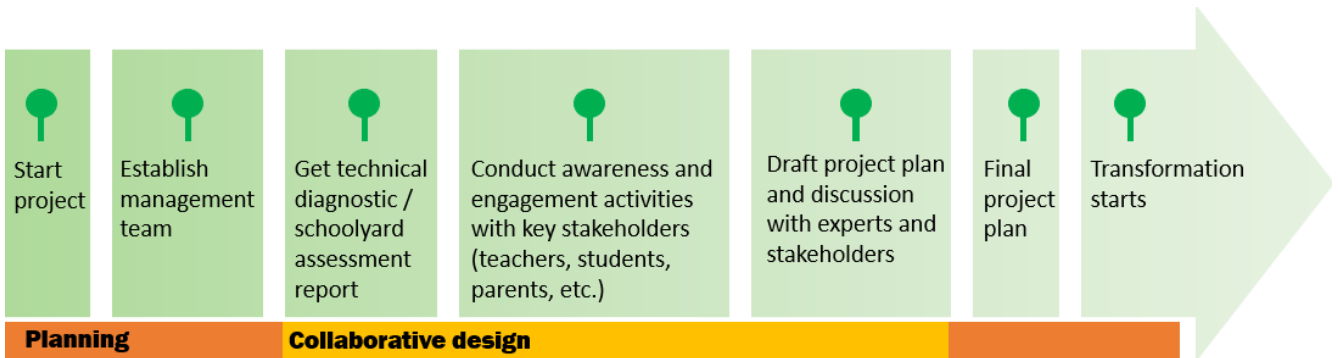


Figure 7. Steps in the process of setting up a green transformation in a school(yard)

Planning

In this sub-section, we describe the key actions included in the planning of the climate shelter. This planning should be centralised to ensure a better management approach and take the long-term perspective to ensure the sustainability of the green space. The key considerations and actions are outlined below:

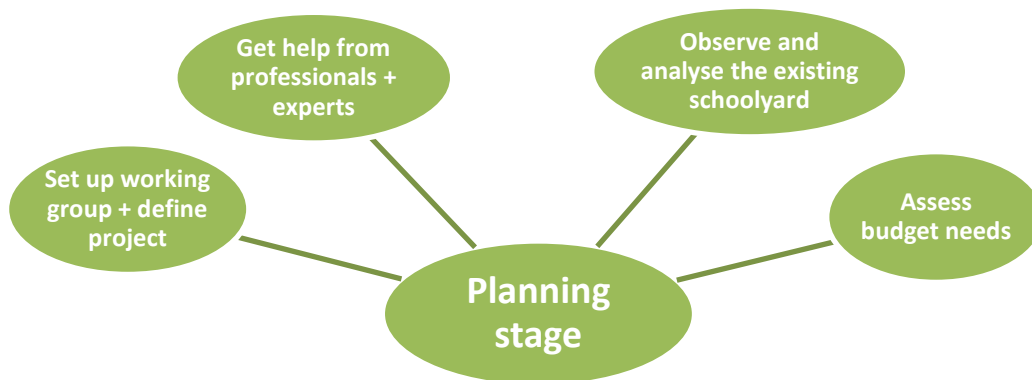


Figure 8. Key considerations and actions within the Planning stage of the Initiation phase

Set up a working group and define a common project.

At that stage, you need to determine who will be needed to make the transformation a reality. Who will manage and supervise the transformation? Who will participate in and moderate the exchange and pedagogical activities with key stakeholders? Who will oversee the budget distribution/ look for additional funding sources? The core team that will coordinate the transformation needs to be able to work collaboratively, be open to compromise, have the time necessary to work actively on the transformation, and have clearly defined roles. In addition, the core team should represent the views of the school management, teachers, students, and parents on the nature-based climate shelter.

Get help from professionals and experts.

Who are the professionals to assist in the transformation? Such a transformation will require urban planning and environmental management expertise, perhaps also landscape design expertise. Finding such expertise will not only help you to establish what is *possible*, but also to determine what is *feasible within your budget*. It is recommended, if possible, to include experts in environmental management, urban planning, landscape, traditional architecture. Professional consultancy or civil society organisations can also help with the planning of the transformation. Before reaching out to third party professionals, reach out to parents who may have relevant skills and careers, this will also help nurture their involvement in the school activities!

Observe and analyse the existing schoolyard (environment, resources, limitations, etc)

This phase can (and should, if possible) include a professional status report and assessment of the schoolyard and all the connected components. It is essential to include experts to ensure that the ideas proposed during the design phase are realistic and achievable. During this phase, you will need to assess the schoolyard and the opportunities for including green features, take stock of infrastructure and determine which can be kept, and which should be removed. It will also be valuable to assess the surroundings of the school to determine if there are green features

or sports facilities that can be exploited in addition to the schoolyard.

Assess the needs of the project in terms of budget.

Such a transformation will incur a significant cost. One of the first sources of budget may include local government initiatives. The case studies showcased in this guide for example, were initiatives of the municipalities in support of creating green spaces to adapt the city to climate change as part of their long-term climate strategies. Are there such initiatives in your area? In the case that no such program is available, another source of financial support will be needed. Organising fund raisers, seeking support from parents, local businesses, or other actors in the community can both support the fundraising effort and strengthen the relationship with the surrounding community. You might also like to check if there is any funding available for similar projects under international organisation, e.g. the European Union or other organisations at national level in your country.

Design

Before engaging in the process of transforming your schoolyard, you should get a clear idea of the possibilities, and possible challenges to the project. The first step is to understand the solutions and adaptations that exist and explore some examples of nature-based climate shelters across Europe. You can do so by referring to Box 1 in section 3.1 on the core design components of a climate shelter and by exploring the repositories of examples of schools in Box 4.

When engaging in the design phase of your nature-based climate shelter, consider the following guiding principle and suggestions:

Involve all stakeholders in the design phase.

Once the planning steps have been completed, and that the objectives, scope, and resources have been established, then comes the time to start designing the schoolyard itself! It is essential that all stakeholders be involved and consulted - these include students, their parents, teachers, and all other relevant stakeholders in the community (if you plan to open the climate shelter to all when school is not in session). It is important to remember that students will be the main users and beneficiaries of the green schoolyard.

As highlighted in the Sekulova & Ruiz-Mallén (in press)¹² “among the variety of actors engaged in green schoolyard transformations, children tend to have the least decision-making power and their petitions and positionality are frequently deemed unrealistic, and easily discounted (Rigolon et al. 2015, Kreutz et al. 2018, Zhang et al. 2021). Yet, adults are not necessarily the experts on the type of elements children will eventually play or engage with (Flax et al. 2020, Maas et al. 2014). Student involvement in the naturalization process strengthens their sense of space ownership, well-being, and learning opportunities (Rigolon 2011, Blair 2009). Involving children as decision-makers in the design of their everyday settings can even be interpreted as a process of identity-development, performed through acts of giving meaning to a space, or type of place-making (Rigolon 2011). Being the alleged ‘target’, or main beneficiary, of schoolyard greening, children stated views and visions may need thorough consideration beyond the preliminary and scoping phases (Giezen & Pellerey 2022, Muela et al. 2019, Rigolon et al., 2015)”. Additionally, the role of school staff and teachers is crucial, as they are frequently the ones who initiate the schoolyard remaking process and actively participate in all of its phases.

¹² This publication currently under review corresponds to the COOLSCHOOLS’ project Deliverable 5.1

Brainstorm ideas and collect feedback from stakeholders in a participatory and inclusive manner.

Involving the stakeholders will help you establish the needs of those who will use the shelter, therefore, the co-creation activities should create ample space to optimise their input. There are a range of stakeholder consultation and engagement activities that should be considered, such as workshops and meetings for teachers, parents and community stakeholders, or hands-on, and practical activities for the students, etc. Because the concept of a climate shelter will likely be new to the potential users, and because the scale of the transformation can make understanding and scoping the project difficult for them, it is important to showcase examples of nature-based climate shelters. It is therefore a good starting point to collect examples of such transformation and there are multiple databases of examples available through the different case studies. These examples will make the transformations more concrete, will help understand the impact of such an intervention on the day to day running of the school, and of course will provide ideas on how to achieve the objectives you have set for your schoolyard. You can find hundreds of examples of schools which have undergone transformations, along with more details about their planning processes, the type of solution they have implemented and other school specific information in the selection of databases introduced in box 4 below.

BOX 4. HOW TO FIND INSPIRATION FOR YOUR GREEN SCHOOLYARD?

You can read about the journey of hundreds of schools in the various repositories of schools created by the case studies explored in COOLSCHOOLS. Explore how other schools have changed their schoolyard, the solutions they have chosen, and how they adapted to their surroundings.

- Operation Recreation (Brussels): <https://www.bubble.brussels/operation-re-creation/>
- Cours Oasis (Paris): <https://www.observatoire-oasis.fr/>
- Groenblauwe Schoolpleinen (Rotterdam): <https://www.groenblauweschoolpleinen.nl/voorbeeldprojecten/>
- C40 Network (this document includes examples of Barcelona schools among other schools and countries from the C40 network): https://www.barcelona.cat/barcelona-pel-clima/sites/default/files/documents/ccn_cooling_schools_city_case_studies.pdf

Gather knowledge from experts and include them in your co-design process.

It is important that all stakeholders be informed about all the aspects of the nature-based climate shelter, from its benefits to possible uses, to the future needs for its long term management. In addition, it is also key to make sure that experts be involved in the process (sometimes the expertise is available within the community itself via parents, etc). Involving experts will ensure that the information is clear and communicated at an appropriate level.

Determine the objectives and key considerations for the transformation.

Define specific objectives to be supported by the schoolyard (pedagogical, social, health, biodiversity, etc), this can help establish a set of priorities and guide you towards the most appropriate transformations for your schoolyard. In addition, you can optimise the renovations and overcome some budget constraints by ensuring planned school maintenance includes climate transformations (that means including green considerations and NBS into planned maintenance, thus optimising an existing expense, rather than creating a new one).

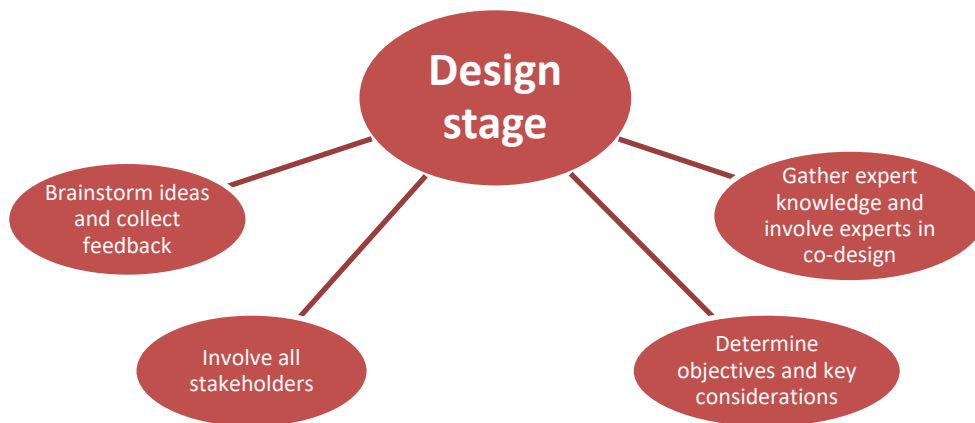


Figure 9. Key considerations and actions within the Design stage of the Initiation phase.

Troubleshooting

In this sub-section, you will find some indication of the most commonly observed challenges to the transformation of a schoolyard into a green shelter, and some troubleshooting advice to overcome them. The observations and advice provided were synthesised from academic studies, grey literature, and the testimonies from the COOLSCHOOLS case studies.

Planning and designing a nature-based climate shelter within a school environment presents various challenges that require careful consideration and proactive troubleshooting strategies. Several common challenges have been identified along with corresponding troubleshooting recommendations: limited space and resources; maintenance and sustainability; stakeholder engagement; climate and environmental factors, etc.

Common Challenges and troubleshooting tips

Challenge 1: Limited space and resources. Schools often face constraints related to limited space and financial resources when implementing nature-based climate shelters. The availability of land and funding can pose significant challenges to the design and development of green spaces within school premises.

Troubleshooting tip: Prioritize multifunctional design elements that maximize space use. Consider vertical gardening, modular seating, and collapsible structures to optimize limited space. Explore funding opportunities through grants, community partnerships, and crowdfunding platforms to supplement school budgets. (Jennings, Browning, & Rigolon, 2019)

Challenge 2: Maintenance and sustainability. Ensuring the long-term maintenance and sustainability of nature-based climate shelters can be challenging, particularly in terms of costs, resource allocation, and community engagement. Without adequate planning and support, nature-based climate shelters may deteriorate overtime, undermining their intended benefits.

Troubleshooting tip: Develop a maintenance plan with clear roles and responsibilities assigned to staff members, students, and volunteers. Implement low-maintenance landscaping and durable materials to reduce upkeep requirements. Seek assistance from local gardening clubs, environmental organizations, or parents open to assist with regular maintenance tasks. (Neudecker, Duvall, & Stutzman, 2011)



Challenge 3: Stakeholder engagement. Engaging diverse stakeholders, including school administrators, teachers, students, parents, and local communities, can be challenging due to a mismatch of priorities, interests, and levels of involvement. Parents may have concerns about the safety of the schoolyard.

Troubleshooting tip: Effective communication and collaboration are essential to gather support and consensus for nature-based climate shelter initiatives. Host stakeholder meetings and workshops to gather input, address concerns, and build consensus around the climate shelter project. Create a project advisory committee comprising representatives from diverse stakeholder groups to facilitate ongoing communication and collaboration. Utilize online platforms, such as school newsletters or social media groups, to solicit feedback and engage the broader school community (United States Fish and Wildlife Service, 2011). Most surveyed schools indicate that while they initially expected concerns from the parents regarding the safety of green schoolyards, this concern did not materialise (Urban Innovative Action, 2022.).

Challenge 4: Climate and environmental factors. Climate variability and environmental factors, such as extreme weather events, pollution, and habitat degradation, can pose risks to the viability and resilience of nature-based climate shelters. Designing climate-resilient structures and implementing adaptive management practices are crucial for managing these risks. As mentioned in Box 1, nature-based climate shelters should be designed to withstand heavy rain and extreme drought.

Troubleshooting tip: Conduct a site assessment to identify potential environmental risks and vulnerabilities, such as flooding or soil contamination. Design nature-based climate shelters with resilient features, such as drought-tolerant plants and rainwater harvesting systems, to limit climate-related impacts. Consult with local environmental agencies or climate resilience experts for guidance on adaptation strategies and best practices (United States Fish and Wildlife Service, 2011) .

NEXT STEPS IN THE PROCESS

Planning and designing a green schoolyard form only the **initial phase** of the transformation. Indeed, these steps are followed by the **implementation** of the climate shelter, that is, the structural transformation itself and the subsequent use, and of course, the short- and long-term **maintenance** of the green infrastructure.

In relation to the transformation of the schoolyard in the **implementation** phase, no particular structural advice can be given, as every school situation is unique (it will be dependent on the school buildings and users themselves). Nevertheless, it is advisable that the nature-based climate shelter be designed with the objective to be sustainable (predominantly self-sustained, if possible), and that good practices in the designing of nature-based climate shelters in similar school environments be consulted in the design process. Doing so will help you select structures and designs that are both suitable for your specific case and have been proven to work in similar circumstances.

Below, we offer some key considerations for schools with relation to the use of the nature-based climate shelter. This, in turn, sets the basis for the long-term **sustainability** and **maintenance** phase of the green schoolyard.

Assess and schedule the maintenance of the green infrastructure realistically.

One potential stakeholder group that could be engaged in the short- and long-term maintenance of your nature-based climate shelter, are parents in your school, whose children would be the largest direct beneficiary group from the nature-based climate shelter. However, you should consider that a high degree of parental involvement in the maintenance could be difficult to achieve in some cases.

Indeed, Sekulova and Ruiz-Mallen (in press)¹³ state that according to parents and families from the Case studies consulted as part of their research, “*in function of geographies and cultural codings, one strand of the literature reports relatively high parent engagement in schoolyard greening and maintenance (Ajuntament de Barcelona 2022, Hensen 2021). Others perceive families as hard to reach, or difficult to engage with the proposals launched by the school (van Nispen et al. 2014). In the study of van Dijk-Wesselius et al. (2021), while parents from schools with a green schoolyard show a lot of appreciation for their compounds, over half of them report unwillingness to help with maintenance tasks. The authors however find that parents’ motivation to get engaged through a representative committee and by means of organizing activities is relatively high, implying that fruitful collaborations may emerge when schools place less predetermined or fixed petitions. The responsive governance of naturalized schoolyards thus requires certain flexibility and innovation in approaching and engaging parents*”.

Look into opening the schoolyard to the community

There can be various arrangements with stakeholders to enable the further use of the schoolyard, not just by the students and school staff, but also by members of the community, with the objective of ensuring the long-term maintenance of the nature-based climate shelter. From targeted openings, green activities and workshops to educate the community on nature-based solutions and raise the profile of the school, to renting out the space for events and communal activities, there are many ways, through which to optimise the use of the green space. Above all, it is essential to consider the added value of opening the space to the community during heatwaves.

Optimise learning opportunities for all stakeholders and users, nurturing among other, an understanding of sustainability, nature based solutions, and biodiversity.

This includes, among other, finding ways of encouraging teachers to use the green space, but also ensuring that they are comfortable and knowledgeable in sustainability education. As clarified in Sekulova & Ruiz-Mallén (in press)¹³, there is a key connection between outdoor schooling and teacher expertise / teacher availability:

Indeed, when it comes to outdoor schooling, Zhang et al. (2021) show that nature-rich school areas translate into student awareness only when instructors actively facilitate this process. As also echoed by Hoover et al. (2021), teachers trained in environmental education are more likely to have students that spent time outdoors. Likewise, surveying tutors in six primary schools with green compounds in the Netherlands, van Dijk-Wesselius and colleagues (2020) find that the absence of outdoor expertise in formal teacher training and the associated low self-confidence in conducting classes outside, form some of the core barriers to the extensive use of natural areas for educational purposes. Marchant et al. (2019) furthermore note that teachers are often emersed in a conflict between the extra work associated with organizing outdoor classes and its lack of acknowledgement and support within school institutions. The increasing pressure and overload faced by teachers thus needs to be factored in, so that outdoor educational practice reinvigorates their professional development and inspiration to re-discover educational approaches, rather than constituting a burden. Teachers need to become facilitators of learning and guide children through open and flexible real-life, bodily experiences that connect to their abilities, needs, and interests (van Dijk-Wesselius et al. 2020).

It becomes clear that teacher training opportunities with relation to sustainability education (and NBS in particular), collaboration encouragement and support with time management would enable the educators to look into ways of implementing the nature-based climate shelters in their lessons and in this way, provide a long-lasting educational impact of the nature-based climate shelter you have created.

¹³ This publication currently under review corresponds to the COOLSCHOOLS’ project Deliverable 5.1



CONCLUDING REMARKS

By defining a nature-based climate shelter as: “a green space in a school (more specifically its schoolyard) accessible to both students and the community, that offers shelter from the impacts of climate change, mitigation of some urban impacts of climate change, a healthier environment for the students on a daily basis, and an enhanced learning space for students to develop”, these Guidelines sought to inform, inspire and support schools in their quest to turning their school(yard) into a nature-based climate shelter with the objective of providing multiple benefits for students, school staff, parents and community members alike. With key examples from case studies developed by the COOLSCHOOLS project in the cities of Barcelona, Brussels, Paris, and Rotterdam, the Guidelines provided quick and easy steps, advice and overall look at the preparation process needed to achieve the goal of greening schools.

Green transformations are gaining momentum in Europe and beyond as the impacts of climate change are becoming ever more present, and the co-benefits of such transforming become better understood. For this reason, these Guidelines offer a snapshot in time, based on the best practice of the case studies, enabling the reader to grasp easily the core elements and considerations that should be at the centre of such green initiative. But the reader should be advised that there are also multiple other resources produced daily, offering new perspectives, ideas, and examples that can help schools refine their understanding of nature-based climate shelters and find strategies that are suited to their circumstances.

Each journey toward a green transformation is unique, and an ongoing process that will continue even after the transformation has been implemented. These Guidelines, therefore, should be revisited frequently, and put in perspective of the additional resources available online and elsewhere.

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