

Biodiversity & Nature Connection

March 2026



CREATING MEANINGFUL EXPERIENCES

March 2026

Biodiversity & Nature Connection: Executive Summary

BUAs will create a campus where thriving ecosystems and meaningful connections to nature drive both climate action and the wellbeing of all life.

1. Why it matters

Students connected to nature experience better mental health, reduced stress, and stronger environmental engagement. Currently, half our students find campus spaces unpleasant due to poor air quality and lack of greenery. By transforming our campus into a biodiverse, nature-rich environment, we simultaneously address student wellbeing, climate action, and institutional reputation—making BUAs a recognised leader among Dutch universities in ecological campus management. As Breda pursues its 2030 goal to become Europe's most nature-rich city, BUAs can demonstrate how educational institutions contribute meaningfully to regional biodiversity goals.

2. Biodiversity and Nature Connection at BUAs

Biodiversity encompasses the variety and vitality of all living forms across ecosystems, species, and genetics, including the complexity of their interconnected relationships. We value native species as the foundation whilst recognising that carefully selected non-native species can enhance ecosystems without causing harm.

Nature connection is a meaningful cognitive, emotional and behavioural relationship with nature that recognises humans as part of ecosystems, promoting a sense of belonging, mutual wellbeing, and environmental awareness where human and ecosystem flourishing are inseparable.

3. Our ambition

BUAs aims to be a **frontrunner** in both biodiversity and nature connection. For biodiversity, this means demonstrating with scientific rigour that we support healthier ecosystems with measurably greater variety and vitality of species than comparable institutions, whilst formally including non-human voices in decision-making through Zoöp governance. For nature connection, this means demonstrating measurably stronger nature connection outcomes among our community than comparable institutions. In both areas, we will inspire other campuses by openly sharing our methods, results, and lessons learned.

4. Making it happen

We begin in 2026 with professional baseline assessments by ecologist Blom Ecologie (measuring vascular plants, birds, pollinators, and soil animals) and validated Nature Connection Index surveys for students and staff. Short-term actions create immediate visibility: implementing ecological mowing, installing wildlife infrastructure (bird boxes, bat boxes, hedgehog houses), planting flowering bulbs and wildflower meadows, and establishing outdoor restorative spaces. The Community Garden and planned food forest provide hands-on nature engagement. Long-term structural changes could include creating ecological corridors connecting our campus to the surrounding areas, installing a green roof, building a rainwater pond with nature-friendly banks, and integrating nature-inclusive design into the new Game & Tech Centre. Annual monitoring tracks measurable increases in species diversity and abundance alongside nature connection scores, with transparent public reporting demonstrating our contribution to climate-positive goals.

5. Investment

The programme requires 0.3 FTE personnel capacity in 2026 for coordination and implementation. This increases to 0.45 FTE by 2027 and so on. Because the food forest requires less attention each year, we expect the FTE to eventually decrease towards 0.35 FTE by 2029. The total costs for the implementation of the topics of Biodiversity and Nature Connection require 52,800 euros to implement. This investment in nature is an investment in our community's health, our climate commitments, and BUAs' leadership in sustainable higher education.

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1 Available information

Haskoning has advised that for BUAs, on the theme of nature, there are two major components that have influence on our ambition to become climate-positive: biodiversity and nature. Their definitions were as following:

- > **Biodiversity.** The campus is designed to enhance local natural biodiversity. Native flora that supports native fauna (insects, birds and small mammals) is selected. The natural environment on campus is also optimised for climate mitigation and adaptation.
- > **Nature.** Biophilic design is used to demonstrate and strengthen our relationship with and access to nature (reducing stress and improving cognitive functions and creativity).

Since Haskoning talks of nature in a relationship-context here, we have decided to call this component at BUAs 'nature connection' instead of simply nature. Other phrasings such as 'nature belongingness' or 'ecological belonging' might feel more at place here because we are, in fact, part of nature, belong to it, and should not be distanced from it.¹ However, there are several arguments as to why we should keep 'nature connection' as our topic name. First of all, with the use of the word 'connection', we acknowledge where we are now: disconnected. The word 'connection' recognises that the relationship has been weakened and needs intentional repair. This framing motivates action rather than assuming people already feel the belonging that objectively exists. Secondly, 'nature connection' is the scientifically used notion with validated measurement instruments, established research literature, and Dutch baseline data that allow us to track progress rigorously and compare our results with other institutions. The Nature Connection Index and related scales specifically measure the cognitive, emotional, and behavioural dimensions of the human-nature relationship we aim to strengthen. While we use the term 'nature connection' for consistency with scientific frameworks, we define it broadly at BUAs to encompass this deeper sense of belonging. We recognise ourselves as part of, rather than separate from, the natural world.

Thus, in this document we distinguish between two closely related but distinct natural elements relevant to our campus: **biodiversity** and **nature connection**.

Although these elements are closely linked, they play different roles. Biodiversity provides the foundation. From it comes the opportunity for people to develop a deeper connection with nature. Recognising this distinction allows us to address both the ecological and human dimensions of sustainability more effectively.

1.1 Foundational concepts

1.1.1 What is biodiversity?

Biodiversity refers to the variety of life forms. Biodiversity is a contraction of the words biological and diversity (Sarkar, z.d.).² It's about the variation of all living forms, from species to ecosystems and to genes and traits.³ Or more specifically we have biodiversity as:

1. Diversity in ecosystems. How many different communities of living organisms do we have? At the campus we have grasslands and a vegetable garden but also roofs and pavements.
2. Diversity in species. How many different species do we observe? At the campus we have butterflies, bees, hoverflies, but also rabbits, blackbirds and robins.
3. Diversity in genetics. How much variation is there within species? At the campus we have cabbage whites, red admirals, but also small heaths and small coppers.

However, biodiversity is also about the complexity of their ecological, evolutionary and genetic relationships. Summarising this, BUAs defines biodiversity as the following:

¹ Zoöp. (2023). Why Zoöp? Retrieved January 26, 2026, from <https://zoop.earth/en/page/459/why-zo%C3%B6p>

² Sarkar, S. (2021). Origin of the Term Biodiversity. *BioScience*, 71(9), 893. <https://doi.org/10.1093/biosci/biab071>

³ IFAD. (2024, April 11). *The three types of biodiversity: explained*. Retrieved January 6, 2026, from <https://www.ifad.org/en/w/explainers/the-three-types-of-biodiversity-explained>

Biodiversity encompasses the variety and vitality of all living forms across ecosystems, species, and genetics, including the complexity of their interconnected relationships.

For biodiversity to be accomplished we value:

- > Native species and their coevolved relationships as the foundation of local ecosystems.
- > Non-native species that enhance ecosystems without threatening native species.

More on the distinction between native and non-native species can be found in Appendix A.

Why biodiversity

Biodiversity is important because it underpins the stability and richness of life on Earth, including human life.⁴ At a basic level, biodiversity provides instrumental or external value: it supports ecosystem services we depend on, like clean air and water, pollination of crops, climate regulation, medicine, and fertile soil.⁵ These services can only exist, not because of single individual species, but because of the complex interactions among many different organisms. Without a diverse web of organisms and interactions, these life-supporting systems would collapse or become far less reliable.

But biodiversity is not only valuable because of what it does for us, it also has intrinsic value.⁶ Many philosophers argue that species and ecosystems have worth in their own right, independent of any use to humans. Just as we recognise human rights independently of utility, we can extend a similar ethical consideration to non-human life. From this view, it is wrong to destroy a species not just because it might benefit us someday, but because it represents a unique form of life, with its own role in the web of nature and its own "right" to exist. From this perspective, protecting biodiversity is an ethical obligation, not just a practical concern.

Moreover, biodiversity holds aesthetic, cultural, and moral significance.⁷ It inspires wonder, shapes cultural and spiritual identities, and prompts reflection on our responsibilities to other living beings. More on this in the chapter 'Nature connection'. All in all, we can conclude, the more we understand biodiversity's full range of values, the better we can make informed, ethical choices about conservation and environmental policy.

1.1.2 What is nature connection?

Just as biodiversity encompasses complex relationships rather than simple species counts, nature connection involves deeper psychological processes beyond mere being close to natural settings. It's about attention, engagement, and meaning developed through individual experiences with the natural world.

One can be connected to nature on three levels (separately or simultaneously)⁸:

1. **Cognitive connection.** This involves understanding our place within ecological systems rather than seeing ourselves as separate from nature. It means recognising our dependence on and impact on ecosystems and seeing ourselves as part of the natural world rather than outside observers or controllers of it.
Do we see ourselves as part of the natural world rather than being a separate entity?
2. **Emotional connection.** This encompasses the feelings and responses nature evokes in us. Many students report lower stress and greater focus after time spent outdoors.⁹

⁴ Hooper, et al. (2005). EFFECTS OF BIODIVERSITY ON ECOSYSTEM FUNCTIONING: A CONSENSUS OF CURRENT KNOWLEDGE. *Ecological Monographs*, 75(1), 3–35. <https://doi.org/10.1890/04-0922>

⁵ Correia, A. M., & Lopes, L. F. (2023). Revisiting Biodiversity and Ecosystem Functioning through the Lens of Complex Adaptive Systems. *Diversity*, 15(8), 895. <https://doi.org/10.3390/d15080895>

⁶ Brennan, A., & Lo, N. Y. S. (2021). *Environmental Ethics > Biodiversity Preservation (Stanford Encyclopedia of Philosophy)*. Retrieved January 6, 2026, from <https://plato.stanford.edu/entries/ethics-environmental/biodiversity.html>

⁷ Chan, et al. (2016). Why protect nature? Rethinking values and the environment. *Proceedings of the National Academy of Sciences*, 113(6), 1462–1465. <https://doi.org/10.1073/pnas.1525002113>

⁸ Zeng, Q., Yang, Z., Chen, Z., & Chen, P. (2025). The relationships between nature connectedness, nature contact, and positive psychological outcomes: A meta-analysis. *Journal of Environmental Psychology*, 105, 102675. <https://doi.org/10.1016/j.jenvp.2025.102675>

⁹ Sprong, L. E. (2024). *Enhancing the human-nature connection on campus, improving the overall health* [Bachelor thesis]. Breda University of Applied Sciences.

How does nature make us feel? Do we feel calm, inspired, or restored when we're in green environments?

3. **Behavioural connection.** This includes both how often we seek out nature experiences (walking through green spaces, observing wildlife, gardening) and how we demonstrate care for the environment through our choices and actions.

How do we act toward nature in our daily lives?

Nature connection refers to the emotional, cognitive, and physical relationship people have with the natural world.¹⁰ It's not just about being with nature, but about feeling engaged with nature, noticing it, valuing it, and seeing ourselves as part of it. A strong connection to nature is linked to greater care for the environment, better mental well-being, and a deeper sense of belonging.^{11 12}

BUas summarises nature connection as the following:

A meaningful cognitive, emotional and behavioural relationship with nature that recognises humans as part of ecosystems, promoting a sense of belonging, mutual well-being, and environmental awareness where human and ecosystem flourishing are inseparable.

Why nature connection?

Nature connection is important because it supports human well-being, but also because it supports environmental awareness and sustainable behaviour. Research shows that people who feel more connected to nature are more likely to act in environmentally responsible ways.¹³

When looking at built environments such as a campus grounds, it's important to look at biophilic design. Biophilic design integrates natural elements into buildings and urban spaces, which helps foster nature connection in everyday environments.¹⁴ On campus, this could mean having green roofs, plant-filled study areas, views of trees from classrooms, or accessible outdoor spaces for rest and reflection. These features don't just make spaces look nicer, they create meaningful sensory and psychological experiences that bring people closer to nature, even in urban settings. Biophilic design can be used indoors and outdoors. The underlying core principles are the same.

Stephen Kellert is seen as the founder of biophilic design. His research focused on the psychological, cultural, and biological importance of nature in human life, and he argued that the built environment should be designed in ways that support this human-nature relationship. He co-developed the biophilia hypothesis (with biologist E.O. Wilson), which proposes that humans have an innate, evolutionarily rooted tendency to seek connections with the natural world.¹⁵ Therefore, anything nature-related makes us feel at ease, makes us feel at home. Kellert later translated this into practical architectural and urban design strategies, laying out structured frameworks and design principles that are now widely used in sustainable design.

¹⁰ Zeng, Q., Yang, Z., Chen, Z., & Chen, P. (2025). The relationships between nature connectedness, nature contact, and positive psychological outcomes: A meta-analysis. *Journal of Environmental Psychology, 105*, 102675. <https://doi.org/10.1016/j.jenvp.2025.102675>

¹¹ Martin, L., White, M. P., Hunt, A., Richardson, M., Pahl, S., & Burt, J. (2020). Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology, 68*, 101389. <https://doi.org/10.1016/j.jenvp.2020.101389>

¹² Zeng, Q., Yang, Z., Chen, Z., & Chen, P. (2025). The relationships between nature connectedness, nature contact, and positive psychological outcomes: A meta-analysis. *Journal of Environmental Psychology, 105*, 102675. <https://doi.org/10.1016/j.jenvp.2025.102675>

¹³ Martin, L., White, M. P., Hunt, A., Richardson, M., Pahl, S., & Burt, J. (2020). Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology, 68*, 101389. <https://doi.org/10.1016/j.jenvp.2020.101389>

¹⁴ Kellert, S. R., & Calabrese, E. F. (2015). The practice of biophilic design. *The Practice of Biophilic Design, 3*. https://biophilicdesign.umn.edu/sites/biophilic-net-positive.umn.edu/files/2021-09/2015_Kellert%20The_Practice_of_Biophilic_Design.pdf

¹⁵ Kellert, S. R., & Calabrese, E. F. (2015). The practice of biophilic design. *The Practice of Biophilic Design, 3*. https://biophilicdesign.umn.edu/sites/biophilic-net-positive.umn.edu/files/2021-09/2015_Kellert%20The_Practice_of_Biophilic_Design.pdf

Biophilic design plays a major role in our connection with nature. It's literary the way to connect us to nature through design. Because it connects us to nature it has three major proven benefits¹⁶:

1. **Physical:** lower blood pressure, reduce stress, improve healing, enhance comfort
2. **Mental:** increase in satisfaction, reduce anxiety, improve creativity and problem-solving
3. **Behavioural:** better concentration, improved social interaction, reduced aggression

1.1.3 Common approaches to biophilic design

According to Kellert and Calabrese there are five core principles to biophilic design.¹⁷ They are summarised below (see Appendix B for more in-depth information on the principles).

1. Nature should be integrated into daily life.
2. The environment should be designed in such a way that it resonates with how humans are biologically predisposed to interact with the world: explorative, understandable, safe and with a sensory variation.
3. Spaces should have familiar natural forms, materials, and patterns to help people feel grounded, comfortable and safe.
4. The design encourages meaningful encounters with nature, such as touching plants, observing wildlife, hearing water, or noticing seasonal changes.
5. Biophilic strategies work best when all elements support one another to form a coherent, holistic experience rather than isolated features.

When adhering to these principles there are 14 ways to design environments, 14 patterns¹⁸. They tell us 14 ways to design an environment in compliance with a connection to nature. They are explained in Appendix C).

1.1.4 Best practices

An overview of the best practices regarding biodiversity and nature connection can be found in Appendix D.

1.1.5 Existing monitoring and assessment methods, frameworks and standards

Biodiversity

The Nature Positive Initiative (NPI) is an international project that relates well to BUAs' CPO project. The NPI has a global societal goal defined as 'Halt and Reverse Nature Loss by 2030 on a 2020 baseline and achieve full recovery by 2050'.¹⁹ According to the NPI organisation no individual organisation can be "nature positive", it is, in fact, a global goal. An individual organisation or the specific activities they undertake cannot be determined as being nature positive in isolation. However, organisations can make a great contribution. The NPI has developed a draft State of Nature Metrics framework so that organisations can measure whether biodiversity is increasing or not. The project began in 2024 with support from The Biodiversity Consultancy and Ernst & Young (EY), following publication of a consultation brief and first draft set.²⁰ See Appendix E for a summary of the draft. The project is still in development, so the metrics cannot be officially used yet!

Beyond these metrics, biodiversity in itself is the existence of species. Therefore, to assess biodiversity on campus, several key species groups can be monitored: vascular plants, birds, butterflies, dragonflies and damselflies, bees and hoverflies, and soil animals. Birds and vascular plants are suggested as primary indicator

¹⁶ Kellert, S. R., & Calabrese, E. F. (2015). The practice of biophilic design. *The Practice of Biophilic Design*, 3. https://biophilicdesign.umn.edu/sites/biophilic-net-positive.umn.edu/files/2021-09/2015_Kellert%20The_Practice_of_Biophilic_Design.pdf

¹⁷ Kellert, S. R., & Calabrese, E. F. (2015). The practice of biophilic design. *The Practice of Biophilic Design*, 3. https://biophilicdesign.umn.edu/sites/biophilic-net-positive.umn.edu/files/2021-09/2015_Kellert%20The_Practice_of_Biophilic_Design.pdf

¹⁸ Ryan, C.O., Browning, W.D., Clancy, J.O., Andrews, S.L., & Kallianpurkar, N.B. (2014). "Biophilic design patterns: Emerging nature-based parameters for health and well-being in the built environment." *International Journal of Architectural Research: Archnet-IJAR*, 8(2), 62-76.

¹⁹ Nature Positive Initiative. (n.d.). *About nature positive*. Retrieved February 9, 2026, from <https://www.naturepositive.org/about/>

²⁰ Nature Positive Initiative. (n.d.-b). *Measuring nature positive*. Retrieved February 9, 2026, from <https://www.naturepositive.org/metrics/>

taxa for global biodiversity monitoring networks²¹, and these groups are frequently monitored across Europe and serve as the basis for national and supranational biodiversity indicators.²² These species groups are chosen because they respond to environmental changes in measurable ways. Pollinators such as butterflies, moths, bees, and wasps are increasingly valued as indicator species because they provide vital ecological roles in plant reproduction and have complex life cycles with different resource requirements at each stage, making them sensitive to environmental conditions.²³ Soil animals are also important to measure. Soil invertebrates contribute to soil health by improving aeration and water infiltration and nutrient turnover, while also providing ecosystem services such as pollination and decomposition.²⁴ National biodiversity monitoring in the UK typically includes birds, mammals, butterflies, moths, bumblebees, freshwater invertebrates, and vascular plants in their abundance measures.²⁵ To map biodiversity in the Netherlands, CBS (Statistics Netherlands) uses data from the Network Ecological Monitoring (NEM).²⁶ NEM also researched the same species with reptiles, amphibians, fish, lichens and fungi on top of that.²⁷ However, one needs to bear in mind that monitoring a species only makes sense when it has a suitable habitat on site. By monitoring all the relevant taxonomic groups together, a comprehensive picture of biodiversity emerges that can track changes over time and inform conservation management decisions.

For the BUas campus with its own habitats, it makes sense to focus on the following species: vascular plants, birds, bees and hoverflies, and butterflies and dragonflies. While the NEM monitors additional taxonomic groups including reptiles, amphibians, fish, lichens, and fungi, the campus biodiversity assessment focuses on five core indicator groups (vascular plants, birds, butterflies and dragonflies, bees and hoverflies, and soil animals). This selection is justified by several factors:

1. These groups have well-established, standardized monitoring protocols with published methodologies.
2. They represent multiple trophic levels and ecosystem functions including primary production, pollination, decomposition, and predation.
3. They are appropriate for the campus habitat context.
4. They align with internationally recognised biodiversity indicators.²⁸

Additional groups such as lichens and fungi require highly specialized taxonomic expertise that is often scarce, while fish, amphibians, and reptiles are primarily relevant in areas with substantial aquatic or natural habitats that are limited on campus.

How each of these species are measured is explained in Appendix F.

Nature connection

Multiple validated scales have been developed to measure the psychological construct of *nature connection*, each capturing different dimensions of the human-nature relationship. The Nature Connection Index (NCI) is a widely

²¹ Pereira, H., & Davidcooper, H. (2005). Towards the global monitoring of biodiversity change. *Trends in Ecology & Evolution*, 21(3), 123–129. <https://doi.org/10.1016/j.tree.2005.10.015>

²² Bucher, R., Nickel, H., Kaib, S., Will, M., Carchi, J., Farwig, N., & Schabo, D. G. (2019). Birds and plants as indicators of arthropod species richness in temperate farmland. *Ecological Indicators*, 103, 272–279. <https://doi.org/10.1016/j.ecolind.2019.04.011>

²³ PALM DESERT CENTER. (2022, July 11). *Indicator species*. Retrieved February 9, 2026, from <https://palmdesert.ucr.edu/calnatblog/2022/07/11/indicator-species>

²⁴ Stork, N. E., & Eggleton, P. (1992). Invertebrates as determinants and indicators of soil quality. *American Journal of Alternative Agriculture*, 7(1–2), 38–47. <https://doi.org/10.1017/s0889189300004446>

²⁵ UK Government. (2025, December 2). *Status of all-species: relative abundance*. GOV.UK. Retrieved February 9, 2026, from <https://www.gov.uk/government/statistics/england-biodiversity-indicators/status-of-all-species-relative-abundance>

²⁶ De Ree, M. (2023, May 30). Biodiversity monitored extensively by CBS. *Statistics Netherlands*. <https://www.cbs.nl/en-gb/corporate/2023/21/biodiversity-monitored-extensively-by-cbs>

²⁷ CBS. (2025, March 17). *Meetdoelen - Meetprogramma's voor flora en fauna*. Meetdoelen - Meetprogramma's Voor Flora En Fauna | CBS. Retrieved February 9, 2026, from <https://longreads.cbs.nl/meetprogrammas-flora-en-fauna-2024/meetdoelen/>

²⁸ PALM DESERT CENTER. (2022, July 11). *Indicator species*. Retrieved February 9, 2026, from <https://palmdesert.ucr.edu/calnatblog/2022/07/11/indicator-species>

used instrument originally developed in English for population surveys.²⁹ The NCI comprises six simple questions designed to assess the affective and experiential relationship with nature in both children and adults, measured on a weighted seven-point scale resulting in scores from 0 to 100, with higher scores reflecting stronger nature connectedness. The scale has demonstrated a one-factor structure, good reliability, excellent concurrent validity, and the ability to detect differences between subgroups. More on this survey can be found in Appendix G.

1.2 Legislation and regulations

There are no current legislation and regulations that have a direct and big impact on the way we approach biodiversity and nature connection. The ones that are related are listed in Appendix H.

1.3 Current context

1.3.1 State of biodiversity at BUAs

Strengths

The overall campus atmosphere intentionally resembles a green park, promoting recreational activities and community engagement. The campus was designed in 2018 with the goal of creating a self-sustaining ecosystem featuring a diverse range of trees, plants, grasses, and wildflower meadows. The design promotes sustainability and biodiversity as ongoing priorities. To preserve an open feel and unobstructed sightlines, the landscaping avoids high shrubs or dense thickets. Biodiversity Initiatives include:

- > Pollinator-friendly flowers supporting local ecosystems
- > Rooftop honey beehives on the Frontier building
- > Pesticide-free Community Garden with native plants including yarrow, foxglove, and sweet woodruff
- > Protected areas creating habitats for insects and small mammals
- > Notable plant species including 'Wilde Liguster' (beneficial for bees and birds), Common Ash (beneficial for bees), Pedunculate Oak (supporting bees and mammals), and fruit trees including apple and pear near the Sibelicious restaurant

The campus is located in Breda, a student city in the south of the Netherlands. The city has its own environmental ambitions through the initiative "Breda Stad in een Park" (Breda City in a Park), which aims to reconnect everyone in Breda with nature. This community-driven project invites participation from nature enthusiasts, entrepreneurs, artists, vegetable growers, children, and gardeners to collectively transform the city into a nature park. Aligning with the municipality's ambition, the project aims to make Breda one of Europe's most nature-rich cities by 2030, which started off great with the National Park City status gained in 2024.

The transformation of the BUAs campus, designed by INBO/Culd, won the 2020 BLASTprijs in the category "Best Public Building" for its significant social impact and addition to Breda's public space. The jury praised the design's cohesive vision, creating a relaxing environment for the surrounding area and balancing aesthetic quality with functionality.

Points for improvement

In 2016 an ecological advice report was written for BUAs by Schueler Ecologisch Advies.³⁰ Lotta loosely compared this document to the current state of our campus and came to the following conclusions:

- > **Missing Wildlife Habitats:**
 - > No bird boxes on campus
 - > No bat boxes installed
 - > No hedgehog houses (though recommended in short-term actions)
- > **Absent Structural Elements:**
 - > Green roofs have not been established despite recommendations

²⁹ Van Den Bogerd, N., Richardson, M., Bentvelsen, J., Holtmaat, K., Labib, S., & Maas, J. (2025). Capturing nature Connectedness: Validity and utility of the Dutch nature connection index. *Journal of Environmental Psychology*, 106, 102727. <https://doi.org/10.1016/j.jenvp.2025.102727>

³⁰ Sprong, L. E. (2024). *Enhancing the human-nature connection on campus, improving the overall health* [Bachelor thesis]. Breda University of Applied Sciences.

- > No dedicated wet zones exist to support biodiversity
- > **Missing Plant Species:**
 - > Many recommended trees aimed at enhancing biodiversity have not been implemented
 - > Many recommended native plants have not been planted
- > **Invasive Species Problem:** A recent issue of invasive grasses has proliferated in some areas at the expense of biodiversity. BUAs is actively addressing this issue and exploring potential solutions.
- > **Insufficient Habitat Creation:** While low shrubs and piles of branches on the southern side of the campus contribute positively to biodiversity, their role in habitat creation needs greater emphasis.
- > **Limited Flowering Diversity:** Vibrant flower meadows and bulbous plants are "a bit more difficult to maintain" and were originally included in the landscaping vision but appear to be underrepresented currently.

To fully assess the current state of biodiversity on campus a baseline measurement is needed. The biodiversity baseline measurement will be done by Blom Ecologie in 2026.

1.3.2 State of nature connection at BUAs

Lotta Estaban Sprong has assessed the current state of students' and employees' connection to nature on campus in 2024. Her results were the following.

Strengths

- > **Visual Connections to Nature:** The BUAs campus demonstrate strong visual connections to nature across multiple zones. Study areas, lecture halls, and open project rooms benefit from large windows and optimal building orientation, particularly in the Ocean building. The campus's green park-like atmosphere provides clear, open views of greenery including lawns, trees, and hedges, with designated seating areas offering sufficient opportunities for visual engagement with nature. Survey results revealed that 76% of respondents strongly agree or agree that they can observe seasonal changes in nature from campus buildings.
- > **Dynamic Lighting:** The campus features sophisticated energy-efficient lighting systems with presence detection, daylight control, and LED technology. In classrooms, lighting automatically adjusts to natural daylight levels, creating comfortable learning environments. This integration of natural and artificial lighting supports circadian rhythms and enhances user comfort, with dynamic and diffuse light scoring highest across all biophilic dimensions (Frontier: 53.3%, Ocean: 55.6%, Horizon: 58.9%).
- > **Indoor Greenery:** Approximately 476 plant units are thoughtfully distributed throughout the campus, with each placement carefully planned according to the plants' environmental needs. Plants improve air quality, enhance acoustics, and reduce stress. Moss walls in the Sibelicious restaurant and near staircase seating provide calming atmospheres. The Horizon building shows slightly better integration in study zones and communal spaces due to large atriums.
- > **Outdoor Biodiversity:** The campus supports biodiversity through pollinator-friendly flowers, rooftop beehives, and a pesticide-free community garden. Native plant species including 'Wilde Liguster' (beneficial for bees and birds), Common Ash, and Pedunculate Oak create habitats for local wildlife. Lawns with trees and seating areas were rated as the most pleasant outdoor spaces by 67% of survey respondents.

Points for improvement

- > **Indirect Experiences of Nature (15.6-20%):** This dimension scored poorly overall, with Frontier at 20%, Horizon at 18.9%, and Ocean at 15.6%. Natural materials such as wood and cork elements are mainly present in hallways and canteens, while classrooms and restrooms lack these components entirely. Biomorphic patterns are almost completely absent across campus, with only light green wallpaper with a biomorphic print present in one Horizon study room. Nature-inspired artwork is very minimal throughout all buildings.
- > **Non-Visual Sensory Stimuli (15.6-18.9%):** This is the weakest dimension across all buildings, with Horizon scoring 18.9%, Ocean 16.7%, and Frontier 15.6%. Textured materials like cork and wooden elements have limited use in hallways, study areas, and communal areas. Natural soundscapes and fragrant plants are completely absent, representing a significant missed opportunity for relaxation and enhanced sensorial experiences.

- > **Water Features:** Water features are completely absent across all buildings and outdoor areas. While the municipality owns a green space with water features on the south boundary of campus, there are no water features within the BUAs campus itself. This absence eliminates opportunities for calming and multisensory experiences.
- > **Classrooms:** Over 50% of survey respondents identified classrooms as "least pleasant" or "somewhat unpleasant." Common issues included poor ventilation (10%), limited daylight (8%), and lack of greenery and comfortable furniture (7%). Indoor plants and living walls are absent from classrooms, and biomorphic patterns and natural materials are lacking.
- > **Hallways:** Hallways consistently underperformed across all buildings, with limited greenery, minimal sensory engagement, and lack of indirect connections to nature. While some natural materials are present, the overall biophilic integration remains weak.
- > **Restrooms:** Restrooms scored poorly due to lack or absence of natural daylight, no indoor plants or living walls, and minimal integration of natural materials or sensory elements.
- > **Bike Parking Areas:** Survey results identified bike parking areas as among the least pleasant outdoor spaces, alongside poorly maintained greenery. These areas lack shade, biodiversity, and engaging design elements.
- > **Pathways:** Pathways were rated as the least pleasant outdoor feature by 22% of respondents, with an additional 15% ranking them as somewhat unpleasant. Participants noted inadequate shade (10%), lack of biodiversity (6%), and limited sense of exploration or curiosity such as hidden paths or unique seating spaces.

To fully assess the current state of nature connection on campus a baseline measurement is needed. One that can be repeated year after year. This survey still needs to be developed.

2 BUas' ambition

BUas' ambition is to be a frontrunner when it comes to biodiversity and nature connection.

2.1 Biodiversity ambition

A biodiversity frontrunner campus can demonstrate with scientific rigor that it supports healthier and more resilient ecosystems with an increase in the variety and vitality of species than comparable institutions, while formally including non-human voices in institutional decision-making processes, and that other campuses are looking to us for inspiration and adopting practices developed there.

2.2 Nature connection ambition

A nature connection frontrunner campus can demonstrate with scientific rigor that it enhances measurable nature connection outcomes among its community members more effectively than comparable institutions, and that other campuses are looking to us for inspiration and adopting practices developed there.

2.3 What it means to be a frontrunner

Measure rigorously

BUas will carry out annual, science-based biodiversity monitoring of its campus grounds. Because we are one of the first nature positive universities, we are already a frontrunner in this aspect. We develop methods while working on the increase of biodiversity and nature connection. At BUas this means:

- > Professional ecological surveys (by Blom Ecologie)
- > Monitoring of plants, insects (especially pollinators), birds, and soil life
- > Fixed monitoring locations to allow year-to-year comparison
- > Clear baselines established in year one

Results are quantitative (species counts, habitat area, quality indicators), not descriptive landscaping reports.

Why this matters: Without consistent data, "green campus" claims remain anecdotal. Monitoring allows BUas to prove improvement over time.

Be transparent and share knowledge

BUas will publish an annual campus biodiversity and nature connection report. This includes:

- > Species trends (what increased, what declined)
- > Habitat improvements (e.g. meadow expansion)
- > Nature Connection Index (NCI) results for students and staff
- > Clear visuals and plain language summaries
- > Monitoring methods
- > Costs and lessons learned
- > What worked and what didn't

These reports will be:

- > Publicly accessible on the BUas website and portal
- > Updated annually
- > Comparable across years

Aside from that we will also:

- > Support student research projects
- > Host visits from other institutions to inspire and learn from each other

Why this matters: Transparency builds credibility and allows students, staff, and partners to see whether actions are working. A frontrunner multiplies impact by helping others move faster.

The campus as an ecosystem

BUAs will manage its grounds as a connected ecological system, not isolated gardens or decorative green areas. At BUAs, this means:

- > Creating continuous habitat corridors across campus and connect to our surroundings outside of our campus
- > Designing water, vegetation, and soil as interacting systems
- > Coordinating biodiversity goals with climate adaptation, nature connection and wellbeing included

Why this matters: Small, disconnected green patches do less for biodiversity than connected areas. Connectivity is what allows species to survive and move.

Connect regionally

At BUAs, this means:

- > Aligning campus habitats with city-wide ecological corridors
- > Supporting species movement between campus and surrounding green areas
- > Sharing monitoring data with municipal and regional partners
- > Organise events together with National Park City

Why this matters: A campus alone cannot sustain biodiversity—but it can be a powerful node in a larger network.

Giving nature a voice

BUAs will explore Zoöp governance, formally representing non-human interests in decision-making. At BUAs, this means:

- > Appointing a Speaker for the Living
- > Integrating ecological perspectives into campus decisions
- > Testing governance innovation in a real-world setting

Why this matters: True frontrunners don't make changes to nature, but with nature.

3 Scope

3.1 Within scope

3.1.1 Biodiversity within scope

- > **Species monitoring** - vascular plants, birds, bees, hoverflies, butterflies, dragonflies and soil animals. As explained in Appendix F.
- > **Habitat management** - creating and managing diverse habitats on campus.
- > **Native vs. non-native species considerations** – as explained in Appendix A
- > **Pollinator support** - pollinator-friendly plants and rooftop beehives (contract falls under Buildings topic owner)
- > **Community Garden** – managing the Gardening Club that takes care of the garden in an ecological manner
- > **Ecological corridors** - connections within campus and to surrounding areas
- > **Wildlife habitat creation** - bird boxes, bat boxes, hedgehog houses, insect hotels
- > **Planting strategies** - native species, flowering meadows, seasonal diversity
- > **Mowing management** - ecological mowing, phased mowing
- > **Outside water management** - ponds, nature-friendly banks, watering the Community Garden
- > **Monitoring and measurement** - baseline assessments, regular monitoring
- > **Community engagement** – Community Garden participation, biodiversity-related events
- > **Alignment with city/regional biodiversity goals** - Breda Stad in een Park / National Park City
- > **Composting** - Community Garden related composting
- > **Outdoor lighting** - any lighting related to the biodiversity on campus (such as bats), but always in consideration with safety
- > **Green roofs** – green roofs in cooperation with the Buildings and Energy topics

3.1.2 Nature connection within scope

Indoor and outdoor

- > **Measurement through NCI** - Nature Connection Index surveys
- > **Biophilic pattern assessment** - evaluating presence and implementation of Kellert's 14 patterns
- > **Visual connections to nature** - views, greenery, seasonal changes
- > **Sensory experiences** - sounds, scents, textures, water sounds
- > **Natural materials** - wood, cork, stone
- > **Outdoor spaces for restoration** - seating areas, quiet zones, walking paths
- > **Community Garden as connection tool** - hands-on engagement with nature

Outdoor only

- > **Student and staff well-being** - stress reduction, cognitive function, creativity
- > **Prospect and refuge spaces** - open views and protected areas

Indoor only

- > **Indoor plants and living walls** - strategic placement for well-being
- > **Dynamic and diffuse lighting** - circadian lighting, natural light
- > **Thermal and airflow variability** - operable windows, natural ventilation

With a clear division between indoor and outdoor nature connection between two colleagues.

3.2 Out of scope

- > **Waste management** – Any recycling outside of Community Garden composting
- > **Climate adaptation** - Rainwater drainage systems, paving, etc. (unless specifically for biodiversity like rainwater ponds)
- > **Green buildings** – anything attached to a building fall under the scope of the 'Buildings' topic.

- > **Air quality/pollution control** - General environmental quality (unless directly related to plants improving air quality)
- > **Food systems broadly** - Sustainable food procurement for canteens (unless related to the Community Garden)
- > **Social sustainability programs** - Mental health services, social safety (unless directly linked to nature connection benefits or programs)

4 Relation to other CPO topics

The topics of Biodiversity and Nature Connection relate to all the other CPO topics. All the connections are listed below. Two of them are most apparent. First of all, climate adaptation. This document did not talk about climate adaptation because most of this is related to buildings and dead materials. The same goes for the topic of Buildings.

4.1 Biodiversity and the other CPO topics

Energy

- > Renewable energy infrastructure (e.g., solar fields, wind turbines) can impact habitats if poorly sited.
- > Low-carbon energy systems reduce climate change, indirectly protecting biodiversity.

Material Flows

- > Extraction of raw materials (mining, quarrying, forestry) is a top driver of biodiversity loss.
- > Circular economy approaches (reuse, recycling, refurbishment) reduce pressure on ecosystems.
- > Some materials (e.g., sustainably sourced timber or biobased materials) can enhance biodiversity if managed well.
- > Choosing biodiversity-positive suppliers (e.g., sustainably certified food, timber, textiles) drives healthier land management.
- > Avoiding problematic commodities (palm oil, soy, beef from deforested areas, non-organic) protects habitats worldwide.
- > Nature-based criteria in tenders (green infrastructure, ecologically responsible maintenance) promote restoration.

Mobility

- > Roads fragment habitats and create wildlife mortality.
- > Transport emissions affect ecosystems through pollution and climate change.
- > Biodiversity-friendly mobility planning (wildlife crossings, green corridors, reduced traffic) supports ecosystem connectivity.

Catering

- > Food production is one of the largest biodiversity pressures (land use, pesticides, water use).
- > Moving toward plant-rich, seasonal, organic, and locally sourced menus reduces biodiversity impact.
- > Sustainable regenerative agriculture directly supports species and ecosystems.
- > The food forest and Community Garden are unavoidably linked to another.

Waste

- > Waste leakage (plastic, chemicals, nutrients) harms wildlife and ecosystems.
- > Waste reduction and recycling reduce the need for resource extraction.
- > Composting supports soil biodiversity and regenerative growing systems.
- > Waste can attract plagues or unwanted wildlife that make the campus ecosystem go out of balance.

Buildings

- > Construction and urban expansion replace habitats.
- > Green buildings can integrate biodiversity (green roofs/walls, bird-safe glass, native vegetation landscaping).
- > Building materials (e.g., cement, steel, timber) have major biodiversity impacts depending on sourcing.

Climate Adaptation

- > Nature-based adaptation (wetlands, forests, green infrastructure) protects both biodiversity and people.
- > Biodiverse systems are more resilient to climate shocks, supporting long-term adaptation.

4.2 Nature connection and other CPO topic

Energy

- > People who feel connected to nature tend to support renewable energy and energy-saving behaviour.
- > Visible integration of renewable systems (solar roofs, wind landscapes) can strengthen awareness of ecological limits.

Material Flows

- > A strong nature connection increases preference for circular, low-impact materials.
- > Repair culture and minimalism are often linked to people who feel responsible for natural systems.
- > Natural materials increase our connection with nature, indoors and outdoors.
- > Storytelling about origin of goods (forests, farms, fisheries) enhances connection and responsible choices.

Mobility

- > Nature connection encourages walking, cycling, and public transit because they allow sensory interaction with surroundings.
- > Designing green, pleasant mobility routes strengthens daily contact with nature.

Catering

- > Nature connection increases appreciation for seasonal, local, and minimally processed food.
- > Farmers' markets, gardens, and transparent supply chains cultivate a deeper awareness of food–nature links.

Waste

- > People with high nature connectedness show higher recycling rates and waste reduction behaviours.
- > Visible ecosystems (e.g., compost projects, community gardens) make the impact of waste tangible.

Buildings

- > Biophilic design (natural materials, views, daylight, greenery) strengthens nature connection.
- > People who experience nature daily in buildings make more environmentally positive decisions.

Climate Adaptation

- > Connecting people emotionally to ecosystems makes climate adaptation measures more accepted and effective.
- > Nature-based adaptation solutions (parks, wetlands, shade trees) increase everyday nature contact.

5 Stakeholders and partners

5.1 Biodiversity stakeholders and partners

Internal stakeholders

Sibelicious chefs utilise the Community Garden produce and contribute to its compost piles and worm hotel. Students from Built Environment and Creative Business conduct research projects and placement assignments related to campus biodiversity and Community Garden development. The CPO project manager and strategic lead ensure alignment with broader climate-positive strategy.

External partners

Blom Ecologie serves as campus ecologist, conducting baseline assessments and providing scientific guidance on species selection and habitat management. Gemeente Breda through the Breda National Park City initiative (formerly Breda Stad in een Park) collaborates on connecting campus to city-wide ecological corridors and aligning with Breda's 2030 ambition to become Europe's first city in a park. The Zoöp governance framework will be implemented to formally include non-human voices in institutional decision-making. Additional knowledge partners may include regional nature organizations and other Dutch universities.

Roles & responsibilities

Biodiversity & Outdoor Nature Connection topic lead (0.1 FTE total, outdoor nature connection included), provides advice on biodiversity strategy, coordination, and implementation.

5.2 Outdoor Nature Connection stakeholders and partners

Internal stakeholders

Students participate in nature connection surveys, outdoor programming, and Community Garden activities. Faculty members can incorporate outdoor learning and place-based education. Research by former BUAs student Lotta Esteban Sprong on enhancing human-nature connection on campus serves as a knowledge resource. The CPO project manager and CPO strategic lead ensure strategic alignment.

External partners

Partners for outdoor nature connection programming and biophilic design implementation to be identified. Potential collaborations include landscape architects for outdoor restorative space design and community organisations for nature-based programming.

Roles & responsibilities

Biodiversity & Outdoor Nature Connection topic lead (0.1 FTE total, biodiversity included), provides advice on Outdoor Nature Connection strategy, coordination, and implementation.

5.3 Indoor Nature Connection stakeholders and partners

Internal stakeholders

- > **BUAs students and staff** are the primary users of indoor spaces and directly benefit from improved biophilic design elements. Research by Lotta Esteban Sprong (2024) shows that 75% of respondents indicate that biophilic design elements such as indoor greenery and sensory experiences positively contribute to their well-being.
- > **Visitors** regularly use the campus for events and conferences. Biophilic design contributes to a positive campus experience and strengthens BUAs's reputation as a sustainable and healthy organization.
- > **Facilities team (C&WS)** is responsible for maintenance and management of indoor & outdoor greenery, natural materials, and technical installations.
- > **Wellbeing team** can integrate indoor nature connection into mental health and wellness initiatives, as research demonstrates that biophilic design reduces stress and improves cognitive functions.

External stakeholders

Design Bureau - Strategic design partner

Their involvement is crucial for:

- > **Design continuity:** Ensuring that new biophilic interventions seamlessly integrate with existing campus aesthetics and design language
- > **Material selection expertise:** Advising on natural materials that fit within the current materialization strategy and colour and texture coherence
- > **Furniture strategy:** Developing replacement plan in collaboration with the permanent furniture supplier, integrating natural materials and biophilic principles within the existing range (circular)
- > **Supplier network:** Access to their network for natural materials (excluding furniture)

Furniture Supplier

The permanent supplier for all campus furniture plays a role in the biophilic design strategy through:

- > **Biophilic furniture solutions:** Selection from assortment with natural materials (wood, cork, natural textiles)
- > **Circular design expertise:** Experience with circular furniture concepts aligns with BUAs sustainability goals
- > **Existing contract & pricing:** Leveraging existing framework agreements and purchasing advantages
- > **Product knowledge:** Advising on products that support biophilic design criteria
- > **Replacement planning:** Phased replacement of existing furniture with biophilic alternatives from collection

Collaboration Design Bureau ↔ Furniture Supplier

Design Bureau advises on which furniture and where; furniture supplier delivers products from their portfolio that best match biophilic design criteria. This triangle (Furniture Supplier – design bureau and C&WS) ensures design coherence, delivery reliability, and cost efficiency.

Indoor plant and maintenance Supplier - (recently extended contract)

Collaboration can be expanded to living walls.

Roles & responsibilities

- > Teamlead C&WS has decision-making authority for indoor nature connection strategy, budget, and prioritization.
- > Project Manager Facilities (C&WS) is responsible for project execution of indoor nature connection initiatives: coordination between all stakeholders and partners, planning and implementation, budget and contract management. Works closely with:
 - > Teamlead C&WS for decision-making and strategic direction
 - > Topic lead for outdoor nature connection → coherent campus-wide approach
 - > Design Bureau as lead design advisor for all indoor interventions
 - > Permanent furniture supplier for furniture selection and replacement planning (via permanent account manager)
 - > Green supplier for greenery maintenance, expansion and living walls
 - > Facilities team for operational implementation and daily maintenance
 - > CPO coordinator (Yvette Stok) for alignment with broader climate-positive goals

6 Action plan

6.1 Action plan Biodiversity + Outdoor Nature Connection

Short-term (2026)

For the short term some actions have been determined based on immediate and visible impact that create momentum. We want people to know we are working hard on the subject and motivate and engage them properly.

Foundation & assessment:

- > Hire ecologist (Blom Ecologie) for campus biodiversity baseline assessment
- > Conduct overall baseline biodiversity assessment by Blom Ecologie:
 - > Current populations of butterflies, bees, hoverflies, birds and vascular plants
 - > Honeybee's influence on wild bee population and determine future approach
 - > Update action plan and timeline for 2027 and so forth based on the baseline assessment
- > Conduct second baseline assessment for soil animals by BUAs (with community) and review differences (citizen science)
- > Develop and conduct first outdoor nature connection survey using validated instruments
- > Develop BUAs icon species list (10-20 species) based on historical species presence and current habitat suitability

Immediate habitat improvements:

- > Eliminate pesticide use across campus (verify current status and implement if not already done)
- > Update ecological mowing schedule and implement as the first full year
- > Plant flowering bulbs across campus for early-season pollinator food sources
- > Install wildlife infrastructure: bird boxes, hedgehog boxes, bat boxes, and wildlife wood piles
- > Expand wildflower meadow areas even more
- > Establish an annual tree assessment by 3rd party

Community & Community Garden:

- > Take the first steps on the realisation of the food forest: prepare soil and plant first species
- > Update compost bins for Community Garden to improve waste processing
- > Create free herb picking zone for students
- > Organise events with the Community Garden (DeStress Fest, International Kick-Off, Campus Connect, Good Mood)
- > Have regular Community Garden sessions (weekly drop-ins for students/staff/neighbours)

Zoöp Governance Implementation:

- > Formally adopt Zoöp principles in decision-making
- > Integrate non-human voices into campus development decisions

Long-term (2027-2029)

Strategic infrastructure:

- > Develop green corridor connecting BUAs campus to surroundings (collaboration with Breda National Park City)
- > Build rainwater pond with nature-friendly banks for amphibian habitat and wildlife observation
- > Install green roof on suitable building with native plant species
- > Integrate nature-inclusive design into new building (Game & Tech Centre): green roof, nesting opportunities, biophilic elements, views to nature
- > Install interpretive signage at key biodiversity locations across campus

Habitat expansion:

- > Combine the food forest and Community Garden in such a way that they complement each other without being redundant
- > Contribute ideas to creation of outdoor classroom space within or adjacent to Community Garden/food forest
- > Plant additional trees strategically for summer shade, biodiversity, and seasonal interest
- > Develop sensory path on campus with diverse textures, scents, and educational elements
- > Plant climbing vegetation against Frontier building walls

Systemic integration:

- > Find two or three people within the organisation who have knowledge about biodiversity and ecological surroundings to use knowledge from in addition to biodiversity topic lead.
- > Implement green waste re-use system: grass clippings, leaves, and branches for Community Garden compost
- > Create interactive biodiversity map (digital and physical) showing key species locations and habitats (student project?)
- > Establish annual monitoring and reporting cycle for both biodiversity and nature connection outcomes
- > Publish methodologies and results to inspire other institutions, establishing BUAs as knowledge hub

Outdoor Nature Connection spaces:

- > Develop and implement biophilic design checklist for all outdoor space planning
- > Create first outdoor restorative spaces and designated quiet zone
- > Install rain barrel attached to building for Community Garden and wildflower irrigation

6.2 Action plan Indoor Nature Connection

- > **Strong foundation present:** BUAs campus already has a strong biophilic foundation with approximately 500 plant units strategically distributed throughout the buildings and 2 moss walls (Sibelicious and Frontier). Research by Lotta Esteban Sprong (2024) shows that the campus scores well on visual connections to nature (76% observe seasonal changes), dynamic lighting systems, and indoor greenery in accessible zones.
- > **Planning 2026:** No major new indoor nature connection initiatives are planned for 2026. Facilities planning is already finalized for 2026, with the exception of targeted additions of plant units in Q1. The baseline Nature Connection Index survey will take place in Q2 2026 among students and staff.
- > **Start development Q3-Q4 2026:** From Q3-Q4 2026, strategic development and planning for implementation in 2027-2029 can potentially begin, utilizing the Q2 survey results and the research by Lotta Esteban Sprong (2024).

Short-term (2026)

Q1 - Adding plant units

-

Q2 - Baseline Survey – Biodiversity & Outdoor Nature Connection topic lead in the lead

Q3 - Analysis & Alignment

- > Survey analysis: Identify strongest and weakest zones
- > Cross-reference Lotta's research (2024) - Gap analysis
- > Presentation of gap analysis, conclusions and plan of approach for review to the budget holder(s)

Q4 - Strategic Planning:

- > Budget & business case development

Long-term (2027-2029)

- > Design Bureau develops Design Plan 2028-2029 with guidelines for coherence
- > Stakeholder kick-off: Project Manager Facilities + Design Bureau + Furniture Supplier + green supplier
- > Furniture Design Plan: Design plan for furniture replacement via regular lifecycle. Choice in furniture and materials so we can apply them when replacement is needed
- > Development of integral biophilic design vision and business case focusing on further elements and priority settings:
 - > **Living Walls Expansion:**
 - > 30-40m² living walls distributed across campus
 - > Priority locations: Restaurant, atriums (Horizon/Frontier), entrances, hallways
 - > Installation + automated irrigation for low maintenance
 - > **Classroom Enhancement:**
 - > Pilot (3 classrooms)
 - > 40-50 classrooms upgraded with natural materials (cork acoustic panels, nature-inspired artwork)
 - > No real plants due to maintenance issues with high occupancy rates
 - > **Biophilic Furniture Design Plan:**
 - > Implementation via regular lifecycle replacements (ongoing)
 - > With each replacement: Apply biophilic guidelines (natural materials, appropriate portfolio)
 - > **Water Features:**
 - > Carefully weigh costs/benefits. Requires extensive structural modifications and high maintenance.
 - > **Greenery Optimization:**
 - > From ~500 to ~550 plant units (strategic placement in accessible zones)
 - > Focus: Study areas, hallways, lounges, staff areas
 - > **Sensory Elements:**
 - > Natural soundscapes in study areas
 - > Aromatic plants in lounges and hallways
 - > Addresses weakest dimension (15.6-18.9% from Lotta's framework)
 - > **Game & Tech Centre (new construction):**
 - > Biophilic design from concept phase
 - > Living walls, water features, natural materials throughout
 - > Collaboration Architect, Contractor + Design Bureau

7 Timeline

7.1 Short term (2026)

Biodiversity

Q1 2026 (January - March)

Campus:

- > Hire Blom Ecologie for campus biodiversity baseline assessment
- > Verify current pesticide use status and implement elimination policy if needed
- > Find 3rd party for an annual tree assessment

Community Garden:

- > Update compost bins for Community Garden
- > Sign up for MoestuïnMix 2026
- > Plan Community Garden drop-in sessions for students/staff/neighbours every other week

Food forest:

- > Decide on food forest short-term plan 2026
- > Sign up for GroenDoen fonds for a subsidy for the food forest

Q2 2026 (April - June)

Campus:

- > Update ecological mowing schedule and implement
- > Baseline biodiversity assessment by Blom Ecologie (butterflies, bees, hoverflies, birds, vascular plants, honeybee impact analysis)
- > Tree assessment by 3rd party

Community Garden:

- > Join DeStress Fest event with Gardening Club / Community Garden (21 May)

Food forest:

- > Contact Meer Bomen Nu and Planboom for free pioneer trees, arrange partnerships with Struikroven Breda for rescued plants and connect with Tuinplanten Kringloop Breda for additional plants
- > Coordinate with Gemeente Breda for compost and wood chips delivery
- > Complete planting plan for Zone A of the food forest
- > Identify location for educational signboards food forest

Q3 2026 (July - September)

Campus:

- > Baseline biodiversity assessment by Blom Ecologie
- > Develop BUas icon species list (10-20 species) based on assessment results
- > Expand wildflower meadow areas if green light by Blom Ecologie
- > Conduct baseline soil animals survey with community (citizen science) (25 September - 12 October 2026) and compare with 2025 baseline

Community Garden:

- > Join International Kick-Off event with Gardening Club / Community Garden (? August)
- > Join Campus Connect event with Gardening Club / Community Garden (? September)

Food forest:

- > Install temporary information board explaining upcoming food forest project

- > Mark out Zone A boundaries food forest
- > Design pathway structure and seating area together with students (student project)

Q4 2026 (October - December)

Campus:

- > Evaluate ecological mowing schedule effectiveness
- > Plant flowering bulbs across campus
- > Install wildlife infrastructure (bird boxes, hedgehog boxes, bat boxes, wildlife wood piles) after Blom's assessment
- > Publish 2026 monitoring results and methodologies

Community Garden:

- > Join Good Mood event with Gardening Club / Community Garden (? November)

Food forest:

- > Host "Future Food Forest" event to generate excitement and get help for the soil preparation
 - > In other words: spread 10cm layer of compost across Zone A (60 m³), Add 10cm layer of wood chips on top (60 m³), Apply lime to reduce soil acidity (5 bags of 10kg)
- > Infrastructure installation: Install sheep fencing around perimeter for protection, create swales/shallow trenches for water capture, establish pathways using wood chips and install permanent educational signboard
- > Create free herb picking zone

Outdoor Nature Connection

Q1 2026 (January - March)

- > Develop outdoor and indoor nature connection survey using validated instruments
- > Develop and begin implementing biophilic design checklist for outdoor space planning

Q2 2026 (April - June)

- > Conduct first indoor and outdoor nature connection survey (all students/staff)

Q3 2026 (July - September)

Q4 2026 (October - December)

- > Analyse results from first nature connection survey
- > **Milestone:** Publish 2026 monitoring results and methodologies

Indoor Nature Connection

Q1 2026 (January - March)

- > Targeted greenery additions (15-25 plant units): offices, student psychologist room, DeStress room, dean offices. Total plant units on campus: from ~476 to 490-500
- > Botanical drawings in hallway Horizon

Q2 2026 (April - June)

- > Conduct first indoor and outdoor nature connection survey (all students/staff)
- > First analysis nature connection survey

Q3 2026 (July - September)

- > Survey results analysis
 - > Identify strongest zones (expected: study areas, restaurant, lounges)
 - > Identify weakest zones (expected: classrooms, hallways, restrooms)

- > User preferences for biophilic interventions
- > Cross-reference with Lotta's research (2024)
 - > Gap analysis per biophilic dimension
 - > Priority interventions identification

Q4 2026 (October - December)

- > Publish 2026 monitoring results and methodologies
- > Stakeholder kick-off meeting
- > **Ontwerpbureau develops Indoor Biophilic Master Plan 2027-2029**
- > Biophilic Furniture Design Plan development
- > Budget & business case development

General evaluation point: December 2026

- > Review biodiversity baseline data and progress on habitat improvements
- > Assess nature connection survey results and outdoor space usage
- > Evaluate community engagement levels (Garden participation, citizen science involvement)
- > Revise action plan and timeline for 2027 onwards based on Blom Ecologie assessment findings and first year results

7.2 Long-term (2027-2029)

2027

Biodiversity + Outdoor Nature Connection

- > Find two or three people within the organisation who have knowledge about biodiversity and ecological surroundings to use knowledge from in addition to biodiversity topic lead.
- > Implement Blom's recommendations
- > Initiate planning for green corridor with Gemeente Breda (Breda National Park City initiative)
- > Investigate possibilities for a green roof
- > Assess feasibility and identify building for green roof installation
- > Begin design process for rainwater pond with nature-friendly banks
- > Conduct annual biodiversity and nature connection surveys
- > Install rain barrel for Community Garden and wildflower irrigation
- > Plant additional native vegetation (mainly plants and shrubs): see Schueler 2016 report and Blom's report for recommended species
- > Install interpretive signage at key biodiversity locations
- > Explore locations for outdoor restorative spaces (benches in green areas, designated quiet zones)
- > Choose location and design for outdoor restorative spaces (benches in green areas, designated quiet zones)
- > Create first outdoor restorative spaces (benches in green areas, designated quiet zones)
- > Design curriculum integration plans with interested faculties
- > Sign up for MoestuinMix 2027
- > Food forest:
 - > Plant pioneers
 - > Order fruit trees and berry shrubs
 - > Plant fruit trees and berry shrubs
 - > Plant herbs and ground cover planting
 - > Organise engaging activities

Indoor Nature Connection

- > Biophilic Furniture Design Plan finalization
- > Budget & business case finalization
- > Milestone: Presentation to Justine Sicard + Yvette Stok for roadmap approval
- > Feasibility assessment interventions
- > Business case presentation to Executive Board (EB)

- > Milestone: Budget approval by Executive Board
- > Living walls installation restaurant
- > User feedback survey classroom pilot
- > Greenery expansion to target ~550 units

2028

Biodiversity + Outdoor Nature Connection

- > Construct rainwater pond
- > Install green roof on identified building
- > Plant additional trees for shade and biodiversity (see Schueler 2016 report and Blom's reports for recommended species)
- > Develop outdoor classroom space in Community Garden/food forest area
- > Complete green waste re-use system implementation
- > Conduct annual monitoring
- > Sign up for MoestuïnMix 2028
- > Food forest: evaluate and redesign where needed
- > Develop sensory path design with diverse textures, scents, and educational elements
- > Launch interactive biodiversity map project (potential student assignment)
- > Improve bike parking areas with more shade, greenery, biodiversity elements
- > Plant climbing vegetation against Frontier building

Indoor Nature Connection

- > Greenery optimization (target 550 units achieved)
- > Review: Classroom pilot evaluation + lessons learned
- > Milestone: Approval classroom rollout 2028 (30-40 classrooms)
- > Living walls Phase 3 installation - Total campus coverage 30-40m²
- > Sensory elements pilots
- > Review: Mid-term evaluation 2027-2028 interventions
- > Game & Tech Centre biophilic design finalization

2029

Biodiversity + Outdoor Nature Connection

- > Complete green corridor connection to city infrastructure (pending municipal collaboration timeline)
- > Integrate nature-inclusive design into new building (Game & Tech Centre) including green roof, nesting opportunities, biophilic elements
- > Achieve measurable increases in icon species populations
- > Demonstrate regular outdoor space usage by majority of campus community
- > Publish comprehensive methodologies and multi-year results
- > Conduct annual monitoring
- > Sign up for MoestuïnMix 2029
- > Update Biodiversity + Outdoor Nature Connection Strategy 2030+

Indoor Nature Connection

- > Milestone: Living walls + water features + classrooms completed
- > Small water features lounges installation
- > Game & Tech Centre realization (delivery Q1 2030)
- > Comprehensive evaluation 2026-2029
- > Set targets 2030-2035
- > Updated indoor nature connection strategy 2030+

7.3 Evaluation Points

- > **Annual review (December each year):** Assess progress on actions, review monitoring data, adjust priorities
- > **Mid-term evaluation (end 2027):** Major review of strategy effectiveness, stakeholder satisfaction, measurable biodiversity and nature connection improvements
- > **Final evaluation (end 2029):** Comprehensive assessment of outcomes, set new targets for 2030-2035

8 Measuring and monitoring

8.1 Baseline assessment

Blom Ecologie is chosen as the ecologist for the baseline measurement for biodiversity on campus. Blom's goal is to:

- > Gain insight into the current biodiversity situation
- > Establish a basis for structural monitoring
- > Stimulate awareness and participation within the institution
- > Develop guidelines for the conservation and enhancement of biodiversity

For the indoor and outdoor nature connection a survey will be made by Nature Connection topic leads, with the use of the already existing Nature Connection Index (more details can be found in Appendix G). Also, in 2027, they will make a biophilic design checklist based on Kellert's 14 patterns (Appendix C) to assess some randomised rooms and outdoor spaces.

8.2 Key performance indicators

8.2.1 KPI's biodiversity³¹

The KPI's will be modified once the Blom baseline measurement is completed in summer 2026. The number of different species within a species group will give an indication on the variety of species. The total number of a species will give an indication of the vitality of species. If species are doing well, they are likely to increase in their numbers.

- > Number of butterfly species (increase of 100-200% from 2026 baseline by 2029).
- > Number of total butterflies (increase of 200-300% from 2026 baseline by 2029).
- > Number of wild bees' species (increase of 100-200% from 2026 baseline by 2029).
- > Number of total wild bees (increase of 200-400% from 2026 baseline by 2029).
- > Number of bird species (increase of 30-50% from 2026 baseline by 2029).
- > Number of total birds (increase of 50-100% from 2026 baseline by 2029).
- > Have an average grade of 8 or higher for soil animal research (according to the Bodemdierendagen by 2029).
- > Number of soil animal species (increase of 100-150% from 2026 baseline by 2029).
- > Number of total soil animals (increase of 150-250% from 2025 baseline by 2029).
- > Number of vascular plant species (increase of 200-300% from 2026 baseline by 2029).
- > Number of tree species (maintain or increase by 2029).
- > Number of total trees (increase of 25 by 2029).
- > 50% of icon species list present by 2029.³²
- > A conversion of 50% of all grasslands into wildflower meadows.³³

³¹ The KPI's for the species and total number are based upon research by Babbe Hengeveld on the feasibility of a food forest and the following sources: Vollmer, B. H., & Jakobsen, R. D. (2016). *How Wild is Vild Campus*. https://www1.bio.ku.dk/vildcampus/doc/HowwildisVildCampus_Vollmer_and_Jakobsen_2016_.pdf and Marshall, et al. (2023). Urban wildflower meadow planting for biodiversity, climate and society: An evaluation at King's College, Cambridge. *Ecological Solutions and Evidence*, 4(2). <https://doi.org/10.1002/2688-8319.12243>

³² Universiteit Utrecht established 20 icon species for monitoring and habitat improvement, with 9 species (45%) already present at baseline (2022). Given BUAs' smaller scale and 4-year timeframe (vs. Utrecht's 2035 target), achieving 75% presence represents ambitious but realistic progress, particularly with targeted habitat creation for specific species: UU. (n.d.-a). *Icon species*. Utrecht University. Retrieved January 6, 2026, from <https://www.uu.nl/en/organisation/sustainable-uu/operations/biodiversity/regreening-university-grounds/icon-species-of-utrecht-university>

³³ Our campus is approximately 5.7 ha of which approximately 0,95 ha is grassland. This is more than 16% of the campus terrain with only grass. A study by Marshall et al. (2022) has shown that the terrain of King's College in Cambridge that was converted by 30-40% into wildflower meadows had a significant effect on biodiversity. Therefore, we propose the same percentages as targets. Since we want to be a frontrunner, we propose 50% of all grass to be turned into wildflower meadows. We don't propose 100% since we have a soccer field and want our students also to be able to sit on the grass underneath the trees in summer and want to maintain necessary sightlines. Marshall, et al. (2023). Urban wildflower meadow

- > Have an increase in biodiversity infrastructure elements on campus.
- > Have a ranking on biodiversity for SustainaBul of at least 0.5 higher than the average of all the institutions by 2029.

8.2.2 KPI's nature connection

- > Nature Connection Index score (target: +20% by 2029).³⁴
- > Nature Connection patterns visibility (target: +40% by 2029).³⁵
- > Have an increase in nature connection facilities by 2029.
- > Community Garden / Food Forest participation (target: 200 showups in total per year by 2029).³⁶

8.3 Monitoring

The measurements will take place on a yearly basis. After three years, we can consider scaling back to once in every three years.

planting for biodiversity, climate and society: An evaluation at King's College, Cambridge. *Ecological Solutions and Evidence*, 4(2). <https://doi.org/10.1002/2688-8319.12243>

³⁴ This percentage takes into account that the average NCI scores in Dutch young adult were 48.5 (SD = 26.6) in 2022 and 46.2 (SD = 26.1), Van Den Bogerd, N., Richardson, M., Bentvelsen, J., Holtmaat, K., Labib, S., & Maas, J. (2025). Capturing nature Connectedness: Validity and utility of the Dutch nature connection index. *Journal of Environmental Psychology*, 106, 102727. <https://doi.org/10.1016/j.jenvp.2025.102727>

³⁵ We expect a high percentage here since more and more students and staff will become aware of the patterns once they remain longer on campus. Awareness is always easier than actual effect.

³⁶ This number is based upon research by Babbe Hengeveld who did a feasibility study for a food forest on campus. Currently (in 2025) we had approximately 70-100 showups in total).

9 Budget and resources

9.1 Budget 2026

Activity description	€'s
Additional personnel (0.1 FTE)	7,000
Ecological baseline measurement	20,000
Food forest implementation	6,000
Outdoor Nature Connection on campus	6,000
Additional Biodiversity action plan implementation	10,000
Indoor Nature Connection	3,800
Total	52,800

9.2 Resources

- > Biodiversity & Outdoor Nature Connection: 0.2 FTE
 - > Standard personnel: 0.1 FTE
 - > Extra personnel: 0.1 FTE
- > Indoor Nature Connection: 0.25 FTE (with 0.1 FTE for 2026)
 - > Project manager: 0.15 FTE
 - > Building project manager: 0.1 FTE
- > Gardening Club for Community Garden and food forest maintenance.

Total FTE 2026: 0.3 FTE

Total FTE 2027+: 0.45 FTE

10 Risks and barriers

True biodiversity frontrunner and nature connection status requires acknowledging difficult trade-offs. A frontrunner campus might have areas that look "messy" because they prioritise native species over manicured landscapes. It means spending resources on monitoring and measurement that don't produce immediate visual results. Safety considerations regarding falling branches, sightlines and lighting must be balanced with habitat creation. Defending decisions that seem counterintuitive to those expecting traditional campus beautification will be necessary. Being a frontrunner means avoiding token features like pollinator gardens without ecosystem-wide thinking, unsubstantiated "nature positive" claims, and focusing on aesthetics rather than biodiversity specifically.

10.1 Finding motivation in the community

Biodiversity topics are frequently deprioritised compared to other climate topics because CO2 reduction isn't easily measurable. **Mitigation:** Show and explain how biodiversity is needed to lower our CO2 emission.

10.2 Cultural resistance and aesthetic expectations

As stakeholders become more involved in biodiversity measures, conflicts often emerge, representing a common challenge institutions face. Campus communities expect manicured landscapes, not wild meadows or "messy" native plantings. **Mitigation:** Install educational signage explaining ecological purpose and benefits. Use Blom Ecologie assessment for scientific credibility. Create differentiated zones (tidy social spaces alongside wilder biodiversity areas). Engage community through participatory activities that build understanding.

10.3 Technical expertise and continuity

Ownership of biodiversity and nature is not yet embedded in BUAs' standard business operations, but exists only as a topic within CPO, making it vulnerable, particularly since it relies on a single part-time staff member who leads the topic based on her ecological expertise, a role that sits outside her core BUAs responsibilities. **Mitigation:** Establish ongoing Blom Ecologie partnership. Build student capacity through research projects. Embed biodiversity into CPO framework with annual monitoring and public reporting. Build broad stakeholder coalition (Zoöp, municipality, students) so initiatives don't depend on one individual. Write everything down so that research can be duplicated and reported on.

10.4 Climate Engagement Through Nature Connection

People who feel more connected to nature are more likely to act in environmentally responsible ways, yet abstract climate data often fails to motivate change. **Opportunity:** Nature connection makes climate issues tangible. When students care for the Community Garden or the food forest, they develop emotional investment in environmental protection that transcends climate debates. **Mitigation:** Frame initiatives as wellbeing first, letting climate connections emerge naturally through experience rather than leading with potentially polarising climate messaging.

11 References

All references from the appendices are also included in the list below.

- Brennan, A., & Lo, N. Y. S. (2021). *Environmental Ethics & Biodiversity Preservation (Stanford Encyclopedia of Philosophy)*. Retrieved January 6, 2026, from <https://plato.stanford.edu/entries/ethics-environmental/biodiversity.html>
- Bucher, R., Nickel, H., Kaib, S., Will, M., Carchi, J., Farwig, N., & Schabo, D. G. (2019). Birds and plants as indicators of arthropod species richness in temperate farmland. *Ecological Indicators*, 103, 272–279. <https://doi.org/10.1016/j.ecolind.2019.04.011>
- CBS. (2025, March 17). *Meetdoelen - Meetprogramma's voor flora en fauna*. Meetdoelen - Meetprogramma's Voor Flora En Fauna | CBS. Retrieved February 9, 2026, from <https://longreads.cbs.nl/meetprogrammas-flora-en-fauna-2024/meetdoelen/>
- Chan, K. M. A., Balvanera, P., Benessaiah, K., Chapman, M., Díaz, S., Gómez-Baggethun, E., Gould, R., Hannahs, N., Jax, K., Klain, S., Luck, G. W., Martín-López, B., Muraca, B., Norton, B., Ott, K., Pascual, U., Satterfield, T., Tadaki, M., Taggart, J., & Turner, N. (2016). Why protect nature? Rethinking values and the environment. *Proceedings of the National Academy of Sciences*, 113(6), 1462–1465. <https://doi.org/10.1073/pnas.1525002113>
- Convention on Biological Diversity. (2022). *COP15: Nations Adopt Four Goals, 23 Targets for 2030 In Landmark UN Biodiversity Agreement*. Retrieved January 6, 2026, from <https://www.cbd.int/article/cop15-cbd-press-release-final-19dec2022>
- Correia, A. M., & Lopes, L. F. (2023). Revisiting Biodiversity and Ecosystem Functioning through the Lens of Complex Adaptive Systems. *Diversity*, 15(8), 895. <https://doi.org/10.3390/d15080895>
- De Ree, M. (2023, May 30). Biodiversity monitored extensively by CBS. *Statistics Netherlands*. <https://www.cbs.nl/en-gb/corporate/2023/21/biodiversity-monitored-extensively-by-cbs>
- Ernst & Young (EY). (2024). Building consensus on state of nature metrics to drive nature positive outcomes. In *Consultation Brief on Draft Metrics* [Consultation brief]. Retrieved January 6, 2026, from https://www.naturepositive.org/app/uploads/2024/10/Consultation-Brief_State-of-Nature-Metrics_8Oct2024.pdf
- EUR. (n.d.-a). *Campus Garden*. Retrieved January 6, 2026, from <https://www.eur.nl/en/about-university/vision-strategy-2030/sustainability/life-campus/green-campus/sustainable-community>
- EUR. (n.d.-b). *Green Campus*. Retrieved January 6, 2026, from <https://www.eur.nl/en/about-university/vision-strategy-2030/sustainability/life-campus/green-campus>
- European Parliament. (2024a). *Nature restoration: Parliament adopts law to restore 20% of EU's land and sea* | News | European Parliament. Retrieved January 6, 2026, from <https://www.europarl.europa.eu/news/en/press-room/20240223IPR18078/nature-restoration-parliament-adopts-law-to-restore-20-of-eu-s-land-and-sea>
- European Parliament. (2024b, August 15). *Nature Restoration Law enters into force*. Environment. Retrieved January 6, 2026, from https://environment.ec.europa.eu/news/nature-restoration-law-enters-force-2024-08-15_en
- Gemeente Breda. (2022). *Duurzaamheidsvisie "Breda2030."* Retrieved January 6, 2026, from <https://open.breda.nl/sites/default/files/2024-11/Duurzaamheidsvisie%20%27Breda%202030%27.pdf>
- Guinan, A., Evans, A. E., Plotkin, A. B., & Bradley, B. A. (2025). Identifying candidate plants for climate-informed restoration. *Restoration Ecology*, 33(4). <https://doi.org/10.1111/rec.70030>
- Hooper, D. U., Chapin, F. S., Ewel, J. J., Hector, A., Inchausti, P., Lavorel, S., Lawton, J. H., Lodge, D. M., Loreau, M., Naeem, S., Schmid, B., Setälä, H., Symstad, A. J., Vandermeer, J., & Wardle, D. A. (2005). EFFECTS OF BIODIVERSITY ON ECOSYSTEM FUNCTIONING: a CONSENSUS OF CURRENT KNOWLEDGE. *Ecological Monographs*, 75(1), 3–35. <https://doi.org/10.1890/04-0922>
- Howard, S. R., & Symonds, M. R. E. (2023). Complex preference relationships between native and non-native angiosperms and foraging insect visitors in a suburban greenspace under field and laboratory conditions. *Die Naturwissenschaften*, 110(3), 16. <https://doi.org/10.1007/s00114-023-01846-9>
- IFAD. (2024, April 11). *The three types of biodiversity: explained*. Retrieved January 6, 2026, from <https://www.ifad.org/en/w/explainers/the-three-types-of-biodiversity-explained>
- Kellert, S. R., & Calabrese, E. F. (2015). The practice of biophilic design. *The Practice of Biophilic Design*, 3. https://biophilicdesign.umn.edu/sites/biophilic-net-positive.umn.edu/files/2021-09/2015_Kellert%20_The_Practice_of_Biophilic_Design.pdf

- Key, I. B., Smith, A. C., Turner, B., Chausson, A., Girardin, C. a. J., Macgillivray, M., & Seddon, N. (2022). Biodiversity outcomes of nature-based solutions for climate change adaptation: Characterising the evidence base. *Frontiers in Environmental Science*, 10. <https://doi.org/10.3389/fenvs.2022.905767>
- Leiden University. (n.d.). *Climate adaptation and biodiversity*. Retrieved January 6, 2026, from <https://www.universiteitleiden.nl/en/dossiers/the-sustainable-university/sustainable-campus/biodiversity>
- Marshall, C. a. M., Wilkinson, M. T., Hadfield, P. M., Rogers, S. M., Shanklin, J. D., Eversham, B. C., Healey, R., Kranse, O. P., Preston, C. D., Coghill, S. J., McGonigle, K. L., Moggridge, G. D., Pilbeam, P. G., Marza, A. C., Szegcsan, D., Mitchell, J., Hicks, M. A., Wallis, S. M., Xu, Z., . . . Akker, S. E. D. (2023). Urban wildflower meadow planting for biodiversity, climate and society: An evaluation at King's College, Cambridge. *Ecological Solutions and Evidence*, 4(2). <https://doi.org/10.1002/2688-8319.12243>
- Martin, L., White, M. P., Hunt, A., Richardson, M., Pahl, S., & Burt, J. (2020). Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology*, 68, 101389. <https://doi.org/10.1016/j.jenvp.2020.101389>
- Ministerie van Algemene Zaken. (2024, January 3). *Environment and Planning Act*. Government.nl. Retrieved January 6, 2026, from <https://www.government.nl/topics/environment-and-planning-act>
- Ministerie van Economische Zaken en Klimaat. (2017, October 4). *Legislation protecting nature in the Netherlands*. Nature and Biodiversity | Government.nl. Retrieved January 6, 2026, from <https://www.government.nl/topics/nature-and-biodiversity/legislation-protecting-nature-in-the-netherlands>
- native*. (n.d.). The Britannica Dictionary. Retrieved January 6, 2026, from <https://www.britannica.com/dictionary/native>
- Nature Positive Initiative. (n.d.). *About nature positive*. Retrieved February 9, 2026, from <https://www.naturepositive.org/about/>
- Nature Positive Initiative. (n.d.-b). *Measuring nature positive*. Retrieved February 9, 2026, from <https://www.naturepositive.org/metrics/>
- Nature Positive Initiative. (2025a, January 18). *State of Nature Metrics: ready for testing - Nature Positive*. Nature Positive. Retrieved January 6, 2026, from <https://www.naturepositive.org/news/latest-news/state-of-nature-metrics-ready-for-testing/>
- Nature Positive Initiative. (2025b, March 20). *Four key indicators in the draft State of Nature Metrics*. Nature Positive. Retrieved January 6, 2026, from <https://www.naturepositive.org/news/blog/four-indicators-state-of-nature-metrics/>
- Nature Positive Initiative. (2025c, May 7). *Nature Positive Initiative launches global piloting programme - Nature Positive*. Nature Positive. Retrieved January 6, 2026, from <https://www.naturepositive.org/news/latest-news/pilot-launch/>
- PALM DESERT CENTER. (2022, July 11). *Indicator species*. Retrieved February 9, 2026, from <https://palmdesert.ucr.edu/calnatblog/2022/07/11/indicator-species>
- Pereira, H., & Davidcooper, H. (2005). Towards the global monitoring of biodiversity change. *Trends in Ecology & Evolution*, 21(3), 123–129. <https://doi.org/10.1016/j.tree.2005.10.015>
- Sarkar, S. (2021). Origin of the Term Biodiversity. *BioScience*, 71(9), 893. <https://doi.org/10.1093/biosci/biab071>
- Sax, D. F., Schlaepfer, M. A., & Olden, J. D. (2022). Valuing the contributions of non-native species to people and nature. *Trends in Ecology & Evolution*, 37(12), 1058–1066. <https://doi.org/10.1016/j.tree.2022.08.005>
- Schlaepfer, M. A. (2018). Do non-native species contribute to biodiversity? *PLoS Biology*, 16(4), e2005568. <https://doi.org/10.1371/journal.pbio.2005568>
- Simberloff, D. (2015). Non-native invasive species and novel ecosystems. *F1000Prime Reports*, 2(7), 47. <https://doi.org/10.12703/p7-47>
- Sprong, L. E. (2024). *Enhancing the human-nature connection on campus, improving the overall health* [Bachelor thesis]. Breda University of Applied Sciences.
- Stork, N. E., & Eggleton, P. (1992). Invertebrates as determinants and indicators of soil quality. *American Journal of Alternative Agriculture*, 7(1–2), 38–47. <https://doi.org/10.1017/s0889189300004446>
- The European Union. (2025, December 22). *The EU #NatureRestoration Law*. Environment. Retrieved January 6, 2026, from https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-regulation_en
- The Netherlands | Global Environmental Education Partnership (GEEP)*. (n.d.). Global Environmental Education Partnership (GEEP). <https://thegeep.org/resources/countries/netherlands>
- Therapin. (2014, September 12). *14 Patterns of biophilic design*. <https://www.terrapinbrightgreen.com/reports/14-patterns/>
- Tilburg University. (n.d.). *Biodiversity*. Retrieved January 6, 2026, from <https://www.tilburguniversity.edu/campus/sustainability/policy-and-business-operations/biodiversity>

- Tilburg University. (2024). *Opening of the Community Garden*. Retrieved January 6, 2026, from <https://www.tilburguniversity.edu/current/events/community-garden>
- UK Government. (2025, December 2). *Status of all-species: relative abundance*. GOV.UK. Retrieved February 9, 2026, from <https://www.gov.uk/government/statistics/england-biodiversity-indicators/status-of-all-species-relative-abundance>
- University of Nottingham. (n.d.-a). *Biodiversity - the University of Nottingham*. Retrieved January 6, 2026, from <https://www.nottingham.ac.uk/sustainability/grounds/biodiversity.aspx>
- University of Nottingham. (n.d.-b). *No mow may*. Retrieved January 6, 2026, from <https://blogs.nottingham.ac.uk/sustainablenottingham/2021/05/20/no-mow-may-biodiversity-at-the-university-of-nottingham/>
- UU. (n.d.-a). *Icon species*. Utrecht University. Retrieved January 6, 2026, from <https://www.uu.nl/en/organisation/sustainable-uu/operations/biodiversity/regreening-university-grounds/icon-species-of-utrecht-university>
- UU. (n.d.). *Increasing biodiversity*. Utrecht University. Retrieved January 6, 2026, from <https://www.uu.nl/en/organisation/sustainability-at-the-university/operations/increasing-biodiversity>
- Van Den Bogerd, N., Richardson, M., Bentvelsen, J., Holtmaat, K., Labib, S., & Maas, J. (2025). Capturing nature Connectedness: Validity and utility of the Dutch nature connection index. *Journal of Environmental Psychology, 106*, 102727. <https://doi.org/10.1016/j.jenvp.2025.102727>
- Van Putten, L. (2021, September 21). *Groene eilandjes rondom universiteitsgebouwen moeten bedreigde insecten lokken*. Universiteit Leiden. Retrieved January 6, 2026, from <https://www.universiteitleiden.nl/nieuws/2021/09/groene-eilandjes-rondom-universiteitsgebouwen-moeten-bedreigde-insecten-lokken>
- Vollmer, B. H., & Jakobsen, R. D. (2016). *How Wild is Vild Campus*. https://www1.bio.ku.dk/vildcampus/doc/HowwildisVildCampus_Vollmer_and_Jakobsen_2016_.pdf
- WUR. (n.d.). *Sustainable business operations*. Wageningen University & Research. Retrieved January 6, 2026, from <https://www.wur.nl/en/about-wur/organisation-profile/sustainable-business-operations>
- Zeng, Q., Yang, Z., Chen, Z., & Chen, P. (2025). The relationships between nature connectedness, nature contact, and positive psychological outcomes: A meta-analysis. *Journal of Environmental Psychology, 105*, 102675. <https://doi.org/10.1016/j.jenvp.2025.102675>
- Zoöp. (2023). *Why Zoöp?* Retrieved January 26, 2026, from <https://zoop.earth/en/page/459/why-zo%C3%B6p>

Appendix A – Native vs. non-native

Royal Haskoning specifically called upon the notion of preferring native species. Their definition of biodiversity has sparked a discussion on the topic of native species. BUAs has decided to take a more nuanced perspective on the matter.

Native species are those that evolved naturally in a particular region over thousands of years, developing complex relationships with local climate, soil, and other organisms.³⁷ Non-native species are those introduced by humans, either intentionally or accidentally, from other regions or continents.³⁸ Native species form the foundation of local ecosystems because they have co-evolved with other native organisms, creating intricate webs of relationships, such as specific pollinator-plant partnerships, predator-prey dynamics, and nutrient cycling processes. These relationships often cannot be replicated by non-native species. This makes native species particularly valuable for supporting local wildlife populations and maintaining ecosystem functions.

However, non-native species can also contribute to biodiversity, especially when they provide resources or habitats that native species can utilize without causing ecological harm.³⁹ Some non-native plants offer nectar when native flowers aren't blooming, extending food availability for pollinators (e.g. crocuses). Others may provide habitat structures in areas where native vegetation has been lost.⁴⁰ In addition, non-native species can provide pollination services, seed dispersal where it's needed and other regulatory services such as extra carbon sequestration and biological control. The key is whether non-native species integrate beneficially into existing ecological relationships or disrupt them. The challenge arises with invasive species: non-natives that spread rapidly and outcompete native species.⁴¹ This happens because often they lack natural predators or diseases in their new environment. Invasive species can reduce biodiversity by displacing natives and breaking down the complex ecological relationships that support ecosystem stability.

Climate change complicates native versus non-native species decisions. As conditions shift, some native species may struggle while certain non-natives prove better adapted to new climates. This raises difficult questions: preserve historical native ecosystems that may become unsustainable or embrace "novel ecosystems" with climate-adapted non-natives?⁴² Conservation strategies like "assisted migration" (moving native species to track suitable conditions) or introducing non-natives for ecosystem services carry risks of creating new invasive species problems.⁴³ The answer to the question is, therefore, a bit more nuanced. In order for nature to adapt to the quickly changing climate, we need to do our best to care for our native environment while introducing non-native species carefully that can assist native species in their struggles. This can be called "climate-informed native restoration"⁴⁴: selecting native species and genetic varieties that are locally adapted but resilient to projected conditions, while using non-natives strategically to fill specific gaps with careful monitoring.

³⁷ *native*. (n.d.). The Britannica Dictionary. Retrieved January 6, 2026, from <https://www.britannica.com/dictionary/native>

³⁸ Howard, S. R., & Symonds, M. R. E. (2023). Complex preference relationships between native and non-native angiosperms and foraging insect visitors in a suburban greenspace under field and laboratory conditions. *Die Naturwissenschaften*, 110(3), 16. <https://doi.org/10.1007/s00114-023-01846-9>

³⁹ Schlaepfer, M. A. (2018). Do non-native species contribute to biodiversity? *PLoS Biology*, 16(4), e2005568. <https://doi.org/10.1371/journal.pbio.2005568>

⁴⁰ Sax, D. F., Schlaepfer, M. A., & Olden, J. D. (2022). Valuing the contributions of non-native species to people and nature. *Trends in Ecology & Evolution*, 37(12), 1058–1066. <https://doi.org/10.1016/j.tree.2022.08.005>

⁴¹ Simberloff, D. (2015). Non-native invasive species and novel ecosystems. *F1000Prime Reports*, 2(7), 47. <https://doi.org/10.12703/p7-47>

⁴² Simberloff, D. (2015). Non-native invasive species and novel ecosystems. *F1000Prime Reports*, 2(7), 47. <https://doi.org/10.12703/p7-47>

⁴³ Key, et al. (2022). Biodiversity outcomes of nature-based solutions for climate change adaptation: Characterising the evidence base. *Frontiers in Environmental Science*, 10. <https://doi.org/10.3389/fenvs.2022.905767>

⁴⁴ Guinan, et al. (2025). Identifying candidate plants for climate-informed restoration. *Restoration Ecology*, 33(4). <https://doi.org/10.1111/rec.70030>

Thus, a biodiversity-conscious approach recognizes that while native species should form the backbone of any ecosystem, carefully selected non-native species can complement and enhance local biodiversity when they don't threaten native ecological relationships.

Appendix B – Five core principles of biophilic design

According to Kellert and Calabrese there are five core principles to biophilic design?⁴⁵

1. Repeated and sustained engagement with nature

Design should create ongoing and recurring opportunities to experience nature, rather than one-off or decorative touches. This means nature is integrated into everyday routines (e.g., regular daylight exposure, views of greenery, or outdoor access).

2. Focus on human adaptations that advance health and wellbeing

Biophilic design recognises that humans evolved in close relationship with natural environments and therefore prioritises features that align with those evolutionary needs, such as environments that support exploration and understanding, provide refuge and safety, and offer sensory variation rather than monotony. The goal is to create settings that feel intuitively supportive, safe, and cognitively engaging, because they resonate with how humans are biologically predisposed to interact with the world.

3. Encourage emotional attachment to places.

Spaces should foster a sense of connection, comfort, and identity. Using familiar natural forms, materials, and patterns helps people feel grounded, contributing to belonging and stewardship of the environment.

4. Promote positive human-nature interactions

The design encourages meaningful encounters with nature, such as touching plants, observing wildlife, hearing water, or noticing seasonal changes. These interactions reinforce curiosity, calm, and delight.

5. Create mutually reinforcing, integrated architectural solutions

Nature should not be an afterthought. Biophilic strategies work best when lighting, materials, spatial layout, and landscape design all support one another to form a coherent, holistic experience rather than isolated features.

⁴⁵ Kellert, S. R., & Calabrese, E. F. (2015). The practice of biophilic design. *The Practice of Biophilic Design*, 3. https://biophilicdesign.umn.edu/sites/biophilic-net-positive.umn.edu/files/2021-09/2015_Kellert%20The_Practice_of_Biophilic_Design.pdf

Appendix C – Patterns

Below you will find all 14 patterns of biophilic design.⁴⁶

1. **Visual connection with nature:** A view to elements of nature, living systems and natural processes.
 - Prioritize real nature over simulated nature, and simulated nature over no nature.
 - Prioritize biodiversity over acreage, area or quantity.
 - Prioritize or enable exercise opportunities that are in proximity to green space.
 - Design to support a visual connection that can be experienced for at least 5-20 minutes per day.
 - Design spatial layouts and furnishings to uphold desired view lines and avoid impeding the visual access when in a seated position.
 - Visual connections to even small instances of nature can be restorative, and particularly relevant for temporary interventions, or spaces where real estate (floor/ground area, wall space) is limited.
 - The benefits of viewing real nature may be attenuated by a digital medium, which may be of greatest value to spaces that, due to the nature of its function (e.g., hospital radiation units), cannot easily incorporate real nature or views to the outdoors.
2. **Non-visual connection with nature:** Auditory, haptic, olfactory, or gustatory stimuli that engender a deliberate and positive reference to nature, living systems or natural processes.
 - Prioritize nature sounds over urban sounds.
 - Design for non-visual connections that can be easily accessed from one or multiple locations, and in such a way that allows daily engagement for 5 to 20 minutes at a time.
 - Integrate non-visual connections with other aspects of the design program.
 - A single intervention that can be experienced in multiple ways can enhance the impacts.
 - Design for visual and non-visual connections to be experienced simultaneously to maximize potential positive health responses.
3. **Non-rhythmic sensory stimuli:** Stochastic and ephemeral connections with nature that may be analysed statistically but may not be predicted precisely.
 - As a general guideline, non-rhythmic sensory experiences should occur approximately every 20 minutes for about 20 seconds and, for visual stimuli, from a distance of more than 20 feet away.
 - Many stimuli in nature are seasonal, so a strategy that is effective year-round, such as with multiple interventions that overlap with seasons, will help ensure that non-rhythmic sensory experiences can occur at any given time of the year.
 - In some cases, the intervention may be similar to that of [P1] Visual or [P2] Non-Visual Connection with Nature; what's important here is the ephemeral and stochastic quality of the intervention.
 - An intervention that leverages simulation of (rather than naturally occurring) natural stimuli will likely necessitate early collaboration with the mechanical engineer or facilities team.
 - A non-rhythmic stimuli strategy can be interwoven with almost any landscape or horticulture plan. For instance, selecting plant species for window boxes that will attract bees, butterflies and other pollinators may be a more practical application for some projects than maintaining a honeybee apiary or butterfly sanctuary.
 - Humans perceive movement in the peripheral view much quicker than straight ahead. The brain also processes the movement of living things in a different place than it does of mechanical objects (Beauchamp et al., 2003), whereby natural movement is generally perceived as positive, and mechanical movement as neutral or even negative. As a result, the repeating rhythmic motion of a pendulum will only hold one's attention briefly, the constant repetitive ticking of a clock may come to be ignored over time, and an ever-present scent may lose its mystique with long-term exposure, whereas the stochastic movement of a butterfly will capture one's attention each time for recurring physiological benefits.
4. **Thermal & airflow variability:** Subtle changes in air temperature, relative humidity, airflow across the skin, and surface temperatures that mimic natural environments.
 - Incorporation of airflow and thermal conditions into materials, daylighting, mechanical ventilation and/or fenestration will help distribute variability over space and time.

⁴⁶ Therapin. (2014, September 12). *14 Patterns of biophilic design*. <https://www.terrapinbrightgreen.com/reports/14-patterns/>

- Thermal comfort is a vital bridging component between biophilic design and sustainable design, especially in the face of climate change and rising energy costs. When Thermal & Airflow Variability is implemented in a way that broadens people's perception of thermal comfort, it may also help reduce energy demands for air conditioning and heating.
 - Designing in features that allow users to easily adapt and modify their perceived thermal conditions of their environment will increase the range of acceptable temperatures by two degrees Celsius above and below the conventional parameters for thermal comfort (Nicol & Humphreys, 2002).
 - Coordination of design strategies among a project team (e.g., architect, lighting designer and MEP engineers) as early as the schematic design process will be particularly important for achieving design intent.
5. **Presence of water:** A condition that enhances the experience of a place through the seeing, hearing or touching of water.
- Prioritize a multi-sensory water experience to achieve the most beneficial outcome.
 - Prioritize naturally fluctuating water movement over predictable movement or stagnancy.
 - High volume, high turbulence water features could create discomfort, impact humidity levels or decrease acoustic quality, so proximity may influence appropriateness.
 - Water features can be water and energy intensive and as such should be used sparingly, particularly in climates with little access to water. Shading the water, using high albedo surfaces, and minimizing the exposed water surface area will minimize water loss through evaporation, and possibly contribute to the biophilic experience.
6. **Dynamic & diffuse light:** Leveraging varying intensities of light and shadow that change over time to create conditions that occur in nature.
- Dynamic lighting conditions can help transition between indoor and outdoor spaces.
 - Drastically dynamic lighting conditions, such as with sustained movement, changing colours, direct sunlight penetration and high contrasts, may not be appropriate for spaces where directed attention activities are performed.
 - Circadian lighting will be especially important in spaces the people occupy for extended periods of time.
7. **Connection with natural systems:** Awareness of natural processes, especially seasonal and temporal changes characteristic of a healthy ecosystem.
- Integration of rainwater capture and treatment into the landscape design that responds to rain events.
 - In some cases, providing visual access to existing natural systems will be the easiest and most cost-effective approach. In other cases, the incorporation of responsive design tactics (e.g., use of materials that change form or expand function with exposure to solar heat gain, wind, rain/moisture, or shading), structures (e.g., steps wells), and land formations (e.g., bioswales, arroyos, dunes) will be necessary to achieve the desired level of awareness.
 - Design interactive opportunities, especially for children, patients, and the elderly (e.g., integrative educational curriculum; horticulture programs, community gardens; seasonal cooking/diet).
8. **Biomorphic forms & patterns:** Symbolic references to contoured, patterned, textured or numerical arrangements that persist in nature.
- Apply on 2 or 3 planes or dimensions (e.g., floor plane and wall; furniture windows and soffits) for greater diversity and frequency of exposure.
 - Avoid the overuse of forms and patterns that may lead to visual toxicity.
 - More comprehensive interventions will be more cost effective when they are introduced early in the design process.
9. **Material connection with nature:** Material and elements from nature that, through minimal processing, reflect the local ecology or geology to create a distinct sense of place.
- Quantities of a (natural) material and colour should be specified based on intended function of the space (e.g., to restore versus stimulate). In the same vein, a degree of variability of materials and applications is recommended over high ratios of any one material or colour.
 - Real materials are preferred over synthetic variations because human receptors can tell the difference between real and synthetic, so minimally processed materials from real nature are preferred whenever possible.

- Incorporating instances of the colour green may help enhance creative environments; however, scientific studies on the impact of the colour green have mostly been conducted in controlled lab environments, so dependence on colour to engender creativity should be considered experimental.
10. **Complexity & order:** Rich sensory information that adheres to a spatial hierarchy similar to those encountered in nature.
- Prioritize artwork and material selection, architectural expressions, and landscape and master planning schemes that reveal fractal geometries and hierarchies.
 - Fractal structures with iterations of three will be more impactful than a design limited to two iterations.
 - Computer technology using the algorithms of mathematical and geometric functions can produce fractal designs for architectural, design and planning applications with ease. If a fractal design is being created, consider using geometries with a mid-range dimensional ratio (broadly speaking, $D=1.3-1.75$).
 - Over-use of and/or extended exposure to high-fractal dimensions could instil discomfort or even fear, countering the intended response: to nourish and reduce stress. Avoidance or under-utilization of fractals in design could result in complete predictability and disinterest.
 - A new building or landscape design should take into account its impact on the fractal quality of the existing urban skyline.
11. **Prospect:** An unimpeded view over a distance for surveillance and planning.
- Orienting building, fenestration, corridors and workstations will help optimize visual access to indoor or outdoor vistas, activity hubs or destinations.
 - Designing with or around an existing or planned savanna-like ecosystem, body of water, and evidence of human activity or habitation will help the information-richness of the prospect view.
 - Providing focal lengths of ≥ 20 feet (6 meters), preferably 100 feet (30 meters); when a space has sufficient depth, spatial properties can be leveraged to enhance the experience by removing visual barriers. Limiting partition heights to 42" will provide spatial barriers while allowing seated occupants to view across a space. Understory vegetation or hedges should use a similar guide; preferred height limitations will depend on terrain and how the space is most experienced (e.g., while sitting, standing, on a bicycle).
 - Locating stairwells at building perimeter with glass façade and interior glass stairwell walls can form a dual Prospect condition.
 - When high ceilings are present, perimeter or interior spaces elevated 12-18" will enhance the Prospect condition.
 - Often the view quality and the balance between Prospect and [P12] Refuge will be more important than the size or frequency of the experience.
 - Refer to [P1] Visual Connection with Nature to optimize the Prospect experience with a quality view.
12. **Refuge:** A place for withdrawal, from environmental conditions or the main flow of activity, in which the individual is protected from behind and overhead.
- weather or climate protection
 - speech or visual privacy
 - reflection or meditation
 - rest or relaxation
 - reading
 - complex cognitive tasks
 - protection from physical danger
13. **Mystery:** The promise of more information achieved through partially obscured views or other sensory devices that entice the individual to travel deeper into the environment.
- Curving edges that slowly reveal are more effective than sharp corners in drawing people through a space.
 - Dramatic shade and shadows can enhance the mystery experience.
 - Strategies that provide dark shadows or shallow depth of field could instil unappreciated surprise or fear.

- The speed at which users are transiting through a space will influence both the size of the aperture and the size of the subject; faster typically means bigger.
 - Organically evolved mystery conditions (e.g., low maintenance gardens with winding paths) are expectedly going to change characteristics over time. These changes should be monitored as they may enhance the mystery condition or otherwise degrade it as it evolves into a surprise condition (e.g., overgrowth of plantings leads to obscuring of depth of field).
14. **Risk / Peril:** An identifiable threat coupled with a reliable safeguard.
- Risk/Peril design interventions are usually quite deliberate and as such will not be appropriate for all user groups or places.
 - Design strategies that rely on spatial conditions will be easier to implement when incorporated as early as concept design and schematic phases of the design process.
 - The element of safety must protect the user from harm while still permitting the experience of risk.

Appendix D - Best practices

Biodiversity best practices

Brabant – Tilburg University

For the Brabant campus, we have chosen for Tilburg University as this campus is still in development with regard to biodiversity and greenifying. Also, its connections to the city centre are very interesting and inspiring.



Tilburg University aims to strengthen its green campus by linking biodiversity efforts with the Brabant city vision, connecting the Stadsbos013 forest with the entire Knowledge Axis (KennisAs) toward the city centre.⁴⁷ The university has installed green rooftops on five campus buildings totalling about 4,500 square meters, largely planted with sedum (succulents) and wild plants on roofs at unfavourable angles to the sun. Rainwater from the roofs of CUBE, the Faculty Club, and De Tuinkamer infiltrates the ground through a system of hollow crates. The campus also features various bioswales next to Warande building, Marga Klompé building, and the Sports Centre, which function as water storage and infiltration systems allowing rainwater to infiltrate the soil rather than draining directly. Plants chosen for the surrounding area can subsist on natural precipitation without requiring additional watering even during severe drought. The university takes ecological principles into account in all construction activities, landscape design, and project implementation. For all new construction, the university aims to achieve BREEAM Excellent or Outstanding certification. The university is implementing ecological mowing in some areas while balancing this with spaces where students can gather and socialize. Colourful and fruit-bearing trees and plants are being added to boost biodiversity. The university is managing its significant American oak population by planning to remove some trees in coming years to make room for other species, since American oaks grow vigorously and suppress species like birch and pine, and this lack of diversity increases risks of disease and pests like oak processionary caterpillars. The university aims for conscious choices to result in far more flora and fauna by 2030. A community garden was established through collaboration between landscape architect Studio Redd and the community, aligning with strategic plans for promoting biodiversity, managing excess rainwater effectively, and realizing a circular campus.⁴⁸

⁴⁷ Tilburg University. (n.d.). *Biodiversity*. Retrieved January 6, 2026, from <https://www.tilburguniversity.edu/campus/sustainability/policy-and-business-operations/biodiversity>

⁴⁸ Tilburg University. (2024). *Opening of the Community Garden*. Retrieved January 6, 2026, from <https://www.tilburguniversity.edu/current/events/community-garden>

The Netherlands

Erasmus University Rotterdam

Erasmus University Rotterdam is especially interesting since the campus looks quite a lot like ours. They also have implemented the same measurements in the last couple of years and are kind of in the same place as we are.



Erasmus University Rotterdam has implemented comprehensive biodiversity measures including engaging an ecologist in 2023 to develop an elaborate planting plan based on native plant species to make the campus substantially greener, climate resilient and biodiverse.⁴⁹ The university eliminated pesticide use with weeds mainly removed by weeding and added more colourful planting to attract insects. Infrastructure improvements include installing green roofs on buildings, planting extensive greenery and installing nesting boxes for birds, bees and bats on a newer building that opened in 2022, and finally, developing a bat protocol for the Tinbergen Building renovation to protect the bat population. The university renovated the large campus pond at the end of 2023 based on ecological consultation, constructing a clay-like nature-friendly bank to promote biodiversity and natural amphibian migration, with carefully selected trees, plants, herbs and puddle/wetland planting added in spring 2024. A campus garden opened in 2019, maintained by Edible EUR and the Erasmus Sustainability Hub using compost from the campus composter.⁵⁰ The campus garden is full of edible plants including fruits, vegetables and herbs, all planted and maintained by students and staff, with everything grown according to principles of natural or sustainable farming. The vision of Edible EUR is students and staff growing natural food all over and around campus whilst enriching the local ecosystem, with the garden designed to inspire, inform, and activate about the application of natural farming on and around campus. Students take care of the 60.000 campus honeybees together with the beekeeper of Bee the Change, promoting the survival of bees. The university offers weekly gardening and beekeeping sessions that are open to all with no registration, experience or materials required. Finally, for the Tinbergen Building renovation in 2024, trees were sustainably replanted rather than removed.⁵¹

⁴⁹ EUR. (n.d.). *Green Campus*. Retrieved January 6, 2026, from <https://www.eur.nl/en/about-university/vision-strategy-2030/sustainability/life-campus/green-campus>

⁵⁰ EUR. (n.d.-a). *Campus Garden*. Retrieved January 6, 2026, from <https://www.eur.nl/en/about-university/vision-strategy-2030/sustainability/life-campus/green-campus/sustainable-community>

⁵¹ EUR. (n.d.). *Green Campus*. Retrieved January 6, 2026, from <https://www.eur.nl/en/about-university/vision-strategy-2030/sustainability/life-campus/green-campus>

Wageningen University

Wageningen is the most sustainable university in the world and should therefore be taken into consideration.



Wageningen University & Research has made biodiversity one of the key elements in its sustainability policies on its approximately 60-hectare campus where more than 18,000 people study and work.⁵² Based on a living lab approach, the development and management of the green space is established in consultation with WUR experts from education, research and operational management, with the approach detailed in the Green Vision for Wageningen Campus. WUR promotes biodiversity by transforming the species-poor, disturbed, mineral-rich soils of the campus into species-rich dry and wet barren haylands in some areas. In other places, WUR develops vegetation by mixing native and non-native species which provide a year-round food source and shelter for insects, birds and other animals. The planting on Wageningen Campus is a mix of natural and cultural greenery, with the central strip on the campus having a park-like character with meadows, ponds, hedgerows and shrubbery, and several natural gardens on campus. With specific management, biodiversity is supported by sowing mixtures for flower meadows, the "winding" mowing of the banks of ditches and ponds, the creation of green elements and nature-inclusive construction. The design of the Wageningen Campus is based on the linear structures of the surrounding cultural-historic landscapes such as lanes, wooden walls, hedgerows and ditches, with a plan made in 2016 to enhance biodiversity within this basic design. Green design on campus differentiates between the tidy, intensely used parts for meeting and relaxation and more 'rugged' areas for biodiversity. Public spaces are designed to be nature-inclusive with green roofs such as on Lumen building and nestle opportunities in buildings for bats and sparrows. The campus has the world's first bio-asphalt cycle path and a green parking deck. The meadows, hedgerows and forested areas on campus form a green oasis and serve as ecological corridors to facilitate migration, reproduction, feeding and adaptation of wildlife and plant life. The Flora and Fauna policy on campus is founded on biodiversity, creating different growing and living conditions for a wide variety of plants and animals and strengthening the connection to surrounding nature. The Netherlands Institute of Ecology building is itself a testing ground for ecotechnology, sporting an experimental green roof that stores water and regulates the building's temperature. The campus serves as a Living Lab where education, research and entrepreneurship come together in pilots and student assignments.

⁵² WUR. (n.d.). *Sustainable business operations*. Wageningen University & Research. Retrieved January 6, 2026, from <https://www.wur.nl/en/about-wur/organisation-profile/sustainable-business-operations>

Utrecht University

Utrecht University is specifically interesting to look at because of their accurate monitoring practices, community engagement and connecting the green patches on campus. The campus is definitely not like ours, but they show us what's possible with long-term planning.



Utrecht University aims to reduce its biodiversity footprint by at least 35% by 2030 and become a green campus by 2035 through enhancing and restoring local biodiversity.⁵³ They manage an area of 350 hectares at Utrecht Science Park (USP) that has an essential role as a connecting element between surrounding nature areas. Together with research firm Dactylis, the university has drawn up a design and maintenance plan to restore biodiversity in the USP where greenery is connected to each other and to the natural areas around. They are taking various measures until 2035 to increase biodiversity such as ecological management of roadsides and lawns including moving from short grass verges to green oasis. The university is creating two ecological corridors covering approximately 10 hectares (equivalent to about fifteen football fields): one from east to west (20 meters wide and 2.2 kilometres long) and one from north to south (30 meters wide and 1.6 kilometres long), with construction of the North-South Connection starting in August 2025. These corridors connect Utrecht Science Park with surrounding natural areas, creating one large continuous habitat for plants and animals. The university actively protects the habitat of plants and animals by creating hiding places for martens, roe deer and badgers, creating nature-friendly banks for frogs, toads and salamanders, providing flyways for bats, and creating flowery grasslands which they manage ecologically. Utrecht University has appointed twenty icon species to monitor, including species that previously lived in the area before the 1960s such as European badgers, barred grass snakes, northern lapwings, little owls, weatherfishes, partridges, and scarce chaser dragonflies, with nine out of twenty icon species already residing in the USP as proven during the BioBlitz where nearly 2,000 people mapped plants, animals and fungi. The university established a Biodiversity Council whose knowledge and expertise helped determine which species are characteristic for the area and most promising for recovery by reviewing studies describing the area's biodiversity before it became Utrecht Science Park. They identified six key habitats necessary for the twenty icon species to survive, with corridors designed to be attractive to many species. Examples of measures include herb-rich verges, nature-friendly banks, species-rich fields, fruit orchards in a car-free energy-generating area, and the Botanical Gardens as a green heart. The thirty-four hectares of grass on campus are mowed less frequently and in phases since 2022. PhD student Petros Constantinides is developing a

⁵³ UU. (n.d.). *Increasing biodiversity*. Utrecht University. Retrieved January 6, 2026, from <https://www.uu.nl/en/organisation/sustainability-at-the-university/operations/increasing-biodiversity>

monitoring system for biodiversity measurements looking at field research, technical tools such as cameras, and the role of citizen science, monitoring species groups including insects, plants and birds.

Europe – University of Nottingham

For Europe's best practice the University of Nottingham has been chosen. It's ranked in the top five most sustainable universities and has also pledged to become a Nature Positive University.



The University of Nottingham, ranked in the top five most sustainable universities for the last ten years, has pledged to become a Nature Positive University, committed to understanding the impacts of the university's activities on nature and setting targets to reverse this.⁵⁴ The university is located on 330 acres of green space, with the award-winning campus including a woodland as well as extensive green spaces and parkland. The main parkland has components of rolling grassland, individual and clumped trees, shrub groups, water features, and 'wild areas' to encourage biodiversity and different plant species from around the world. Jubilee Campus is based around three lakes that were designed and are maintained with emphasis on wildlife conservation. The university works with student groups, internal specialists and a local consultancy to monitor the flora and fauna of campuses, enabling them to monitor and manage biodiversity and ensure protection of species and habitats in line with local, national and international conventions and legislation. New wildflower areas have been created in recent years on both University Park and Sutton Bonington, including the creation of a wildflower meadow at Florence Boot Hall and on the current lawn at Lenton Hurst House. Each year the university takes part in No Mow May and leaves verges, fields and spaces to grow a little wilder through the summer, with new wild spaces specifically created including grounds near Derby Hall and a strip between Highfields Lake and Jubilee Avenue being left uncut.⁵⁵ At Nightingale Hall, wildflower seed has been sown to encourage a mix of bees and butterflies. Throughout the year, more wild areas are created including near the Hemsley building and Teaching and Learning building. New native, species-rich hedgerows have been planted at Riverside and the traditional orchard on University Park has had new trees added to increase foraging for people and wildlife. The university has reduced mowing by 25% over the last 10 years, with grass left to grow longer and flower, which increases wildlife habitats and sources of food while saving fuel and reducing CO₂

⁵⁴ University of Nottingham. (n.d.). *Biodiversity - the University of Nottingham*. Retrieved January 6, 2026, from <https://www.nottingham.ac.uk/sustainability/grounds/biodiversity.aspx>

⁵⁵ University of Nottingham. (n.d.-b). *No mow may*. Retrieved January 6, 2026, from <https://blogs.nottingham.ac.uk/sustainablenottingham/2021/05/20/no-mow-may-biodiversity-at-the-university-of-nottingham/>

emissions. New battery-powered mowers are used on Highfields, Riverside and University Park sports grounds. The university has a Biodiversity Management Plan for University Park that sets out a 10-year program for enhancing the biodiversity of the campus. Significant increases in flora and fauna diversity have been seen on University Park, but the benefits are especially evident on Jubilee Campus, a former industrialized area that has been transformed into a green oasis. The university has around 60 beehives, each housing tens of thousands of honeybees, helping to increase biodiversity and pollination. The beehives are managed on the university's behalf by a professional bee farmer, with hives located at Bunny Park (arable farmland south of Nottingham used for university research) and King's Meadow Campus in Lenton. Since 2016, the university has planted 15,000 trees on its campuses and around the city of Nottingham. The university utilizes a variety of organic gardening practices to manage grounds and gardens to encourage biodiversity, with all campuses awarded the Green Flag Award.

Main take-aways

When looking at the university campuses above, the following practices can be deduced. These are not yet analysed or related to our own BUas campus.

Planning & governance

- > Engage an ecologist to develop planting plans
- > Establish a Biodiversity Council with expert knowledge
- > Create 10-year Biodiversity Management Plan
- > Link biodiversity efforts with city/regional vision
- > Adopt living lab approach with expert consultation
- > Set measurable targets (e.g., 35% footprint reduction by 2030)
- > Aim for BREEAM Excellent or Outstanding certification for new construction
- > Pledge to become Nature Positive University

Green infrastructure

- > Install green roofs (with sedum, wild plants, or experimental designs)
- > Create bioswales for water storage and infiltration
- > Install rainwater infiltration systems (hollow crates)
- > Plant green parking decks
- > Install bio-asphalt cycle paths
- > Create nature-inclusive construction with nesting opportunities in buildings

Planting & vegetation management

- > Use native plant species in planting plans
- > Mix native and non-native species for year-round food sources
- > Plant colourful and fruit-bearing trees
- > Manage tree diversity (remove monocultures like American oaks)
- > Plant species-rich hedgerows
- > Create herb-rich verges
- > Establish traditional orchards
- > Sow wildflower meadows
- > Plant flower meadow mixtures

Mowing & maintenance

- > Implement ecological mowing strategies
- > Reduce mowing frequency (e.g., 25% reduction over 10 years)
- > Mow grass less frequently and in phases
- > Use "winding" mowing of ditch and pond banks
- > Participate in "No Mow May"
- > Leave verges, fields and spaces to grow wilder
- > Eliminate pesticide use

- > Remove weeds by hand weeding
- > Use battery-powered mowers
- > Use organic gardening practices

Water features

- > Renovate ponds with nature-friendly banks (clay-like slopes)
- > Create ditches with nature-friendly banks
- > Plant puddle/wetland vegetation
- > Design lakes with emphasis on wildlife conservation
- > Create water features and buffers

Habitat creation

- > Transform lawns into wildflower areas
- > Create 'wild areas' for biodiversity
- > Establish ecological corridors
- > Create hiding places for specific species (martens, roe deer, badgers)
- > Provide flyways for bats
- > Install nesting boxes for birds, bees and bats
- > Create flowery grasslands
- > Develop bat protocols for building renovations
- > Differentiate between tidy social spaces and rugged biodiversity areas

Species management

- > Appoint icon species to monitor
- > Identify key habitats for target species
- > Manage beehives (professional bee farmer)
- > Plant fruit orchards for wildlife foraging
- > Sustainably replant trees during renovations rather than removing them

Monitoring & research

- > Work with internal specialists and external consultancies
- > Conduct baseline biodiversity assessments
- > Monitor flora and fauna regularly
- > Organize BioBlitz events (citizen science)
- > Develop monitoring systems using field research, cameras, and citizen science
- > Monitor species groups (insects, plants, birds)
- > Ensure protection in line with legislation and conventions
- > Track progress toward measurable goals

Community engagement

- > Establish campus gardens maintained by students/staff
- > Offer weekly gardening and beekeeping sessions (open to all)
- > Collaborate with landscape architects and community
- > Engage students in practical biodiversity work
- > Create educational signage and wayfinding
- > Use campus as Living Lab for student assignments
- > Partner with student groups

Landscape design

- > Base design on cultural-historic landscape structures
- > Create park-like central areas with meadows, ponds, hedgerows
- > Plant several natural gardens

- > Maintain rolling grassland with tree clumps
- > Create transition zones between buildings and nature
- > Balance aesthetic/functional needs with biodiversity goals

Regional connection

- > Connect campus to city green infrastructure (forests, parks)
- > Create ecological corridors to surrounding nature areas
- > Strengthen connection to surrounding nature
- > Link to regional biodiversity initiatives

Outdoor nature connection best practices

University of Nottingham



Figure 11.1: The Downs



Figure 11.2: Highfields Park

The University of Nottingham enhances nature connection through accessible outdoor spaces designed for restoration and engagement. Highfields Park, a 121-acre historic park adjacent to campus, features a boating lake, turf maze, flower garden, and pavilion café where students, staff, and visitors can relax and reconnect with nature between study sessions. The Downs, a large grassland wildflower meadow in the campus centre, serves as both a recreational space and educational resource, representing one of the few remaining neutral to acidic grasslands in the county. The traditional orchard on University Park provides foraging opportunities for both people and wildlife, creating a tangible connection to food production and seasonal cycles. These spaces reduce stress, provide mental restoration, and offer opportunities for informal nature observation, strengthening the emotional and cognitive connections between the campus community and the natural world.

Erasmus Rotterdam



Figure 11.3: Edible EUR



Erasmus University Rotterdam promotes nature connection through participatory outdoor spaces that engage the campus community in active stewardship. The Campus Garden (Edible EUR), open 24/7 and maintained by students and staff, creates a tangible connection to food production and natural farming principles, with edible fruits, vegetables, and herbs grown throughout the space.⁵⁶ The bee palace housing 60,000 campus bees offers weekly beekeeping sessions where students work alongside a professional beekeeper, fostering both knowledge and emotional bonds with pollinators. These hands-on gardening and beekeeping sessions require no registration, experience, or materials, making nature engagement accessible to everyone. By growing food and caring for bees, participants develop strong behavioural connections through regular interaction, cognitive connections through learning about ecosystems and natural farming, and emotional connections through the satisfaction of nurturing living things. The garden inspires, informs, and activates the community about natural processes while enriching the local ecosystem.

Leiden University

Leiden University strengthens nature connection through citizen science projects that transform passive observers into active participants.⁵⁷ The pavement plants research project invites the public to identify and map "stoeplantjes" (pavement plants) using chalk, raising awareness that these often-overlooked plants prevent heat stress, absorb rainwater and particulate matter, and provide urban wildlife habitat. The green islands corridor creates a visible, flower-rich pathway for wild bees from the Hortus Botanicus through campus, offering students and staff opportunities to observe pollinators in action while walking between buildings.⁵⁸ Flowering plants added around Van Steenis, Sylvius, and Oude UB buildings, the courtyard garden at Johan Huizinga building, and the rooftop garden on Wijnhaven building provide multiple outdoor spaces for relaxation and nature observation. The 12-hectare Schilperoortpark and the Hartlijn project with medicinal plantings along verges, lunch benches, and 65 extra trees create diverse outdoor environments for walking, sitting, and seasonal nature experiences. These initiatives build cognitive connection by teaching ecological principles in accessible locations, emotional connection through the beauty and tranquillity of green spaces, and behavioural connection by establishing regular nature-based routines that connect students, staff, experts, and residents in shared environmental stewardship.

Indoor nature connection best practices

De Verwondering in Almere

The primary school 'De Verwondering', designed by ORGA architect, stands as a leading example within Dutch education and received the 2023 Stephen R. Kellert Biophilic Design Award from Living Future Europe. This recognition establishes the school as a certified model for nature-focused educational design. The interior features extensive natural elements, including a large wooden staircase, various wooden accents throughout the space, and abundant plant life. A natural ventilation system brings outdoor scents inside, enhancing the sensory learning environment. The triangular spaces and design elements create seamless connections between indoor and outdoor areas. The school demonstrates measurable success in creating a healthy environment for students and staff.

⁵⁶ EUR. (n.d.-a). *Campus Garden*. Retrieved January 6, 2026, from <https://www.eur.nl/en/about-university/vision-strategy-2030/sustainability/life-campus/green-campus/sustainable-community>

⁵⁷ Leiden University. (n.d.). *Climate adaptation and biodiversity*. Retrieved January 6, 2026, from <https://www.universiteitleiden.nl/en/dossiers/the-sustainable-university/sustainable-campus/biodiversity>

⁵⁸ Van Putten, L. (2021, September 21). *Groene eilandjes rondom universiteitsgebouwen moeten bedreigde insecten lokken*. Universiteit Leiden. Retrieved January 6, 2026, from <https://www.universiteitleiden.nl/nieuws/2021/09/groene-eilandjes-rondom-universiteitsgebouwen-moeten-bedreigde-insecten-lokken>



Figure 11.4: Indoors at De Verwondering in Almere

Appendix E - Nature Positive Initiative draft

Each metric can be measured at three different maturity levels: Entry (for entities beginning their biodiversity measurement journey), Standard (minimum level for all users), and Advanced (for leadership demonstration).⁵⁹

Universal indicators (measured by all users) include⁶⁰:

1. **Ecosystem extent** - Tracking the area of different ecosystem types and how they've changed over time, measuring changes in habitat size and showing whether an ecosystem is expanding, shrinking, or shifting in type.
2. **Ecosystem condition** - The condition of biodiversity within an ecosystem, comparable to human health where internal functioning may differ from external appearance.
3. **Landscape intactness/condition** - Measuring the health of biodiversity in the larger area surrounding a site, important because achieving nature-positive outcomes at a site depends on the health of the surrounding landscape.
4. **Species extinction risk** - Tracking the risk of species extinction over time through species extinction risk scores and trends, providing critical information for planning activities.

Case-specific indicators (up to 5 additional) are triggered when certain conditions are met, such as presence of threatened species, overlap with Key Biodiversity Areas, or activities affecting Indigenous Peoples' and Local Communities' territories.⁶¹

Current limitations: The current framework applies to terrestrial biodiversity, with further development of state of nature metrics for freshwater and marine ecosystems planned for 2025.⁶² The framework does not yet provide guidance on establishing credible connections between organizational efforts and nature positive outcomes, as multiple entities may impact the same landscape. Over thirty businesses and financial institutions across 32 countries in six sectors have committed to test the practicality of the unified metrics through a global piloting programme launched in May 2025.⁶³

⁵⁹ Ernst & Young (EY). (2024). Building consensus on state of nature metrics to drive nature positive outcomes. In *Consultation Brief on Draft Metrics* [Consultation brief]. Retrieved January 6, 2026, from https://www.naturepositive.org/app/uploads/2024/10/Consultation-Brief- State-of-Nature-Metrics_8Oct2024.pdf

⁶⁰ Nature Positive Initiative. (2025, March 20). *Four key indicators in the draft State of Nature Metrics*. Nature Positive. Retrieved January 6, 2026, from <https://www.naturepositive.org/news/blog/four-indicators-state-of-nature-metrics/>

⁶¹ Ernst & Young (EY). (2024). Building consensus on state of nature metrics to drive nature positive outcomes. In *Consultation Brief on Draft Metrics* [Consultation brief]. Retrieved January 6, 2026, from https://www.naturepositive.org/app/uploads/2024/10/Consultation-Brief- State-of-Nature-Metrics_8Oct2024.pdf

⁶² Nature Positive Initiative. (2025a, January 18). *State of Nature Metrics: ready for testing - Nature Positive*. Nature Positive. Retrieved January 6, 2026, from <https://www.naturepositive.org/news/latest-news/state-of-nature-metrics-ready-for-testing/>

⁶³ Nature Positive Initiative. (2025c, May 7). *Nature Positive Initiative launches global piloting programme - Nature Positive*. Nature Positive. Retrieved January 6, 2026, from <https://www.naturepositive.org/news/latest-news/pilot-launch/>

Appendix F - Measurement of species on campus

Vascular plants

This section will be updated after we receive the report from Blom Ecologie. Possible sources include:

- > **Peet, R.K., Wentworth, T.R., & White, P.S. (1998).** "A flexible, multipurpose method for recording vegetation composition and structure." *Castanea*, 63(3), 262-274. [The North Carolina Vegetation Survey method]
- > **Kent, M. (2011).** *Vegetation Description and Data Analysis: A Practical Approach* (2nd ed.). Wiley-Blackwell.
- > **Mueller-Dombois, D. & Ellenberg, H. (1974).** *Aims and Methods of Vegetation Ecology*. John Wiley & Sons.
- > **Braun-Blanquet, J. (1964).** *Pflanzensoziologie, Grundzüge der Vegetationskunde* (3rd ed.). Springer-Verlag. [The classic Braun-Blanquet relevé method]
- > **Elzinga, C., Salzer, D., & Willoughby, J. (1998).** *Measuring and Monitoring Plant Populations*. Bureau of Land Management Technical Reference 1730-1.

Birds

This section will be updated after we receive the report from Blom Ecologie. Possible sources include:

- > **Van Turnhout, C. & Aarts, B. (2007).** "MUS: een nieuw meetnet voor broedvogels in stedelijk gebied." *Limosa*, 80, 40-43 [ResearchGate](#). [MUS = Meetnet Urbane Soorten / Monitoring scheme for Urban Species]
- > **SOVON (2011).** *Handleiding Sovon Broedvogelonderzoek 2011*. SOVON Vogelonderzoek Nederland [GBIF](#). [Manual for SOVON Breeding Bird Research]
- > **Bibby, C.J., Burgess, N.D., Hill, D.A., & Mustoe, S.H. (2000).** *Bird Census Techniques* (2nd ed.). Academic Press.
- > **Vergeer, J., Van Dijk, A.J., Boele, A., Van Bruggen, J., Hustings, F., Plate, C., & Verstrael, T. (2016).** "Broedvogels in Nederland in 2014." *Sovon-rapport 2016/04*. Sovon Vogelonderzoek Nederland [ResearchGate](#).
- > **Gregory, R.D., Gibbons, D.W., & Donald, P.F. (2004).** "Bird census and survey techniques." In *Bird Ecology and Conservation: A Handbook of Techniques* (eds. W.J. Sutherland, I. Newton, & R.E. Green), pp. 17-56. Oxford University Press.

Bees and hoverflies

This section will be updated after we receive the report from Blom Ecologie. Possible sources include:

- > **O'Connor, R.S., Kunin, W.E., Garratt, M.P.D., et al. (2019).** "Monitoring insect pollinators and flower visitation: The effectiveness and feasibility of different survey methods." *Methods in Ecology and Evolution*, 10(12), 2129-2140 [Wiley](#).
- > **Westphal, C., Bommarco, R., Carré, G., et al. (2008).** "Measuring bee diversity in different European habitats and biogeographical regions." *Ecological Monographs*, 78(4), 653-671.
- > **Prendergast, K.S., Menz, M.H.M., Dixon, K.W., & Bateman, P.W. (2020).** "The relative performance of sampling methods for native bees: an empirical test and review of the literature." *Ecosphere*, 11(5), e03076 [Wiley Online Library](#).
- > **Hutchinson, L.A., Oliver, T.H., Breeze, T.D., et al. (2022).** "Inventorying and monitoring crop pollinating bees: Evaluating the effectiveness of common sampling methods." *Insect Conservation and Diversity*, 15(3), 299-311 [Wiley Online Library](#).
- > **Kremen, C., Ullman, K.S., & Thorp, R.W. (2011).** "Evaluating the quality of citizen-scientist data on pollinator communities." *Conservation Biology*, 25(3), 607-617.
- > **Cane, J.H., Minckley, R.L., & Kervin, L.J. (2000).** "Sampling bees (Hymenoptera: Apiformes) for pollinator community studies: Pitfalls of pan-trapping." *Journal of the Kansas Entomological Society*, 73(4), 225-231.

This section will be updated after we receive the report from Blom Ecologie. Possible sources include:

- > **Pollard, E. (1977).** "A method for assessing changes in the abundance of butterflies." *Biological Conservation*, 12(2), 115-134 [Wikipedia](#). [This is the original "Pollard Walk" method]
- > **Van Swaay, C., Regan, E., Ling, M., Bozhinovska, E., Fernandez, M., Marini-Filho, O.J., et al. (2015).** *Guidelines for Standardized Global Butterfly Monitoring*. GEO BON Technical Series 1, 32pp [ResearchGate](#).
- > **Van Swaay, C., Nowicki, P., Settele, J., & van Strien, A.J. (2008).** "Butterfly monitoring in Europe: methods, applications and perspectives." *Biodiversity and Conservation*, 17, 3455-3469.
- > **Schmucki, R., Pe'er, G., Roy, D.B., et al. (2016).** "A regionally informed abundance index for supporting integrative analyses across butterfly monitoring schemes." *Journal of Applied Ecology*, 53(2), 501-510.
- > **Habel, J.C., Teucher, M., Ulrich, W., et al. (2023).** "Standardized butterfly surveys: comparing transect counts and area-time counts in insect monitoring." *Biodiversity and Conservation*, 32, 1-19 [Springer](#).
- > **European Butterfly Monitoring Scheme (eBMS) manual:**
- > **Butterfly Conservation Europe & De Vlinderstichting (2012).** *Manual for Butterfly Monitoring* [ResearchGate](#)
- > **Oertli, B. (2008).** "The use of dragonflies in the assessment and monitoring of aquatic habitats." In *Dragonflies and Damselflies: Model Organisms for Ecological and Evolutionary Research*, pp. 79-95. Oxford University Press [ResearchGate](#).
- > **Raebel, E.M., Merckx, T., Riordan, P., Macdonald, D.W., & Thompson, D.J. (2010).** "The dragonfly delusion: Why it is essential to sample exuviae to avoid biased surveys." *Journal of Insect Conservation*, 14, 523-533.
- > **Hardersen, S. (2008).** "The relative merits of censusing adult and exuviae populations of *Somatochlora alpestris* (Selys) (Odonata)." *Journal of Insect Conservation*, 12, 627-636.
- > **Solano, E., Cochard, R., Auriol, P., Barascud, B., & Danflous, S. (2022).** "Detection and Monitoring of Riverine Dragonfly of Community Interest (Insecta: Odonata): Proposal for a Standardised Protocol Based on Exuviae Collection." *Diversity*, 14(9), 728 [MDPI](#).
- > **Kalkman, V.J., et al. (2008).** "Measuring dragonfly diversity: a prerequisite for conservation." In *Dragonflies and Damselflies: Model Organisms for Ecological and Evolutionary Research*, pp. 122-137. Oxford University Press.

Appendix G - Nature Connection Index

The Dutch translation of the NCI has been validated in two large samples of young adults aged 18-35 years (n=1728; n=1608), demonstrating high internal consistency, strong correlations with other nature connectedness measures, and moderate correlations with nature contact and climate change importance. The scale successfully detected differences across demographic subgroups defined by gender, education level, relationship status, and student status, confirming its utility for Dutch-speaking populations. Mean NCI scores in Dutch young adult samples were 48.5 (SD = 26.6) in 2022 and 46.2 (SD = 26.1) in 2023, providing benchmark values for comparison.

Another way to assess the connection to nature is by assessing the presence of biophilic design. One can literary use Kellert's patterns for biophilic design like our thesis student Lotte Esteban Sprong did. By listing these 14 patterns (see Appendix C) and letting participants indicate how much they feel these patterns are present can show how much people feel these elements are present and influencing their mood and behaviour that indirectly influence their connection to nature. While this is a more indirect way to assess their connection to nature, it can be an important additional and supporting assessment.

Appendix H - Legislation and regulations

Below are the relevant legislations and regulations listed.

Biodiversity

Global level

Kunming-Montreal Global Biodiversity Framework (2022)

The Kunming-Montreal Global Biodiversity Framework was adopted on 19 December 2022 at the 15th Conference of Parties to the UN Convention on Biological Diversity (COP15), chaired by China and hosted by Canada, with 188 governments participating.⁶⁴ The framework includes four goals for 2050 and 23 targets to be achieved by 2030. Among the global targets for 2030 are effective conservation and management of at least 30% of the world's lands, inland waters, coastal areas and oceans, with emphasis on areas of particular importance for biodiversity and ecosystem functioning, and completion or initiation of restoration on at least 30% of degraded terrestrial, inland waters, and coastal and marine ecosystems. The framework aims to halt and reverse nature loss amidst a dangerous decline threatening the survival of 1 million species and impacting the lives of billions of people. The Netherlands, as a party to the Convention on Biological Diversity, was committed to implementing the framework's targets at the national level. However, they still haven't published the National Biodiversity Strategy and Action Plan (NBSAP) yet (119 other countries have) and are therefore already 6 months behind schedule. Therefore, we don't know yet what this entails.

European Union Level

EU Nature Restoration Law (Regulation 2024/1991)

The Nature Restoration Law was adopted by the Council of the European Union on 17 June 2024 and entered into force on 18 August 2024, establishing binding targets for EU Member States to restore at least 30% of habitats in poor condition by 2030, 60% by 2040, and 90% by 2050.⁶⁵⁶⁶ EU countries are expected to submit National Restoration Plans to the Commission within two years of the Regulation coming into force (by mid-2026), showing how they will deliver on the targets.⁶⁷ As an overall target, Member States will put in place restoration measures in at least 20% of the EU's land areas by 2030, with the goal of restoring all ecosystems in need of restoration by 2050⁶⁸. Specific requirements include (relevant to BUAs):⁶⁹

- > Improving and re-establishing biodiverse habitats on a large scale and bringing back species populations by improving and enlarging their habitats.
- > Reversing the decline of pollinator populations by 2030, and achieving an increasing trend for pollinator populations, with a methodology for regular monitoring of pollinators.
- > Achieving an increasing trend for standing and lying deadwood, uneven aged forests, forest connectivity, abundance of common forest birds and stock of organic carbon.
- > No net loss of green urban space and tree cover by 2030, and a steady increase in their total area from 2030

⁶⁴ Convention on Biological Diversity. (2022). *COP15: Nations Adopt Four Goals, 23 Targets for 2030 In Landmark UN Biodiversity Agreement*. Retrieved January 6, 2026, from <https://www.cbd.int/article/cop15-cbd-press-release-final-19dec2022>

⁶⁵ The European Union. (2025, December 22). *The EU #NatureRestoration Law*. Environment. Retrieved January 6, 2026, from https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-regulation_en

⁶⁶ European Parliament. (2024). *Nature restoration: Parliament adopts law to restore 20% of EU's land and sea | News | European Parliament*. Retrieved January 6, 2026, from <https://www.europarl.europa.eu/news/en/press-room/20240223IPR18078/nature-restoration-parliament-adopts-law-to-restore-20-of-eu-s-land-and-sea>

⁶⁷ The European Union. (2025, December 22). *The EU #NatureRestoration Law*. Environment. Retrieved January 6, 2026, from https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-regulation_en

⁶⁸ European Parliament. (2024b, August 15). *Nature Restoration Law enters into force*. Environment. Retrieved January 6, 2026, from https://environment.ec.europa.eu/news/nature-restoration-law-enters-force-2024-08-15_en

⁶⁹ The European Union. (2025, December 22). *The EU #NatureRestoration Law*. Environment. Retrieved January 6, 2026, from https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-regulation_en

- > Increasing grassland butterflies and farmland birds, the stock of organic carbon in cropland mineral soils, and the share of agricultural land with high-diversity landscape features; restoring drained peatlands under agricultural use.

National Level

Environment and Planning Act (Omgevingswet)

Nature areas, wild animals and plants in the Netherlands are protected by the Nature Conservation Act, which took effect on 1 January 2017, replacing three other laws: the Nature Conservancy Act 1998, the Flora and Fauna Act, and the Forestry Act.⁷⁰ The Nature Conservation Act expired on 1 January 2024 when the Environment and Planning Act (Omgevingswet) entered into effect.⁷¹ The actual protections for nature remain, but they're just now governed under the broader Environment and Planning Act instead of the standalone Nature Conservation Act.

City level

Duurzaamheidsvisie 'Breda 2030'

The municipality of Breda has established ambitious sustainability goals through its Duurzaamheidsvisie Breda 2030 (Sustainability Vision Breda 2030).⁷² The vision emphasizes biodiversity as essential for a strong ecosystem, thriving agriculture, and preservation of nature and ecology in and around Breda, with the municipality pursuing biodiversity enhancement as a primary goal. A key target is ensuring that by 2030, every Breda resident has access to a green resting place within 200 meters ("pantoffelafstand"). The vision also promotes the transition toward a sustainable, circular, and biobased economy, with particular attention to opportunities for European subsidies for sustainable development. The municipality's goal to make publicly accessible green areas along the inner canal (binnensingel) to mitigate climate change effects, combined with the broader "Breda Stad in een Park" initiative aiming to make Breda one of Europe's most nature-rich cities by 2030, creates a supportive ecosystem for campus-based biodiversity and nature connection projects. BUAs' efforts to enhance campus biodiversity and strengthen human-nature connections through biophilic design contribute to these broader municipal sustainability objectives.

Nature Connection

While there is no specific legislation mandating nature connection measurement, the Netherlands enacted its first national environmental education policy in 1988 and has a long history of using environmental education as a key strategy in addressing environmental issues, with the government facilitating a "learning society" through education and sustainable practices.⁷³ Nature connectedness research has gained policy relevance because stronger nature connectedness is associated with both mental wellbeing and pro-environmental behaviour, making it a valuable metric for evaluating the effectiveness of environmental education and green space interventions on university campuses.

⁷⁰ Ministerie van Economische Zaken en Klimaat. (2017, October 4). *Legislation protecting nature in the Netherlands*. Nature and Biodiversity | Government.nl. Retrieved January 6, 2026, from <https://www.government.nl/topics/nature-and-biodiversity/legislation-protecting-nature-in-the-netherlands>

⁷¹ Ministerie van Algemene Zaken. (2024, January 3). *Environment and Planning Act*. Government.nl. Retrieved January 6, 2026, from <https://www.government.nl/topics/environment-and-planning-act>

⁷² Gemeente Breda. (2022). *Duurzaamheidsvisie "Breda2030"*. Retrieved January 6, 2026, from <https://open.breda.nl/sites/default/files/2024-11/Duurzaamheidsvisie%20%27Breda%202030%27.pdf>

⁷³ *The Netherlands | Global Environmental Education Partnership (GEEP)*. (n.d.). Global Environmental Education Partnership (GEEP). <https://thegeep.org/resources/countries/netherlands>



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