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Nature-Based Education in European Early Childhood Settings: A Scoping Review of Psychosocial Wellbeing and Equity Outcomes for Children Aged 3-8 Years

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List of Acronyms

ECEC	Early Childhood Education and Care
EU	European Union
FS	Forest School
JBI	Joanna Briggs Institute
NBEI	Nature-Based Education Intervention(s)
PCC	Population, Concept, Context
PRISMA-SCR	Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews
SES	Socio-economic status
UK	United Kingdom
UN	United Nations
UNCRC	United Nations Convention on the Rights of the Child
WHO	World Health Organization

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Abstract

Background: Early childhood is a critical period for psychosocial development, yet many children in Europe face barriers to accessing nature-rich environments that support wellbeing and equity. Nature-Based Education Interventions (NBEIs) have emerged as a promising approach within the formal Early Childhood Education and Care (ECEC) settings, but the evidence on their psychosocial and equity impacts remains fragmented.

Objectives: This scoping review maps the extent, range, and nature of evidence on the psychosocial and equity outcomes of NBEIs for children aged 3-8 years in European ECEC settings.

Methods: Following PRISMA-ScR guidelines, a comprehensive literature search was conducted in PubMed, Web of Science, and Scopus for studies published during 2015-2025. Inclusion criteria comprised empirical studies of structured or semi-structured NBE interventions in formal ECEC settings in Europe, reporting on psychosocial wellbeing and/or equity outcomes for children aged 3–8. Seventeen studies met eligibility criteria and were included for narrative and thematic synthesis.

Results: Seventeen studies from European countries met the inclusion criteria, with UK and Nordic countries were most represented. The majority of studies reported positive associations between NBEI participation and improvements in children’s emotional regulation, confidence, autonomy, social interaction, and resilience. Children in nature-rich environments demonstrated enhanced peer relationships, engagement, and creative problem-solving, particularly in urban and disadvantaged contexts. Equity was addressed through inclusive participation, access for marginalised groups, and culturally responsive practices, though few studies systematically measured differences by socioeconomic status, gender, or ethnicity. Methodological diversity and limited quantitative measurement restrict comparability across contexts.

Conclusions: NBEIs in European ECEC settings are linked to multiple psychosocial benefits, but evidence on their role in reducing inequities remains limited. Future research should prioritise robust, equity-focused designs and systematic measurement of outcomes to inform inclusive policy and practice.

Keywords: Scoping review, early childhood, Nature-based education interventions, early childhood education and care settings, Europe

1 Introduction

1.1 Early Childhood Development: Context and Importance

Early childhood spans from birth to eight years. The early years are marked by rapid growth, where children's bodies, minds, and social skills quickly evolve, creating an opportunity for their future health and learning (1-3). Within this critical developmental period, children aged 3 to 8 usually transition from their homes to classrooms. Access to natural spaces, engaging activities, and supportive connections have a significant impact on their behavioural patterns (4). The developmental trajectories of children are not exclusively dictated by biological variables, but also socio-economic status, cultural background, and access to supportive educational environments (5, 6). These can lead to disparities in developmental outcomes, highlighting the necessity for initiatives that tackle these imbalances (5). Policymakers are increasingly recognising this stage of children's lives as a strategic focus for social equity and public health interventions (7, 8).

1.2 Early Childhood Education and Care (ECEC) and Policy context in Europe

To support children during this time, Early Childhood Education and Care (ECEC) is structured around formal educational and caregiving institutions and systems. Preschools, kindergartens, nursery schools, daycare centres, and early primary education are all included in ECEC, which focuses on enhancing developmental outcomes, primarily when the quality and accessibility are guaranteed. ECEC is a component of policy frameworks across Europe that support inclusive, high-quality early education, especially for children in vulnerable situations, such as the EU Strategy on the Rights of the Child and the European Child Guarantee (9-11).

In the context of European policy, ECEC is increasingly acknowledged as a mechanism for combating child poverty and social exclusion. The European Child Guarantee and the European Pillar of Social Rights (Principle 11) advocate universal access to high-quality ECEC, emphasising the specific needs of children from marginalised or disadvantaged backgrounds. The 2019 Council Recommendation on high-quality ECEC highlights five essential aspects for quality: ensuring all children can access provision, supporting and developing the skills of the workforce, delivering a well-designed and relevant curriculum, establishing effective systems for monitoring and evaluation, and maintaining strong governance and sustainable funding (12-14). Nordic countries, like Sweden, Norway, and

Finland, have incorporated NBEIs into their national curricula, facilitated by government funding and training for educators (15).

Nonetheless, the adoption of policies varies significantly across the continent. Countries in Southern and Eastern Europe encounter challenges concerning infrastructure, teacher capacity, and environmental inequality, potentially restricting the feasibility or sustainability of NBEIs in certain contexts. Although ECEC policy is progressively endorsing inclusion, there is a scarcity of national frameworks that explicitly assess or require equity outcomes in NBEIs.

1.3 Theoretical and Policy Foundations of Nature-Based Education Interventions

Modern childhood differs greatly from childhood in the past because, despite these frameworks, children today are growing increasingly disconnected from nature. Urbanisation, safety concerns, economic disparities, and the widespread use of digital media have significantly diminished opportunities for unstructured outdoor play, leading to what author Richard Louv refers to as "nature-deficit disorder" (16). In addition to its cultural significance, this phenomenon has obvious medical complications and health impacts. Children's sedentary behaviour, anxiety, poor self-regulation, attention span, and social skills have all been linked to less time spent in nature (7, 17). Children from low SES are especially affected by these findings because they frequently encounter the greatest obstacles when trying to access (18, 19).

Given the amount of time children spend in learning environments, Nature-Based Education Interventions (NBEIs) have emerged as a viable approach to address these problems within the educational framework (20, 21). The incorporation of natural elements and outdoor spaces into the educational process facilitates the operationalisation of NBEIs as structured teaching resources. These include the incorporation of school gardens, the development of naturalised play spaces, the frequent use of outdoor learning modules in the ECEC curriculum, and the use of pre-existing models such as FS (22, 23). Improved emotional regulation, prosocial behaviour, resilience, and cognitive function are some of the psychosocial advantages NBEIs have demonstrated for kids (24).

NBEIs are based on a synthesis of developmental, ecological, and educational theories. Vygotsky's sociocultural theory and the Zone of Proximal Development highlight the significance of social interaction and scaffolding in the learning process, which are inherently supported in collaborative outdoor settings (17, 24). Bronfenbrenner's ecological systems theory emphasises the significance of environmental context, encompassing both natural

and social factors, in influencing developmental pathways, thereby reinforcing the inclusion of nature as a crucial learning environment in early childhood (17, 25).

Gibson's affordance theory offers a framework for comprehending how natural environments specifically encourage child-initiated exploration, risk taking, and problem-solving, providing a range of sensory and physical experiences that are often absent in conventional classroom settings (12, 26). Constructivist approaches, as articulated by Piaget, underpin NBEIs by positing that children construct knowledge through direct, hands-on engagement with their environments, thereby making nature-rich settings particularly conducive to cognitive and social development (27, 28).

In addition to these developmental and ecological views, environmental psychology offers further insight into the mechanisms by which nature exposure benefits children. Attention Restoration Theory proposes that natural environments help restore depleted attentional resources, which can improve self-regulation and cognitive performance (29). Stress Reduction Theory suggests that time spent in nature reduces physiological and psychological stress, supporting emotional wellbeing and resilience (30). The Biophilia Hypothesis posits that humans have an innate affinity for nature, which may explain observed increases in autonomy, confidence, and social engagement among children participating in NBEIs (31). Empirical studies support these frameworks, showing that children exposed to nature-based interventions often demonstrate gains in attention, self-esteem, social competence, and emotional health (17, 24).

Modern frameworks, including place-responsive and rights-based education, build upon these foundational concepts. Place-responsive education views the natural world as a key contributor to children's meaning making and identity formation (27). Concurrently, rights-based frameworks, in accordance with the United Nations Convention on the Rights of the Child (UNCRC), promote children's agency, participation, and inclusion in educational experiences (27). FS implements these principles via consistent, extended, child-directed activities in outdoor woodland environments, typically guided by trained professionals (15).

1.4 Equity: Gaps and Challenges

Equity in the context of early childhood education refers to the fair allocation of resources, opportunities, and support to ensure all children can thrive, accounting for systemic barriers, diverse backgrounds, and starting points (32). Rather than treating every child identically, equity recognises that some children face greater barriers to participation and benefit and therefore require additional support or tailored interventions to achieve comparable outcomes (17). In the context of nature-based education, equity is a pressing concern because children

from disadvantaged backgrounds, urban areas, or minority groups often have less access to nature-rich environments, which can reinforce existing developmental and health disparities (33). Hence, in this review, equity is operationalised as the extent to which children aged 3-8 from low-income families and other marginalised groups in Europe have fair access to and benefit from NBEIs. Green spaces and habitats are sometimes unfairly and unequally accessible to children from lower SES or underprivileged urban areas and may have greater difficulties engaging with nature (18, 23). Promoting equitable access to nature as a primary public health objective is crucial because this disparity may worsen health and developmental inequalities (7, 34).

Access to NBEIs remains unequal despite an expanding body of data, children from low-income, immigrant, or urbanised communities are disproportionately affected by socioeconomic and structural barriers. Even though the evidence is growing, we still do not fully understand how NBEIs work, what factors affect their application, or how much these treatments improve equity for different early childhood populations. Research that has been done so far uses a range of methodologies, primarily cross-sectional and observational designs. There is a lack of experimental or longitudinal studies on children aged 3 to 8 who attend formal ECEC settings (21, 24). Furthermore, there are not many thorough evaluations of the results, despite some research suggesting that nature-based approaches could promote inclusion, particularly for kids from disadvantaged homes or with special needs (24). By mapping the current research on NBEIs in European ECEC settings, this scoping study aims to fill these gaps with a focus on psychosocial and equity outcomes. We can learn more about NBEIs by combining data from various study designs and geographic settings. To guide future ECEC research, policy, and practice, this evaluation also seeks to determine what encourages and hinders participation.

1.5 Addressing Equity in Research and Practice

Despite normative commitments to equity, empirical evaluations of NBEIs often do not systematically assess the differential impacts associated with SES, gender, ethnicity, or disability (26, 27). Instead of being described as a quantifiable outcome, equity is usually expressed in aspirational terms or as a contextual quality, such as targeting interventions at urban or low-income schools. Recent findings suggest that effectively structured NBEIs can improve participation and engagement among children with varying needs. FS programs demonstrate benefits for children with behavioural challenges, trauma histories, or limited verbal communication, particularly when educators employ inclusive, trauma-informed, or culturally responsive teaching strategies (28). Community-based gardening and foraging

initiatives enhance social inclusion, cultural identity, and intergenerational learning, especially in contexts that emphasise local heritage and collective participation (27).

The absence of disaggregated data and standardized equity measures constitutes a notable weakness. In the absence of such data, it is challenging to determine which groups derive the greatest benefit from NBEIs or to recognize potential disparities in access or outcomes.

1.6 Psychosocial Outcomes in Nature-Based ECEC

A consensus is emerging that nature-based learning enhances various aspects of psychosocial wellbeing. Qualitative and mixed methods research consistently indicate enhancements in confidence, emotional regulation, attention, peer interaction, and autonomy (15, 35). Children in biodiverse, unstructured environments exhibit increased cooperative behaviours, enhanced sensory engagement, and improved emotional resilience compared to those in indoor or highly structured settings. The advantages are frequently linked to the freedom, novelty, and risk-taking opportunities provided by outdoor settings(17).

However, the absence of standardised measures and longitudinal data complicates the quantification of the extent and durability of these outcomes. Comprehensive, multi-site evaluations are essential for a deeper understanding of the psychosocial effects of NBEIs and their variability across different contexts and child populations (21).

1.7 Summary and Gaps

The literature suggests that NBEIs are grounded in well-established developmental, ecological, and educational theories and demonstrate potential for enhancing psychosocial wellbeing and equity in early childhood education. Nonetheless, considerable gaps persist in the empirical evaluation of equity outcomes, the application of standardized measures, and the representation of varied European contexts. To address these gaps, it is essential to implement more rigorous, equity-oriented research and align policies to guarantee that all children can access nature-rich educational experiences (15, 36).

During my internship at EuroHealthNet, I was engaged in a range of projects with the policy and research team, covering various topics related to public health and Nature-Based Interventions. The research presented in this thesis was developed as the principal academic component of my practicum, conducted under the supervision of Alba Godfrey and Aurore Gely Pernot. While my responsibilities at EuroHealthNet encompassed multiple concurrent tasks, the thesis work was conceptualised and carried out independently, with my specific contributions including the formulation of research objectives, design and implementation of

the methodology, systematic data collection and analysis, and the drafting of the thesis manuscript. All work presented is my own, with guidance and feedback provided by my supervisors.

2 Objectives

2.1 General objectives

The primary aim of this scoping review is to map and synthesize the existing research literature concerning NBEIs within formal ECEC settings across Europe. The review will specifically focus on the reported impacts of these interventions on the psychosocial wellbeing of children aged 3-8 years and will investigate considerations of equity in access and outcomes.

2.2 Specific objectives

- To identify and characterize the range of NBEIs implemented in European formal ECEC contexts for children aged 3-8 years. This includes describing the types of interventions, their pedagogical approaches, duration, intensity, and the natural settings utilized.
- To examine and synthesize the reported effects of these NBEIs on the psychosocial wellbeing of children. This involves exploring outcomes related to emotional health (e.g., emotional regulation, mood), social health (e.g., social skills, peer relationships, pro-social behaviour), and behavioural health (e.g., attention, conduct).
- To investigate how these NBEIs consider and influence equitable outcomes for children from diverse backgrounds within European ECEC settings. This objective focuses on understanding whether and how interventions address disparities related to SES, cultural background, or geographical location in terms of access to nature-rich environments and positive developmental support.
- To identify current knowledge gaps and research gaps in existing literature. This includes pinpointing areas where further research is needed regarding specific NBEIs, populations, outcomes, methodological approaches, or long-term effects.
- To discuss the implications of the findings for evidence-based policy development and practical application within the ECEC sector in Europe, as well as for future research directions. This involves translating the synthesized evidence into actionable insights for stakeholders.

3 Materials and Methods

3.1 Study design

This thesis is based on a scoping review, designed to identify, appraise, and synthesise empirical evidence on the psychosocial and equity outcomes of NBEIs for children aged 3-8 years in formal ECEC settings across Europe. For the purposes of this review, psychosocial wellbeing is defined as the emotional, mental, and social functioning of children. This includes outcomes such as emotional regulation, social interaction, attention, behaviour, resilience, and inclusion (15, 17). Outcomes related to physical health, motor skills, or physical activity were excluded from this definition in order to maintain a focused analysis on relational and regulatory domains relevant to child mental and emotional development. This review adheres to the methodological framework originally proposed by Arksey and O'Malley (37), further developed by Levac et al. (38), and aligned with the Joanna Briggs Institute (JBI) Manual for Evidence Synthesis (39) and the PRISMA-SCR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) checklist to ensure methodological rigour and transparency (40).

3.2 Eligibility Criteria (PCC Framework)

The inclusion and exclusion criteria were structured using a Population, Concept, Context, and Outcome (PCC) framework as represented in Table.1:

Table 1: PCC Framework

PCC	
Population	Children aged 3-8. Studies with a broader age range were included only if data for the target age group could be extracted or if the mean age fell within the specified range.
Concept	Structured or semi-structured Nature-based education interventions (e.g., FS, school gardens, green play areas, outdoor learning) delivered in formal ECEC settings.
Context	Formal early childhood educational care settings (e.g., nursery schools, preschools, daycares, kindergartens, early primary schools) across Europe
Outcome	Empirical, child-level outcomes related to psychosocial wellbeing (e.g., social skills, emotional regulation, self-confidence, engagement, resilience) and equity of access (e.g., inclusion, participation, accessibility, supportive environments).

Study type	Empirical research (quantitative, qualitative, or mixed methods), including systematic reviews
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3.3 Inclusion criteria

- Children aged 3-8 years.
- Describe structured or semi-structured nature-based education interventions in formal ECEC settings in Europe.
- English language, human participants.
- Published between 2015 and 2025.
- The interventions involve structured or semi-structured nature-based activities.
- Outcomes related to both psychosocial wellbeing and equity of access.
- Empirical studies (quantitative, qualitative, mixed methods) and systematic reviews.

3.4 Exclusion criteria

- Interventions outside the 3-8 age range, or where age-specific data could not be disaggregated.
- Interventions in informal or unregulated educational settings.
- Studies focusing solely on disability, neurodevelopmental conditions, or disease-specific populations without broader relevance.
- Grey literature, editorials, conference abstracts, and non-peer-reviewed material.
- Studies conducted outside Europe.
- Outcomes focusing solely on educators, parents, or settings, or using unvalidated instruments.

3.5 Strategy of Literature Search

A comprehensive literature search was performed across three key electronic databases: PubMed, Web of Science, and Scopus. These databases were selected for their extensive coverage of relevant studies in health sciences and multidisciplinary research (41). The search terms were adapted for each database and included a combination of keywords related to NBEI, early childhood, ECEC terms, ages 3-8, European countries, psychosocial terms, and equity terms. Boolean operators (AND, OR) were utilized to refine the search strategy.

Full search strings and database-specific queries are included in [Appendix 1](#).

3.6 Study Selection Process

All retrieved citations were imported into EndNote for initial duplicate removal. All stages of this review, including title and abstract screening, full-text review, and data extraction, were conducted independently. This approach was necessary due to the scope and resource constraints of the thesis. While single-reviewer screening and extraction is not uncommon in student-led reviews, it is recognized as a limitation because it may introduce selection or extraction bias (40). Following this, references were uploaded into Rayyan, where a second round of deduplication was conducted. The study selection proceeded in two stages:

Title and Abstract Screening: All records were screened independently using pre-specified inclusion/exclusion criteria. Tags were used to filter out non-relevant studies (e.g. non-European setting, irrelevant age group, informal interventions).

Full-Text Review: Full texts of potentially eligible studies were retrieved and assessed against the inclusion criteria. Reasons for exclusion were documented in Rayyan for transparency. Studies were excluded at the full-text stage if they did not meet all PCC(O) criteria or if the full text could not be obtained after exhaustive efforts.

3.7 Data Extraction Process

A standardized data extraction form was developed and piloted. For each included study, the following information was extracted:

- Citation details: author, year, title, journal,
- Country and setting,
- Description of intervention: type, duration, frequency,
- Population characteristics: age, sample size, relevant socioeconomic indicators,
- Study design and methods,
- Psychosocial wellbeing outcomes: measures, findings,
- Equity of access outcomes: measures, findings,
- Key findings and limitations.

3.8 Synthesis and Analysis

Extracted data were synthesized narratively using a descriptive and thematic analysis.

Studies were grouped by intervention type, outcome domain, and equity relevance. Thematic codes were derived inductively during synthesis and structured to highlight:

- Type and distribution of NBEIs across Europe.
- Psychosocial and equity outcomes reported.
- Populations and settings are underrepresented.
- Gaps in evidence and methodological limitations.

This approach enabled both a mapping of evidence and the identification of areas requiring further research or policy attention.

3.9 Ethical Considerations

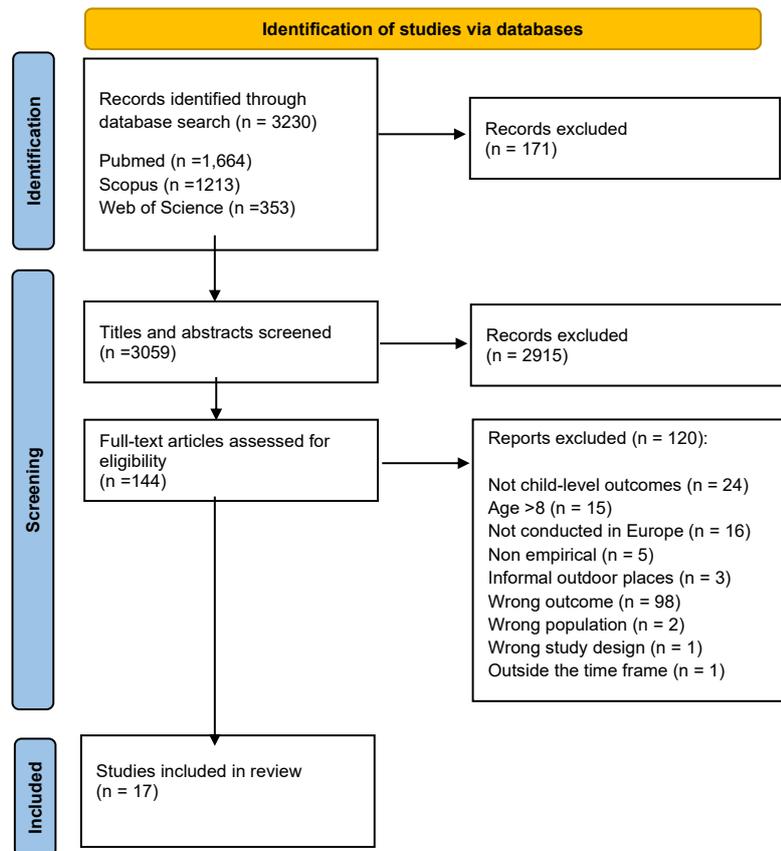
This study is based solely on the analysis of publicly available, secondary data. As such, no ethical approval was required. No human participants were involved, and no personal data was collected.

4 Results

4.1 Overview of study included in the scoping review.

The preliminary search yielded 3230 studies that were published in the last ten years. After excluding duplicates and studies based on titles and abstracts, 144 reviews remained for subsequent review. Of these, 17 studies met the inclusion criteria and were included in this scoping review (refer to PRISMA flow diagram, Figure 1).

Figure 1: PRISMA flow diagram of study selection.



The included studies were conducted in the UK (n=5) and Norway (n=5), with additional studies from Sweden, Finland, the Netherlands, Scotland, and multi-country collaborations (Italy, Bulgaria, UK, Spain). While the primary focus was on children aged 3-6 years, the overall age range of participants extended from 0-8 years. ECEC settings encompassed a variety of environments, including nature kindergartens, preschools, municipal nurseries, and primary schools. Interventions themselves were diverse, featuring FS sessions, gardening, foraging activities, greening initiatives for schoolyards, and general outdoor play-based

learning. The sample sizes across these studies varied considerably, ranging from small, in-depth qualitative cohorts to larger-scale multi-country collaborations.

Study designs were predominantly qualitative (n=11), including ethnographic, interpretative, and case study approaches. The review also included one ethnographic qualitative study, one small-scale ethnographic/interpretative/qualitative study, one mixed-methods study, one mixed-methods systematic review, one narrative review, and one quasi-experimental intervention. Data collection methods were diverse, encompassing interviews, focus groups, observations, participatory child drawings, video analysis, practitioner reflection, surveys, and, in some cases, biological or cognitive measures (e.g., hair cortisol, digit span tests). Pedagogical approaches varied from child-led and participatory models, emphasising autonomy and experiential learning to teacher-facilitated and community-based practices that integrated local heritage and collective knowledge. Duration and intensity also ranged considerably, from short-term weekly sessions over 6-11 weeks to ongoing, curriculum-embedded, or daily activities, particularly in Nordic nature kindergartens and greening projects. Certain interventions, such as staff training programmes in the Netherlands, spanned a full year. Overall, the included literature reflects a growing body of evidence on NBEI in European ECEC, with strong qualitative documentation and emerging efforts toward empirical evaluation of outcomes.

(A detailed summary of included studies is provided in [Appendix.2](#)).

4.2 Geographic Patterns

The reviewed studies covered a broad North European distribution, with most studies from the UK (n=5) and Norway (n=5). These countries demonstrated strong institutional and pedagogical integration of nature-based pedagogies. Fewer studies emerged from Southern or Eastern Europe, highlighting a regional research gap (42). Most interventions were situated in urban or peri-urban settings, often targeting children in deprived, multi-ethnic, or otherwise marginalised communities (35, 43). Fewer studies focused on rural or nature-rich environments, such as Norwegian kindergartens and Scottish forest nurseries (44, 45). This distribution highlights both the policy emphasis on nature-based education in Northern Europe and the need for further research in Mediterranean and post-socialist contexts.

4.3 Thematic Synthesis: Type and Characteristics of NBEIs in European ECEC

A wide range of NBEIs were found in the included reviews. Despite contextual variations, the data revealed three major types of intervention methods, along with several mixed approaches.

4.3.1 Forest School and Nature Kindergarten Models

FS and nature kindergarten were the most frequently documented, particularly in the UK and Nordic countries (17, 35, 43-47). These programmes typically involved regular outdoor sessions, sometimes weekly, sometimes part of the daily routine, where children engaged in play, exploration, and collaborative activities in woodland or similarly biodiverse environments. The pedagogical emphasis was on child-led learning, autonomy, and risk-taking, with adults acting as facilitators rather than direct instructors. Some settings offered such activities as an inherent part of the curriculum throughout the year, while others operated shorter-term initiatives.

4.3.2 Gardening and Foraging-Based Interventions

Several studies, especially from Norway and multi-country collaborations, described gardening and foraging projects (13, 42, 48, 49). Gardening and harvesting produce, gathering wild foods, and cooking meals together were some examples of these interventions. These initiatives were often distinguished by their emphasis on intergenerational learning and cultural heritage. Children occasionally worked with elders or members of the community, learning about ecological cycles, regional culinary customs, and the value of sustainability. Regardless of background or ability, all children were encouraged to engage in these activities, which were primarily created to be inclusive.

4.3.3 Greening Schoolyards and Playgrounds

A smaller group of studies focused on transforming urban or high-density outdoor spaces by introducing natural features such as gardens, forest floors, or habitats for insects and birds (50, 51). In areas where access to nature was generally restricted, the goal was to create richer, more engaging play and learning environments. These adjustments, according to teachers and staff, helped youngsters develop a feeling of environmental stewardship, creativity, and wellbeing.

4.3.4 Structured Outdoor Learning and Mixed Approaches

According to several initiatives, outdoor learning was combined with other frameworks as rights-based education, trauma-informed practice, or sustainability themes (52-54). These models occasionally spanned an entire school year and frequently included more scheduled activities or staff training components. The goal was to tailor outdoor activities to the different needs of children while making sure that everyone could gain significant benefits from spending time in nature.

4.3.5 Adaptation to Local Contexts

Across all categories, interventions were shaped by the realities of their setting. In urban areas, educators frequently had to be creative in their efforts to identify or establish green spaces, whereas rural areas could depend on their daily access to forests or fields. Several studies have described intentional efforts to overcome obstacles to participation, particularly for children from underprivileged backgrounds or those with limited prior experience with nature (35, 43). The natural settings utilised represented a dedication to ensuring that nature-based experiences were accessible to all, ranging from schoolyards and rural woodlands to city parks and

4.3.6 Duration and Intensity

The length and frequency of interventions varied widely. While some programs were short-term, lasting only a few weeks (35, 46), others were incorporated into the setting's weekly or daily routines; this was especially evident in the Nordic countries (44, 51). A year-long staff training programme, like the Community of Practice (CoP) model in the Netherlands, demonstrated the value of ongoing professional development in fostering excellent outdoor pedagogy (52). Natural settings utilized for this intervention included urban parks and community allotments to biodiverse schoolyards and rural forests, reflecting adaptation to local context and efforts to address barriers to green space access (35, 43). (See Table.2)

Table 2: Key Characteristics of NBEIs

Study (Author, Year)	Country	ECEC Setting	Intervention Type	Pedagogical Approach	Duration/ Intensity
Alme & Reime, 2021	Norway	Rural kindergarten	Nature kindergarten - Rural woodland, open natural spaces	Child-led, collaborative, participatory	Daily, full day
Askerlund et al., 2024	Sweden	Urban/suburban preschool	Greening urban/suburban schoolyards, gardens	Teacher-facilitated, ecosystem services	Ongoing, integrated
Bergan et al., 2021	Norway	Kindergarten	Foraging, Gardening - Arctic woodland, local gardens	Culturally responsive, community-based	Regular, seasonal cycles
Bergan et al., 2024	Norway	Kindergarten	Foraging, Gardening, local nature	Child-centred, collective knowledge	Regular, project-based

Corsano et al., 2025	Italy, Bulgaria, UK, Spain	Kindergartens, primary schools, museums	School gardens, museums, agro foundation	Structured, semi-structured, inclusive	Weekly sessions, varied
Cronin de Chavez et al., 2024	UK (Bradford)	State-funded urban nurseries (deprived, multi-ethnic)	FS - Urban parks, woodlands	Child-led, play-based, Level 3 FS leader	11 weekly sessions
Donnelly et al., 2025	Scotland	Forest nurseries	Forested nursery grounds	Child-led, engineering habits of mind	Weekly, term-based
Garden & Hirst, 2024	Norway	Urban kindergarten, community allotment	Urban allotment, community garden	Intergenerational, risk-managed, play	Regular, ongoing
Hine, 2024	UK	State primary school (mainstream)	FS - School woodland area	Rights-based, ecofeminist, reflective	6 weekly sessions
Hogarth, 2024	UK (London)	Urban primary school	Urban FS-Urban Park, biodiverse spaces	Participatory, posthuman, child agency	Weekly, ongoing
Johnstone et al., 2022	Various (Europe)	Nature preschools, kindergartens, gardens	Mixed - Forests, green playgrounds, gardens	Mixed (child-led, teacher-facilitated)	Varied (weekly to daily)
Kiviranta et al., 2024	Various (Europe)	Preschools, kindergartens, daycare centres	Outdoor learning	Teacher-facilitated, play-based	Varied
Montalvan Castilla et al., 2024	Norway	Municipal kindergartens	Urban parks, gardens, forests	Experiential, teacher-adapted	Regular, curriculum-linked
Papadopolou & Vincent, 2025	UK	Urban nursery, state primary school	Structured outdoor learning	Place-responsive, participatory action	Project-based, reflective
Puhakka et al., 2019	Finland	Urban daycare centres	Greening daycare yards, biodiverse materials	Inclusive, health-promoting, play-based	Ongoing, integrated

Van den Berg et al., 2024	Netherlands	Nature-based daycare centres	Outdoor pedagogy training	Community of Practice, staff-led	1 year, regular
Waite & Goodenough, 2018	UK	FS settings within/alongside ECEC provision	FS - Woodland, outdoor school sites	Learner-led, risk-managed, creative	Long-term, regular

4.4 Psychosocial and Equity Outcomes

The following section synthesises the main psychosocial and equity-related outcomes identified across the included studies. By thematically organising the findings, this review highlights how NBEI in European ECEC settings influence children’s emotional, social, and behavioural development, as well as patterns of inclusion and access for diverse groups. This overview provides the foundation for a more detailed exploration of specific outcomes and equity considerations in subsequent subsections.

4.4.1 Psychosocial Wellbeing Outcomes

Across the included studies, a consistent pattern of positive psychosocial outcomes was reported. The most frequently reported outcomes were improvements in emotional regulation, confidence, autonomy, and social interaction (22, 43). Children engaged in nature-rich environments, whether through FS sessions, gardening, or unstructured outdoor play, were frequently described as more relaxed, resilient, and expressive. noted that the open and less structured environment of nature kindergartens and FS allowed children to take more initiative, make independent choices, and develop a stronger sense of self (35, 44).

Social-emotional development was a prominent theme with children exhibiting stronger peer relationships, increased collaboration, and greater empathy. Several studies highlighted the role of nature-based play in reducing conflict, fostering cooperation, and strengthening group identity within ECEC environments (13, 22, 45, 49). Children’s ability to negotiate roles, resolve conflicts, and support each other was often enhanced by the participatory and hands-on nature of these activities. Outdoor environments were often characterized as emotionally safe spaces where children could navigate interpersonal dynamics more freely than in traditional classrooms. Children demonstrated higher levels of concentration, curiosity, and creative thinking during nature-based activities. Teachers and researchers observed improvements in attention, engagement, and curiosity, especially when children engaged with biodiverse environments or had opportunities for creative, open-ended play (45, 51). In

some studies, children also showed increased initiative, problem-solving capacity, and persistence, attributes often associated with early indicators of executive function. Importantly, the studies employed various data collection methods to assess psychosocial outcomes, including structured teacher observations, ethnographic field notes, participatory child drawings, video analysis, and, in a small number of cases, biological and cognitive measures (e.g., hair cortisol, digit span tests)(52). While most studies did not use standardized tools, the convergence of findings across diverse settings supports the relevance of NBEIs in enhancing psychosocial wellbeing in early childhood.

4.4.2 Equity-Related Outcomes

Equity was addressed in several ways, though often more as a guiding principle than a systematically measured outcome. Studies most frequently reported equity in terms of access to nature, inclusive participation, and support for marginalised groups, rather than through formal disaggregation of outcomes by socioeconomic status (SES), gender, or ethnicity.

Several interventions were purposefully designed to include children from disadvantaged backgrounds, urban neighbourhoods, or ethnically diverse communities who might otherwise have limited access to green spaces (35, 43, 54). FS interventions were frequently implemented in state-funded schools serving disadvantaged or multilingual populations (35, 43). These studies emphasised the potential of NBEIs to provide equitable developmental opportunities by offering access to restorative and stimulating environments that children may not otherwise experience.

Several studies highlighted inclusive pedagogies that supported children with additional needs, including trauma-informed approaches, gender-sensitive practices, and adaptations for children with behavioural or language challenges (46). Interventions were often described as creating emotionally safe, autonomy-supportive spaces where non-dominant learners, such as quiet children or those who struggled indoors, could flourish.

Equity was also conceptualized through participatory and culturally responsive practices. For example, in Arctic Norway, nature-based food projects incorporated Sami cultural heritage, enabling children to build identity and ecological understanding through collective, local knowledge (13). Similarly, projects in urban settings often addressed spatial inequalities by intentionally using public green spaces, such as allotments or city parks, as shared educational resources (49, 53). Barriers to equitable participation, such as lack of green space in urban areas, resource constraints, or cultural expectations, were frequently discussed by educators and researchers (50, 54).

A few studies explored gender equity and the negotiation of social norms, finding that outdoor environments could both challenge and reinforce traditional roles, depending on how

activities were facilitated (45, 46). However, only a few studies systematically measured equity outcomes or analysed differential effects. SES, ethnicity, or gender were often reported descriptively, but not used as analytic categories. This represents a methodological gap and underscores the need for future research to incorporate more robust, disaggregated outcome measures to assess how and for whom NBEIs work best.

In summary, equity in this reviewed literature was often addressed through context, intent, and pedagogical framing, rather than quantified outcomes. Nonetheless, the review highlights a strong normative and practical commitment to inclusion within NBEI across European ECEC systems.

4.5 Gaps in the Literature

Despite a growing body of research on NBEIs in European ECEC settings, several important gaps and methodological limitations remain evident.

4.5.1 Limited Quantitative and Longitudinal Evidence

Most studies employed qualitative designs, with only a small number using controlled or longitudinal methodologies. While qualitative insights provided rich descriptions of psychosocial and equity outcomes, few studies included validated tools or empirical assessments that could quantify the effects of NBEIs on child-level development. Long-term impacts and sustainability of intervention effects remain largely unknown, particularly beyond the duration of the intervention.

4.5.2 Geographic and Population Underrepresentation

Geographically, the literature is concentrated in the UK, Norway, Sweden, and Finland, with few studies from Southern and Eastern European countries. This lack of geographic diversity may limit the generalizability of findings, particularly in regions with diverse cultural, ecological, or educational frameworks. In addition, while most studies targeted children aged 3-6, there is inconsistent age disaggregation, and the youngest learners (ages 3-5) are often underexplored. Populations such as children with disabilities, trauma backgrounds, or from highly marginalised groups remain underrepresented in systematic evaluations.

4.5.3 Equity Analyses are Thematic, Not Empirical

While equity was a central theme across many studies, few included disaggregated analyses based on socioeconomic status, gender, disability, or cultural background. Although many studies were conducted in disadvantaged or multicultural contexts, equity was typically discussed descriptively or as a goal rather than being measured or analysed as an outcome.

As such, it remains unclear which groups benefit most from NBEIs or how these interventions might exacerbate or mitigate existing disparities.

4.5.4 Limited Integration of Nature-Based Education within ECEC Policy Frameworks

Few studies directly examined how NBEIs align with national curricula, policy frameworks, or teacher training systems. This limits the field's ability to draw conclusions about the structural enablers or barriers to scaling and sustaining NBEIs within formal education. Greater attention to implementation of science, institutional context, and system-level analysis is warranted.

4.5.5 Barriers to Access and Participation

Several studies highlight practical barriers to participation, such as limited access to green space in urban areas, resource constraints, and challenges related to staff training or parental support. While many interventions aim to be inclusive, the actual measurement and evaluation of participation barriers and facilitators are inconsistent.

5 Discussion

This scoping review mapped and synthesised the current evidence NBEIs within formal ECEC settings across Europe for children aged 3-8 years. The findings indicate that, despite considerable diversity in interventions and local contexts, The findings reveal that while NBEIs are diverse in form and context, certain patterns are evident, particularly the prominence of FS and nature kindergarten models in the UK and Nordic countries, and the widespread adoption of gardening, foraging, and greening interventions across a range of European settings.

A notable feature of the literature is the strong representation of studies from Nordic countries. These countries are internationally recognised for their high levels of social equality, robust welfare systems, and consistently high rankings in quality of life and childhood wellbeing indices. Nordic ECEC systems are supported by universal access, public funding, and a policy commitment to equity, which is reflected in the design and implementation of NBEIs. For example, Norwegian and Finnish kindergartens frequently offer daily access to natural environments for all children, regardless of SES, and interventions are typically embedded within the mainstream curriculum (13, 44, 51). These settings foster social inclusion, generational interdependency, and child agency, and are characterised by participatory pedagogies and collective responsibility. In Sweden, greening projects in urban preschools specifically addressed barriers to participation for disadvantaged families, further exemplifying an equity-driven approach (50).

In contrast, studies from other parts of Europe, particularly the UK and Southern or Eastern European countries, often highlight challenges related to access, resource constraints, and persistent socioeconomic disparities. While the UK has a strong tradition of FS, access to high-quality nature-based provision is not universal and may depend on local funding, voluntary enrolment, or parental advocacy (22, 43). Interventions in more deprived or urbanised contexts frequently focus on overcoming barriers to green space and ensuring inclusion for children from low-income backgrounds (35, 43). In Southern and Eastern Europe, the evidence base remains limited, and there is little systematic research on how NBEIs are adapted to local policy frameworks or cultural contexts.

Across the reviewed studies, participation in NBEIs was consistently associated with improvements in emotional regulation, confidence, autonomy, and social skills. But the mechanisms and scope of impact often reflected the broader social and policy environment. Nordic studies emphasised universal participation and inclusivity as core principles, while studies from other regions more often described targeted interventions for disadvantaged or marginalised groups. Equity was a recurring theme, but empirical assessment of equity

outcomes was rare. Most studies described inclusive practices, such as adapting activities for children with diverse needs or integrating cultural heritage and intergenerational learning (13, 42), yet few systematically measured the differential effects of NBEIs by socioeconomic status, gender, or ethnicity. The Nordic approach, with its emphasis on universalism and public provision, stands in contrast to more fragmented systems elsewhere in Europe, where access to nature-based education may depend on local resources or voluntary initiatives. The findings of the review are consistent with prior research that emphasises various advantages of nature exposure during early childhood (17, 24). This review extends the evidence base by concentrating on the 3-8 year age group within formal ECEC settings and emphasising equity as a primary outcome. While these strengths are acknowledged, the review also identifies ongoing gaps in literature. The lack of systematic disaggregation by equity dimensions such as SES, gender, and ethnicity restricts comprehension of the effectiveness of NBEIs across different populations. The review may have overlooked relevant research available in other languages or in grey literature because it only included peer-reviewed, English-language studies published between 2015 and 2025. The reliance on single-reviewer screening and extraction, despite being common in student-led reviews, may have introduced bias. Most of the examined studies were qualitative, with small sample sizes and context-specific findings. Furthermore, there were very few examples of experimental or longitudinal designs in use.

The findings of this review suggest that NBEIs in ECEC curricula offer a powerful tool to enhance psychosocial wellbeing and create more equitable learning environments supported by the available data. Policymakers and practitioners should consider how to adapt the Nordic principles, ensure universal access, invest in teacher training for inclusive, child-centred outdoor pedagogy and give priority to the development and maintenance of accessible, nature-rich spaces in urban and underprivileged areas. Interventions should be purposefully created to encourage all children to participate, paying special attention to children from under-represented or marginalised groups.

Future research should employ more rigorous, longitudinal, and experimental designs to clarify the mechanisms of NBEI impact and evaluate long-term outcomes. There is a pressing need for studies that systematically measure and disaggregate equity outcomes by ability, gender, ethnicity, and socioeconomic status. Mixed-method approaches that combine qualitative insights with quantitative measurements will be essential for capturing the complexity of children's experiences and informing evidence-based policy and practice.

6 Conclusion

This scoping review explores how NBEIs offer considerable promise for supporting psychosocial wellbeing and promoting equity among children aged 3-8 years in formal ECEC settings across Europe. While the evidence base is growing, further research is needed to ensure that these benefits are accessible to all children, regardless of background or setting. Crucially, this overview also points out important literary gaps. These comprise under-representation of studies from Southern and Eastern Europe, a dearth of longitudinal and experimental studies, and limited application of disaggregated data. Dealing with these gaps guarantees that NBEIs are not only efficient but also fair and scalable over the whole spectrum of European ECEC systems.

Ultimately, early childhood NBEI has great public health and social equity intervention value. NBEIs provide a grounded, child-centric approach that links learning, environment, and justice as legislators, teachers, and researchers search for ways to build resilience, inclusion, and wellbeing from the earliest years of life. Realising these potential calls for ongoing investment, evidence collecting, and dedication to making sure no child is deprived of the developmental advantages of the natural world.

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List of Appendix

Appendix 1: Search strategy

Appendix 2: Characteristics of Included Studies

Appendix.1 Search strategy

Steps	Free terms & Mesh terms	Results
Population		
Free terms	(((((("child") OR (child*)) OR (toddler*)) OR (preschool*)) OR ("early childhood")) OR ("young children")) OR ("3–8 years")) OR ("children"[All Fields])) OR (kids*)	2,265,031
Mesh terms	((("Child"[Mesh]) OR "Child, Preschool"[Mesh]))	3,527,201
Concept/ intervention		
Free terms	((((((((((((Nature-based education) OR (Nature-based learning (NBL)) OR ((forest school*) OR (garden-based learning) OR (school garden*) OR (green schoolyard*) OR (environmental education in natural settings) OR (adventure education) OR (outdoor experiential learning) OR (loose-parts play in nature) OR (play-based learning in natural environments) OR (outdoor kindergarten*)) OR (Nature-based interventions (NBI))) OR (Nature-based interventions (NBI))) OR (Nature-based learning (NBL))) OR ((Green learning environments) OR (Nature-based education))) OR (Nature pedagogy)) OR (Green education)) OR (Green pedagogy)) OR (Eco-education)) OR (Nature-integrated curriculum)) OR (Nature-rich learning)	154,721
Mesh terms	((("Play and Playthings"[Mesh]) OR "Gardening"[Mesh]) OR "Parks, Recreational"[Mesh])	22,476
Context		
Free terms	"Early childhood education" OR "early childhood education and care" OR "ECEC" OR "nursery school*" OR "preschool*" OR "pre-school*" OR "kindergarten*" OR "daycare" OR "childcare" OR "early years setting*" OR "early learning centre*" OR "early primary school*" OR "reception class"	1,070,808
Mesh terms	("Child Day Care Centers"[Mesh]) AND "Child, Preschool"[Mesh]	4,520
Free terms	("Europe" OR "European" OR "EU" OR "Austria" OR "Belgium" OR "Bulgaria" OR "Croatia" OR "Cyprus" OR "Czech Republic" OR "Czechia" OR "Denmark" OR	8,932,784

	"Estonia" OR "Finland" OR "France" OR "Germany" OR "Greece" OR "Hungary" OR "Iceland" OR "Ireland" OR "Italy" OR "Latvia" OR "Lithuania" OR "Luxembourg" OR "Malta" OR "Netherlands" OR "Norway" OR "Poland" OR "Portugal" OR "Romania" OR "Slovakia" OR "Slovenia" OR "Spain" OR "Sweden" OR "Switzerland" OR "United Kingdom" OR "England" OR "Scotland" OR "Wales" OR "Northern Ireland")	
Mesh terms	("Europe"[Mesh] OR "Europe, Eastern"[Mesh]) OR "European Union"[Mesh]	1,627,741
Outcome		
Free terms	"equity" OR "health equity" OR "accessibility" OR "inclusion" OR "participation" OR "supportive environment"	151,982
Mesh terms	((("Health Equity"[Mesh]) OR "Health Services Accessibility"[Mesh]) OR "Social Determinants of Health"[Mesh]) OR "Social Inclusion"[Mesh]	917,458
Free terms	("psychosocial wellbeing" OR "emotional wellbeing" OR "social wellbeing" OR "psychological wellbeing" OR "wellbeing scale*" OR "positive affect" OR "negative affect" OR "self-esteem" OR "mood" OR "stress" OR "resilience" OR "prosocial behaviour" OR "social relation*" OR "social skill*" OR "peer relationship*" OR "inclusion" OR "attention" OR "executive function" OR "self-regulation" OR "problem-solving" OR "cognitive skill*" OR "accessibility" OR "participation" OR "health equity" OR "supportive environment*")	1,463,996
Mesh terms	((("Cognition"[Mesh]) OR "Mental Health"[Mesh]) OR "Executive Function"[Mesh]) OR "Attention"[Mesh]) OR (((("Emotions"[Mesh]) OR "Object Attachment"[Mesh]) OR ("Interpersonal Relations"[Mesh] OR "Social Skills"[Mesh] OR "Emotional Intelligence"[Mesh] OR "Social Behaviour"[Mesh])) OR "Self Concept"[Mesh]) OR "Resilience, Psychological"[Mesh]) OR (((("Social Behaviour"[Mesh]) OR "Social Inclusion"[Mesh]) OR "Interpersonal Relations"[Mesh]) OR "Peer Group"[Mesh]))	3,051,940

Appendix 2. Characteristics of Included Studies

Sl. No	Author/Year	Country	Study design	Age Group	ECEC Setting	Intervention Type	Psychosocial Outcomes	Equity Outcomes	Brief Findings
1	Alme & Reime, 2021	Norway	Qualitative	3-5 years	Nature kindergarten - rural	Nature kindergarten (outdoor play, collaborative building, child-led activities).	Participation, creativity, social inclusion, autonomy, cooperation, generational interdependency .	Social inclusion, fluid gender roles, accessibility for all developmental stages, shared responsibility, generational interdependency.	Nature kindergartens foster children's self-directed participation, collaboration, creative role play, and shared responsibility with staff; open natural spaces remove rigid adult-child hierarchies and gender norms.
2	Askerlund et al., 2024	Sweden	Mixed methods	3-6 years	Preschool	Ecosystem services development project (greening schoolyards, forest gardens, insect hotels, etc.).	Wellbeing, play, movement, learning, nature connection, teacher, and child engagement.	Inclusive, health-promoting, sustainable activities; addressing social/logistical obstacles; participation of all children and adults.	Greening schoolyards and introducing ecosystem services innovations fostered children's connection to nature, wellbeing, play, and learning. Teachers and children reported increased engagement and positive experiences. The intervention was inclusive, promoted health and sustainability, and addressed barriers to participation for all children.

3	Bergan et al., 2021	Norway	Qualitative	1-6 years (focus on 3-6 years in video and activity data)	Kindergarten	Foraging (wild food, fishing, Sami reindeer husbandry); Gardening (sowing, planting, harvesting, food prep).	Agency, social interaction, engagement, participation, connection to local food heritage.	Inclusion, participation of all children, cultural and social sustainability, connection to local heritage.	Foraging and gardening projects fostered strong communities of practice, increased children's agency, social interaction, and engagement. Participation was inclusive, connecting children and staff to local food heritage and culture, contributing to social and cultural sustainability in ECEC.
4	Bergan et al., 2024	Norway	Qualitative	3-6 years	Kindergarten	Foraging (flower/berry picking, making cordials), gardening (planting/harvesting potatoes).	Children's participation, engagement, learning, and collective knowledge/skills in foraging and gardening; focus on psychosocial development and eco-citizenship.	Inclusive participation, collective skill-building, adaptation for all children, teacher role-modelling for equity.	Teachers play a pivotal role in fostering engagement, curiosity, and learning in nature-based activities. Key themes: facilitating adventurous experiences, child-centred communication, and building collective knowledge/skills. Teachers' enthusiasm and leadership inspire children's participation and learning outdoors.

5	Corsano et al., 2025	Multi-country, Europe-Italy, Bulgaria, UK, Spain	Qualitative	4-6 years	Kindergartens, primary schools, children's museums, agro-ecological foundation	School gardening (structured, semi-structured, free/exploratory activities).	Children's emotional states, forms of interaction, and organization of activities during gardening; focus on inclusion and psychosocial wellbeing. Teacher practices for inclusion; organization of activities; group dynamics; teacher-child and peer interaction; development of a coding grid for inclusive practice.	Inclusion was a central analytical dimension; study focused on inclusive practices and their indicators (e.g., emotional states, interaction patterns).	Gardening activities in ECEC settings support emotional engagement, positive peer and adult interactions, and inclusive participation. The study provides a coding grid for teachers to observe and improve inclusivity in gardening. Implications for inclusive practice are discussed.
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6	Cronin de Chavez et al., 2024	United Kingdom	Ethnographic qualitative study	3 years	State-funded nurseries in deprived, multi-ethnic urban neighbourhoods.	Forest School (FS) sessions (11 weekly sessions) in parks and woodlands, run by Level 3 FS leaders.	Early Years Foundation Stage (EYFS) domains including social interaction, language development, emotional wellbeing, independence, and physical activity.	Focused on urban, disadvantaged populations with limited prior exposure to green spaces. Addresses access, inclusion, and potential for reducing developmental inequalities.	20 urban 3-year-olds (diverse backgrounds) attended 11 weekly FS sessions. FS participation led to improvements in children's confidence, social-emotional development, motor skills, and language use. The intervention supported children previously unfamiliar with natural environments, highlighting the role of structured nature access in reducing early developmental inequalities.
7	Donnelly et al., 2025	Scotland (Europe) and Australia (only Scottish data included for synthesis)	Qualitative	3-5 years	Forest nurseries (Scotland), bush Kinders (Australia)	Nature-based learning: FS/nursery, bush kinder, outdoor play.	Engagement with all six EHoM : creative problem solving, systems thinking, collaboration, persistence, adapting, improving (cognitive,	Gender inclusion: girls and boys equally engaged; outdoor settings reduce gendered play and promote equitable participation in engineering activities.	Children in Scottish forest nurseries readily engaged with all six EHoM through play with natural materials, construction, group problem-solving, and creative exploration. The forest nursery environment fostered collaboration, systems thinking, and persistence. The study provides practical examples for

							social, and emotional development).		educators to support engineering play in nature-based ECEC.
8	Garden & Hirst, 2024	Norway	Qualitative, Small-scale ethnographic interpretative .	3-6 years	Urban kindergarten, community allotment "Garden School"	Outdoor learning in community allotment: gardening, tree climbing, den making, intergenerational activities.	Social interaction, emotional engagement, risk-taking, child-nature relationships.	Inclusion and participation, community engagement, access for children from diverse backgrounds (e.g., newcomers, migrants), intergenerational learning, accessible environment, reciprocal relationships.	Outdoor pedagogy fostered wellbeing, agency, social skills, and inclusion; risk-taking was encouraged and managed; intergenerational and cross-cultural relationships were nurtured; respect for nature was central.

9	Hine, 2024	United Kingdom	Qualitative	Primary-aged children (focus on early primary, ages 5-8)	State primary school with Year 1 children (mainstream setting)	Weekly Forest School sessions (6 weeks); compared with classroom-based art lessons.	Social relationships, agency, risk-taking, resilience, wellbeing, identity, gender constructions.	Gender equity, inclusion, participation, challenging gender stereotypes and barriers.	FS can both challenge and reinforce gender norms. While the outdoor, flexible environment sometimes disrupts traditional gender roles and promotes agency, resilience, and inclusion, societal gender expectations can persist. Teachers' intentional strategies are needed to ensure equity and to prevent the reinforcement of stereotypes. The study highlights the importance of critical, reflective practice to maximize gender equity and psychosocial wellbeing in FS.
10	Hogarth, 2024	United Kingdom	Qualitative	4-6 years (Reception and Year 1 children; some data up	Urban primary school	Forest School in urban park with structured and child-led play exploring biodiversity.	Emotional expression, empathy, curiosity, collaboration, environmental awareness, grief, joy, sensory	Inclusive participation, access for all children in a diverse, urban setting; co-research with children as agents; access to	FS in an urban park fostered creative play, nature connection, and agency. Children engaged with nature and each other, co-created stories, and developed a sense of belonging and stewardship for the park. The intervention promoted inclusive participation, with all children,

				to Year 2)			engagement, self-confidence, agency.	nature for children in a deprived area.	regardless of background, able to access and benefit from nature-based play. The study highlights the importance of sustained, inclusive, nature-rich experiences for psychosocial wellbeing and equity in urban ECEC contexts.
11	Johnstone et al., 2022	International (with studies from Europe including Portugal, Norway, Finland, Belgium, UK)	Mixed-methods systematic review	2-7 years	Formal ECE - Nature preschools, forest kindergartens, green playgrounds, gardens.	Forest schools, naturalised playgrounds, garden-based interventions, and nature-enriched ECE.	Social, emotional, cognitive development; play; self-regulation; nature relatedness; awareness of nature; prosocial behaviour; attention; attachment; initiative; environmentally	Inclusion, participation, access, diversity, and pathways for equity discussed in synthesis.	Positive associations between nature-based ECE and self-regulation, social skills, social/emotional development, nature relatedness, awareness of nature, and play interaction. Qualitative studies highlight opportunities for play, socializing, and creativity. Some evidence for equity, inclusion, and participation, but more high-quality research is needed.

							responsible behaviour.		
12	Kiviranta et al., 2024	International (20 studies from 10 countries)	Narrative review	3-8 years	Preschools, kindergartens, and daycare centres.	Outdoor learning: forest schools, biodiverse daycare yards, natural playgrounds, nature-based pedagogy.	Holistic development, health, wellbeing, social/personal development, engagement, multimodal learning opportunities.	Barriers to access (space, equipment, weather, parental support), inclusion, teacher competence, access for diverse children.	Outdoor learning in ECEC supports holistic development, wellbeing, engagement, and multimodal learning. Barriers include lack of space, equipment, teacher confidence, and parental support. Equity of access is influenced by physical and social resources, teacher training, and community involvement.
13	Montalvan Castilla et al., 2024	Norway	Qualitative	4-6 years	Municipal kindergartens in Stavanger	Nature-based experiential learning using urban green spaces (gardens, forests, parks).	Teacher-reported impacts on children's engagement, emotional wellbeing,	Touches on access and inclusion in urban contexts, particularly the educational use of public green	Urban green spaces are perceived by educators as vital to children's holistic development, especially for mental wellbeing, attention, creativity, and fostering inclusive learning environments. Teachers adapt outdoor

							creativity, social interaction, and connection to nature.	spaces for all children.	pedagogies based on proximity, accessibility, and curriculum needs. Barriers include access, weather, and resources.
14	Papadopoulou & Vincent, 2025	United Kingdom	Qualitative	3-4 years (nursery); 4-11 years (primary), focus on Reception and KS1 for ECEC relevance).	Urban nursery (3-4 years), state primary school (Reception, Y3, Y5)	Structured outdoor learning (place-responsive, participatory action research).	Autonomy, agency, participation, learning engagement, teacher support, pedagogical affordances.	Focus on inclusion, equitable access to outdoor learning, teacher strategies for supporting all children.	Outdoor learning in nursery and primary school supports children's autonomy, agency, and engagement. Teachers reflected on their own practice, identified strategies for supporting inclusion and equitable access, and discussed challenges in aligning outdoor and indoor learning. The study highlights the importance of teacher knowledge and institutional support for equitable, effective outdoor pedagogy.

15	Puhakka et al., 2019	Finland	Qualitative	3-5 years	Urban daycare centres	Greening of daycare yards with biodiverse materials - forest floor, sod, peat blocks, vegetable, and flower planters.	Well-being, physical activity, diverse play, multi-sensory experiences, art/crafts, nature exploration, pre-academic skills, environmental relationships, engagement, enthusiasm.	Inclusive, accessible play for children of all sexes, ages, and competences; broader participation and creative opportunities; promoted sense of responsibility and environmental relationship.	Green, biodiverse yards were considered safe, inspired children's play, diversified activities, increased physical activity, and promoted well-being and environmental relationships. Children were enthusiastic and engaged, and staff found the green yards useful for pedagogic goals. The intervention was inclusive and accessible to all children in the centres.
16	Van den Berg et al., 2024	Netherlands	Quasi-experimental intervention	0-4 years	Nature-based daycare centres.	1-year Community of Practice training for caregivers to enhance pedagogical use of outdoor space.	Stress - reduced hair cortisol, improved wellbeing, involvement, physical activity, positive social/play behaviour.	Focus on vulnerable groups (youngest, oldest, and boys); children at sites with higher quality outdoor spaces showed greater benefits. Training aimed to support	COP program improved wellbeing, engagement, and creative play for boys and oldest/youngest children; high-quality, nature-rich outdoor areas and skilled, attentive staff are key to maximizing benefits and inclusivity in ECEC.

								all children, with attention to those at risk of lower engagement/benefit.	
17	Waite & Goodenough, 2018	United Kingdom	Qualitative	Early years case: 4-5 years (others: 12-17, 17-24)	Forest School settings, situated within or alongside formal ECEC provision.	FS (long-term, regular woodland sessions, learner-led, risk-managed, creative/play-based).	Psychosocial wellbeing: social, emotional, and cognitive development, identity, agency, confidence, sense of belonging, creativity, and pedagogical contrast to mainstream education.	Inclusion, differentiated participation, support for children with additional needs, group bonding, autonomy for all.	FS offers a distinctive, learner-led, nature-based pedagogy that contrasts with mainstream English education. Empirical case studies (including early years, age 4-5) show benefits for psychosocial wellbeing: confidence, agency, social skills, belonging, and creativity. The article highlights the importance of maintaining FS's unique principles and warns against dilution by standardization.

Résumé en français

Contexte: La petite enfance (3-8 ans) est une période clé pour le développement psychosocial, mais de nombreux enfants européens, notamment issus de milieux défavorisés, rencontrent des obstacles à l'accès à des environnements naturels favorables à leur bien-être et à l'équité. Les interventions éducatives basées sur la nature (IEBN) suscitent un intérêt croissant dans les structures d'accueil et d'éducation de la petite enfance (EAJE), bien que les preuves de leurs effets psychosociaux et sur l'équité restent dispersées.

Objectif: Cette revue vise à cartographier et synthétiser les données empiriques sur les effets psychosociaux et l'équité des IEBN auprès des enfants de 3 à 8 ans dans les EAJE européennes.

Méthodes: Une recherche systématique a été menée dans PubMed, Web of Science et Scopus pour les études publiées entre 2015-2025. Les études incluses rapportaient des résultats psychosociaux ou d'équité au niveau de l'enfant, issus d'IEBN structurées ou semi-structurées dans des EAJE formelles en Europe. Les données ont été extraites puis analysées de façon narrative et thématique.

Résultats: La plupart des études ont rapporté des associations positives entre la participation aux NBEIs et des améliorations de la régulation émotionnelle, de la confiance, de l'autonomie, des interactions sociales et de la résilience chez les enfants. Les enfants exposés à des environnements riches en nature présentaient de meilleures relations entre pairs, un engagement accru et une résolution créative des problèmes, en particulier dans les contextes urbains et défavorisés. L'équité était abordée à travers la participation inclusive, l'accès pour les groupes marginalisés et des pratiques culturellement adaptées, bien que peu d'études aient mesuré systématiquement les différences selon le statut socio-économique, le genre ou l'origine ethnique. La diversité méthodologique et le manque de mesures quantitatives limitent la comparabilité entre les contextes.

Conclusions: Les IEBN dans les EAJE européennes montrent un potentiel clair pour améliorer le bien-être psychosocial et promouvoir l'équité, notamment pour les enfants défavorisés. Cependant, des recherches plus rigoureuses, centrées sur l'équité et les effets à long terme, restent nécessaires pour orienter les politiques et pratiques futures.

Mots-clés: revue de la littérature, petite enfance, interventions éducatives basées sur la nature, bien-être psychosocial, équité, Europe.

