Nature on School grounds:

for Learning, Health, and Sustainability

BECC POLICY BRIEF | 01·2024

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Green, species-rich environments enhance children's well-being and knowledge acquisition, not only by promoting health benefits associated with biodiversity but also by encouraging play and learning about nature and environmental issues. School grounds could contribute to all of this, but today remain an unexploited space for biodiversity and climate adaptation of cities. This policy brief presents the main rationale and possible measures for developing green spaces and biodiversity on school and pre-school playgrounds.

Green school grounds benefit learning, play, and health

Today, more children than ever live in urban environments, which reduces children's direct connection with nature. Consequently, the fear of nature, sometimes called "biophobia", is a growing phenomenon in society. Increased contact with wildlife, nature, and green spaces, particularly during childhood, can contribute to reversing this negative trend. Green school grounds could play a central role. Nature on school grounds can be used as a teaching resource and contribute to children's contact with animals and plants in different seasons and weather conditions. Research shows that being able to follow nature's processes in one's everyday life benefits ecological literacy, i.e., practical and experience-based understanding of how ecosystems work. Outdoor lessons on school grounds also contribute to making pupils more enthusiastic about nature, which in turn can aid education on environmental issues and promote environmentally friendly behaviour. Greener surroundings also improve children's self-discipline, concentration, and learning, which contributes to educational goals in general.

School grounds with extensive natural features and green space benefit children's learning and development in many ways. It encourages movement and social interaction by promoting varied physical activity and play using imagination, for example through loose objects such as sticks and stones, as well as children of different ages and genders playing together. Activities in natural and green environments play an important role in children's socio-emotional development, including the part linked to taking risks and pushing boun-

daries. Cognitive development, in general, also benefits from nature and green environments. Research done in primary schools shows that attention and working memory are better among children who attend schools with more greenery on the school grounds compared to schools lacking in nature. Vegetation on school grounds can also reduce levels of harmful air pollution. Such reductions, in turn, link to increased cognitive development. Children with concentration difficulties may especially benefit from nature on school grounds. Outdoor activities in nature reduce symptoms of ADHD compared to the same activities indoors or in a built-up outdoor setting.

Physical contact with nature helps prevent many of the most common lifestyle diseases by contributing to a healthy immune system in children and young people. Studies have shown that children who come into contact with nature, including its beneficial microorganisms, have a lower risk of non-contagious immune-mediated diseases such as type 1 diabetes, asthma, atopy, and allergies. By adding natural elements to children's play settings, it is possible to improve both immunoregulation and health-related microbes in children living in cities. The development of natural environments on school grounds can therefore reduce the incidence of certain common illnesses in urban populations.

The examples given above are just a few of the multiple ways in which nature contributes to human well-being and sustainable social development, something called ecosystem services or benefits of nature.

Green school grounds promote biodiversity

The current drastic loss of biodiversity is well-documented. It is largely caused by the degradation and loss of habitat because of increasingly intensive land use, agriculture, and forestry, including related problems such as eutrophication, pollution, and invasive species. School grounds are part of the built landscape and have the potential to accommodate several species and promote ecosystem services. School grounds may therefore form an important puzzle piece of the UN's Sustainable Development Goals and the goals of the Convention on Biological Diversity.

Summary:

- The positive effects that contact with nature has on children's health and development are numerous and increasingly well-documented.
- With the right planning, school grounds can contribute to increased local biodiversity and climate adaptation, as well as nature's positive effects on children's health and learning.
- Measures include securing large green spaces, preserving existing greenery, and a careful selection of plants adapted to the local ecosystem.
- In the long term, there are great opportunities to improve school grounds as an outdoor environment through increased integration in green infrastructure and planning, new methods for sustainable design and maintenance, as well as increased nature-based teaching.

Green school grounds can play a key role in restoring and increasing both the quantity and quality of green environments in cities, thus contributing to urban green infrastructure. There is also a social justice element to this: green school grounds can contribute to making access to nature and nature's benefits more equal. They therefore play a particularly important role in areas with few green spaces and in neighbourhoods where locals rarely visit nature. Green school grounds can contribute to habitats that benefit many different species, including those linked to local and regional biodiversity, which also aids ecological literacy about the ecosystems where children grow up.

School grounds can contribute to climate adaptation

Green school grounds can be one of several solutions to dealing with increasingly severe heat waves and downpours in cities as a result of climate change. Younger children are particularly affected by both heat and UV

Bild: Naturskolan i Lund, 2016

Loose natural material used during an outdoor language class.

radiation. Paved, open surfaces in playgrounds lead to warmer local microclimates and unhealthy amounts of sun exposure. More trees, shrubs, tall grass, and herbs contribute to reducing air temperatures by increasing the proportion of shaded surfaces and through evaporation from leaves. More plants and more porous surfaces help to infiltrate and slow water run-off after heavy rain. When deciding on school ground adaptations, it is crucial to consider not only climate change but also biodiversity loss. That is why green, nature-based solutions are often preferable to more technological ones. It is, however, also important to carefully choose which plant species are introduced, avoiding plants that risk becoming invasive or negatively affecting native fauna.

Several ways to make school grounds greener

Sweden has legislation that requires sufficient outdoor space for children's play and recreation at schools. According to the Swedish National Board of Housing, Building and Planning, school playgrounds are to function both as an educational environment for teaching, for breaks and activities after school, and to create the opportunity for social, mental, motor, and physical stimulation and development. School grounds could contribute to international treaties and goals on strengthening biodiversity and ecosystem services on a larger scale (such as the Convention on Biological Diversity) by viewing them as part of the green infrastructure of cities, towns, and villages by being integrated into their planning and maintenance. This is particularly relevant when it comes to the renovation or new construction of schools and playgrounds. Below is a description of what should be prioritised to create greener school grounds with biodiversity (also see the tips in Box 1).

- *Improving the quality* of existing greenery – "making green spaces greener"–is an efficient and relatively simple first step towards improving school grounds. Knowledge

of biodiversity, the need for climate adaptation, and educational activities should be integrated into this work. One way of improving quality is by adding more plants that naturally exist in the local region to link up with existing ecosystems. Where there are copses or school woodlands, understorey can be planted, or additional trees and shrubs. Where possible, lawns can be replaced with meadow plants that promote pollinating insects and bird life. Tall grass can also be retained around green spaces and playing fields. Large lawns can be replanted for play and/or make way for more varied topography. Putting up birdboxes and insect hotels is one way of both helping species and making them visible to children, provided the playground is green enough for the animals to be able to find food.

► *Adapted maintenance* of vegetation can also contribute to improving the green qualities of school grounds. By moving towards less intensive and more selective management, plants and soils can attain greater value for both play and biodiversity. Allowing a thicker layer of mulch under trees and shrubs contributes to richer insect life and, subsequently, more birds. Leaves, grass, clay, dead wood, and other elements are important both for biodiversity and for children's opportunity to get in touch with natural processes, such as food chains and the changing of the seasons. Spontaneously established herbs can be allowed to remain on the playground. These species often spread from neighbouring areas and can be considered a free addition to species diversity.

► Setting aside suitable *good land and plenty of space* for school grounds is crucial, both for creating good conditions for biodiversity and for outdoor teaching. These prerequisites are also crucial in meeting children's physical needs. The amount of space available for each child to roam in has fallen in recent times, often because additional buildings are constructed on existing playgrounds and many new school grounds are given limited outdoor space, but also because the number of children per school has been increasing.

► *Using existing vegetation* when new school buildings are built. It is particularly important for biodiversity that mature and old trees are retained and that hollow trees and dead wood stay in place where

Ten tips for improving school grounds

1. Raise the quality of existing green environments – "making green spaces greener" – through additional planting and sowing, preferably of species that grow in the wild nearby. Nesting boxes for various animals can be provided.
2. Adapt maintenance and allow more spontaneous growth ("weeds"), leaves, pinecones, dead branches, and the like on the ground.
3. Ensure a sufficiently large playground in new builds and expansions and plan for possible increases in the number of pupils and buildings.
4. Make use of existing vegetation, and take the ecological value already at the site as your starting point.
5. Establish whether there are little-used paved surfaces that could be transformed into greenery or accommodate raised planting beds.
6. Determine whether it is possible to have climbing plants and green roofs on service buildings, bike sheds, and so on.
7. Protect new plants for at least a year after planting, if possible, with a low fence that still gives the children some access to the area.
8. Hold more lessons outdoors and use the outdoor environment in several subjects, not just biology and natural history.
9. Plan, build, and maintain the playground plants with the children.
10. Together with the children, find out which plants and which species are found in the playground.

possible. Generally speaking, it is difficult to replace existing nature with new without losing biodiversity. If the existing greenery cannot be preserved, or if there is no vegetation, the new vegetation should be planted as early as possible while schools are being built so that it has time to become established before children start using the space. Newly planted vegetation may struggle to survive the pressure that results from intensive use, especially on school grounds with little space per child. It is, therefore, beneficial to preserve existing vegetation in order to promote both biodiversity and play.

► *Creating new green environments* in existing school grounds may be possible but requires particular consideration both for the limitations of the space and children's play and use. It is possible to re-evaluate the need for paved surfaces, for example parking and staging areas, and use those areas for planting instead. Large, prefabricated play equipment on paved areas can be replaced by several smaller pieces of equipment on surfaces that include vegetation. Other opportunities include climbing plants on walls and low buildings. Even if certain ecosystem services, such as temperature and water regulation, can benefit from this, such vegetation has limited value for children's experiences, however. When creating new environments, it should also be recognised that some plant species are better able to cope with the harsh conditions and specific habitats of the playground than others. In order to provide children with greater opportunities for contact with nature, working methods and ways of planting and design should therefore be developed to avoid only the hardiest plants dominating. In the long term, the aim should be to create sustainable environments with conditions good enough to accommodate native species.

► When it comes to new plantings, it is often appropriate to fence off the area for at least one growing season to ensure the establishment is successful. Over-the-top measures to restrict children's access can cause problems since it limits children's movement. Often, a simple wooden fence is sufficient, allowing the children to have some contact with the vegetation. One alternative is to provide access to other vegetation during the establishment process, such as temporary raised flowerbeds or sowing of annual seed-mixes, on existing areas or near the school grounds. This can simultaneously promote both play and the establishment of new shrubs and trees. Children's involvement in the development of green spaces on school grounds through planting, seeding, and gardening has a particular value and can contribute to both the establishment of plants and children's attachment to them.

► *Integrating the school grounds* into teaching helps to create an understanding of biodiversity and as such, raises the status of school grounds as an educational resource and an irreplaceable part of the school environment and education. Outdoor education on school grounds can satisfy various needs, be linked to themes within the curriculum, and, not least, contribute to environmental awareness and environmentally friendly behaviour in children through experiences in and of nature. Allowing children to participate in 'real' projects and in natural habitats close to school has been shown to be especially important in creating positive bonds with nature. There are several initiatives currently underway in Sweden: within the "So(w) Wild!" project, children have sown meadow flower seeds, the project Natural Nations has produced guidelines for conducting an inventory of school ground species, and through BirdLife Sweden, children can get to count birds at bird feeders and report their results.

Since many teachers are not used to conducting outdoor, biodiversity-themed lessons, initiatives to support the training of teachers and their professional development may be needed. Various stakeholders offer this kind of support, such as municipal nature schools, Sweden's botanical gardens, as well as stakeholders from higher education.

Better school grounds for the future

To promote all the aspects mentioned above, the quality, status, and use of school grounds must increase. New research and practices are needed for the outdoor environment to be integrated into teaching and the curriculum and to create working outdoor classrooms for different age groups. Educational materials adapted

for outdoor education (such as Natural Nations) already exist, but integrating them into regular teaching can be challenging. Therefore, commitment and prioritisation from school leaders can be crucial, such as allocating resources in the form of initial support from experienced nature and outdoor teaching organisations and extra staff and time in the schedule.

Knowledge on the role of school grounds in cities' and towns' green infrastructure is also needed: what kind of habitats and ecosystem services are particularly important to school grounds' multifunctionality? Development of methods is needed, for example, in design, plant selection, and management, to enable the simultaneous fulfilment of multiple objectives, such as increased biodiversity, regulation of microclimate, and better conditions for children's play and development.

It is also necessary to define the areas of responsibility and collaboration for initiating and implementing changes, as well as ensuring management and maintenance that does not inherently undermine the green and educational values of school grounds. Development often benefits from being a team effort. When school management, teachers, children, administrators, planners, parents, and others work together, the process can be much smoother. Today, the UN Convention on the Rights of the Child has been written into Swedish law. It includes focusing on children being allowed to express their opinions on matters that affect them. Assessments of the impacts on children are often highlighted in urban planning, but there are also opportunities to involve children in the design and management of school grounds. Involving children over a prolonged period and in a concrete way can lead to a more attractive and useable playground. Ongoing research projects in Sweden are studying how teachers, maintenance, and planning staff, work together to create green playgrounds (see suggested reading).

Today, only a few of the country's municipalities actively invest in developing the design of playgrounds based on biodiversity, education, and children's health and well-being. The funding of school ground greening projects, therefore, needs to increase nationally and be accessible to more municipalities and stakeholders. Making relatively simple and low-cost alterations can raise the quality of school grounds significantly. What is most often lacking is knowledge of how to do this. That is why general awareness of the issue needs to be raised.

Conclusion

Actively working with green school grounds in urban planning, management, and education can increase children's understanding of the significance of biodiversity and climate change while at the same time contributing to concrete benefits for learning and health. This work can therefore contribute to sustainable development through raised awareness, engagement, and increased well-being in the next generation's citizens and decision-makers.

Efficient maintenance should not come at the cost of green, thriving school grounds. A certain level of acceptance for biological "messiness" on school grounds is required so that maintenance does not encroach upon biodiversity or children's play and experiences. This is an educational challenge for both the administration, school management, and parents; it demands cooperation, enthusiasm, and know-how.

There is a need for research and development around how schools are located in order to obtain suitable quality land and how the biological value of school grounds can be integrated into the green infrastructure of cities and towns. In addition, the potential for using school grounds as arenas for teaching needs to be developed, for example by strengthening the role of outdoor teaching. New ways of working also need to be evaluated and developed by the professionals involved in the planning, design, and maintenance of school grounds.

It is important that all schools and students, regardless of their socio-economic situation, can enjoy the benefits that green school grounds provide. Children from families with limited access to natural areas have a particular need for contact with nature in their daily lives. Support from various administrative departments can be crucial in achieving long-term improvements that will benefit many children.

Further reading

Here, we list some key references used in this policy brief. In addition, we have based the content on a large number of published research studies

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About this policy brief

This text has been produced using the supporting documents from a BECC-funded workshop and a public event during Lund's Sustainability Week in 2023 on the theme "Biodiversity on school grounds – for learning and experiences." In addition to the authors, Joy Husham of the Learning through Landscapes Trust UK also took part in these events.

This policy brief is a contribution to the strategic research area BECC – Biodiversity and Ecosystem Services in a Changing Climate, funded by the Swedish government. The work was initiated and led by Anna S. Persson, Maria von Post, and Johan Kjellberg Jensen at Lund University.

Omslags fotografi: iStock.com/TT. | Layout och tryck: Media-Tryck, Lunds Universitet Svanenmärkt trycksak, 3041 0903

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CEC Policy brief nr 01/2024
ISBN 978-91-987132-8-2 (PDF)