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Review

Youth Engagement in Environmental Health Research and Initiatives: A Scoping Review of Co-Creation Practices in Europe and MENA Regions with Regional Comparisons

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Abstract

Children and youth face unprecedented environmental health challenges. Despite their heightened vulnerability, they are essential to shaping sustainable futures. Yet youth engagement in environmental health is uneven globally, reflecting broader environmental inequities. Indeed, the Middle East and North Africa (MENA) offer limited opportunities for youth participation. In contrast, Europe has fostered visible youth leadership. Comparing youth co-creation approaches across Europe and the MENA region offers an opportunity to examine how environmental health initiatives are shaped by differing contextual conditions. Thus, this scoping review aims to (1) map and classify youth co-creation approaches in environmental health initiatives across Europe and the MENA region and (2) analyze lessons from both regions, highlighting effective strategies, challenges, and opportunities for cross-regional learning to strengthen youth engagement in environmental health initiatives. We conducted a comprehensive search across three databases, grey literature, and organizational websites. In total, 18 studies met the inclusion criteria; 15 studies were conducted in Europe, while 3 studies were situated in the MENA region. Four key themes emerged: (1) creating space for youth collaboration, dialogue and engagement, which underscores the importance of providing learning opportunities for children and youth; (2) no one-size-fits-all approach to co-creation, which underscores the need for diverse approaches, including innovative methods to engage with children and youth; (3) recruitment and retention challenges and contextual barriers to co-creation, which include social norms that may present additional barriers for girls to participate in co-creation initiatives; and (4) outcomes (such as environmental knowledge, behavioural change, skill development, and participation in decision-making) in co-creation. Several research, policy, and practice recommendations were outlined.

Keywords: youth; co-creation; MENA region; Europe; environmental health; scoping review; climate change

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1. Introduction

Nearly half of the world's children, approximately 1.1 billion, face at least three overlapping climate hazards (including drought, extreme heat, and heatwaves) that threaten their health, wellbeing, and survival (UNICEF, 2026). Indeed, the future of childhood is increasingly shaped by global environmental crises. Projections indicate that by the 2050s,

substantially more children will be exposed to extreme heatwaves, river flooding, droughts, wildfires, and other climate-related hazards compared to previous generations (UNICEF, 2024). These exposures are linked to adverse physical, mental, and social health outcomes, including infectious disease, food and water insecurity, displacement, and disruptions to education and community life (Arpin et al., 2021; Proulx et al., 2024; UNICEF, 2024).

Although environmental health challenges affect children globally, their impacts are not distributed equally, with significant regional variation driven by differences in environmental conditions, socioeconomic resources, governance structures, and adaptive capacity (Sheffield & Landrigan, 2011). For example, children in low-income regions face a higher risk of severe climatic events, compounded by 'socio-political stratifiers' (such as housing conditions and conflicts), reinforcing inequity and negatively affecting health and wellbeing outcomes (Diep et al., 2025).

As environmental threats intensify, there is a growing need for approaches that not only protect children and youth's health but also actively involve them in shaping responses to the environmental challenges that will define their futures (Gasparri et al., 2022). Children and youth need to be recognized as important stakeholders and agents of change in efforts to address environmental and public health challenges (Arnot et al., 2024). Engaging children and youth in environmental health initiatives can enhance the relevance, responsiveness, and sustainability of interventions by incorporating the lived experiences and perspectives of those most directly impacted by environmental change (Cardarelli et al., 2021). Moreover, participation can improve environmental literacy, civic engagement, a sense of agency, and leadership among young people (Trott, 2020). As a result, interest has grown in participatory approaches that position youth as active partners in research (Cardarelli et al., 2021; Gasparri et al., 2022).

One such approach is co-creation, a collaborative process in which researchers, practitioners, policymakers, and community members work together to develop knowledge, solutions, and actions that address complex societal challenges (Vargas et al., 2022). In the context of youth engagement, co-creation moves beyond traditional models of participation by positioning youth as key knowledge users in decision-making and by emphasizing shared power throughout the design, implementation, and evaluation of initiatives (World Health Organization, 2026). The literature also describes several similar approaches, including co-design, co-production, and citizen science, which are often used interchangeably (Lee et al., 2024). For example, citizen science is defined as collaborating with the public in order to increase knowledge (L. Marks et al., 2026). Co-design involves the meaningful involvement of end-users throughout the process, and, similarly, co-production emphasizes engagement (Lee et al., 2024; L. Marks et al., 2026). While these approaches differ, a key similarity is the active collaboration among key knowledge users (L. Marks et al., 2026). Therefore, youth co-creation has the potential to be a valuable strategy for promoting both effective environmental health action and meaningful youth engagement.

However, opportunities for youth engagement in environmental health initiatives are uneven globally, reflecting broader environmental, social, and political inequities. The Middle East and North Africa (MENA) region (see Figure 1) is home to one of the world's youngest and fastest-growing populations, with individuals aged 15 to 29 accounting for roughly 30 percent of the population (Raz, 2019). Educational attainment rates vary across the region, with Qatar and the United Arab Emirates ranking highest and Oman, Palestine, Egypt, and Algeria ranking lowest (American Caldwell, 2026). In contrast, Europe's youth population is shrinking, with youth representing 16.4% of Europe's population (Data Army Intel, 2026). Of note, educational systems differ across Europe. For example, the Nordic countries provide near-universal, low-cost early childhood education, and countries such as Finland use a centralized educational system (Campos et al., 2025). In terms of envi-

ronmental health challenges, the MENA region faces some of the world's most pressing issues, including water scarcity, air pollution, extreme heat, and rising climate-related risks (Aloui et al., 2026). At the same time, limited institutional capacity, fragmented governance structures, political instability, limited access to high-quality education, and inadequate civic engagement mechanisms often constrain youth participation in environmental decision-making (Labkir et al., 2026; UNICEF Middle East and North Africa, 2026). Of note, these challenges are not spread evenly across the region. Higher-income countries, such as Saudi Arabia and the United Arab Emirates, have higher adaptive capacity compared to other countries (i.e., Jordan and Egypt) (Osman, 2024). For example, Saudi Arabia has established a Climate Change Center, which studies climate variability and projects future changes in partnership with international collaborators (Hoteit et al., 2025). Comparatively, Europe is currently facing several environmental public health challenges, including air pollution, traffic noise, road injuries, heatwaves and cold spells (European Environment Agency, 2026; Mitsakou et al., 2019). Notably, many countries across Europe (see Figure 1) have established participatory governance and youth engagement, supported by policy frameworks, institutional resources, and democratic structures that facilitate youth involvement in public decision-making (Nederlands Jeugdinstituut, 2023). As a result, young people in Europe may have greater opportunities to contribute to environmental health initiatives and influence policy and practice. These regional differences suggest that social, political, cultural, and institutional contexts shape youth co-creation. Existing discussions of co-creation often emphasize principles such as stakeholder participation, shared decision-making, knowledge exchange, and partnership, but we still need to understand how these principles translate into practice across different geographical and institutional contexts. Comparing Europe and MENA is particularly informative because differences in research infrastructures, governance arrangements, stakeholder relationships, and environmental-health contexts may shape who participates in co-creation, how knowledge and decision-making authority are shared, and which barriers or facilitators emerge. Further, comparing these two regions offers a unique case study because of their geographical proximity and the historical exchange of ideas, cultures, and practices (Bowden, 2020). Hence, by comparing the two regions, this review seeks to identify both recurring principles and context-specific adaptations. In doing so, it addresses an important gap in the literature and in practice and contributes to developing more context-sensitive approaches to co-creation in environmental health. In sum, comparing youth co-creation approaches across Europe and the MENA region offers a unique opportunity to examine how environmental health initiatives are shaped by differing contextual conditions. These differences provide a valuable basis for exploring how youth co-creation is conceptualized, implemented, and supported under distinct environmental, social, and governance conditions. Therefore, the objectives of this scoping review were to (1) map and classify youth co-creation approaches in environmental health initiatives across Europe and the MENA region and (2) analyze lessons from both regions, highlighting effective strategies, challenges, and opportunities for cross-regional learning to strengthen youth engagement in environmental health initiatives. By examining experiences across both regions, opportunities may emerge for cross-regional learning, enabling researchers, practitioners, and policymakers to identify transferable strategies, address common challenges, and strengthen meaningful youth engagement in environmental health initiatives.



Figure 1. Map of MENA Region and Europe. Created using mapchart.net by S.D.

2. Materials and Methods

Search Strategy

The scoping review follows the methodology proposed by Arksey and O'Malley (2005) and the updated version by Levac et al. (2010). The protocol has been registered on the Open Science Framework and is available here: https://osf.io/k5wuv/overview (accessed on 31 August 2026).

A detailed search for published articles was conducted on 17 January 2026, using Scopus, Web of Science, and PsycInfo, with the search terms listed in Table 1. Search strategies for each database are included in the Supplementary Materials.

A grey literature search was also conducted using the World Health Organization database, the United Nations Development Programme, the United Nations Environment Programme, and Google Advanced. For the grey literature databases, we used a combination of the search terms described in Table 1 (such as "youth-led" AND "environment") and the inclusion/exclusion criteria described in Table 2. The grey literature search was conducted on 18 May.

Table 1. Search Strategy for Scoping Review.

Domain	Key Terms
Children and Youth	("child" OR "children" OR "adolescent*" OR "student*" OR "teen*" OR "youth*" OR "young people" OR "young adult*" OR "emerging adult*" OR "muraheq*" OR "murahiq*" OR "yafi*" OR "yafee*" OR "kid*")
Environmental Health	("air quality" OR "air pollution" OR "chemicals" OR "climate change" OR "conservation" OR "disasters" OR "ecological determinants" OR "environmental health" OR "environmental human rights" OR "environmental justice" OR "environmental literacy" OR "environmental monitoring" OR "environmental risk" OR "exposures" OR "environmental hazards" OR "healthy homes" OR "home hazard" OR "home injuries" OR "musculoskeletal injuries" OR "occupational hazards" OR "pesticides" OR "pests" OR "school hazards" OR "sustainab*" OR "toxins" OR "water pollution" OR "water quality" OR "Climate advocacy")
Co-Creation	("Community Participation" OR "co-design*" OR "codesign*" OR "co-produc*" OR "coproduc*" OR "Participatory research" OR "participatory action research" OR "community engagement" OR "collaboration" OR "consultation" OR "co-research*" OR "Community consultation" OR "community initiated" OR "community driven" OR "community lead" OR "citizen involvement" OR "activism")

The authors generated search terms using the previous literature and knowledge from the research team.

Citation Management

After completing the peer-reviewed literature search, the results were exported to Covidence. During title and abstract screening and full-text screening, each article was screened by S.D. and J.H. against the predetermined inclusion and exclusion criteria (see Table 2). Any conflicts were then resolved through discussion between the two reviewers. For the grey literature search, sources were recorded manually in a Microsoft Excel database, and both reviewers (S.D. and J.H.) were responsible for title/abstract and full-text screening.

Data extraction and analysis

Data extraction was captured in Covidence and in an Excel document. Bibliographic information, study objective, geographic location, and sample size were extracted from the included studies. We also extracted the environmental health outcome, definition of co-creation, data collection tools, and key outcomes. We piloted the standardized data extraction form with a small subset of articles ($n = 3$) to ensure both data extractors were on the same page. Afterward, S.D. and J.H. independently extracted data from 8 articles. Questions and disagreements were discussed at our regular meetings and resolved with the support of C.B.

We used an inductive thematic synthesis approach to analyze the data. Both the peer-reviewed and grey literature sources were analyzed using the same coding approach and all sources were coded for recurring concepts related to our research objectives. These codes were then compared across sources and grouped into broader thematic categories, from which the final themes were developed. S.D. was primarily responsible for the data analysis process, with input from J.H. and C.B.

Table 2. Inclusion and Exclusion Criteria.

Domain	Inclusion	Exclusion
Publication Information	• Published in English • Published between 2010 and 2026 [1] • Original research (both peer-reviewed and reports from relevant organizations)	• Written in a language other than English • Literature review (inclusive of scoping, systematic and narrative reviews) • Conceptual/theoretical papers, conference abstracts, theses, commentaries, etc.
Target Population	• Children (18 years or younger) and youth (15–24 years) • Papers that include all ages, but focus on children and youth in a more prominent manner	• Individuals aged 25 years or older • Papers that included all ages but did not focus on children and youth were excluded
Geographic Location	• Focus is on at least one country in Europe and Middle East and North Africa (MENA) region [2]. European Countries Albania, Andorra, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia/Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Monaco, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Vatican City. MENA Countries: Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates, Yemen.	• Focus is on a geographical location not based in Europe or the MENA Region
Outcome	• Primary focus is on programs or initiatives that engage [3] with children and youth to address environmental health [4] challenges	• Primary focus is NOT on programs or initiatives that engage with children and youth to address environmental health [2] challenges

[1] The year 2010 was the starting year for our search, as it allows us to include articles that may have been inspired by both the MDGs and SDGs, and during this time there was an increased recognition of climate change, which is a large component of environmental health. [2] The review used the World Bank Country Classification (The World Bank, 2026) as a guiding framework, which we then tailored based on the objectives of this review. [3] For this research project, the term engage means to actively involve children and youth within the program/research initiative in a meaningful manner, beyond being a data source (for example, answering surveys) (Percy-Smith & Burns, 2013). Studies that included children as a means for data collection (such as answering surveys or participating in interviews) and/or educating children on environmental health initiatives were excluded, while studies that emphasized the active involvement of children and youth in the development and implementation of initiatives were included. Researchers have noted that this is often a continuum, depending on the degree to which community members/representatives of the community are involved in the planning, decision-making, and dissemination of the program/research initiative (Key et al., 2019). [4] Environmental health is defined as the branch of public health that addresses all aspects of the broader environment that can impact human health, including the direct and indirect impacts of these environmental factors (Morand & Lajaunie, 2018).

3. Results

The search identified 5337 articles from 3 databases (Scopus, Web of Science, and PsycInfo) and 1220 articles through grey literature searches. After 1826 duplicates were removed by Covidence, 4731 articles underwent title and abstract screening by two reviewers (S.D. & J.H.), resulting in the exclusion of 4576 articles. The remaining 155 articles were screened for full-text eligibility, of which 137 were excluded based on the predefined inclusion and exclusion criteria. Figure 2 presents a summary of the study selection process using the PRISMA flow diagram.

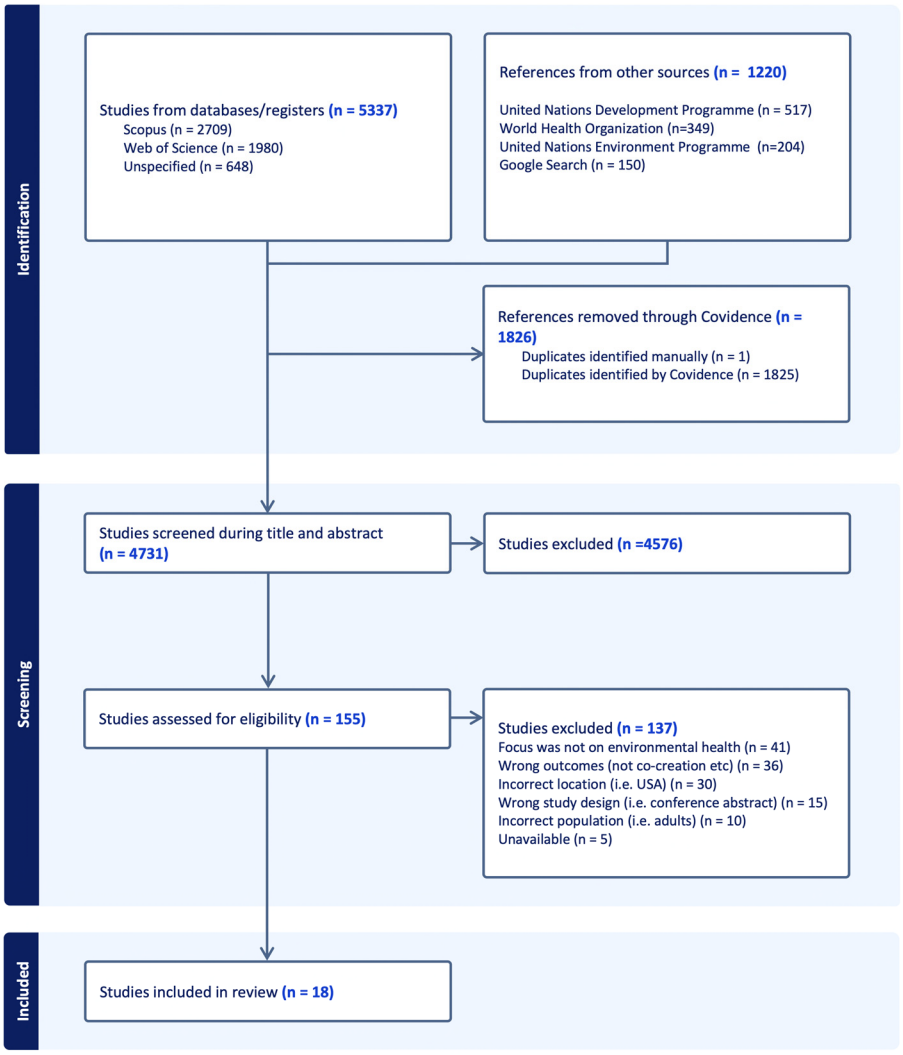


Figure 2. PRISMA Flow Diagram.

Key attributes of included studies

In total, 18 studies met the inclusion criteria, comprising 16 peer-reviewed articles and 2 grey literature documents. Apart from 1 study published before 2020, all included sources were published between 2020 and 2026, highlighting the growing importance and interest in co-creating environmental health research and projects with youth.

The majority of studies ($n = 15$) were conducted in Europe. Well-represented countries in the European region included Norway, Portugal, Ireland, and the United Kingdom, whereas only 3 studies focused on the MENA region. Detailed characteristics of the included studies are presented in Tables 3 and 4. A table focusing on the themes in more detail can be found in the Supplementary Materials.

Table 3. Characteristics of Included Studies Conducted in Europe.

Title	First Author, Year and Source	Country	Research Focus	Name of Co-Creation Framework Applied	Study Design and Data Collection Tools	Sample Size	Sample Demographics	Key Findings
A Videogame for Architectural Design? Minecraft for Young People to Imagine Desirable Climate Futures	(Andrade et al., 2024) Peer-reviewed	Ireland	To evaluate whether Minecraft supports youth engagement in co-designing climate adaptation scenarios for heritage-sensitive sites	Participatory co-design	Participatory case study using three online Minecraft co-design workshops, pre- and post-workshop questionnaires, an online geolocation survey, and qualitative content analysis of participants' designs	N = 38 children across three workshops (May: n = 12; July: n = 11; October: n = 15). Two questionnaire respondents	Children aged 10–12 years (20 girls, 18 boys) from the Rogerstown Estuary area in North Dublin, Ireland	Minecraft was effective as a participatory tool for engaging children in climate adaptation planning and design
Implementing Citizen Science in Primary Schools: Engaging Young Children in Monitoring Air Pollution	(Castell et al., 2021) Peer-reviewed paper	Norway	To develop and test a citizen science toolbox engaging primary school children in air pollution monitoring and assess its impact on awareness and knowledge integration.	Citizen Science and knowledge co-production, incorporating four knowledge integration elements: eliciting ideas, adding new ideas, distinguishing among ideas, and reflecting on ideas	School-based citizen science intervention with an uncontrolled pre–post evaluation. Data collection included low-cost air pollution monitors, scientific notebooks, and 10-item multiple-choice questionnaires administered before and after the intervention.	Individual N not reported; 60 fourth-grade classes across 30 schools. Evaluation subset: 12 classes (245 pre-intervention and 238 post-intervention questionnaires)	Fourth-grade primary school students aged 8–9 years from Oslo and Akershus County, Norway. Sex/gender and other demographic characteristics not reported	Increased knowledge and awareness of air pollution Demonstrated that young children can participate in full-cycle citizen science and knowledge co-production
Schools' air quality monitoring for health and education: Methods and protocols of the SAMHE initiative and project	(SAMHE Project Consortium et al., 2023) Peer-reviewed paper	United Kingdom	To develop and test a bespoke citizen science framework for collecting environmental and indoor air quality data in classrooms and (2) to simultaneously use these methods to raise awareness among communities regarding their exposure to air pollution in the school environment.	Participatory co-design and citizen science (SAMHE framework)	Methodological and participatory co-design study involving online workshops, feedback sessions, virtual bulletin boards, prototype testing, and classroom air quality monitoring using low-cost sensors and a co-designed Web App.	Individual N not reported; 20 co-design schools and 123 Pioneer schools involved in Web App development and testing.	Students aged 6–18 years and teachers from participating UK schools. Pioneer schools included institutions serving students aged 5–18 years across England, Scotland, Wales, and Northern Ireland. Individual participant demographics were not reported.	Provided information about how indoor air quality datasets are collected at national and, potentially, international levels, while simultaneously enabling schools to better manage their indoor environments and empowering students and teachers to reduce their environmental health risks.

Table 3. *Cont.*

Title	First Author, Year and Source	Country	Research Focus	Name of Co-Creation Framework Applied	Study Design and Data Collection Tools	Sample Size	Sample Demographics	Key Findings
Becoming 'Wild Citizens': Children's Articulation of Environmental Citizenship in the Context of Biodiversity Loss	(Christodoulou & Grace, 2025) Peer-reviewed paper	United Kingdom	To develop and implement a school-based program (Wild Citizens) to examine how children express environmental citizenship in the context of biodiversity loss	Socioscientific Inquiry-Based Learning (SSIBL), incorporating three stages: ASK, FIND OUT, and ACT	Qualitative exploratory study involving a co-designed, school-based biodiversity programme. Data were collected through semi-structured group interviews at two time points and analyzed using inductive and deductive thematic analysis.	In total, 130 children participated across five primary schools; 77 children participated in initial interviews and 65 in follow-up interviews (40 group interviews total)	Primary school children aged 6–10 years from five inner-city schools in socioeconomically deprived areas of South-East England. Of the 77 initially interviewed, 41 were boys and 36 were girls	Environmental citizenship was articulated at both local and global scales of influence in relation to (a) environmental awareness, (b) values and (c) action competence.
Finding Your Tribe! Participatory Evaluation of Co-Creation With Children and Young People in Support of Environmental Action	(Deane et al., 2025) Peer-reviewed paper	Ireland	To examine experiences and perspectives of children and young people involved in a citizens' assembly on biodiversity loss, and a co-creation initiative	Multi-stage participatory process, including citizens' assembly, co-design, participatory evaluation. Lundy Model of Child Participation: Space, Voice, Audience, and Influence.	Qualitative case study using participatory evaluation; two post-project semi-structured focus groups (8 children and young people, 5 parents); participatory feedback tools (photo elicitation, Jamboard, Rose–Bud–Thorn).	TRYBE co-design team: 14 children and young people. Evaluation: 8 children and young people and 5 parents (n = 13 across two focus groups)	Children and young people aged 8–17 years (6 boys, 8 girls in TRYBE), recruited from across Ireland, including rural and geographically dispersed communities. Parent participants (n = 5); further demographic characteristics not reported	The research indicates that children value the opportunity to participate and co-create as they feel best placed to say what their peers want and need, and they report a strong sense of agency gained from participation in such processes.
Transforming young adults' climate learning and actions through a co-created climate communication retreat	(Doyle et al., 2024) Peer-reviewed paper	Austria	To evaluate the impact of a co-created climate communication retreat on young adults' sociocultural understanding of climate change	Peer-to-peer collaborative production	Qualitative evaluation of a four-day participatory climate communication retreat; individual semi-structured interviews with 20 participants before and six months after the retreat; one end-of-retreat focus group	Twenty young adults (n = 20); 10 categorized as highly engaged in climate action and 10 as early journey participants	Young adults aged 21–29 years; 12 women and 8 men; 85% White European. Participants from Austria, Germany, United Kingdom, Netherlands, Finland, Belgium, and Sweden	Results show that participants developed new climate communication skills and strategies

Table 3. *Cont.*

Title	First Author, Year and Source	Country	Research Focus	Name of Co-Creation Framework Applied	Study Design and Data Collection Tools	Sample Size	Sample Demographics	Key Findings
Co-creating innovative climate policy frameworks for urban decarbonization: high school engagement in carbon pricing	(Ferreira et al., 2025) Peer-reviewed paper	Portugal	To evaluate how the co-development of carbon pricing processes in secondary schools can promote CO_2 emissions reduction and student awareness as community agents	Participatory action research, collaborative co-decision-making, co-creation and co-design	Participatory action research-based case study conducted over approximately 12 months (2022–2023). Data collected through seven quantitative and qualitative surveys (closed-ended, open-ended, and 5-point Likert-scale questions), digital commuting and emissions-monitoring logs.	Sixty-nine secondary school students and 3 teachers (n = 72)	Students aged 15–17 years, enrolled in grades 10 and 11 across Science and Technology and Socioeconomic Sciences classes. Approximately 53.6% of students were male and 46.4% female	Students were able to co-create a carbon pricing mechanism through experiential learning and understand complex climate policy tools. Further, there were behavioural changes as well (i.e., students developed increased self-efficacy, agency, and collective decision-making capacity).
Junkbox, a waste management educational game for preschool kids	(Gizzi et al., 2019) Peer-reviewed paper	Italy	To design and test a gamified educational tool to promote recycling behaviour and environmental awareness in preschool children	Co-design	Exploratory participatory co-design and pilot-testing study. Data collected through stakeholder meetings, parent interviews, teacher feedback, preliminary card-sorting activities, prototype testing, and observations of children's learning and task performance	N = 33 preschool children across two classes; 4 teachers also participated in co-design. Parents were consulted (number not reported)	Children aged 3–5 years (18 females, 15 males). Class 1: 12 children aged 3 years (6 females, 6 males); Class 2: 21 children aged 4–5 years (12 females, 9 males)	Children learned about recycling behaviour and the game became an integral part of every child's routine during school hours.

Table 3. *Cont.*

Title	First Author, Year and Source	Country	Research Focus	Name of Co-Creation Framework Applied	Study Design and Data Collection Tools	Sample Size	Sample Demographics	Key Findings
Reimagining activism to save the planet: Using transdisciplinary and participatory methodologies to support collective youth action	(Jones et al., 2024) Peer-reviewed paper	England	To promote the coconstruction of knowledge and co-production of change, and, wherever possible, provided the space and opportunities for at least some aspects of the research to move towards youth-led work.	Co-production, co-creation. Participatory Action Research (PAR)	Methodological meta-reflection across three participatory action research projects involving intergenerational storytelling, community research, citizen science, arts-based activities, and collaborative resource development.	N = 85 across three projects (INSECURE: 60; HedgeHunters: 7; Vietnam Youth Futures: 18), excluding an international Youth Advisory Board of unspecified size	INSECURE: Sixty secondary school students aged 12–13 years in Withernsea, England. HedgeHunters: 7 young people aged 8 years and older in East Riding, England. Vietnam Youth Futures: 18 young people aged 15–30 years from three northern Vietnamese provinces. Sex/gender distributions not reported.	Using co-creation approaches facilitates the empowerment of young people to co-create and lead solutions, adaptations and mitigations that can make a significant impact on the climate and biodiversity crises whilst influencing policymakers and inspiring collaborative change-making.
Stories of hope created together: A pilot, school-based workshop for sharing eco-emotions and creating an actively hopeful vision of the future	(E. Marks et al., 2023) Peer-reviewed paper	South West England, United Kingdom	To co-create and pilot a school-based workshop exploring young people's eco-emotions related to climate change and the potential of storytelling and peer discussions to foster realistic, active hope for the future.	Co-creation; Youth Participatory Action Research (YPAR) principles	Exploratory qualitative pilot study involving participatory workshop co-design and a three-hour school-based workshop. Data collected through audio-recorded group discussions, creative storytelling and illustrations, and follow-up feedback questionnaires.	N = 7 (3 youth co-creators; 4 workshop participants)	Youth co-creators aged 19–25 years (2 females, 1 male); workshop participants aged 16–18 years (2 females, 2 males). All workshop participants identified as White	Participants valued having a supportive space to express and share eco-emotions related to climate change. Storytelling and creative activities facilitated emotional expression, peer connection, and exploration of hopeful futures. Participants reported greater confidence in discussing climate change, although some emphasized the need for meaningful action beyond hope.

Table 3. *Cont.*

Title	First Author, Year and Source	Country	Research Focus	Name of Co-Creation Framework Applied	Study Design and Data Collection Tools	Sample Size	Sample Demographics	Key Findings
Using online tools in participatory research with adolescents to promote civic engagement and environmental mobilization: the WaterCircle (WC) project	(Marques et al., 2020) Peer-reviewed paper	United Kingdom	To test whether an environmental education program can develop students' understanding of the nature of environmental problems	Participatory Research (PR), informed by Freire's critical pedagogy and emancipatory education	Mixed-methods, quasi-experimental study with intervention and control groups and a two-month pre/post evaluation. Data collected through two versions of student questionnaires (5-point Likert scales), Instagram photographs and comments, classroom discussions, and collaboratively developed scientific posters.	N = 361 adolescents (intervention: n = 158; control: n = 203)	Students in grades 7–9 attending one public secondary school in northern coastal Portugal. Exact ages, sex/gender distribution, and other demographic characteristics were not reported	Statistically significant changes in self-efficacy were found for the experimental group, improved student's awareness of the socio-political dimensions of environmental problems
Empowering London Primary School Communities to Know and Tackle Air Pollution Exposure	(Otu et al., 2024) Peer-reviewed paper	United Kingdom	To engage primary school communities with the issue of air pollution to enable them to identify, understand, and reduce pollution exposure in their school and surrounding urban environment.	Student-led participatory research incorporating citizen science, co-design, and collaborative environmental monitoring.	Multi-school participatory environmental education and citizen science intervention with an uncontrolled pre/post survey evaluation. Methods included educational workshops	Approximately 300 children across three primary schools (active and non-active participants); 58 baseline survey respondents	Primary school children generally aged 6–11 years, attending three schools in London boroughs including Westminster, Hammersmith and Fulham, and Lambeth. Sex/gender distributions and other individual demographic characteristics were not reported	The findings indicated that this approach significantly enhanced children's understanding and knowledge of air quality, as well as their confidence, competence, and skills in air quality education.

Table 3. *Cont.*

Title	First Author, Year and Source	Country	Research Focus	Name of Co-Creation Framework Applied	Study Design and Data Collection Tools	Sample Size	Sample Demographics	Key Findings
It's In Our Hands: facilitating agency, personal connections and collective cohesion in climate education through board game play	(Padwick et al., 2025) Peer-reviewed paper	England	This paper presents preliminary observations and outcomes of Climate Change: It's In Our Hands, a co-designed educational board game for children, which was piloted in primary school classrooms	Participatory co-design, using iterative user testing and feedback to refine an existing game	Qualitative participatory co-design and exploratory ethnographic pilot evaluation. Two co-design workshops involved gameplay testing, facilitated discussions, feedback, and field notes. Subsequent classroom pilots used participant observation, descriptive field notes, facilitator reflective diaries, group discussions, and debriefing meetings.	N = 83 children (10 in co-design workshops; 73 in classroom pilot), plus 3 co-design teachers.	Co-design participants aged 10–11 years; pilot participants were primary school children from two schools in Northeast England (exact ages not separately reported). Sex/gender distribution not reported.	Analysis of data from sessions found evidence that children were engaging with the game and increased their understanding of climate change.
Reflections on co-productive research in a youth-focused climate education project	(Portus et al., 2025) Peer-reviewed paper	Finland, Ireland, United Kingdom and Italy	To explore how co-production with young people can effectively be achieved and offer meaningful ways for young people to share their stories in a time of climate crisis.	Co-production; five principles of co-production, subsequently expanded into an eight-principle youth-focused co-production model	Qualitative participatory research and reflective evaluation embedded within a longitudinal, international mixed-methods project.	Approximately 17 Youth Action Partnership (YAP) members recruited across the project, with membership fluctuating. Ten youth contributors are identified by pseudonym in the reported reflective findings; the exact number completing each interview or survey method is not explicitly reported.	Young people aged 15–18 years participating in YAPs across European project locations. The 10 named contributors represented Bristol, UK (n = 4), Galway, Ireland (n = 1), and Tampere, Finland (n = 5). Sex/gender distribution, ethnicity, and socioeconomic characteristics were not systematically reported.	Key findings included that young people had improved their skillset and built rapport with one another

Table 3. *Cont.*

Title	First Author, Year and Source	Country	Research Focus	Name of Co-Creation Framework Applied	Study Design and Data Collection Tools	Sample Size	Sample Demographics	Key Findings
"I am an air quality scientist"– Using citizen science to characterise school children's exposure to air pollution	(Varaden et al., 2021) Peer-reviewed paper	United Kingdom	To assess the extent to which a citizen science approach to data collection could contribute to and impact the research, development, and outcomes.	Citizen Science and participatory research (contributory data collection and knowledge co-production).	School-based participatory citizen science study using a mixed-methods evaluation and pre/post surveys without a control group.	In total, 258 children were involved in the data collection, with 250 parents and 10 teachers	Children aged 7–11 years old Pre-study survey—240 parents, 220 children Post-study survey—51 parents, 160 children 25 focus groups with children (8–10 children in each group), 3 focus groups with parents (3, 5 and 8 parents in each group respectively) and 10 interviews with teachers	Students' awareness of air pollution increased as a result of this work.

Table 4. Characteristics of Included Studies Conducted in the MENA Region.

Title	First Author, Year and Source	Country	Research Focus	Name of Co-Creation Framework Applied	Data Collection Tools	Sample Size	Sample Demographics	Key Findings
Building Youth Capacity for Climate-Health Science: Lessons From Implementing The DataJam in Jordan	(Nielsen et al., 2026) Peer-reviewed empirical study (implementation evaluation)	Jordan	The aim of the intervention was to build data science capacity to address issues at the intersection of climate and health.	Student-led collaborative DataJam approach (no named co-creation framework); CFIR used for implementation evaluation.	Focus groups, meetings, post-hoc analysis of The DataJam using the Consolidated Framework for Implementation Research (CFIR)	N = 87 students enrolled across 21 schools (54 completed 18 projects; 33 did not complete). Evaluation focus groups included 24 students and 10 teachers; five implementation personnel were interviewed.	Secondary school students (Grades 9–12; predominantly Grade 10); exact ages not reported	The program increased both the confidence and interest of students in engaging in climate change-related challenges facing their communities. Majority of projects created by students did not focus on climate and health

Table 4. *Cont.*

Title	First Author, Year and Source	Country	Research Focus	Name of Co-Creation Framework Applied	Data Collection Tools	Sample Size	Sample Demographics	Key Findings
Meaningful Climate Action: Young People as Changemakers in the MENA Region	(Hassan, 2023) Organizational research report (grey literature; participatory primary research and policy desk review)	Primary participatory research: Egypt, Iraq, Jordan, Lebanon, Palestine, and Yemen. Additional policy review: Morocco, Saudi Arabia, Tunisia, and United Arab Emirates	To map child and youth inclusion in the climate policy landscape in the region, and to identify concrete entry points to make young people's participation in climate action more meaningful	Participatory approach (youth-led research and consultation)	Key informant interviews, participatory workshops, desk review of climate policies, and youth-led validation discussions.	N = 12 youth co-researchers	Youth aged 18–26 years old from Egypt, Iraq, Jordan, Lebanon, Palestine, Yemen	Children and youth each navigate distinct challenges and opportunities within the realm of climate policymaking. Children often have limited participation avenues, and their contributions, though valued, are sometimes seen more in the context of their vulnerability rather than as proactive stakeholders. Key entry points include education, children as information disseminators, accessible climate science, enhanced communication, participatory policymaking, policy monitoring frameworks, and child and youth-driven climate finance
Youth and Climate Change in the Middle East and North Africa.	(Yerkes & Uakkas, 2025) Policy analysis (grey literature; desk-based analysis and country case studies)	Egypt, Morocco, and Tunisia (primary case-study focus; broader MENA context discussed)	This article examines the impact of climate change on youth in MENA, focusing on North Africa and how young people are fighting to make their voices heard through formal and informal mechanisms.	Not applicable; desk-based policy analysis describing youth participation initiatives	Desk review	N/A	N/A	Presented challenges (limited funding and lack of collaboration) in this region for youth, while also sharing what is working well in this region

Theme: Creating space for youth collaboration, dialogue and engagement

Across the included studies, co-creation was consistently emphasized, echoing the slogan, "Nothing about us without us." Although originally rooted in the fight for disability rights and justice (Charlton, 2004), this principle also applies to involving youth in co-creating environmental health initiatives. The studies highlighted the importance of creating opportunities for children and youth to engage in the process, as they can both learn from and contribute to these initiatives (Ferreira et al., 2025; E. Marks et al., 2023; Nielsen et al., 2026; Padwick et al., 2025; Yerkes & Uakkas, 2025).

The included studies used various terms to describe the process of involving youth, such as co-production, participatory action research, citizen science, and co-design. For example, Marques et al. (2020) applied a participatory research framework that involved collaboration with young people and local communities to promote social change. Castell et al. (2021) described a co-production process in which children contributed across multiple stages of the research process, whereas SAMHE Project Consortium et al. (2023) used co-design as ongoing involvement of participants to design an innovation, create prototypes, and receive feedback. Although the terminology and degree of youth involvement varied, the key similarity is the necessity of involving the participants, in this case, children and youth, in a meaningful manner.

Theme: No one-size-fits-all approach to co-creation

The included studies used diverse approaches to engage children and youth in environmental health. These approaches included school-based educational programs, citizen science projects, participatory research, and the co-design of educational resources and games. For example, Castell et al. (2021) used a citizen science approach to involve primary school children in air pollution monitoring by having them select monitoring locations, build and use low-tech air pollution monitors, collect data, and help interpret results. Similarly, Varaden et al. (2021) evaluated the effectiveness of a program in which children were given a backpack with a small air pollution sensor to monitor air pollution in their community. They were also given a badge that read "I am an air quality scientist." Following participation, children reported increased awareness and understanding of air pollution and its potential health implications (Varaden et al., 2021).

Other studies adopted participatory educational and co-design approaches. For example, Marques et al. (2020) described the development of a school-based educational program designed to engage students in discussions about environmental challenges and to encourage them to become advocates within their communities. In Italy, Gizzi et al. (2019) co-designed and tested an educational waste management game with children, parents, and teachers, ensuring the final product reflected the needs and perspectives of its intended users.

A varied range of environmental health issues were discussed in the included studies. All three of the studies from the MENA region focused solely on climate change (n = 3), while studies conducted in Europe focused primarily on air pollution (n = 6), climate change (n = 5), biodiversity (n = 1), waste management (n = 1) and general environmental initiatives (n = 1). These differences reflect the environmental topics addressed in the included sources; however, the limited number and geographical coverage of MENA sources prevent broader conclusions about regional research priorities.

Collectively, these findings demonstrate that co-creation was operationalized through a wide range of participatory methods. Rather than serving solely as recipients of environmental education, children and youth were engaged as collaborators who contributed to the development, implementation, and refinement of environmental health initiatives.

Theme: Recruitment and retention challenges and contextual barriers to co-creation

While co-creation offers numerous benefits and there are effective strategies for engaging youth, studies have identified barriers to implementing meaningful youth engagement in environmental health initiatives. Practical challenges include recruiting and retaining youth participants. For example, some youth opportunities require substantial time commitments and are unpaid, potentially limiting participation among those from lower socio-economic backgrounds (Portus et al., 2025). Further, some opportunities raise concerns about tokenistic participation, in which young people are unsure about the extent to which their perspectives are considered in ongoing projects (Portus et al., 2025). Additionally, collaborations between youth and academic researchers may inherently create power imbalances and a space where youth may not feel comfortable sharing their opinions (Portus et al., 2025).

The limited literature from the MENA region identifies additional contextual barriers that may further constrain youth participation. Cultural and gender norms, which may limit girls to participating only during school hours or not at all, were reported to restrict girls' opportunities to engage in environmental health initiatives in Jordan (Nielsen et al., 2026). More broadly, several countries in the MENA region are experiencing a profound polycrisis of interlinked challenges, including political instability and economic pressures, leaving youth feeling hopeless, apathetic, and unwilling to participate in environmental health initiatives (Hassan, 2023; Yerkes & Uakkas, 2025). A lack of institutional trust and competing priorities in this region, such as in Morocco, Tunisia and Egypt, leads to a lack of dedicated environmental health initiatives for youth (Hassan, 2023; Yerkes & Uakkas, 2025).

These findings suggest that meaningful co-creation required more than participatory methods alone. Structural, socioeconomic, and sociocultural factors shape who is able to participate and the extent to which youth can meaningfully influence environmental health initiatives.

Theme: Outcomes of Youth Engagement in Co-Creation

Studies emphasized the key learning benefits as outcomes of co-creation for the children and youth involved. These outcomes include environmental knowledge, behavioural change, skill development, participation in decision-making, and environmental health. Regarding environmental knowledge, Castell et al. (2021) and Varaden et al. (2021) reported increased awareness and understanding of air pollution and its potential health implications following children's participation in citizen science initiatives, highlighting the potential of co-creation to support environmental learning. Skill development was another reported outcome. Portus et al. (2025) found that engagement in co-productive research supported the development of communication and collaborative skills while fostering relationships and a sense of community among participants. Similarly, Doyle et al. (2024) reported that participants developed and refined their climate communication skills and strategies. These findings suggest that co-creation can provide opportunities for youth to develop transferable skills through collaboration and active participation. Regarding behavioural change, Doyle et al. (2024) reported that a four-day in-person retreat focused on climate change helped youth develop and refine their climate communication skills and strategies and led to behavioural changes, such as reduced meat consumption. Co-creating environmental health initiatives also created a space for dialogue and improved understanding of environmental health concerns, such as air pollution and climate change (Castell et al., 2021; Padwick et al., 2025; Varaden et al., 2021). Participation in decision-making was reflected in opportunities for children and youth to contribute to the development of environmental health initiatives. For example, SAMHE Project Consortium et al. (2023) involved students in co-designing air quality monitoring resources, while Gizzi et al. (2019) engaged children in developing and testing an educational waste management game. Environmental

health outcomes were primarily addressed through environmental exposure monitoring rather than direct assessments of health improvements. For example, Varaden et al. (2021) involved children in measuring personal exposure to air pollution, providing information about environmental conditions without establishing improvements in health outcomes. Collectively, these findings suggest that meaningful youth participation can contribute both to the development of environmental health initiatives and to young people's knowledge, skills, agency, and social connections.

4. Discussion

This scoping review aimed to synthesize evidence on youth co-creation approaches in environmental health initiatives across Europe and the MENA region. Overall, the findings demonstrate that co-creation is increasingly used to engage children and youth through participatory approaches such as citizen science, co-design, participatory research, and educational interventions. Although these approaches were associated with improvements in environmental knowledge, communication skills, agency, and community engagement, barriers to meaningful participation remain, particularly in the MENA region.

A key finding of this review was the value of co-creation as a strategy for engaging children and youth in environmental health initiatives. Previously published research has demonstrated that co-creation can reduce depressive and anxiety symptoms by strengthening young people's sense of agency and social connections (Tao et al., 2025). Similarly, the included studies underscored that meaningful participation can yield benefits beyond individual projects' environmental outcomes. Indeed, studies in this review using qualitative methods found that co-created initiatives improved communication skills, strengthened peer relationships, and created opportunities for youth to share concerns about environmental issues such as climate change, resulting in a sense of community among those with similar feelings (Doyle et al., 2024; E. Marks et al., 2023). Those involved in the air pollution citizen science projects showed increased knowledge and awareness of air pollution and fewer misconceptions as assessed through a pre-post evaluation using self-reported multiple-choice questionnaires (Castell et al., 2021). Collectively, these findings suggest that co-creation not only improves the relevance of environmental health initiatives by incorporating young people's lived experiences (Madsen et al., 2025), but also supports broader developmental outcomes for youth.

Another key theme emerging from the included studies is that while co-creating environmental health initiatives with youth offers many benefits, it also faces limitations and barriers. Other peer-reviewed studies have acknowledged that, at times, co-creation approaches may seem transactional, and it is essential for youth's perspectives to be incorporated into practice (Mendes et al., 2025; Paterson-Young et al., 2024). Other studies, situated in the MENA region, included in our review, underscored examples of other barriers to youth engagement, such as power dynamics, lack of information, and income poverty (Nesrallah et al., 2023; Yerkes & Uakkas, 2025). Of note, Nesrallah et al. (2023) designed a framework to support meaningful youth engagement that increasingly emphasizes principles such as respect, inclusivity, voluntariness, and accountability while encouraging collaboration with existing community organizations and youth leaders.

One notable finding was the substantial geographic imbalance in the evidence included in our review. In total, 15 of the 18 included studies were conducted in Europe, and 3 focused on the MENA region. The evidence from the MENA region may suggest that youth co-creation is shaped by unique contextual challenges. For example, ongoing environmental crises, water insecurity, regional and international conflicts, and limited employment opportunities often compete with climate change as immediate priorities for governments and young people in several MENA countries, such as Iraq, Palestine and Egypt (Hassan, 2023).

Crises that demand immediate attention (such as regional conflict) may take precedence over other concerns. In addition, limited institutional trust and gendered social norms may further restrict opportunities for meaningful youth participation, particularly among those living in the MENA region (Yerkes & Uakkas, 2025). Studies in Jordan have found that women are less likely to participate in research studies because of social and cultural norms (Z. A. Al Subeh & Alzoubi, 2020; Z. Y. Al Subeh & Alzoubi, 2021). These findings highlight the importance of adapting co-creation approaches to local cultural, political, and environmental contexts rather than directly transferring models developed elsewhere. Hence, at conferences such as the Conference of Youth (COY17) in Sharm el-Sheikh, youth developed several key recommendations, including increased "adaptation finance and equitable and concessional funding and enhancing resilience strategies tailored to local contexts" (Yerkes & Uakkas, 2025). Further, the International Association for Adolescent Health at a recent meeting in the MENA region published a declaration which focused "*on youth and included commitments to address: the neglect of youth in humanitarian and fragile settings; comprehensive school-based adolescent health services; developing expertise in research and data collection; the safety and identity of women through combating gender-based violence, forced early marriage and trafficking; improving mental health; increasing physical activity; working with families, and promoting a culture of evidence-based development of policies, programs, plans, services and initiatives targeting adolescents and youth*." All of this speaks to the attention that is being paid to youth and environmental health initiatives that may not yet be reflected in available sources.

Notably, European studies covered a wide range of environmental health issues, including biodiversity, air pollution, and recycling. Surprisingly, there was no direct focus on heatwaves, despite the continent experiencing record-breaking heatwaves (Croft, 2026). The European region can model their environmental health initiatives on work already conducted in the MENA region on rising temperatures. For example, a district cooling system can distribute cooling to multiple buildings, improving energy efficiency and reducing costs (Mante, 2026). While these initiatives do not involve youth and this initiative was not included in this particular review, these strategies offer a strong solution to current environmental health issues and could be improved by involving key knowledge users in a co-creation model. Knowledge users, such as policymakers in the MENA region, should also learn from Europe's co-creation work to engage youth in a meaningful way. Many European initiatives successfully engaged children and other key knowledge users (such as parents and teachers), creating supportive environments for sustained participation. This approach may help knowledge users in the MENA region mitigate social and cultural barriers. Similar multi-knowledge user approaches may offer valuable lessons for policymakers and practitioners seeking to strengthen youth engagement in environmental health initiatives within the MENA region. However, these approaches should be adapted to reflect local priorities, governance structures, and cultural contexts to ensure that participation remains meaningful and equitable. For example, both regions can utilize trusted community organizations, religious institutions, and community gathering spots to engage youth in a non-tokenistic, respectful manner. This will also help ensure diversity in the sample. Overall, both regions can draw on best practices from each other to improve their own approaches to environmental health initiatives.

Limitations

Our review focused on the MENA and European regions, enabling an in-depth analysis of the included studies. However, we recognize that a global review would enable cross-regional comparisons among regions with differing socio-economic and climatic conditions. Further, our search focused primarily on English, which may have excluded relevant evidence published in Arabic or other languages, particularly within the MENA

region. The relatively limited evidence identified from MENA countries and the methodological heterogeneity across sources and differences between peer-reviewed studies and grey literature may limit comparability across findings. In addition, classifying levels of youth participation based on the information reported by authors may have introduced some misclassification. Importantly, the absence of identified publications from particular countries should not be interpreted as evidence that youth co-creation initiatives are not occurring, as such activities may be undocumented, unpublished, or not captured by our search strategy. Further, the lack of studies from the MENA region may have been due to not using specialized Arabic databases or to not employing an Arabic/French search strategy. The limited number of studies from the MENA region may also reflect the inequities embedded in the global publishing system (Bol et al., 2023; Nature, 2023).

5. Conclusions

Our study underscored that co-creation is a valuable strategy for engaging children and youth in environmental health research and action, with reported benefits including improved communication skills, agency, and community connectedness. Several of the included studies underscored that the initiatives implemented with youth improved environmental knowledge and awareness and helped with behavioural change. However, meaningful youth participation requires more than simply involving young people in research or interventions; it depends on authentic partnerships that promote decision-making, address power imbalances, and ensure that youth perspectives meaningfully inform project development.

Despite growing interest in youth co-creation, the majority of studies in our review focused on Europe. While this geographic imbalance may reflect limitations in our review, it does underscore the need for greater investment in research, policy, and practice that support contextually appropriate approaches to youth engagement in underrepresented regions.

We have several future areas of research, including conducting an updated search using Arabic scholarly databases (such as Al Manhal). Doing so would ensure we capture papers written in Arabic and French. We would also be interested in interviewing knowledge users in the MENA region and Europe to hear their perspectives on co-creating environmental health initiatives with youth. Future research should also prioritize developing and evaluating co-creation approaches that are culturally responsive, locally relevant, and designed in collaboration with young people to strengthen environmental health initiatives across various settings.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/youth6040158/s1, Table S1. Aligning the themes with relevant European and MENA studies.

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Abbreviation

The following abbreviation is used in this manuscript:

MENA Middle East and North Africa

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