



YouthMove15

Youth-centric Mobility and Activity in the 15-minute City

Deliverable 2.1

Systematic Literature Review Report

Lead partner: Groningen University

Call Title:	DUT Call 2024
Start date of project:	January 2026
Duration:	24 months
Date of report:	
Document authors:	
Work Package	WP2
File name:	YM15_D2.1_Systematic Literature Review Report

REVISION HISTORY:

Date	Version	Author / Contributor	Revision by	Comments
15-06-2026	V0	Luana Silveri and Lucy Avraamidou	-	
30-06-2026	-	Imre Kesorü, Rosa Esi Ennison and Samyajit Basu	VUB	
16-07-2026	-	Olívia Kurucz	BME	
26-07-2026	V1	Luana Silveri and Lucy Avraamidou		

Table 1 – Deliverable revision track

Executive summary

This deliverable, produced within WP2 of the YouthMove15 project, presents a systematic literature review examining the 15-minute city (15mC), spatial proximity, and the specific needs and experiences of children and young people (CYP aged 8–16). The review aims to refine the conceptualisation of the 15mC by foregrounding two dimensions insufficiently addressed in existing scholarship: child-calibrated proximity and **participatory approaches** that enable CYP to contribute meaningfully to urban planning and governance. The findings support the development of a shared conceptual framework for the project and inform the design of forthcoming participatory and Living Lab activities.

The review addresses three sub-research questions:

- What does existing international evidence reveal about the relationship between the built environment and CYP's spatial autonomy and independent mobility?
- How do participatory engagement strategies, including Living Labs, co-design and youth-led tactical urbanism, foster CYP agency in urban planning and governance?
- What socio-spatial barriers and facilitators influence the successful integration of CYP-led initiatives into broader sustainability transitions and 15-minute city policies?

The review was conducted using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology as elaborated by Page and colleagues (2021). Searches were conducted across two international databases (Scopus and Web of Science) in March–April 2026, yielding 74 included studies after screening and reference chaining. Its scope is intentionally delimited to the intersection of proximity, CYP, and participatory planning, providing a targeted evidence base for the project's methodological and conceptual development.

Note about the target age of the review:

The review screens for evidence on CYP aged 8–16, while the empirical phase of YouthMove15 will work with children aged 10–14. The wider band is used for three reasons. First, the primary literature rarely reports on a 10–14 sample in isolation: the included studies use bands such as 4–18, 5–13, 5–14, 6–12, 9–12 and 12–17, so restricting the search to 10–14 would have excluded most of the relevant evidence. Second, 8–16 spans the developmental transition that matters for this project, the shift from accompanied to independent travel, which typically begins around ages 8–10 and consolidates in early adolescence; the wider band therefore shows what changes immediately before and after the project's target group. Third, it matches the age ranges used in the child-mobility measurement traditions on which the review draws, including children's independent mobility surveys and child-specific walkability indices. Where the primary studies

allow, findings specific to the 10–14 range are identified in the syntheses, and it is this subset that informs the design of the Living Lab activities, the participatory tools proposed, and the age-calibrated proximity thresholds discussed.

Key findings

The analysis does not aim to provide a comprehensive review of all urban planning literature related to the 15-minute city, nor of all dimensions of children's geographies. It is specifically scoped to the intersection of proximity, CYP, and participatory planning, with the intention of providing a conceptual and empirical foundation for the participatory activities and living lab processes planned in subsequent work packages. Here below the key findings are briefly summarized:

- **Proximity as a necessary but insufficient condition:** Spatial proximity is consistently identified as a core structural prerequisite for CYP's independent mobility. However, proximity alone does not guarantee mobility: perceived and actual safety, parental norms, and limited governance mechanisms for incorporating CYP knowledge significantly constrain mobility even in proximity-rich environments.
- **Adult-centred bias in 15mC models:** Existing 15mC frameworks predominantly reflect adult needs, assumptions, and walking speeds, and rarely integrate CYP perspectives or child-relevant amenities.
- **Participatory approaches and the translation gap:** Multi-method participatory processes generate high-quality, context-specific insights that cannot be replicated through adult-proxy approaches. Nonetheless, a persistent gap remains between CYP contributions and their translation into implemented planning measures.
- **Equity considerations:** Gender, socioeconomic status, disability, and ethnicity significantly shape CYP's ability to benefit from proximity and participation. These dimensions are under-reported across the evidence base.
- **Evidence limitations:** Research is dominated by cross-sectional studies from Global North contexts, limiting transferability to diverse urban settings.

Framework Contribution

The deliverable introduces a *critical-imagination framework* integrating child-calibrated proximity, participatory methodologies, barrier/facilitator mapping, and governance mechanisms for translation. This framework is intended to guide the project's Living Lab activities

and support the development of child-inclusive, proximity-based urban planning approaches aligned with European sustainability and participation objectives.

Acknowledgements

This project is funded by the Driving Urban Transitions (DUT) Partnership under the Horizon Europe programme, co-funded by national funding agencies including Innoviris, UK Research and Innovation (UKRI), Walk Wheel Cycle Trust and the European Union.



Statement of AI use

For this report, we used LLM to perform a language check (DeepL.com).

Table of Contents

1. Introduction	6
1.1 Objectives and Position within the Project	6
1.2 Research Questions	6
1.3 Structure of this Deliverable	6
2. Definitions	8
2.1 Proximity	8
2.2 The 15-Minute City.....	10
2.3 Living Labs	12
2.4 Conceptualising Children’s Geographies and Mobility	15
3. Methodology.....	18
3.1 Search Procedure and Selection of Papers	18
3.2 Inclusion and Exclusion Criteria.....	19
3.3 Screening Process.....	22
3.4 Data Extraction and Analysis.....	22
4. Results	25
4.1 Research Question 1: What does existing international evidence reveal about the relationship between physical proximity (built environment) and the spatial autonomy/independent mobility of CYP?	25
4.1.1 Barriers and Drivers	26
4.1.2 The 15-Minute City Model and CYP: Facilitation or Constraint?.....	29
4.2 Research Question 2: In what ways do participatory engagement strategies (e.g., Living Labs, youth-led tactical urbanism, co-creation) foster CYP agency in the design and governance of sustainable urban spaces?	31
4.2.1 Methods and Approaches for CYP Participation in Urban Planning	33
4.2.2 Best Practices and Conditions for Meaningful Agency.....	39

4.3 Research Question 3: What socio-spatial barriers and facilitators influence the successful integration of CYP-led initiatives into broader sustainability transitions and 15-minute city policies?.....	39
4.3.1 Physical and Infrastructural Barriers and Facilitators	40
4.3.2 Policy-Level Enablers and Structural Interventions.....	44
4.3.3 Marginalised and Under-Served CYP Populations: Compounded Barriers	45
4.3.4 Methodological Limitations.....	46
4.4 Cross-Cutting Synthesis Across the Three Sub-Research Questions.....	47
5. Conclusions and Implications	49
6. Towards a Child-Inclusive 15-Minute City: Theoretical Foundations and Key Principles	51
6.1 The Critical Imagination Lens as an Overarching Framework.....	51
6.2 Framework Dimensions and Components.....	51
6.3 Equity and Intersectionality as Cross-Cutting Principles.....	54
6.4 Practical Recommendations: CYP Participation in the Living Labs	55
6.4.1 Proposed Tools for the Living Labs.....	55
References	57
Annex I [Selected Papers]	67

List of figures

Figure 1 - YouthMove15 logo.....	Error! Bookmark not defined.
Figure 2 – Graphic example	Error! Bookmark not defined.
Figure 3 – Graphic example 2	Error! Bookmark not defined.
Figure 4 – Graphic example 3	Error! Bookmark not defined.

List of tables

Table 1 - Table caption.....	2
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1. Introduction

1.1 Objectives and Position within the Project

This deliverable is the end product of Task 2.1 within Work Package 2. The objective of the task is to establish the conceptual and empirical foundation on which the project's later empirical work rests, by revisiting the 15-minute city through two dimensions that the existing literature treats only marginally: spatial proximity as children and young people actually experience it, and participatory approaches through which CYP can act on the planning and governance of their own environments.

Within WP2 the deliverable performs three functions. It supplies the shared vocabulary and definitions used across the work package; it establishes what is already known, and what is not, about the proximity–mobility–participation relationship for CYP; and it converts that evidence into a framework and a set of participatory tools that the Living Labs in the subsequent work packages are intended to apply and test. The empirical phase will work with children aged 10–14; the reasoning behind the wider 8–16 screening band is set out in the Executive Summary above.

1.2 Research Questions

The review is structured around three sub-research questions (SRQs):

SRQ1: What does existing international evidence reveal about the relationship between physical proximity (the built environment) and the spatial autonomy and independent mobility of CYP?

SRQ2: In what ways do participatory engagement strategies, including Living Labs, youth-led tactical urbanism and co-creation, foster CYP agency in the design and governance of sustainable urban spaces?

SRQ3: What are the socio-spatial barriers and facilitators that influence the integration of CYP-led initiatives into broader urban sustainability transitions and 15-minute city policies, and how do environmental, social and cultural factors, including gender, parental permission and socioeconomic status, mediate the success of proximity-based and participatory mobility interventions for CYP?

1.3 Structure of this Deliverable

This deliverable is organised in ten sections. Section 1 outlines that structure. Section 2 defines the three concepts on which the review rests, proximity, the 15-minute city, and living labs, and establishes the vocabulary used throughout. Section 3 sets out the PRISMA-based methodology:

the search strings, the inclusion and exclusion criteria, the screening process, and the data extraction and analysis procedure.

Sections 4 to 6 present the evidence, one section per sub-research question. Section 4 addresses SRQ1 and asks what the international evidence reveals about the relationship between physical proximity and the spatial autonomy and independent mobility of CYP. Section 5 addresses SRQ2 and examines how participatory engagement strategies, including living labs, youth-led tactical urbanism and co-creation, foster CYP agency in the design and governance of urban space. Section 6 addresses SRQ3 and identifies the socio-spatial barriers and facilitators, among them gender, parental permission and socioeconomic status, that mediate whether proximity-based and participatory interventions succeed. Each of these three sections closes with a synthesis that answers its own SRQ and draws out the implications for the other two.

Sections 7 to 10 move from evidence to application. Section 7 brings the three evidence sections together in a cross-cutting synthesis, presenting five findings that hold across the SRQs. Section 8 states the conclusions and their implications for research and practice. Section 9 presents the theoretical foundations and key principles of a child-inclusive 15-minute city, built around the critical imagination lens and four framework dimensions. Section 10 translates these into practical recommendations and a proposed toolkit for CYP participation in the project's Living Labs. The reference list follows.

2. Definitions

The definitions chapter sets out the conceptual foundations of this review by clarifying how core terms proximity, the 15-minute city, living labs, and children's geographies are understood and operationalised within YouthMove15. Its purpose is to delineate the analytical scope of these concepts and ensure terminological consistency across the deliverable. To provide clarity and a more complete and exhaustive understanding of the keywords guiding the analysis, the chapter draws on a broader and more diverse body of literature than the 74 studies included in the systematic review. This is necessary because the definitions themselves rely on established theoretical traditions and long-standing scholarly debates that extend beyond the empirical evidence captured through the PRISMA search.

2.1 Proximity

Proximity refers to the physical distance between two points that are close to each other (Di Marino et al., 2023). When the distance between people, services, and activities is reduced, this can improve social, economic, and environmental sustainability, for example, by reducing car use and increasing active mobility (Bibri, 2021; Di Marino et al., 2023; Fernández-Núñez et al., 2024). Proximity is closely related to the broader concept of accessibility, which goes beyond physical distance to also consider how easily a destination can be reached. Even when something is nearby, structural barriers such as missing infrastructure can prevent certain groups from accessing it (Levine, 2019). Proximity and accessibility should therefore be considered together to effectively and inclusively evaluate whether destinations are truly reachable (Levine, 2019; Fernández-Núñez et al., 2024).

In urban planning, walkability, the extent to which the built environment assists residents in accessing locations on foot, often plays a central role in proximity. This has led to the emergence of proximity-centred planning that emphasizes minimizing distances to vital services and promoting active mobility infrastructure as a substitute for reliance on cars (Arias-Molinares et al., 2025; Moreno et al., 2021).

Most research focused on adults when assessing proximity in cities. However, the proximity of children and young people (CYP; with a particular focus on 8–16-year-olds) to their direct environment is especially relevant, as they are legally and practically constrained in their mode of transportation. Their ability to move around depends on walking, cycling, public transport, or being driven by adults, which means that the physical design of their neighbourhood directly affects their independence and wellbeing (Mitra & Manaugh, 2019; Riazi et al., 2022). A key outcome of proximity for CYP is independent mobility, the freedom to travel to everyday

destinations without adult accompaniment. Independent mobility is associated with a range of physical, social and developmental benefits, and the extent to which it is possible is directly shaped by proximity and perception of route safety (Riazi et al., 2022).

Asadi (2025) found that higher parental satisfaction with the proximity and safety of green spaces was directly associated with increased children's outdoor play and independent mobility, reinforcing that the spatial distribution of recreational amenities carries measurable wellbeing consequences for CYP beyond proximity to services alone. Most frequently, when CYP have been investigated, distance to school is the primary proximity measure used in the literature (Ito et al., 2017; Mandic et al., 2023; Xing et al., 2025). However, proximity to other spaces, such as outdoor playgrounds, recreational facilities, and spaces for weekend activities, is equally important to consider (Riazi et al., 2022). CYP further experience proximity differently from adults in practical terms. Children walk more slowly than adults, meaning that the effective radius of a given time threshold is physically smaller for children (Arias-Molinares et al., 2025; Giannoulaki & Christoforou, 2024).

Furthermore, most existing accessibility measures apply the same spatial principles to children as to the general population, despite children having distinct daily activity patterns, narrower independent movement ranges, and parental mediation as a critical intervening factor between physical proximity and actual access (Teeuwen et al., 2025). In response to these gaps, Wang et al. (2025) proposed a dedicated 'Children's Healthy 15-Minute Life Circle' concept, arguing that child-specific amenities, pedestrian infrastructure, and road network density must be treated as distinct planning objectives from those serving the adult population.

Proximity for CYP faces multiple physical, social, and structural obstacles. Physically, distance remains the most consistent barrier to independent mobility, particularly distance to school, but also to other relevant everyday destinations (Mandic et al., 2023; Xing et al., 2025). Compounding this, a lack of pedestrian and cycling infrastructure combined with high traffic volumes and road danger further restricts CYP's ability to move independently and safely through their neighbourhood (Burford et al., 2026; Gorrini et al., 2023; Michail et al., 2025; Wilson et al., 2018).

Measurement tools developed specifically for children further substantiate this: the Walkability for Children Index (Gorrini et al., 2023) assessed neighbourhoods on child-specific dimensions of usefulness, comfort, safety, and attractiveness, and found that areas scoring well on generic adult walkability indices can simultaneously score poorly on child-relevant criteria, pointing to systematic blind spots in standard proximity assessment. At the structural level, school choice policies in some countries increase travel distances beyond what would otherwise be walkable (Mandic et al., 2023). CYP in peripheral and outskirts areas face all these obstacles; greater distances, fewer amenities, and poorer infrastructure make proximity gaps wider precisely where children are most dependent on their immediate neighbourhood (Arias-Molinares et al., 2025).

These obstacles fall disproportionately on specific groups of CYP whose characteristics or circumstances place additional constraints on their ability to benefit from physical proximity. CYP with physical disabilities and mobility impairments face the most direct form of this inequality. The absence of basic pedestrian infrastructure can cause neighbourhoods to be entirely inaccessible, restricting their independence and everyday participation (Stafford et al., 2020). Similarly, CYP with cognitive and developmental differences, such as autism spectrum conditions, face distinct challenges as standard proximity planning does not account for the sensory and accessibility needs that shape how they experience public space (Colacios, 2025). Beyond physical and cognitive differences, female CYP consistently experience lower independent mobility than boys, a disparity driven largely by parental restrictions rather than children's own preferences (Hecker et al., 2025; Legorburu et al., 2022).

Lastly, socioeconomic status constitutes a further axis of inequality in this regard: children from lower-income households are disproportionately likely to reside in areas with lower walkability, sparser amenity coverage, and weaker active travel infrastructure, meaning that the benefits of proximity-based planning can accumulate primarily among already advantaged populations (Omwamba et al., 2025). This suggests that physical proximity alone is insufficient and that spatial distance gaps and structural disadvantage compound one another most severely for the children who are simultaneously most dependent on their immediate neighbourhood.

2.2 The 15-Minute City

The 15-Minute City (15mC) was formally introduced by Carlos Moreno, who defined it as a concept of urban planning that aims to create places where all essential services, such as work, education, healthcare, and recreation, are located within a 15-minute walk or bike ride from each other (Moreno et al., 2021). From the theoretical framework of chrono-urbanism, Moreno advocated for “an urban set-up where locals are able to access all of their basic essentials at distances that would not take them more than 15 min by foot or by bicycle” (Moreno et al., 2021, p. 100).

The concept operationalises proximity as a concrete urban planning target, proposing that neighbourhoods should be organised so that residents can fulfil their daily needs through active mobility rather than relying on motorised transport (Moreno et al., 2021; Allam et al., 2022). Definitions of the 15mC vary considerably depending on context. In the general urban core literature, definitions focus on the 15-minute threshold and the primacy of walking and cycling, emphasising easy accessibility, optimised location of services, socioeconomic equity, reduced private vehicle use, and strong pedestrianisation (Arias-Molinares et al., 2025). López García de Leániz and Fernández Lobo (2023) note that proximity in the 15mC sense extends beyond metric distance to encompass affective, cultural, and social forms of proximity, a multidimensional conception that links physical access to the lived experience of neighbourhood belonging.

Outskirts-oriented literature tends to extend the threshold to 20, 30, or even 45 minutes, incorporating public transport and shared mobility as essential components (Arias-Molinares et al., 2025). The broader X-minute city concept has emerged to capture adaptations across different urban morphologies (Logan et al., 2022; Arslan & Laporte, 2025).

Localised policy implementations, including Shanghai's "15-Minute Community Life Circle" (2016), Paris's "Ville du Quart d'Heure," and Melbourne's "20-Minute Neighbourhood" framework, demonstrate how proximity-centred planning translates into diverse governance contexts (Da Silva et al., 2020). Despite terminological variation, all definitions converge on reducing car dependency and ensuring access to essential services within a short, human-powered travel time. As Caprotti et al. (2024) observe, it is best understood not as a strict system of urban development standards but as "a paradigmatic model for sustainably managing urban development and for thinking about cities."

Cities pursuing this model aim to make services more spatially accessible and optimally distributed, prioritise pedestrians and cyclists over cars, and ensure equitable access regardless of car ownership (Basbas et al., 2023). Underpinning the model are four interconnected dimensions, the first concerns how close services are to residents (proximity), the second addresses the variety and mix of land uses and social groups (diversity), the third relates to the concentration of people and activities in a given area (density), and the fourth concerns the role of technology in enabling the others (digitalisation; Allam et al., 2022). The concept did not emerge in isolation but builds on decades of prior urban planning thinking that prioritised walkable, mixed-use neighbourhoods and reduced car dependency (Arias-Molinares et al., 2025). The specific time threshold is widely understood as a guideline rather than a fixed rule, with researchers and practitioners adapting it to different urban densities and contexts, leading some to prefer broader framings that do not anchor the concept to a single number (Arias-Molinares et al., 2025; Logan et al., 2022).

Despite its growing prominence, the concept has been critiqued for its predominantly adult-centred orientation. CYP face distinct challenges in accessing their immediate environment, which are compounded when 15mC frameworks fail to explicitly account for them. CYP are frequently overlooked as pedestrians in 15mC research, with many studies either aggregating them with the adult population or excluding them entirely, resulting in gaps, particularly in access to green spaces and child-relevant amenities such as playgrounds and recreational facilities (Gorrini et al., 2023; Khanian et al., 2026; Wang et al., 2025; Plaza-Herrera & Mercadé-Aloy, 2025). Adapting the 15mC concept to serve CYP therefore requires not only reconsidering which amenities are treated as essential and how proximity thresholds are defined across different age groups, but also actively involving CYP in the planning processes that shape these decisions.

2.3 Living Labs

Living labs are defined as dynamic ecosystems focused on open innovation happening in real-life environments instead of the usual isolated, controlled laboratories, placing stakeholders at the center of development to ensure found solutions are grounded in real-world needs and experiences (European Network of Living Labs). Beyond this foundational definition, Müller (2026) characterises living labs as socio-technical networks and platforms that foster continuous learning and iterative experimentation among participating actors, serving as intermediaries between knowledge creation and application.

Four dimensions are commonly identified as distinguishing urban living labs from other forms of policy experiment or community project: their aims (learning and experimentation), their activities (iterative co-creation and development), their participants (citizens alongside public, private and knowledge actors with decision-making power), and their embeddedness in real-world urban conditions (Clossick et al., 2025; Steen & Van Bueren, 2017). This experimental dimension has led scholars to describe Urban Living Labs (ULLs) as laboratories of transition and learning, and even as urban drama labs, performative arenas where conflicting narratives of urban futures are enacted and where emotion, conflict and creativity are inherent to the process (Charalambous et al., 2025).

Embedded civic learning is a feature of all living lab processes, and this emphasis on knowledge co-production, flattening knowledge hierarchies and supporting collective action makes living labs particularly well-suited to nurturing civic resilience across diverse urban communities (Belfield, 2025). Typically, they involve collaboration between public authorities, researchers, private actors, and citizens, increasing their relevance and applicability (Bulkeley et al., 2016). However, bringing together such diverse stakeholder interests requires active mediation, and recent evidence from urban living lab case studies confirms that divergent priorities among actors frequently constitute a barrier to genuine co-creation rather than a condition it automatically resolves (Heger et al., 2025).

As such, the focus of living labs is co-creation and participatory engagement, shifting urban planning towards more inclusive, bottom-up practices. Müller (2026) further identifies five distinct types of living labs based on their driving actor: provider-driven (initiated by academia or research), utiliser-driven (established by the private sector), user-driven (grassroots-led community initiatives), enabler-driven (initiated by public bodies or NGOs for long-term societal impact), and a fifth, network-driven type characterised by shared leadership across stakeholders and oriented towards more radical, systemic innovation. This typology is relevant for understanding the governance and purpose of living labs deployed in urban planning contexts, where enabler- and user-driven models are most common. Within this study, particular attention is given to living labs operating at the intersection of co-creation, 15-minute cities, and youth

engagement.

The implementation of participatory approaches, including living labs, is not without its challenges. Mainstreaming Living labs as tools for urban transformation implies methodological consistency, scalability, and replicability across cases (Charalambous et al., 2025). More than this conceptual diversity, the participation of young people brings its own challenges, such as age-related power imbalances, institutional barriers, and marginalization (Charalambous et al., 2025).

An important but often underexplored dimension of living labs is their pedagogic role incompleteness and provisionality, which stimulate iteration and collective reasoning rather than confirming predetermined outcomes (Clossick et al., 2025), as a community-led civic design method. Living-labs, based on the co-design of urban spaces, can function as knowledge-producing instruments through which communities generate and contest understanding of their own environments. From this view, living labs are not merely sites of innovation but of situated knowledge production: physical and social artefacts generate new understanding of governance, values, and spatial relations precisely because of their incompleteness and provisionality, which stimulate iteration and collective reasoning rather than confirming predetermined outcomes (Clossick et al., 2025).

This dimension connects directly to the role of co-design in living labs, which goes beyond tool selection to constitute a practice of flattening knowledge hierarchies. Co-design brings together expert and diffuse designers in collaborative dialogue, where the term "diffuse designers" refers to citizens without formal design training whose situated knowledge of their neighbourhood constitutes its own form of expertise (Belfield, 2025).

In this process, design-researchers act as cultural intermediaries, mediating and facilitating a co-creative process that is oriented not towards a predetermined outcome but towards enabling others: moving from designer to educator to co-learner, progressively relinquishing control in favour of the participants' voices (Belfield, 2025). This progressive redistribution of authority is a precondition for genuine co-authorship, the condition in which participants have something genuinely at stake in the process and begin to move from the periphery to the centre of governance (Belfield, 2025). This epistemic dimension is directly relevant to participatory planning with CYP, as it frames engagement activities not as data-collection exercises but as co-constitutive processes in which young people's lived knowledge of their neighbourhoods is shaped by, and shapes, the spatial artefacts through which they articulate it.

Müller (2026) identifies knowledge and learning as one of five key dimensions of living lab success, alongside economic value, user-centricity, innovation, and societal impact. Provider-driven living labs, typically initiated by universities and educational institutions, place particular emphasis on this dimension, using living lab methodologies to cultivate experiential learning and

integrate academic research with practical problem-solving, positioning the living lab as a pedagogic environment as much as an innovation ecosystem. In youth-focused living labs, universities have increasingly repositioned themselves as civic actors within local governance networks, with ULLs blurring the boundaries between research, teaching and public engagement (Charalambous et al., 2025).

Through participatory studio environments, living labs serve as pedagogical spaces that extend Schön's notion of the reflective practitioner, learning through cycles of action and reflection in authentic settings, into a collective practice distributed across peers, communities and mentors (Charalambous et al., 2025). Belfield (2025) operationalises this through three modes of civic learning: learning by doing (hands-on skills-based activities), learning from place (neighbourhood explorations and sensory engagement with physical environments), and learning through togetherness (performative and creative workshops centred on community cohesion and building relations between groups). Together, these modes cultivate what Belfield (2025) terms civic pedagogies, situated and critical learning practices embedded within neighbourhoods that aim to foster civic action and contribute to socio-ecological transitions. Taken together, these strands suggest that living labs carry an epistemic and pedagogic potential that is especially significant in the context of youth participation: when designed to elicit and value CYP's embodied knowledge of urban space, they can operate simultaneously as planning tools, learning environments, and civic instruments.

Central to these approaches is the concept of youth agency, the capacity of CYP to act as knowledgeable contributors to decisions that shape their urban lives, which connects to the broader principle of the right to the city, arguing that all urban inhabitants, including CYP, have both the capacity and the right to participate in shaping the spaces where they live, learn, and move (Vidal & Castro Seixas, 2022). Engaging CYP in participatory processes is therefore understood not merely as a methodological choice but as a recognition that children's perspectives are valid, necessary, and distinct from those of adults (Mansfield, 2023; Michail et al., 2025).

Among the participatory tools used with CYP, participatory mapping has established itself as particularly prominent. It positions children as active researchers and experts of their own environments rather than passive subjects, enabling them to spatially articulate their experiences of urban space in ways that adult-led or purely quantitative methods cannot capture (Wilson et al., 2018). Map-based focus groups, qualitative GIS, and web-based mapping tools allow children to identify and locate barriers, enablers, play spaces, and mobility-related features of their neighbourhood, producing spatially grounded knowledge that is directly relevant to urban planning (Wilson et al., 2018, 2019; Michail et al., 2025; Zhou et al., 2016).

Recent applications have confirmed and enriched this evidence base: Ozbil Torun et al. (2024)

combined participatory mapping with qualitative GIS analysis with children aged 9–12 across different neighbourhood types in Ankara, finding that children consistently identified safety and mobility barriers that adult-led surveys failed to surface, and that experiences varied meaningfully by gender, with girls more frequently flagging concerns about built environment quality and security. Similarly, Rodela et al., (2025) demonstrated that involving youth as co-researchers in participatory mapping produces procedurally just planning outcomes by generating spatially grounded evidence of young people's preferences, fears, and spatial exclusions, evidence that conventional planning consultation mechanisms are structurally unlikely to elicit.

These participatory approaches provide critical insights into how CYP experience proximity and mobility in their everyday lives. By capturing lived experiences of distance, safety, accessibility, and autonomy, they contribute to a more complete understanding of how proximity-based urban models, such as the 15-minute city, facilitate or constrain independent and sustainable mobility among young people.

2.4 Conceptualising Children's Geographies and Mobility

Before assessing how participatory strategies foster agency, it is necessary to clarify how the literature has conceptualised and investigated children's geographies and mobility, since these traditions supply both the theoretical justification for engaging children as spatial actors and many of the methods on which participatory urban research now relies. Children's geographies emerged as a distinct subdiscipline at the turn of the century, closely tied to the “new social studies of childhood” that reframed children not as incomplete adults or developmental objects but as competent social actors who actively produce and contest the spaces they inhabit (Holloway & Valentine, 2000; Prout & James, 1997).

Holloway and Valentine (2000) argued that geographers should examine how global and local scales connect in children's lives, how young people's identities are constituted through particular spaces, and how dominant social constructions of childhood shape the meanings attached to those spaces, including the normative assumption that the proper place of the child is the bounded, supervised, domestic realm. Subsequent reviews consolidated the field around questions of play, work, identity, mobility, and migration, while insisting that children's spatial experience be studied on its own terms rather than through adult proxies (Matthews & Limb, 1999; Skelton, 2009). This conceptual move is foundational to SQR 2.1 and to the present review: it establishes children as legitimate knowledge-holders about urban space, which is the premise on which any claim to participatory agency ultimately rests.

Children's mobility has been investigated through two broadly distinguishable lineages. The first,

and historically dominant, is the children's independent mobility (CIM) tradition, which defines mobility as the freedom to move around the neighbourhood without adult accompaniment and has documented a marked decline in that freedom across high-income countries since the 1970s (Hillman et al., 1990; Shaw et al., 2013, 2015). Methodologically, this lineage relies on parent and child travel surveys, "licences" and roaming-range measures, and increasingly on objective tools such as GPS tracking and accelerometry, and it is frequently coupled with public-health concerns about physical activity and with environmental-psychology models of child-friendliness. Kyttä's (2004) influential synthesis of independent mobility and Gibsonian affordances exemplify this strand, modelling environmental child-friendliness as the interaction between children's licence to move and the number of affordances a setting allows them to actualise.

The second lineage follows the wider "mobilities turn" in the social sciences (Sheller & Urry, 2006) and critiques the very notion of "independent" mobility as analytically misleading. Drawing on ethnographic and mixed-method work, Mikkelsen and Christensen (2009) showed that children's movement is thoroughly social and accompanied, while Barker et al. (2009) and Murray and Cortés-Morales (2019) reconceptualise children's mobilities as relational, interdependent, and imagined, constituted through peers, parents, technologies, and material objects rather than through solitary, adult-like autonomy. This second tradition has driven a methodological shift toward mobile and creative methods: walking interviews and child-led walks, participatory and web-based mapping (PPGIS/SoftGIS), drawing and photo-elicitation, and GPS combined with ethnography, all of which treat children as expert narrators of their own spatial worlds.

These conceptual and methodological developments connect directly to the broader debates on participation, agency, and urban governance that frame this review. The conceptualisation of children as competent spatial actors, and the relational reframing of their mobility, recast spatial knowledge as a form of agency: the capacity not merely to move through the city but to interpret, evaluate, and reshape it. Yet a recurring critique is that much mobility research still positions children as objects of measurement, counting their trips, ranges, and risks, rather than as agents who co-produce planning knowledge, a tension that participatory and tactical approaches explicitly attempt to resolve (Murray & Cortés-Morales, 2019; Skelton, 2009). The methods catalogued in this review map closely onto the children's-geographies toolkit: participatory and digital mapping (Wilson et al., 2018; Zhou et al. 2016) descends from PPGIS and affordance-based traditions, drawing-based elicitation (Berastegi Sancho et al., 2026) from visual children's geographies, and travel-mode surveys and school-journey studies (Quadraro Mussi et al., 2021) from the CIM lineage.

Reading the participatory evidence through this lens clarifies why method design is so consequential for agency: instruments inherited from mobility measurement tend to elicit preferences, whereas instruments inherited from the relational and participatory turn invite

children to reimagine and govern space. The persistent “translation gap” between expressed spatial knowledge and governance outcomes, identified across recent reviews (Hagemann & Randrup, 2024; Riádigos-Couso et al., 2025), can thus be read as the unfinished business of children’s geographies: the field has established children’s spatial competence far more securely than it has secured their authority within the institutions that decide how urban space is produced.

3. Methodology

3.1 Search Procedure and Selection of Papers

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was used for the systematic review selection technique. The PRISMA approach was chosen to ensure an open, replicable, and structured review process.

The review aimed to examine the international literature addressing the connection between spatial proximity, participatory engagement, and sustainable mobility practices among children and young people (CYP). To address the three sub-research questions, systematic searches were conducted across two multidisciplinary academic databases: Scopus and Web of Science. These databases were selected due to their broad coverage of peer-reviewed literature across urban studies, mobility research, geography, planning, education, and social sciences.

Searches were conducted in February-June 2026 using keywords corresponding to each sub-research question. The search strings combined terms related to built environment and proximity, children and youth, participatory approaches, and sustainable mobility practices. The search was done in multiple batches to ensure adequate coverage of each topic. The strings used are included in Table 1.

Question	Search String	Web of Science Finds	Scopus Finds
SRQ1	("built environment" OR walkability OR "neighbourhood accessibility" OR proximity OR "distance to school") AND (child* OR adolescent* OR youth) AND ("independent mobility" OR "active travel" OR "school travel" OR "spatial autonomy")	365	250

SRQ2	(child* OR youth OR adolescent*) AND (participatory OR “co-design” OR “co-creation” OR “participatory mapping” OR “student voice” OR “living lab”) AND (mobility OR “urban planning” OR “public space” OR transport) AND (“active travel” OR proximity)	16	19
SRQ3	(“15-minute city” OR “15-minute neighbourhood” OR “walkable city” OR “compact city”) AND (child* OR youth OR “child-friendly city”)	26	43

Table 1 - Search Strings per Research Question

In total, the database searches yielded 719 records. Following removal of duplicate studies, 485 unique records remained for screening.

While this may exclude relevant research published in other languages, English was selected due to its dominant use in international academic publishing. Moreover, the timeframe selected was between 2016-2026 to ensure relevance to current contexts.

3.2 Inclusion and Exclusion Criteria

To account for methodological consistency, inclusion and exclusion criteria were established prior to screening.

Inclusion Criteria	Exclusion Criteria
Focus on children and young people (CYP, particularly aged 8–16)	Studies not focused/not including on CYP
Focus on mobility, proximity, walkability, or accessibility	Studies unrelated to mobility or urban accessibility
Focus on participatory approaches, co-design, or youth engagement	Studies without participatory or mobility relevance
Focus on urban planning, sustainable mobility, or public space	Purely technical transport studies

Peer-reviewed journal articles	Conference papers, editorials, book reviews
English-language studies	Non-English studies

Table 2 - Inclusion and Exclusion Criteria

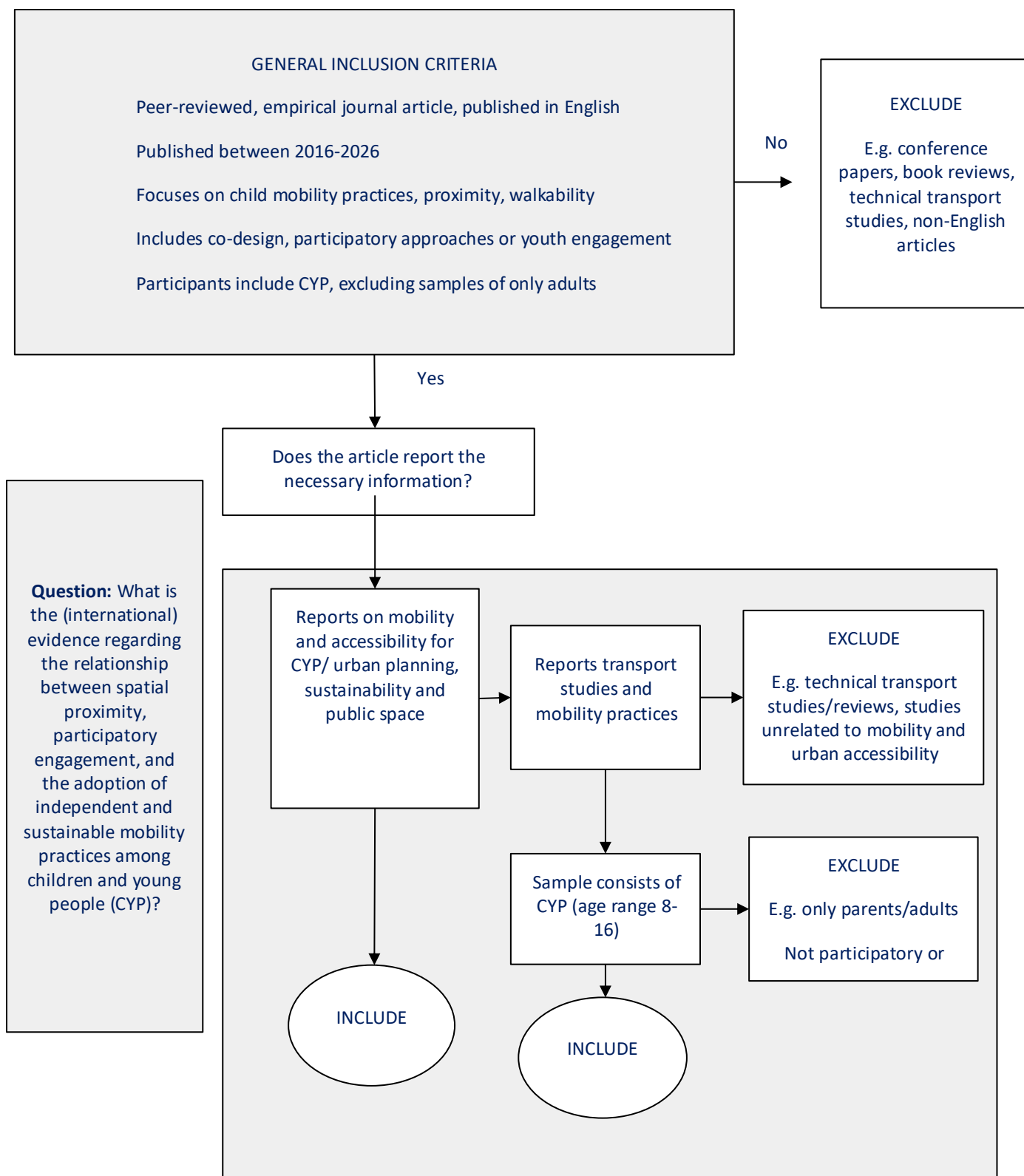


Figure 1 – Inclusion and Exclusion criteria

3.3 Screening Process

The screening process followed the PRISMA protocol consisting of identification, screening, eligibility assessment, and final inclusion stages. Following the screening process with the inclusion criteria, 44 papers were identified for the review.

Additional studies were identified through reference chaining and partner-provided literature were also included where they contributed to the conceptual framework of proximity, independent mobility, participatory planning, or 15-minute city debates. The number of added papers via this method is 30, making the total number of papers included in this research 74.

To ensure transparency and traceability, the full list of records screened at each PRISMA stage and the extraction table for the included studies (author, year, country, sample, age range, methods, proximity dimensions and key findings) are provided as a supplementary file accompanying this deliverable, Annex 1. A number of works cited in Sections 2 (Definitions) and in the conceptual framework design, were not identified through the systematic search but through reference chaining and partner-provided literature. These are used for conceptual framing only, are not counted among the included studies, and are marked as such in Annex 1 so that the systematically screened corpus remains distinguishable from the background literature.

3.4 Data Extraction and Analysis

The selected studies were analysed through qualitative thematic synthesis. Metadata was extracted for the following categories:

- study purpose and research questions,
- participants,
- age ranges,
- geographical and spatial context,
- methodological approaches,
- data analysis methods,
- proximity-related dimensions,
- references to 15-minute city frameworks,
- references to minority populations or marginalized groups,
- key findings.

A structured extraction table was developed to ensure consistency across studies. After the metadata was extracted, a Python script was developed to assess the patterns emerging from the literature. This involved a mixed descriptive and thematic synthesis of the metadata, which were grouped intuitively in categories using keywords found in the extracted text. Data collection

methods were separated as:

- Surveys and questionnaires,
- Interviews and focus groups,
- Participatory and co-design methods,
- GIS and mapping approaches,
- Secondary/open datasets,
- Creative and visual co-participation methods,
- Observational
- Case study,
- Review

In a similar manner, data analysis methods were also grouped into:

- Statistical analysis,
- GIS/spatial analysis,
- Qualitative thematic analysis,
- Descriptive analysis,
- Computational,
- Conceptual,

Since many studies involved multiple methods, the code made it possible to assign them to several categories at the same time. Using pandas, matplotlib, and seaborn, visualizations were then produced from this data involving: publication trends over time, geographical distribution, journal distributions, frequency of data collection/analysis methods, etc.

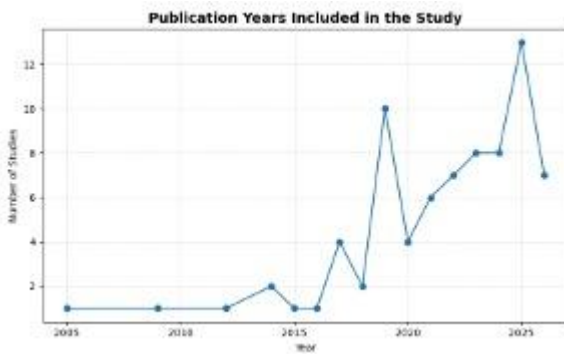


Figure 2 – Publication years included in the study

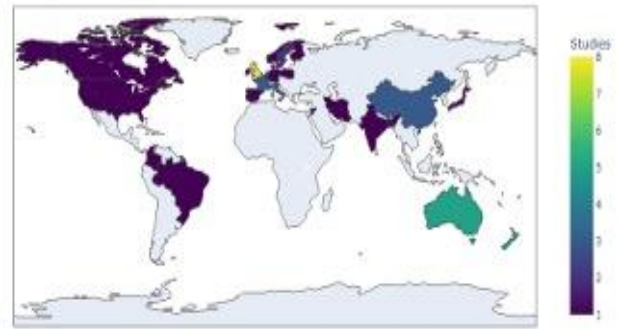


Figure 3 – Geographical Distribution of Included Studies

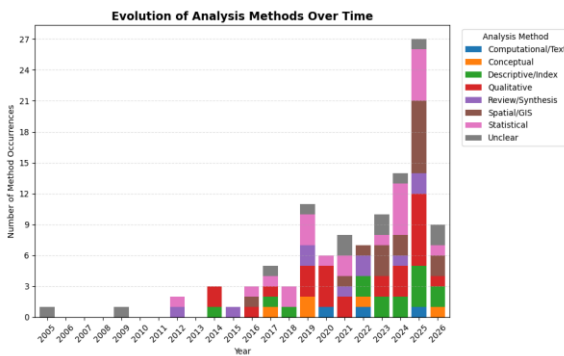


Figure 4 – Analysis Methods Over Time

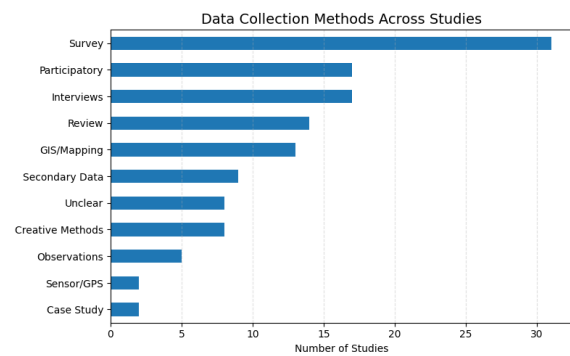


Figure 5 – Analysis Methods Across Studies

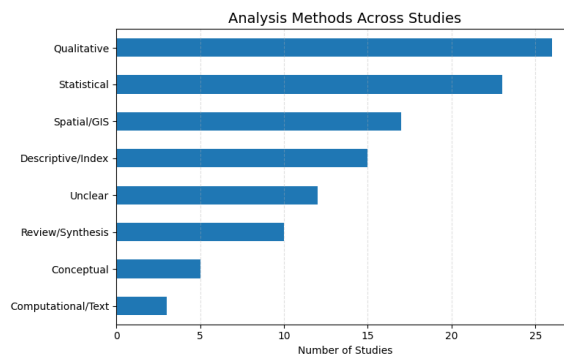


Figure 6 – Data Collection Methods Across Studies

4. Results

The results section presents the empirical findings emerging from the systematic review, translating the conceptual foundations established earlier into an evidence-based account of how proximity, mobility, and participation shape the everyday urban experiences of children and young people. The section is structured to guide the reader through the main thematic patterns identified across the included studies: first, the barriers and drivers that condition CYP's independent mobility within the built environment; second, the extent to which proximity-based planning models, such as the 15-minute city, facilitate or constrain CYP's access to essential services; and finally, the cross-cutting implications that connect these findings to broader questions of equity, governance, and participatory design. This organisation provides a clear pathway from empirical evidence to analytical interpretation, allowing the reader to understand both the specific results and their relevance for child-inclusive urban planning.

4.1 Research Question 1: What does existing international evidence reveal about the relationship between physical proximity (built environment) and the spatial autonomy/independent mobility of CYP?

Drawing on the definitions of proximity, the 15-minute city, and participatory approaches established in Section 2 (Definitions), this synthesis examines how the built environment shapes CYP's ability to move independently through their neighbourhoods, what barriers and drivers affect how children navigate their everyday environments, and how the 15-minute city model is currently framed for this demographic. In response to SRQ1, the synthesis is organised around the barriers and drivers identified across the included studies, followed by an assessment of how the 15-minute city model currently serves CYP.

The synthesis draws on 15 studies spanning ten countries, New Zealand (Ikeda et al., 2019; Mandic et al., 2023), the United States (Ito et al., 2017), China (Li et al., 2023; Wang et al., 2025), Australia (Loh et al., 2024), Norway (Andersen et al., 2024), Canada (Williams et al., 2018), Italy (Gorrini et al., 2023), Spain (Maté Sánchez-de-Val et al., 2025; Plaza-Herrera & Mercadé-Aloy, 2025), Poland (Khanian et al., 2026), and Scotland (Bulloch & Olsen, 2024), as well as two international systematic reviews (Omwamba et al., 2025; Xing et al., 2025).

Data were collected through questionnaires and interviews (Wang et al., 2025), travel behaviour surveys (Ito et al., 2017; Li et al., 2023), online questionnaires (Mandic et al., 2023), participatory mapping with parental telephone interviews (Ikeda et al., 2019), self-reported travel modes with objective built environment measures (Loh et al., 2024), an online participatory place standard tool with linked spatial data (Bulloch & Olsen, 2024), GPS-based tracking and accelerometer measurement (Williams et al., 2018; Andersen et al., 2024), and GIS-based spatial analysis of official and open-source data (Gorrini et al., 2023; Maté Sánchez-de-Val et al., 2025; Plaza-Herrera & Mercadé-Aloy, 2025; Khanian et al., 2026).

The included studies cover age ranges from 4 to 18 years, with individual studies reporting on CYP aged 4–18 years (Wang et al., 2025), 5–13 years (Gorrini et al., 2023), 5–14 years (Ito et al., 2017), 5–17 years (Xing et al., 2025), 6–12 years (Li et al., 2023), 6–16 years (Maté Sánchez-de-Val et al., 2025), 7–15 years (Khanian et al., 2026), 8–13 years (Ikeda et al., 2019), 10–13 years (Williams et al., 2018), around 12 years (Andersen et al., 2024), 12–17 years (Loh et al., 2024), 12–18 years (Bulloch & Olsen, 2024), and 13–18 years (Mandic et al., 2023), while Omwamba et al. (2025) and Plaza-Herrera and Mercadé-Aloy (2025) cover mixed age groups.

4.1.1 Barriers and Drivers

Distance as Primary Barrier. Across the reviewed literature, physical distance emerges as the most consistent and robust barrier to CYP's active travel and independent mobility. Xing et al. (2025), through a systematic review of 149 studies, find that parental perceptions of greater distance from school are most reliably and negatively linked to active travel among CYP (children: 5 out of 7 associations; pooled $n = 14,113$; adolescents: 3 out of 4 associations; $n = 2,328$). Individual studies from multiple countries corroborate this pattern. Li et al. (2023) and Andersen et al. (2024) show that the likelihood of active school travel drops by 27% and 5%, respectively, and of exclusive active travel drops by 56%. Furthermore, Ikeda et al. (2019) report that distance to school has the strongest direct association with active school travel of all variables tested within a sample of children in Auckland, for every 100-metre increase in home-to-school distance. Similarly, Loh et al. (2024) found that among 440 adolescents in Melbourne, each additional kilometre of distance to school decreases the probability

Distance is also shaped by school choice behaviour. Mandic et al. (2023) document that only 43% of CYP in Dunedin enrolled in their closest school, and half of those lived within walking distance. Among those living within walking distance of their school, over half used active transport, and most made their own travel decisions. However, among those attending a school beyond walking distance, over three-quarters relied on motorised transport.

Safety Perceptions as Barriers. The reviewed evidence consistently shows that safety

perceptions mediate the relationship between physical proximity and CYP's actual independent mobility. Even when destinations are nearby and infrastructure exists, perceived danger can prevent CYP from travelling independently.

Ikeda et al. (2019) find that parental concerns about traffic safety are adversely linked to children's active commuting to school, and that parents' apprehensions about strangers influence this relationship indirectly through their concerns about traffic safety. Importantly, how children perceive the safety of their neighbourhood is positively linked to their active travel, indicating that safety perceptions influence both parents and children at the same time. Loh et al. (2024) strengthen this point by noting that the perception of traffic safety influences the link between residential density near schools and active travel among adolescents in Melbourne; increased density encourages active travel only for those who feel their traffic surroundings are safe. Xing et al. (2025) find that parental perceptions of good street lighting and the presence of crossing guards are favourably associated with active travel of CYP. However, the review notes that most associations between parental perceptions and CYP's physical activity did not reach significance or showed inconsistent patterns, and the overall quality of evidence ranged from very low to low.

Beyond perceptions, the physical presence of safety infrastructure also shapes CYP's mobility. Andersen et al. (2024) find that greater distance to the nearest traffic-calming device is associated with a reduced likelihood of active school travel in Oslo, with each additional 100 metres to the nearest device reducing the odds by 7%. Further, Gorrini et al. (2023) note that neighbourhoods scoring higher on child walkability tend to have calmer traffic conditions with lower vehicle volumes and speeds. As highlighted in the wider literature, this factor likely enhances pedestrian safety, which is particularly important given that road traffic injuries affecting child pedestrians represent one of the most significant causes of injury-related child deaths. Yet even in areas where services meet official distance criteria of 15-minute cities, Omwamba et al. (2025) reinforce at a review level that safe and continuous pathways appropriate for CYP travelling independently are often lacking.

Safety concerns also extend beyond traffic to personal security: Bulloch and Olsen (2024) combined objective crime data with young people's subjective perceptions and found agreement between the two. Young people in the most crime-prone areas of Scotland were over three times more likely to report feeling unsafe, demonstrating that CYP's perceptions of safety are grounded in actual neighbourhood conditions.

Walkability and Built Environment Quality as Drivers of CYP's Independent Mobility. Where the built environment is configured to support walking, the evidence consistently shows a facilitating effect on CYP's active travel and independent mobility. The most comprehensive evidence comes

from Williams et al. (2018), who find that children in Kingston's (Canada) most walkable neighbourhoods spent more than double the time in active transportation compared to those in the least walkable areas (16.2 versus 7.1 minutes per day), with each of the three walkability components, street connectivity, destination proximity, and pedestrian safety, showing independent associations with active travel.

Several studies identified specific built environment features that facilitate walking. Low-traffic routes with mixed land use are among the strongest predictors of walking to school (Ito et al., 2017), while commercial land use along the route nearly doubles the likelihood of walking (Li et al., 2023). Wang et al. (2025) find that children's ability to reach service facilities on foot within 15 minutes varies significantly across neighbourhoods in Guilin and is shaped primarily by the density of the street network, the size of urban blocks, and surrounding landscape patterns, with neighbourhoods that have denser and better-connected street networks scoring substantially higher.

When these supportive conditions are in place, independent mobility becomes a key enabler of CYP's active travel. Ikeda et al. (2019) show that independent mobility is positively and directly associated with active school travel and also mediates the relationship between school year, sex, and active travel: older CYP and boys have higher independent mobility, supporting their active travel. When destinations are within walking distance, CYP gain not only independent mobility but also decision-making freedom over their travel choices. Mandic et al. (2023) find that among CYP living within a walkable distance of school, over half made their own decisions about how they travelled, compared to 29.2% and 21.8% among the two groups living beyond a walkable distance, where parental decisions dominated. This suggests that when destinations are close enough for CYP to reach independently, the locus of transport decisions shifts from parent to child.

Sociodemographics as Moderator. The proximity-mobility relationship is not uniform across CYP populations, gender, socioeconomic status, and age moderate how physical proximity translates into independent mobility.

Regarding gender, Loh et al. (2024) find that adolescent boys in Melbourne are 24% more likely than girls to use public transport if they live further from school. Andersen et al. (2024) indicate that boys seem to be more responsive to traffic safety conditions than girls, with each extra traffic calming measure in the area enhancing boys' chances of active travel by 9% in comparison to girls. Bulloch and Olsen (2024) find that female young people in Scotland were almost four times as likely as males to report that they could not easily walk, wheel, or cycle around their local area.

Concerning socioeconomic status, Andersen et al. (2024) observe that although the overall rates of active school travel are greater among adolescents from higher socioeconomic (SES)

backgrounds (91% compared to 71% for those from low SES), these adolescents also exhibit a greater sensitivity to increased distances to school. Each additional 100 meters diminishes their likelihood of engaging in active travel more so than for their lower SES peers. The authors propose that as distance increases, families with greater resources may opt for car travel, while families with limited income might have fewer transport options, leading active travel to remain the primary choice regardless of the distance. Maté Sánchez-de-Val et al. (2025) indicate that in Madrid, wealthier neighbourhoods often offer lower walkability due to more spread-out development patterns and an increased dependence on cars, while areas with a larger number of families with children also tend to show decreased walkability.

The role of sociodemographic factors should, however, be considered within a broader context. According to Li et al. (2023), when analysing both built environment and sociodemographic traits simultaneously, the influence of sociodemographic factors tends to lose significance, whereas the aspects related to the built environment continue to be crucial. This implies that in densely populated urban areas, the physical layout of the neighbourhood may have a greater impact than the characteristics of individuals or households.

4.1.2 The 15-Minute City Model and CYP: Facilitation or Constraint?

Several studies explicitly assess whether the 15-minute city framework adequately serves CYP. The evidence suggests that while the model provides a useful planning framework, its predominantly adult-centred orientation creates specific limitations.

Maté Sánchez-de-Val et al. (2025) demonstrate for Madrid, Spain, that the 15-minute city model provides meaningful access to essential services for children, with 208,539 out of 320,616 children (65%) able to reach all three basic services (schools, playgrounds, and parks) within a 15-minute walk, compared to only 14,364 (4.5%) within 5 minutes. The authors highlight the importance of the model as a strategic tool for urban planning that encourages increased independence and mobility for children while lessening the dependence on motorized vehicles. However, even within the 15-minute threshold, over 86,000 children can access schools and playgrounds but lack access to parks, and nearly 9,000 children have no access to any of the three services.

A similar pattern of unequal coverage emerges in Wang et al. (2025), who assess children's walkability within 15-minute life circles in Guilin, China, and find that only 3.06% of neighbourhoods achieve scores categorised as very walkable or above, while over 85% are classified as poor or very poor, meaning most children's trips require motorised transportation. The authors suggest a tailored approach specifically for children, termed the "Children's Healthy

15-minute Life Circle," contending that current research seldom takes into account walkability from the viewpoint of children or factors in their reduced walking pace (established at 70 m/min in their analysis). Their proposed framework aims to address children's multifaceted needs, encompassing physical well-being, mental health, and social adaptability. This point is reinforced by Plaza-Herrera & Mercadé-Aloy (2025), who assign children (up to 14) a walking speed of 4.00 km/h for their Barcelona analysis, resulting in an effective 15-minute radius of only 1,000 metres compared to 1,125 metres for adults, demonstrating that the same time threshold produces a physically smaller catchment area for children.

Beyond distance thresholds, the quality of the walking environment within 15-minute catchments also varies significantly for CYP. Gorrini et al. (2023) developed a child-specific Walkability for Children Index for Bologna that evaluates factors such as usefulness and safety. Their comparison with the standard Walk Score reveals that areas with high standard walkability can score poorly on child-specific dimensions, for example, central Bologna neighbourhoods ranked lower on the child-specific index due to high pedestrian-car accident rates and insufficient child-friendly infrastructure, such as playgrounds and safe crossings. A further tension within the framework is identified by Khanian et al. (2026), who find in Łódź, Poland, that while high-density areas offer improved access to services, they provide less visual exposure to green spaces, whereas low-density outskirts feature more greenery but decreased accessibility.

Omwamba et al. (2025) affirm this wider trend, stating that while the proximity needs of CYP are becoming more recognized in research on 15-minute cities, they are still not adequately addressed in real-world applications. This disconnect between framework and experience is reflected in CYP's own perceptions. Bulloch and Olsen (2024) add a further dimension, finding that CYP's satisfaction with active travel specifically to school was notably low, with one-third reporting dissatisfaction despite high satisfaction with general active travel, and that rural young people were significantly less satisfied across nearly all domains of their local neighbourhood.

Taken together, these findings suggest that while the 15-minute city model has the potential to facilitate CYP's independent mobility, realising this potential requires moving beyond adult-centred distance thresholds towards child-specific assessments that account for slower walking speeds, distinct service needs, route safety and quality, and the particular challenges faced by children in peripheral and low-density areas.

4.2 Research Question 2: In what ways do participatory engagement strategies (e.g., Living Labs, youth-led tactical urbanism, co-creation) foster CYP agency in the design and governance of sustainable urban spaces?

The synthesis is organised around three thematic axes: (1) the landscape of methods and approaches used to engage CYP in urban planning; (2) the conditions that enable or constrain genuine agency; and (3) the substantive contributions CYP make when meaningfully engaged.

Before assessing how participatory strategies foster agency, it is necessary to understand the structural conditions that suppress it. Bourke (2014) demonstrates that urban public space is routinely governed by adult-imposed rules that treat children's presence as conditional and their behaviour as subject to correction. These are not incidental exclusions but systemic ones: children are designed out of decision-making as much as they are designed out of physical space, regarded as future participants rather than current ones.

Crucially, the concept of agency is not monolithic. Hart's (1992) Ladder of Children's Participation provides a useful evaluative framework. Building on Arnstein's (1969) ladder of citizen participation, it distinguishes between tokenistic forms of engagement, where CYP are consulted but exert no real influence, and genuinely child-initiated, shared decision-making. The participatory strategies examined below must be assessed against this spectrum. Increasing recognition of CYP as legitimate urban stakeholders has led to a proliferation of such strategies (Brown et al., 2019), but quantity of engagement does not guarantee quality of agency.

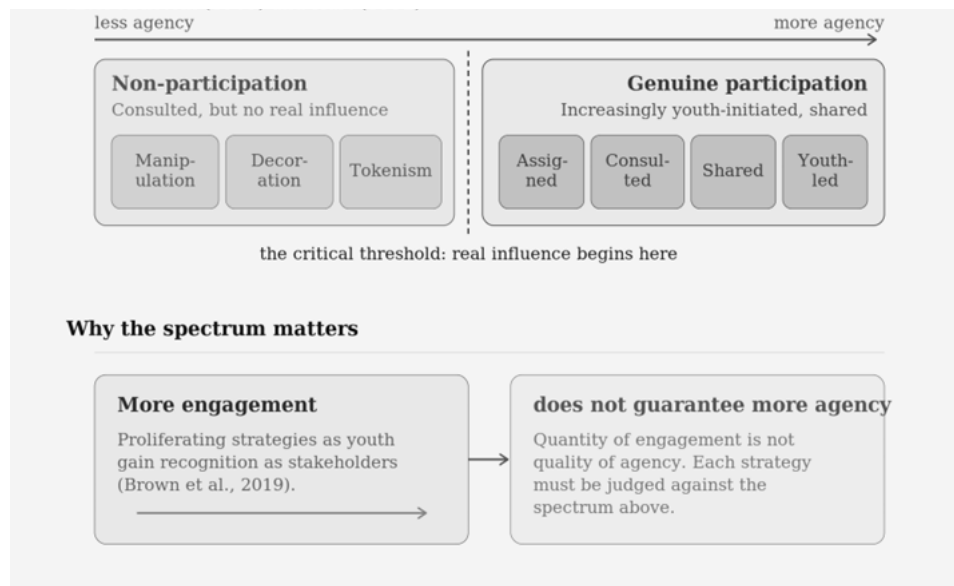


Figure 7 - The youth agency concept. Figure reworked by the authors.

Participatory engagement strategies foster child and youth agency by shifting their role from passive recipients of planning decisions to active co-authors involved in planning their own environment (Rodela et al., 2025; Nelischer, 2025). These strategies provide situated, reflexive spaces where diverse youth can challenge existing power relations and co-produce spatial knowledge (Charalambous et al., 2025). Increasing recognition of CYP as legitimate urban stakeholders has led to growing interest in participatory engagement strategies in urban planning.

The synthesis draws on 13 primary studies spanning eight countries, Belgium (Quadraro Mussi et al., 2021), Canada (Wilson et al., 2018), Spain (Legorburu et al., 2022; Berastegi Sancho et al., 2026), Italy (De Iorio et al., 2026), Cyprus/international (Charalambous et al., 2025), Fiji (Zhou et al., 2016), and Iran (Tayefi Nasrabadi et al., 2021), alongside studies from the Netherlands (Michail et al., 2025), Portugal (Vidal & Castro Seixas, 2022), and Belgium (Colacios, 2025), as well as the speculative participation study (Rodela et al., 2025).

Methods span workshops and co-design, participatory and web-based GIS mapping, drawing-based and visual techniques, questionnaires, qualitative case studies, citizen-science co-design, and persona-based future scenarios, each detailed below. Studies cover a wide age range (approximately 6–25 years), with most targeting children of primary and secondary school age. The geographic base is predominantly European and Global North, representing a significant limitation for the universality of conclusions.

4.2.1 Methods and Approaches for CYP Participation in Urban Planning

A Spectrum from Consultation to Co-Governance. The included studies collectively illustrate a wide spectrum of participatory approaches, ranging from information elicitation to genuine co-design and, in exceptional cases, to child-initiated governance. Mapping this spectrum against Hart's (1992) Ladder, which distinguishes between manipulation, tokenism, consultation, and child-initiated action, the evidence reveals that most current practice clusters in the middle rungs of consultation and assigned but informed participation, with genuine co-creation and child-led governance remaining the exception. A recent scoping review of 44 studies on young people's participation in urban landscape planning confirms this pattern, finding a prevalence of less-interactive approaches and identifying only 17 studies with genuinely interactive methods (Hagemann & Randrup, 2024). These interactive methods demonstrate the greatest potential to facilitate young people's own articulations of their lifeworld within the urban landscape, particularly in extended processes deploying multiple creative methods.

Participatory and Digital Mapping. Participatory mapping represents one of the most widely used approaches in this synthesis for eliciting CYP's spatial knowledge of their urban environments. people in urban landscapes further argues that such approaches advance procedural justice by systematically centring spatial knowledge that is otherwise systematically excluded from planning processes (Hagemann & Randrup, 2024). Wilson et al. (2018) used focus groups combined with participatory mapping and qualitative GIS analysis to examine how children's perceptions of their environments influence school journey experiences in Canada, identifying safety-related, material, and affective features that function as barriers and enablers to active school travel, findings that would not have been accessible through adult-proxy data alone. Zhou et al. extended this approach to web-based platforms, using digital participatory mapping to investigate children's perceptions and the spatial distribution of outdoor play places, demonstrating that digital tools can broaden geographic reach and enable more granular spatial analysis of CYP's own environmental experiences. A 2025 study on participatory mapping with young. Drawing-based and visual methodologies offer an important complement to mapping approaches for younger children who may have limited capacity for verbal or written participation. Berasategi Sancho et al., 2026 used school journey drawings with primary-aged children in Spain, applying visual content analysis to identify four thematic categories: reference points, obstacles, environmental characteristics, and facilitators. Their findings underscore the value of visual methods in revealing children's cognitive maps of their neighbourhoods, maps that often highlight barriers (such as uncontrolled intersections and pavement discontinuities) that adults either overlook or rationalise away. This aligns with UNICEF Innocenti's 2025 report on why participation matters, which documents that when children actively participate in urban

planning through appropriately adapted methods, their insights lead to tangible improvements in city design that adult-only processes consistently miss.

Workshops, Co-Design, and Tactical Urbanism. Workshop-based co-design is the most structurally ambitious method in the synthesis, as it moves beyond data collection toward collaborative problem-solving and solution development. De Iorio et al., (2026) implemented a participatory data-driven workshop approach with Italian school communities, combining citizen sensing technology with co-design principles to address sustainable mobility challenges. Their results confirm the effectiveness of this approach in analysing problems and co-creating solutions together with stakeholders, explicitly attributing the quality of outcomes to the participatory process itself rather than to technical inputs alone. Critically, the study demonstrates that participatory approaches can generate what the authors call 'evidence-based' co-design, using real mobility data generated by participants to ground design decisions in lived experience rather than normative assumptions.

The Living Labs model represents the most institutionally embedded form of co-design in the synthesis. Charalambous et al., 2025 examined youth engagement in urban living labs across several European contexts (Cyprus, Croatia), exploring the tools, methods, and pedagogies deployed. Their analysis finds that Living Labs blur the boundaries between research, teaching, and public engagement, enabling higher education institutions to act not merely as knowledge providers but as urban actors engaged in the co-production of space. Student-led Living Labs produced higher levels of reflection and skill acquisition than settings where youth are positioned merely as participants, supporting the argument that the pedagogical design of participatory processes materially shapes the agency CYP are able to exercise. Crucially, Charalambous et al. (2025) identify intergenerational trust and everyday relationality as dimensions often overlooked in the literature but essential to embedding youth voices into institutional processes, suggesting that the quality of adult-youth relationships, not just the quality of methods, determines whether participation translates into genuine governance influence.

Tactical urbanism, the use of low-cost, temporary physical interventions to test urban changes, represents an emerging approach for moving participation from consultation toward co-production with visible spatial outcomes. Anderson et al. (2024) document the Nashville Youth Design Team's multi-year youth participatory action research programme, in which marginalised adolescents conducted traffic audits, designed pedestrian safety improvements, and installed a temporary mini-soccer pitch at a dangerous intersection, demonstrating that youth tactical urbanism can achieve policy traction beyond symbolic recognition. The programme's iterative approach, dream, design, test, reflect, advocate, operationalises Hart's higher ladder rungs in a real urban governance context, and provides one of the few documented cases in the literature where CYP's participatory design work directly influenced public infrastructure investment.

Creative, Speculative, and Rights-Based Methods. Several studies in the synthesis deploy creative and speculative methods that go beyond spatial elicitation toward future thinking and identity-based engagement. Rodela et al., 2025 explored persona-based participation to engage young voices in imagining their 'future city', finding that speculative scenarios enabled adolescents to articulate urban visions they could not access through conventional consultation formats. This approach is particularly promising for engaging young people on climate and sustainability transitions, where the relevant timeframes extend well beyond their childhood and conventional participatory methods struggle to bridge the gap between present experience and future stakes. Colacios (2025) used citizen science co-design specifically to engage autistic children in the co-creation of public play spaces, developing methodologically adapted processes that centred sensory and social needs that neurotypical design processes systematically overlook, a rare example in the literature of intersectionality being operationalised in participatory urban design rather than simply advocated for.

Vidal and Seixas examine children's rights to green infrastructure in cities, arguing from a rights-based perspective that children's participation in green space design and governance is not a best-practice aspiration, but a legal obligation grounded in the UNCRC. Their analysis of children's green infrastructure connects participatory rights to environmental rights, positioning child-inclusive urban greening as simultaneously a health equity, climate justice, and democratic participation issue. Tayefi Nasrabadi et al. (2021) take a similarly rights-anchored approach, developing a sustainable child-friendly city framework in which children actively plan their own neighbourhoods, finding that structured participatory neighbourhood planning processes produce not only better spatial outcomes for children but also measurable shifts in CYP's attitudes toward civic responsibility and environmental sustainability, an outcome that aligns with broader evidence that participation has developmental as well as planning benefits.

Enabling Conditions and Structural Barriers to CYP Agency. Across the synthesis, a persistent tension emerges between the aspirational rhetoric of CYP participation and the structural conditions that constrain genuine agency. While all included studies report positive participatory processes, a critical reading reveals that the depth of agency exercised varies substantially, and is shaped by institutional, relational, methodological, and socio-cultural factors that are often underacknowledged in the literature.

Parental and Institutional Gatekeeping. Legorburu et al. (2022), through questionnaire-based research on children's independent school journeys in Spain, find that parents function as both enablers and barriers to children's mobility autonomy, and by extension to their capacity for genuine spatial participation. Parents can sometimes be barriers to their children's ability to travel independently, adding to their fears and insecurities, while gender significantly shapes these dynamics, with girls adopting more constrained roles. This parental gatekeeping extends

into formal participatory settings: children's voices in workshops and consultations are often filtered through prior adult decisions about which children attend, what topics are discussed, and how outputs are used. Mansfield's qualitative case study of children's participation in informal settlement revitalisation in Suva, Fiji, provides the most theoretically sophisticated analysis in the synthesis of this structural dimension.

Drawing on Hart's Ladder, Mansfield (2023) finds that institutional factors, including municipal planning capacity, legal frameworks for child participation, cultural norms of childhood, and staff attitudes, collectively determine whether children's participation moves beyond tokenism regardless of the method deployed. The findings from Fiji also raise a critical Global South dimension: participation models developed in European and North American contexts make assumptions about legal frameworks, institutional capacity, and cultural norms that do not translate universally. Hart's ladder itself has been critiqued for being based on Western theories of childhood that may not align with how children's agency is understood and exercised in other cultural contexts.

Method Design as an Enabler of Agency. The synthesis consistently shows that the design of the participatory method, not merely its existence, determines the quality of CYP agency. Quadraro Mussi et al. (2021), in their Belgian study of children's current and desired school commutes, combined surveys with workshops to reveal a significant gap between current and desired transport modes, with an untapped potential for cycling identified primarily through the workshop component rather than the survey alone. When children were asked to redesign their school neighbourhood, the most recurring suggestions were cycling and walking infrastructure and reduced car access, suggestions that have direct policy relevance but that emerged only because the method invited spatial reimagining rather than mere preference elicitation. Similarly, Michail et al. find that involving children in neighbourhood design processes requires methodological adaptation to children's developmental capacities: abstract consultation formats that work for adults systematically exclude younger children or produce superficial responses.

Colacios's (2025) citizen science approach with autistic children demonstrates that the 'standard' participatory toolkit is itself a form of exclusion if not adapted. Creating healthier and more inclusive environments required methods that accommodated sensory differences, non-verbal communication, and varied social interaction preferences, adaptations that also produced richer environmental knowledge about sensory landscape quality than neurotypical participants would have contributed. This finding has broad implications: if participatory methods must be adapted to include autistic children, the same principle applies to children with other disabilities, to younger children, to children from non-literate backgrounds, and to children whose language or cultural context differs from the dominant framing of the participatory process.

Institutional Capacity and the Translation Gap. Perhaps the most significant structural barrier across the synthesis is what might be termed the 'translation gap': the distance between what CYP express in participatory processes and what is subsequently implemented in urban planning decisions. Hagemann and Randrup's (2024) scoping review documents that while interactive participatory processes with young people produce tangible insights and engagement, their direct impact on urban policies is typically limited, with most impact concentrated in diversifying public discussions rather than in shifting planning outcomes.

This finding is consistent with Riádigos-Couso et al.'s (2025) systematic review of child and adolescent participation in local government, which identifies the translation from participation to policy as the most consistently underdeveloped element of CYP engagement frameworks, and calls for further research on the governance and power dimensions of children's participation that determine whether expressed voices become embedded in policy changes. Evidence from the most institutionalised form of youth governance reinforces this diagnosis: Augsberger et al. (2024) scoping review of municipal youth councils finds that such bodies translate young people's voice into genuine policy influence only under specific conditions, adult allies with real authority, clear remits, and mechanisms linking councils to decision-making, and otherwise tend toward tokenistic, advisory roles. Read alongside the children's-geographies literature discussed under SQR 2.1, this suggests that the translation gap is less a deficit of children's spatial knowledge than a deficit of institutional design.

Charalambous et al. (2025) identify intergenerational trust as the key relational condition for embedding youth voices into institutional processes but also note that even well-designed Living Labs with high levels of youth agency reveal tensions between institutional aims and youth-led agendas. The transformative potential of Living Labs depends on whether institutional partners genuinely cede decision-making space to young people, or whether the Lab structure functions as an elaborate consultation exercise dressed in co-creation language. This risk of participatory washing is the central critique levelled at many participation initiatives, and the synthesis provides insufficient evidence that most included studies produce governance-level change rather than process-level engagement.

Substantive CYP Contributions to Urban Design and Governance. Across the synthesis, a consistent and compelling finding is that CYP, when given appropriate methods and genuine agency, generate substantive urban knowledge that is not accessible through adult-proxy participation and that materially improves planning outcomes. This section summarises the key domains of CYP contribution identified in the literature.

Safety, Fear, and Affective Geographies. CYP's participatory contributions consistently foreground safety, fear, and what Wilson et al., 2018 call 'affective features' of the urban

environment, qualities of place that shape whether children feel welcome, visible, or safe in urban space. These affective geographies are systematically underweighted in technical planning assessments, which tend to privilege measurable physical attributes (traffic volume, crossing density, distance) over experiential and emotional ones. Wilson and colleagues' participatory mapping reveals that children identify barriers to active school travel that combine physical infrastructure (missing pavements, dangerous crossings) with affective elements (feeling watched, perceived stranger danger, hostile driver behaviour at school gates) in ways that adult-designed survey instruments do not capture. Quadraro Mussi et al., 2021 find that children's most recurring suggestion when redesigning their school neighbourhood is the reduction of car access, a preference for pedestrian primacy that directly addresses their dominant source of fear and that aligns with School Streets evidence (Hoelscher et al., 2022) but emerges entirely from children's participatory design process.

Green Space, Play, and Environmental Rights. Children's participatory contributions show a consistent prioritisation of green space, nature contact, and play infrastructure in their urban visions, a priority that diverges significantly from adult-dominated planning agendas that tend to foreground transport efficiency, housing density, and economic productivity. Zhou et al.'s (2016) web-based participatory mapping reveals that children's preferred outdoor play places cluster around accessible green spaces with natural elements, and that these preferences are systematically unmet in higher-density urban areas. Vidal and Castro Seixas connect this finding to a rights-based framework, arguing that children's right to nature and to the city is a participatory rights issue: if children do not participate in green infrastructure planning, their distinctive valuation of nature will not be represented. Tayefi Nasrabadi et al. (2021) find that children, when given the opportunity to plan their own neighbourhoods, consistently prioritise pedestrian connectivity, neighbourhood greenery, and safe play areas over transport infrastructure, a set of priorities that, if mainstreamed, would significantly shift the balance of urban investment toward child-serving public goods.

Peer Relationships and Social Infrastructure. A dimension of children's urban knowledge that emerges repeatedly but is rarely foregrounded in planning frameworks is the social infrastructure of neighbourhood life: the places where peer relationships are formed, maintained, and experienced. Michail et al. find that children's insights on neighbourhood design consistently identify social meeting points, informal gathering spaces, comfortable routes dimension of children's urban knowledge is further developed by Rodela et al. (2025) persona-based futures work, in which young people's imagined 'future city' scenarios centre belonging, social inclusion, and intergenerational encounter, values that are difficult to quantify but that have been identified in the broader urbanism literature as foundational to liveable, healthy cities between

homes, and visible play areas as central to their experience of neighbourhood quality, while adult-dominated design processes tend to treat these as secondary to functional infrastructure.

4.2.2 Best Practices and Conditions for Meaningful Agency

Drawing upon these findings, we propose the following as conditions most strongly associated with meaningful CYP agency in urban design and governance:

- 1) multi-method processes that combine spatial, visual, narrative, and deliberative approaches, adapted to participants' ages, abilities, and cultural contexts;
- 2) extended engagement over time rather than one-off consultation events, enabling iterative learning and trust-building between CYP and adult institutional partners;
- 3) genuine governance commitments, pre-agreed decision-making pathways through which CYP contributions will influence planning outcomes, not merely inform them;
- 4) intersectional design that actively adapts methods for children with disabilities, minority backgrounds, and from low-income communities, rather than treating CYP as a homogeneous group;
- 5) adult facilitation that positions practitioners as co-learners rather than knowledge authorities, creating the intergenerational trust that Charalambous et al. (2025) identify as essential to Living Labs' effectiveness;
- 6) documentation and transparency about how CYP contributions are used, modified, or rejected in planning decisions, the absence of which is the primary driver of children's disengagement from participatory processes.

4.3 Research Question 3: What socio-spatial barriers and facilitators influence the successful integration of CYP-led initiatives into broader sustainability transitions and 15-minute city policies?

This section synthesises evidence from 14 studies: 8 primary studies identified through systematic search, and 6 additional studies identified through supplementary searching. The primary studies span six countries: Finland (Rinne et al., 2025), New Zealand (Smith et al., 2020), Canada (Wilson et al., 2018; Hecker et al., 2025), Japan (Zeng et al., 2025), Australia (Stafford et al., 2020; Jafari et al., 2025), and the United States (Burford et al., 2026). The age range spans approximately 6 to 18 years. The analysis is organised around four thematic axes: (1) physical and infrastructural barriers and facilitators; (2) social, parental, and cultural mediators; (3) policy-level enablers and structural interventions; and (4) the differential experiences of marginalised and under-served CYP populations.

4.3.1 Physical and Infrastructural Barriers and Facilitators

The relationship between physical infrastructure and CYP's active and independent travel is a central theme across the synthesis. The evidence consistently shows that infrastructural quality, the presence and condition of footpaths, crossings, cycle lanes, and traffic calming, functions as both a primary barrier and a primary facilitator of CYP mobility, mediating the extent to which proximity to destinations translates into actual independent travel.

1. Road Infrastructure and Active Travel: The New Zealand Evidence

Smith et al. (2020) provide the most comprehensive multi-methods assessment of built environment infrastructure change and CYP active travel in this synthesis, drawing on a natural experiment from Auckland, New Zealand, where a significant road safety and infrastructure upgrade was implemented on a route commonly used for school travel. Using a combination of before-after road audits, GIS-based spatial analysis, and qualitative interviews with children and parents, they find that built environment infrastructure supporting active travel can meaningfully increase children's active travel rates, but that infrastructural improvements alone are insufficient: school and community culture, partnerships between local authorities and school communities, and the social normalisation of walking and cycling are essential co-determinants of whether infrastructure improvements translate into behavioural change. This multi-layered finding is critical for 15-minute city policy: it suggests that proximity provision and infrastructure investment must be accompanied by community-level social interventions if they are to change travel behaviour among CYP.

A complementary finding on traffic safety and active commuting comes from Burford et al., who examined traffic safety conditions in neighbourhoods associated with active commuting to school in Austin, Texas. Their analysis finds that the physical characteristics of road environments near schools, traffic volumes, crossing safety, presence of sidewalks, are strongly associated with

active commuting rates, with unsafe traffic conditions functioning as the dominant physical barrier even in neighbourhoods where schools are within walkable distance. This corroborates the Auckland evidence: infrastructure proximity does not automatically produce active travel when road environments feel dangerous to CYP and their parents.

2. Community Safety Initiatives: Japan as a Facilitator Model

Zeng et al. (2025) examine the key factors of independent active school travel in Chiba, Japan, with a particular focus on crime safety perceptions and community initiatives. Their findings offer an important counterpoint to the predominantly physical infrastructure focus of much active travel research: in Japan, community-based safety initiatives, including networks of designated 'safe houses' (known as 'kodomo 110-ban' or children's emergency shelters), volunteer walking escorts, and formalised community-school partnerships, function as powerful facilitators of CYP independent travel that partially compensate for the absence of premium physical infrastructure.

This community-institutional model demonstrates that the social architecture of neighbourhood safety is not merely a soft complement to physical infrastructure but can constitute an independent enabling condition for CYP mobility, particularly in contexts where parents' primary concern is personal safety rather than traffic danger. The implication for 15-minute city planning is significant: creating child-friendly proximity environments requires investment in social infrastructure, community trust, institutional safety networks, adult-child relationships in public space, alongside physical infrastructure.

3. Disability and the Invisible Infrastructure Gap

Stafford et al. (2020) address a dimension systematically absent from the broader active travel literature: the experiences of children with physical mobility impairments in neighbourhood street environments. Using body-space ethnographic methods, they document the profound tensions experienced by children using mobility assistive devices who encounter streets designed exclusively for ambulatory pedestrians. Their findings reveal that standard footpath and crossing design, even in contexts that would be rated as 'walkable' in conventional metrics creates what they term 'body-space tensions': moments where the physical design of the environment renders movement impossible, uncomfortable, or socially stigmatising for children with impairments. The literature on non-physical and invisible disability is thinner still. Within this review only Colacios (2025) addresses it directly, through citizen-science co-design of play spaces with autistic children, showing that sensory conditions such as noise, crowding and unpredictable movement can make a nominally accessible route unusable. No included study examines children with mental health conditions, chronic illness, or cognitive and learning differences in relation to proximity or independent mobility. This is a substantive gap: because invisible disability does not register in the infrastructure audits on which accessibility assessment relies, the populations affected are absent from proximity measurement altogether.

Absent curb cuts, rough surfaces, narrow footpaths, and the absence of seating or resting points make what should be a 5-minute neighbourhood trip into an exhausting, exclusionary, and sometimes dangerous experience. This finding is directly relevant to 15-minute city policy: if walkability metrics do not account for the specific physical requirements of CYP with mobility impairments, proximity-based planning will systematically exclude a significant minority of children who cannot benefit from nearness to services they cannot physically reach.

4. Social, Parental, and Cultural Mediators of CYP Mobility

Across the synthesis, parental perceptions, household norms, and social-cultural factors emerge as the most powerful mediators of whether physical proximity and infrastructure quality translate into CYP independent and active travel. The evidence consistently shows that parents function as critical gatekeepers to children's mobility, and that their decisions are shaped by a complex interplay of personal beliefs, social norms, perceived neighbourhood safety, and cultural frameworks that are not simply reducible to build environment quality.

Parental Perceptions as the Primary Gatekeeper

Wilson et al. (2018) examine child and parent perceptions of barriers influencing children's active school travel in a Canadian context, finding a rich and differentiated landscape of barriers that operate simultaneously across the physical, social, and affective dimensions of neighbourhood experience. From the child perspective, safety-related concerns (traffic, strangers), material features (poor crossings, lack of bike infrastructure), and affective factors (feeling unwelcome or unsafe) all function as barriers. From the parent perspective, traffic safety and stranger danger dominate, but are also shaped by time constraints, convenience, and social norms about responsible parenting.

Critically, Wilson et al., 2018 find that parental perceptions and child perceptions of neighbourhood safety do not always align: children sometimes report feeling capable of travelling independently in environments that parent's rate as unsafe, suggesting that parental gatekeeping may sometimes exceed the actual risk environment experienced by children. This misalignment between parental perception and child experience is a direct barrier to CYP spatial autonomy and to the realisation of proximity-based mobility ambitions in the 15-minute city model. Hecker et al. (2025) extend this analysis to parental travel behaviour itself as a determinant of children's independent mobility across multiple Canadian sites. Their multi-site study finds that parents' own travel mode choice (particularly car dependency) is significantly associated with lower levels of children's independent mobility, even after controlling for neighbourhood walkability. Parents who habitually drive are more likely to drive their children, and less likely to permit independent travel, regardless of proximity. This suggests a cultural dimension to the active travel barrier that built environment interventions alone cannot address. Households with strong car-dependent travel cultures may not convert to independent child

travel even when physical proximity and infrastructure quality improve, unless social and cultural norms around child mobility also shift.

Gender as a Structural Mediator

Gender emerges across the synthesis as a consistent and structurally significant mediator of CYP mobility, shaping both the barriers CYP face and the ways in which interventions can address them. The evidence from multiple studies in the broader literature (Loh et al., 2024; Andersen et al., 2024; Bulloch & Olsen, 2024) consistently shows that girls face greater mobility constraints than boys, a pattern that Wilson et al. (2018) confirm in the Canadian active travel context, where safety concerns disproportionately restrict girls' independent travel.

This gendered restriction operates across multiple levels: at the parental level, where concerns about stranger danger and harassment more often constrain girls' unsupervised movement; at the peer level, where social norms about appropriate feminine behaviour in public space limit girls' use of streets for cycling and play; and at the institutional level, where physical planning rarely accounts for the gendered dimensions of street safety. The 15-minute city model, by focusing on the spatial proximity of services, risks overlooking the socio-cultural dimensions of access that determine whether girls can use nearby services independently, a gap that requires gender-sensitive planning approaches that go beyond service location to address the social conditions of access.

Socioeconomic Status: The Paradox of Constrained Access

The relationship between socioeconomic status (SES) and CYP active travel is more complex than a simple deprivation narrative suggests. The broader evidence base (Andersen et al., 2024; Maté Sánchez-de-Val et al., 2025) shows that higher-SES families are paradoxically more sensitive to distance barriers because car access provides an alternative, while lower-SES families may maintain active travel out of necessity even when conditions are poor. Burford et al.'s analysis in Austin confirms that neighbourhood traffic safety characteristics interact with household SES in shaping active commuting: children in low-income neighbourhoods are often simultaneously more dependent on active travel and more exposed to unsafe traffic conditions, creating a compounded disadvantage that proximity-based planning, which assumes that nearby services are accessible, fails to resolve.

Similarly, Rinne et al.'s (2026) Finnish study demonstrates that fare-free public transport policies produce the strongest mobility gains for children from lower-income households, who face the most binding financial constraints on travel. These findings collectively suggest that SES mediates access to proximity-based mobility environments through multiple channels, financial (cost of travel), physical (infrastructure quality in low-income areas), and cultural (household travel norms), that must each be addressed if 15-minute city policies are to be equitable.

4.3.2 Policy-Level Enablers and Structural Interventions

Beyond individual and household-level factors, the synthesis identifies a set of policy-level interventions and governance structures that function as structural enablers of CYP mobility, either by directly reducing barriers or by creating institutional conditions under which proximity-based mobility can be realised in practice.

Fare-Free Public Transport as a Structural Facilitator

Rinne et al. (2026) provide the most direct evidence in the synthesis of a policy-level intervention's effect on CYP independent mobility: a cross-sectional comparison of children's travel patterns in two Finnish towns, one with fare-free public transport (FFPT) and one without. Their findings show that children with access to fare-free public transport reported using the bus independently much more than their peers in the comparison town and were accessing a greater number of their everyday destinations by public transport. Critically, FFPT appears to operate through two mechanisms simultaneously: it removes the financial barrier that prevents lower-income families from allowing children to travel independently, and it lowers the psychological and logistical cost of allowing independent travel (parents do not need to provide money or manage payment systems). The policy implication is direct: fare-free or heavily subsidised public transport for CYP is not merely an equity measure but a structural enabler of children's spatial autonomy, a 15-minute city intervention that operates across the entire transport network rather than only in specific neighbourhoods. The Finnish evidence also suggests that FFPT effects are strongest for school-age children who have the physical capacity and parental permission for independent travel but face financial constraints, pointing to a clear policy priority.

School and Community Culture as Institutional Mediators

Smith et al.'s (2020) study identifies school and community culture as an institutional-level facilitator that is as important as physical infrastructure in determining CYP active travel rates. Schools that actively normalise walking and cycling through walking school buses, cycle training programmes, and active travel policies produce higher rates of active commuting even in-built environments that are only moderately walkable. This finding echoes the School Streets evidence from Haker et al. (2025) reviewed in SRQ1: institutional commitment to active travel at the school level can shift travel norms and produce behavioural change that infrastructure improvement alone cannot. Smith et al. further identify that strategic resourcing for leadership-dedicated school active travel coordinators with authority to engage with local authorities and transport agencies is a critical enabling condition for sustaining community-level active travel culture. This has important implications for 15-minute city governance: if child-friendly proximity environments require sustained community-institutional commitment and not merely spatial

planning, then governance structures must embed child mobility as a cross-sectoral responsibility rather than a transport planning add-on.

Public Transport as a Mobility Bridge for Adolescents

Jafari et al. (2025) examine the factors associated with public transport use to school and non-school destinations among adolescents in Australia, providing important evidence on how public transport functions as a bridge between the immediate neighbourhood and the broader city for older CYP. Their findings show that accessibility to public transport stops (proximity, frequency, coverage) is strongly associated with adolescent public transport (PT) use, but that the relationship is moderated by safety perceptions, particularly for girls and for late-evening travel. Adolescents who perceive public transport the stops themselves as unsafe, that is poorly lit, isolated, or sites of anti-social behaviour, are significantly less likely to use PT independently even when stops are nearby. This intersection of proximity and safety at the transit stop level is directly relevant to 15-minute city policy: if the model is to serve adolescents who need to access destinations beyond their immediate 15-minute radius, the quality and safety of public transport connections must be incorporated into proximity planning, not treated as a separate transport policy domain.

4.3.3 Marginalised and Under-Served CYP Populations: Compounded Barriers

The synthesis reveals that the barriers and facilitators described above do not operate uniformly across all CYP populations. Children and young people who face multiple intersecting disadvantages: disability, low income, minority ethnic background, rural location, experience compounded barriers that make the realisation of proximity-based mobility significantly harder than for their more advantaged peers. This section synthesises the evidence on these differential experiences.

Stafford et al.'s (2020) evidence on children with mobility impairments represents the most direct documentation of compounded exclusion in the synthesis: the same street environment that a non-disabled child can navigate independently becomes a series of insuperable physical obstacles for a child using a wheelchair or mobility aid. Absent curb cuts, rough surfaces, and narrow footpaths are not minor inconveniences but fundamental barriers to spatial autonomy, barriers that the 15-minute city model, with its emphasis on walking, structurally fails to address for this population. The study also documents the social dimension of this exclusion: children with impairments who navigate hostile streets do so at the cost of physical discomfort, social embarrassment, and personal safety risk, creating a triple burden, physical barrier, social stigma, and safety risk, that effectively eliminates the independent mobility that proximity is meant to enable.

While no primary study in the synthesis directly addresses race and ethnicity as a barrier category in SRQ3, the wider evidence reviewed across SRQ1 and SRQ2 consistently identifies this as a critical gap. Hosford et al. (2022) document that Vancouver neighbourhoods with the worst walkable access concentrate children, visible minorities, and lower-income households simultaneously and we find the same trend also in US (Yin et al., 2020). Burford et al.'s Austin evidence suggests that low-income neighbourhoods, which in the US context are disproportionately minority communities, face simultaneously worse traffic safety conditions and higher levels of car-dependent school travel out of necessity, creating a spatial justice problem that proximity-based planning must address through targeted infrastructure investment rather than spatially neutral proximity thresholds.

This absence is itself a finding and marks a clear research opportunity. Establishing how ethnicity, migration background and racialised experience shape CYP mobility would require designs that handle sensitive personal data and the risk of stigmatising the communities studied. Such work should be built on participatory and community-led principles, with consent obtained from both children and caregivers, ethical review at the design stage rather than at approval, and reporting that avoids deficit framing. The project's Living Labs offer a suitable setting for developing and testing such an approach.

4.3.4 Methodological Limitations

The evidence base for RQ3 carries important limitations. Most studies are cross-sectional, preventing causal attribution of barriers to outcomes. The primary studies are geographically restricted to high-income, Global North contexts; no evidence exists from the Global South on how the multi-level barrier framework operates in contexts of informality, rapid urbanisation, and different cultural norms of child mobility. Disability is addressed by only one primary study. Race and ethnicity are absent as primary analytic categories across all primary studies.

Across the three sub-research questions these limitations converge on a single point. The mediating conditions identified here, infrastructure quality, parental culture, gendered norms and household resources, are what determine whether the proximity established under SRQ1 becomes mobility, and the participatory processes examined under SRQ2 are the mechanism through which those conditions can be identified locally rather than assumed. Equity is the thread that runs through all three: the same characteristics that reduce a child's ability to convert nearness into movement also reduce the likelihood of that child being present in a participatory process. Sections 9 and 10 therefore treat equity as a cross-cutting requirement rather than as a separate dimension.

4.4 Cross-Cutting Synthesis Across the Three Sub-Research Questions

This section states what the evidence establishes when the three sub-research questions are read together. Its purpose is analytical: it identifies the findings that hold across the SRQs and the points at which the evidence base is silent. Section 8 then sets out what follows from these findings for research and for practice, and Sections 9 and 10 translate them into a framework and a set of recommendations for the project's Living Labs.

Finding 1: Proximity is necessary but insufficient, and its insufficiency is systematic, not incidental. Across all three SRQs, the evidence consistently shows that spatial proximity to services, while the single most important structural prerequisite for CYP active and independent travel, does not on its own deliver mobility equity. Safety (SRQ1), parental culture (SRQ3), and the absence of governance mechanisms to embed CYP knowledge into planning (SRQ2) each represent independent barriers that persist even where proximity conditions are met. The 15mC model, as currently operationalised, addresses the spatial dimension while systematically underaddressing these social, relational, and governance dimensions.

Finding 2: The 15-minute city framework is adult-centred in measurement, in amenity prioritisation, and in design process. The adult-centrism of the 15mC is not a single limitation but three overlapping ones: it uses adult walking speeds that overstate effective access for children (SRQ1); it prioritises adult-relevant service types over child-relevant amenities such as playgrounds, peer spaces, and recreational facilities (SRQ1 and SRQ2); and it is designed through planning processes that have rarely included CYP as co-designers (SRQ2). Rectifying this requires calibrating proximity thresholds to child walking speeds, expanding the service typology to include child-relevant amenities, and embedding CYP participation in the design of proximity frameworks themselves.

Finding 3: CYP conceptualise proximity differently from adults, and this difference is planning-relevant. CYP experience proximity as inherently relational, safety-dependent, social, and developmentally variable (RQ1 and RQ2). For children, effective proximity is shaped not only by metric distance but by route familiarity, peer geography, safety perceptions, and independence norms. When given genuine participatory opportunities (RQ2), CYP articulate urban priorities, pedestrian safety, green space, social gathering points, sensory accessibility, that are absent from or peripheral to adult planning agendas and that, if incorporated into 15mC frameworks, would produce substantially more child-inclusive urban environments.

Finding 4: Equity dimensions are the critical blind spot across all three RQs. Gender, SES, disability, and race and ethnicity all moderate whether children can convert spatial proximity into genuine mobility equity (RQ1 and RQ3); all moderate who participates in and benefits from

participatory processes (RQ2); and all are systematically under-reported or absent from the primary study evidence bases across all three SRQs. The standard metrics of 15mC planning, Euclidean or network distance, adult walking speeds, counts of amenities are equity-blind in ways that systematically advantage already-advantaged CYP and render the most disadvantaged children invisible to proximity assessment.

Finding 5: Methodological and geographic limitations constrain the generalisability of existing evidence. The evidence base across all three RQs is dominated by cross-sectional, observational designs from high-income, Global North contexts. Longitudinal designs tracking mobility and participation change over time are absent. The Global South, where urban morphologies, informal mobility, governance frameworks, and cultural norms of childhood differ fundamentally, is almost entirely unrepresented. These limitations mean that the conclusions of this review, while robust within their geographic and methodological scope, cannot be assumed to transfer to other urban contexts without substantial further research.

5. Conclusions and Implications

The five findings set out in Section 4 have direct consequences for how the 15-minute city should be conceived, measured and governed if it is to serve children and young people. Five implications follow, each of which is carried into the framework proposed in Section 9 and the Living Lab recommendations in Section 10.

Proximity metrics should be recalibrated to children before they are used to make claims about child-friendliness. Because effective proximity for CYP is a function of walking speed, route safety, familiarity and permission rather than of metric distance alone, assessments that apply adult speeds and adult destination sets systematically overstate what is reachable for a child. The practical implication is that 15mC indicators should be reported for a child-calibrated catchment alongside the standard adult one, and that the destination set should include playgrounds, sports and recreational facilities, green space and informal peer meeting places.

Participation should be designed for depth rather than for coverage. The evidence indicates that the marginal value of an additional one-off consultation is low, while extended, multi-method and institutionally embedded processes generate knowledge that adult-proxy methods cannot replicate. For YouthMove15 this means designing the Living Labs as iterative processes with a defined decision pathway rather than as a sequence of engagement events.

The translation gap should be treated as a governance problem. Since the binding constraint on CYP influence is the absence of agreed mechanisms for acting on what children say, participation should be accompanied by an explicit commitment specifying which decisions are open to CYP input, who is accountable for responding, and how outcomes are reported back to participants. Documenting what was accepted, modified or rejected, and why, is a minimum condition of non-tokenistic practice.

Equity should be built into the design of both environments and processes. Gender, socioeconomic status and disability moderate every relationship identified in this review, yet they are the least consistently reported dimensions in the primary evidence. Universal design of pedestrian infrastructure, gender-sensitive design of both space and process, targeted attention to low-income and peripheral neighbourhoods, and culturally adapted participatory methods are therefore treated below as requirements rather than as refinements.

Finally, the review identifies where the evidence base itself needs strengthening. Longitudinal designs that track mobility and participation over time are absent; the Global South is almost entirely unrepresented; disability is addressed by a single primary study; and race and ethnicity are largely absent as analytic categories. These gaps mark the boundaries within which the

framework proposed below should be read, and they define a research agenda that the project's empirical phase can begin to address for the 10–14 age group in European contexts.

Linkage to the remaining project activities. These conclusions feed the project in four concrete ways. The framework in Section 9 supplies the analytical structure for the Living Lab design; the toolkit in Section 10 supplies the participatory methods to be selected from and adapted; the child-calibrated proximity discussion supplies the indicators against which the Living Lab neighbourhoods can be characterised; and the governance conclusion supplies the requirement that each Living Lab agree a decision pathway with its municipal partner before engagement begins. The evidence gaps identified above, in particular the absence of longitudinal designs and of evidence on invisible disability, define what the project's empirical phase can realistically contribute to the wider field for the 10–14 age group in European contexts.

6. Towards a Child-Inclusive 15-Minute City: Theoretical Foundations and Key Principles

Drawing on the evidence synthesised across the three sub-research questions, this section proposes a framework for reviewing and facilitating CYP participation in the development of a child-inclusive vision of the 15-minute city. The framework integrates insights from the proximity literature, the participatory planning evidence base, and the socio-spatial barriers and facilitators identified across RQ1–3. The critical imagination lens is adopted as the overarching theoretical framework, positioning children not merely as research subjects or planning beneficiaries but as knowledgeable actors capable of imagining and co-producing alternative urban futures.

6.1 The Critical Imagination Lens as an Overarching Framework

The critical imagination lens, developed within children's geographies and participatory action research traditions, holds that children's knowledge of their urban environments is not merely descriptive but imaginative and transformative: children do not simply report on existing conditions but can envision and articulate alternative spatial arrangements that reflect their values, needs, and desires.

Within this framework, children's participation is understood not as a consultation mechanism through which adult planners gather child preferences, but as a co-productive practice in which CYP and adult professionals jointly develop new knowledge about what urban environments could and should be and they develop a new sense of how urban spaces can be more just and inclusive changing their values toward a more equitable set of possible futures cities (Butcher, 2016,). This distinction is critical: it shifts the goal of CYP participation from preference elicitation to collaborative spatial imagination, and positions living labs and co-design workshops as arenas for this imaginative co-production rather than as data-collection instruments. aspirations (Butcher, 2016). This lens challenges the deficit framing of children as users who need to be served by adult-designed spaces and positions them instead as creative agents capable of contributing original spatial thinking to urban planning processes (Dickens, 2017; Butcher, 2016).

6.2 Framework Dimensions and Components

The proposed framework operationalises the critical imagination lens across four interconnected dimensions, held together by the lens at the centre and bounded by equity as a cross-cutting principle

The four dimensions are not sequential stages but mutually constitutive: child-calibrated proximity (Dimension 1) defines what is to be made near; participatory processes (Dimension 2) determine how children co-produce that definition; barrier and facilitator mapping (Dimension 3) identifies the social and infrastructural conditions that convert nearness into mobility; and governance and translation (Dimension 4) secures the institutional commitments without which participation cannot reshape the city. The lens connects all four, signalling that each dimension is approached not as a technical input but as a site of imaginative co-production:(Figure xx).

Correspondence with the YouthMove15 methodology. The four dimensions are intended to be read at the weight the project gives them rather than as an equally balanced set. Two clarifications follow from the proposal. First, child-calibrated proximity (D1) functions here as an analytical correction to the 15mC literature rather than as a major strand of primary data collection: the project does not set out to produce new walking-speed or catchment measurements, and D1 is used mainly to characterise the Living Lab neighbourhoods and to interpret existing accessibility data. Second, and conversely, the project places substantially more weight on the full range of children's everyday activities, where they go, with whom, for what purpose, and what they would like to be able to do, than on independent mobility narrowly defined as unaccompanied travel. This is the distinction drawn in Section 2.4 between the children's independent mobility tradition and the relational mobilities approach, and the framework follows the latter. D3 is best understood in these terms: it is the step in which the Living Labs establish which local conditions, infrastructural, parental, institutional and cultural, are actually converting proximity into activity, or preventing it, in the specific neighbourhoods studied.

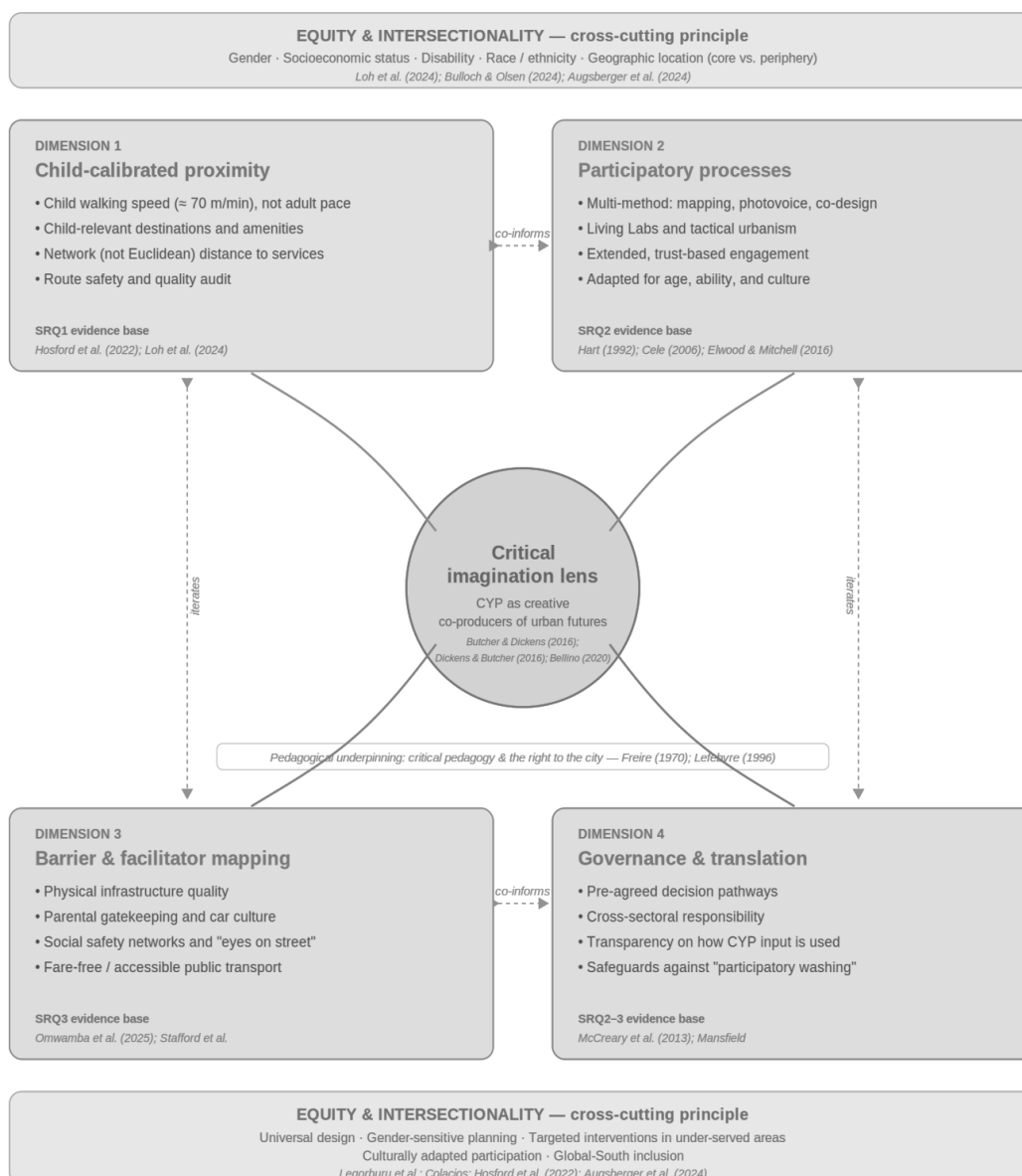


Figure 9: Graphical visualization of the YouthMove15 critical-imagination framework for the child-inclusive 15-minute city: Integrating Proximity, Participation, and Governance.

Each dimension contributes to a specific limitation in the existing knowledge base as identified in the review:

- D1: Child-calibrated proximity responds to the demonstration across the SRQ1 evidence that standard accessibility metrics, calibrated to adult walking speeds and adult destinations, systematically overstate effective access for children (Teeuwen et al., 2025; Loh et al., 2024). Recalibrating proximity to child pace, child-relevant amenities and

network rather than Euclidean distance is therefore a precondition for any child-inclusive 15-minute city, but it remains a technical correction that, on its own, leaves the adult-centred frame intact.

- D2: Participatory processes are where the critical imagination lens does its principal work. The participatory-planning literature consistently distinguishes consultation from co-production and warns that methodological sophistication alone does not guarantee influence (Elwood & Mitchell, 2016). The framework accordingly specifies multi-method, extended and trust-based engagement, embedded in Living Labs, rather than one-off workshops, and insists that methods be adapted to age, ability and culture.
- D3: Mediating conditions, that is the mapping of barriers and facilitators, integrates the SRQ3 evidence that proximity becomes mobility only when mediating conditions, infrastructure quality, parental gatekeeping and car culture, social safety, and affordable transport are addressed (Omwamba et al., 2025).
- D4: Governance and translation names the field's central unresolved problem: the translation gap between what children express and what planners enact. By requiring pre-agreed decision pathways, cross-sectoral responsibility and transparency about how contributions are used, this dimension converts the ethical commitments of participatory praxis into institutional obligations (McCreary et al., 2013; Dickens & Butcher, 2016).

6.3 Equity and Intersectionality as Cross-Cutting Principles

The framework places equity and intersectionality as cross-cutting principles that must inform all four dimensions. The review demonstrates that the barriers and facilitators affecting CYP mobility are not uniform across the population but are shaped by overlapping dimensions of disadvantage: gender, socioeconomic status, disability, ethnicity, and geographic location (urban core versus periphery). A child-inclusive 15mC framework must actively address these intersections through:

- Gender-sensitive design of both the physical environment and participatory processes, recognising that girls face consistently higher mobility constraints
- Universal design principles applied to pedestrian infrastructure, ensuring that children with physical, cognitive, and sensory differences can benefit from proximity-based planning

- Targeted equity interventions for CYP in low-income, peripheral, and under-served neighbourhoods, where proximity gaps, infrastructure deficits, and safety concerns compound
- Culturally adapted participatory methods that do not assume Western norms of child autonomy or institutional frameworks for youth participation

6.4 Practical Recommendations: CYP Participation in the Living Labs

This section turns the framework into practice. The recommendations and tools set out below are not a generic inventory of participatory techniques: each is proposed because it responds to a specific finding of this review, and each is intended to be taken up directly in the design of the project's Living Lab activities. Together they operationalise the four framework dimensions of Section 9, and the equity requirements of Section 9.3 apply to all of them.

6.4.1 Proposed Tools for the Living Labs

The tools below are proposed on the basis of the evidence synthesised in Sections 4 to 6 and are put forward for implementation in the project's Living Lab activities in the subsequent work packages, subject to adaptation by the Living Lab teams to their local partners, age groups and consent arrangements. Each was selected because the review shows it to generate knowledge that adult-proxy methods do not reach. They illustrate how the critical imagination lens can be put to work with children and young people. They are deliberately multi-modal and progressive, moving from reading the existing city to imagining and testing alternatives:

- ***Child-led walks and go-along interviews.*** Children guide adults through their everyday routes, narrating thresholds, hazards and valued places in situ; transect walks systematise this across a neighbourhood
- ***Participatory and emotion mapping.*** Paper or digital (PGIS) mapping in which CYP annotate safe and unsafe places, desire lines, barriers and favourite destinations, surfacing the relational geography that standard metrics miss
- ***Photovoice and participatory video.*** Children document and narrate their environment through photography or film, producing evidence that travels into public and policy arenas
- ***Speculative design: model-building, collage and “dream street” drawing.*** Open-ended making that licenses children to propose alternatives rather than evaluate adult options, the core imaginative move of the lens

- ***Futures-visioning workshops.*** Structured techniques such as the futures wheel and backcasting in which CYP describe a preferred 15-minute neighbourhood and work backwards to the steps required to reach it.
- ***Tactical urbanism and 1:1 street experiment.*** Temporary, low-cost interventions, pop-up play streets, painted crossings, parklets, that let children prototype and physically test changes at real scale.
- ***Game-based and digital sandbox co-design.*** Role-play, board games and digital city-builders (e.g. Minecraft-style environments) that make spatial trade-offs tangible and engaging for a range of ages and abilities.
- ***Co-design with planners.*** Facilitated sessions that bring CYP and professionals to the same table under pre-agreed decision pathways

References

- Allam, Z., Khavarian-Garmsir, A. R., Lassaube, U., Chabaud, D., & Moreno, C. (2024). Mapping the Implementation Practices of the 15-Minute City. *Smart Cities*, 7(4), 2094-2109. <https://doi.org/10.3390/smartcities7040083>
- Allam, Z., Bibri, S. E., Chabaud, D., & Moreno, C. (2022). The Theoretical, Practical, and Technological Foundations of the 15-Minute City Model: Proximity and Its Environmental, Social and Economic Benefits for Sustainability. *Energies*. <https://doi.org/10.3390/en15166042>
- Allam, Z., Bibri, S. E., Jones, D. S., Chabaud, D., & Moreno, C. (2022). Unpacking the '15-Minute City' via 6G, IoT, and Digital Twins: Towards a New Narrative for Increasing Urban Efficiency, Resilience, and Sustainability. *Sensors*. <https://doi.org/10.3390/s22041369>
- Andersen, O. K., Gebremariam, M. K., Kaupang, O. B., Lien, N., & Kolle, E. (2024). Built for movement: Neighborhoods and adolescent physical activity behaviors, and the moderating role of socioeconomic position and gender. *Health & Place*, 89, 103313. <https://doi.org/10.1016/j.healthplace.2024.103313>
- Anderson, K. M., McCormick, M. L., Morgan, K. Y., Gibson, M., Harper, A., Clark, M., & Christens, B. D. (2024). Youth participatory action research for equitable urban design. *Journal of Participatory Research Methods*, 5(2). <https://doi.org/10.35844/001c.120406>
- Aranda-Balboa MJ, Chillón P, Saucedo-Araujo RG, Molina-García J, Huertas-Delgado FJ. Children and Parental Barriers to Active Commuting to School: A Comparison Study. *Int J Environ Res Public Health*. 2021 Mar 3;18(5):2504. <https://doi.org/10.3390/ijerph18052504>
- Arias-Molinares, D., Geurs, K., Grigolon, A. et al. Exploring the 15-Minute City concept for the urban outskirts: a systematic literature review. *Eur. Transp. Res. Rev.* 17, 50 (2025). <https://doi.org/10.1186/s12544-025-00743-8>
- Arslan, O., & Laporte, G. (2025). The 15-minute city concept: An operations research perspective and a research agenda. *Transportation Research Part E: Logistics and Transportation Review*, 202, 104287. <https://doi.org/10.1016/j.tre.2025.104287>
- Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners*, 35(4), 216–224. <https://doi.org/10.1080/01944366908977225>
- Asadi, M. (2025). How parental satisfaction with green open spaces shapes children's outdoor play considering independent mobility as the key mediator. *Cities & Health*, 9(2), 197–208. <https://doi.org/10.1080/23748834.2024.2421100>

- Augsberger, A., Collins, M. E., & Howard, R. C. (2024). The global context of youth engagement: A scoping review of youth councils in municipal government. *Children and Youth Services Review*, 156. <https://doi.org/10.1016/j.childyouth.2023.107349>
- Barker, J., Kraftl, P., Horton, J., & Tucker, F. (2009). The road less travelled, New directions in children's and young people's mobility. *Mobilities*, 4(1), 1–10. <https://doi.org/10.1080/17450100802657939>
- Basbas, S., Campisi, T., Papas, T., Trouva, M., & Tesoriere, G. (2023). The 15-minute city model: The case of Sicily during and after COVID-19. *Communications — Scientific Letters of the University of Žilina*, 25(2), A83–A92. <https://doi.org/10.26552/com.C.2023.021>
- Berasategi Sancho, N., Eiguren Munitis, A., Legorburu Fernandez, I. L., & Idoiaga-Mondragon, N. (2026). Children's active and autonomous school journeys and their implications: An investigation using drawing methodology. *Child & Youth Care Forum*, 55, 227–245. <https://doi.org/10.1007/s10566-025-09867-3>
- Bibri, S.E. Data-driven smart eco-cities and sustainable integrated districts: A best-evidence synthesis approach to an extensive literature review. *Eur J Futures Res* 9, 16 (2021). <https://doi.org/10.1186/s40309-021-00181-4>
- Bourke, J. (2014). "No messing allowed": The enactment of childhood in urban public space from the perspective of the child. **Children, Youth and Environments*, 24*(1), 25–52. <https://doi.org/10.7721/chilyoutenvi.24.1.0025>
- Brown, C., de Lannoy, A., McCracken, D., Gill, T., Grant, M., Wright, H., & Williams, S. (2019). Special issue: Child-friendly cities. *Cities & Health*, 3(1–2), 1–7. <https://doi.org/10.1080/23748834.2019.1682836>
- Bruzzone, F., Cavallaro, F., & Nocera, S. (2023). The definition of equity in transport. *Transportation Research Procedia*, 69, 440–447. <https://doi.org/10.1016/j.trpro.2023.02.193>
- Bulkeley, H., Coenen, L., Frantzeskaki, N., Hartmann, C., Kronsell, A., Mai, L., Marvin, S., McCormick, K., van Steenbergen, F., & Voytenko Palgan, Y. (2016). Urban living labs: Governing urban sustainability transitions. **Current Opinion in Environmental Sustainability*, 22*, 13–17. <https://doi.org/10.1016/j.cosust.2017.02.003>
- Bulloch, M., & Olsen, J. R. (2024). Exploring young people's views of their local area related to the 20-minute neighbourhood policy: A national cross-sectional study. **Cities & Health*, 8*(6), 1081–1093. <https://doi.org/10.1080/23748834.2024.2315804>
- Burford, K. G., Salvo, D., Kohl, H. W., Ganzar, L. A., Bauer, C. X., Resendiz, E., Zhang, Y., & Hoelscher, D. M. (2026). Examination of traffic safety in neighborhoods associated with

- active commuting to school in Austin, Texas. **Journal of Physical Activity and Health*, 23*(2), 206–218. <https://doi.org/10.1123/jpah.2025-0130>
- Butcher, M. (2016). Re-imagining home: Visualising the multiple meanings of place. In K. Nairn, P. Kraftl, & T. Skelton (Eds.), **Space, place and environment** (Geographies of Children and Young People, Vol. 3, pp. 1–18). Springer. https://doi.org/10.1007/978-981-287-044-5_16
- Caprotti, F., Duarte, C., & Joss, S. (2024). The 15-minute city as paranoid urbanism: Ten critical reflections. **Cities*, 155*, 105497. <https://doi.org/10.1016/j.cities.2024.105497>
- Charalambous, N., Panayi, C., Mady, C., Augustinčić, T., & Berc, D. (2025). Youth engagement in urban living labs: Tools, methods and pedagogies. *Buildings & Cities*, 6(1), 1061–1080. <https://doi.org/10.5334/bc.643>
- Clossick, J., Khonsari, T., & Steven, U. (2025). Living labs: epistemic modelling, temporariness and land value. *Buildings and Cities*, 6(1), pp. 841–861. <https://doi.org/10.5334/bc.645>
- Colacios, R. (2025). Citizen science for healthier and more inclusive environments: Co-creating public play spaces with autistic children. *Cities & Health*. Advance online publication. <https://doi.org/10.1080/23748834.2025.2566563>
- Da Silva, D. C., King, D. A., & Lemar, S. (2020). Accessibility in practice: 20-minute city as a sustainability planning goal. *Sustainability (Switzerland)*. <https://doi.org/10.3390/SU12010129>
- De Iorio, A. G., Le Pira, M., Giuffrida, N., & Ignaccolo, M. (2026). *Fostering active citizen participation and co-design of evidence-based sustainable mobility solutions: A case of Italian schools*. *European Transport / Trasporti Europei*, 105, Article 8.
- Derr, V., & Kovács, I. G. (2015). How participatory processes impact children and contribute to planning: A case study of neighborhood design from Boulder, Colorado, USA. *Journal of Urbanism*, 10(1), 29-48. <https://doi.org/10.1080/17549175.2015.1111925>
- Dickens, L., & Butcher, M. (2016). Going public? Re-thinking visibility, ethics and recognition through participatory research praxis. *Transactions of the Institute of British Geographers*, 41(4), 528–540. <https://doi.org/10.1111/tran.12136>
- Dickens, L. (2017). World making, critical pedagogies, and the geographical imagination: Where youth work meets participatory research. *Antipode*, 49(5), 1285–1305. <https://doi.org/10.1111/anti.12342>
- Di Marino, M., Tomaz, E., Henriques, C., & Chavoshi, S. H. (2023). The 15-minute city concept and new working spaces: A planning perspective from Oslo and Lisbon. *European Planning Studies*, 31(3), 598–620. <https://doi.org/10.1080/09654313.2022.2082837>

- Elwood, S., & Mitchell, K. (2016). Critical spatial learning: Participatory mapping, spatial histories, and youth civic engagement. *Children's Geographies*, 14(5), 558–572. <https://doi.org/10.1080/14733285.2015.1136736>
- Fernández-Núñez, M.-B., Maciejewska, M., Mojica, L., & Marquet, O. (2024). Car-use reduction in 15-Minute Cities: A matter of modal shift or shorter travel distances? *Journal of Urban Mobility*, 6, 100093. <https://doi.org/10.1016/j.urbmob.2024.100093>
- Giannoulaki, M., & Christoforou, Z. (2024). Pedestrian walking speed analysis: A systematic review. *Sustainability*, 16(11), 4813. <https://doi.org/10.3390/su16114813>
- Gorrini, A., Presicce, D., Messa, F., & Choubassi, R. (2023). Walkability for children in Bologna: Beyond the 15-minute city framework. *Journal of Urban Mobility*, 3, 100052. <https://doi.org/10.1016/j.urbmob.2023.100052>
- Hagemann, F. A., & Randrup, T. B. (2024). Young people's participation in urban landscape planning and transformation: A scoping review of interactive approaches. *Socio-Ecological Practice Research*, 6(4), 433–454. <https://doi.org/10.1007/s42532-024-00200-1>
- Hart, R. A. (1992). *Children's participation: From tokenism to citizenship* (Innocenti Essays No. 4). UNICEF International Child Development Centre.
- Hecker, V., Blanchette, S., Faulkner, G., Riazi, N. A., Tremblay, M. S., Trudeau, F., & Larouche, R. (2025). *Parental travel behaviors and children's independent mobility: A multi-site study*. *Pediatric Exercise Science*, 37(2), 112–117. <https://doi.org/10.1123/pes.2023-0064>
- Heger, P., Bieber, C., Hendawy, M., & Shooshtari, A. (2025). Co-creating urban transformation: A stakeholder analysis for Germany's heat transition. *Buildings & Cities*, 6(1), 1046–1060. <https://doi.org/10.5334/bc.613>
- Hillman, M., Adams, J., & Whitelegg, J. (1990). One false move: A study of children's independent mobility. Policy Studies Institute.
- Hoelscher, D.M.; Ganzar, L.A.; Salvo, D.; Kohl, H.W., III; Pérez, A.; Brown, H.S.; Bentley, S.S.; Dooley, E.E.; Emamian, A.; Durand, C.P. (2022). Effects of large-scale municipal safe routes to school infrastructure on student active travel and physical activity: design, methods, and baseline data of the safe travel environment evaluation in Texas Schools (STREETS) Natural experiment. *International Journal of Environmental Research in Public Health*, 19, 1810. <https://doi.org/10.3390/ijerph19031810>
- Holloway, S. L., & Valentine, G. (Eds.). (2000). *Children's geographies: Playing, living, learning*. Routledge.
- Holloway, S. L., & Valentine, G. (2000). Spatiality and the new social studies of childhood. *Sociology*, 34(4), 763–783. <https://doi.org/10.1177/S0038038500000468>

- Hosford, K., Beirsto, J., & Winters, M. (2022). Is the 15-minute city within reach? Evaluating walking and cycling accessibility to grocery stores in Vancouver. *Transportation research interdisciplinary perspectives*, 14, 100602. <https://doi.org/10.1016/j.trip.2022.100602>
- Ikeda, E., Hinckson, E., Witten, K., & Smith, M. (2019). Assessment of direct and indirect associations between children active school travel and environmental, household and child factors using structural equation modelling. *International Journal of Behavioral Nutrition and Physical Activity*, 16. <https://doi.org/10.1186/s12966-019-0794-5>
- Innocenti. (2025). Why participation matters: The evidence for involving children and youth in policy and decision-making [Discussion paper].
- Ito, K., Reardon, T. G., Arcaya, M. C., Shamsuddin, S., Gute, D. M., & Srinivasan, S. (2017). Built environment and walking to school: Findings from a student travel behavior survey in Massachusetts. *Transportation Research Record: Journal of the Transportation Research Board*, 2666(1), 78–84. <https://doi.org/10.3141/2666-09>
- Jafari, M., Delbosc, A. & Currie, G. (2025). Factors associated with public transport use to school and non-school destinations among adolescents. *Transportation*. <https://doi.org/10.1007/s11116-025-10699-2>
- Khanian, M., Łaszkiwicz, E., Kronenberg, J., Baró, F., & Khmara, Y. (2026). *Greenery in the 15-minute city: Children's walking accessibility and visual exposure to greenery in urban zones*. *Landscape and Urban Planning*, 271, Article 105641. <https://doi.org/10.1016/j.landurbplan.2026.105641>
- Kyttä, M. (2004). The extent of children's independent mobility and the number of actualized affordances as criteria for child-friendly environments. *Journal of Environmental Psychology*, 24(2), 179–198. [https://doi.org/10.1016/S0272-4944\(03\)00073-2](https://doi.org/10.1016/S0272-4944(03)00073-2)
- Levine, J., Grengs, J., & Merlin, L. A. (2019). *From Mobility to Accessibility: Transforming Urban Transportation and Land-Use Planning*. Cornell University Press. <http://www.jstor.org/stable/10.7591/j.ctvfc52mj>
- Legorburu, I., Idoiaga Mondragon, N., Alonso, I., & Berasategi, N. (2022). Why are you allowed to go to school on your own? Exploring children's voices on independent mobility. *Children & Society*, 36(6), 1111–1125. <https://doi.org/10.1111/chso.12559>
- Li, M., Wang, Y., & Zhou, D. (2023). Effects of the built environment and sociodemographic characteristics on Children's school travel. *Transport Policy*, 134, 191–202. <https://doi.org/10.1016/j.tranpol.2023.02.018>
- López García de Leániz, C., & Fernández Lobo, A. (2023). 15-minute city: Utopia or reality? *Transportation Research Procedia*, 71, 203–210. <https://doi.org/10.1016/j.trpro.2023.11.076>

- Logan, T. M., Hobbs, M. H., Conrow, L. C., Reid, N. L., Young, R. A., & Anderson, M. J. (2022). The x-minute city: Measuring the 10, 15, 20-minute city and an evaluation of its use for sustainable urban design. *Cities*. <https://doi.org/10.1016/j.cities.2022.103924>
- Loh, V., Sahlqvist, S., Veitch, J., Walsh, A., Cerin, E., Salmon, J., Mavoa, S., & Timperio, A. (2024). Active travel, public transport and the built environment in youth: Interactions with perceived safety, distance to school, age and gender. *Journal of Transport & Health*, 38, 101895. <https://doi.org/10.1016/j.jth.2024.101895>
- Mandic, S., Sandretto, S., Hopkins, D., Wilson, G., Kidd, G., & García Bengoechea, E. (2023). School choice, distance to school and travel to school patterns among adolescents. *Journal of Transport & Health*, 33, 101704. <https://doi.org/10.1016/j.jth.2023.101704>
- Mansfield R. G. (2023). "They'll be the ones that's looking after it" - Unravelling institutional factors that shape children's participation in urban planning for informal settlements. *Children's geographies*, 21(5), 944–960. <https://doi.org/10.1080/14733285.2022.2159331>
- Maté Sánchez-de-Val, A. P., Maté Sánchez-de-Val, M., & López Hernández, F. A. (2025). Are 15-minute cities for children? Exploring the socio-economic factors in Madrid. *Regional Statistics*, 15(4), 653–676. <https://doi.org/10.15196/rs150403>
- Matthews, H., & Limb, M. (1999). Defining an agenda for the geography of children: Review and prospect. *Progress in Human Geography*, 23(1), 61–90. <https://doi.org/10.1191/03091329967096149>
- Michail, N., Ozbil Torun, A., & Parnell, R. (2025). Towards child-friendly and walkable cities: Children's insights on neighbourhood design. *Cities & Health*. Advance online publication. <https://doi.org/10.1080/23748834.2025.2494880>
- Mikkelsen, M. R., & Christensen, P. H. (2009). Is children's independent mobility really independent? A study of children's mobility combining ethnography and GPS/mobile phone technologies. *Mobilities*, 4(1), 37–58. <https://doi.org/10.1080/17450100802657954>
- Mitra, R., & Manaugh, K. (2019). A social-ecological conceptualization of children's mobility. In O. Waygood & M. Friman (Hrsg.), *Transport and Children's Wellbeing* (S. 81–100). Elsevier. <https://doi.org/10.1016/B978-0-12-814694-1.00005-1>
- Moreno, C., Allam, Z., Chabaud, D., Gall, C., & Pratlong, F. (2021). Introducing the "15-minute city": Sustainability, resilience and place identity in future post-pandemic cities. *Smart Cities*, 4(1), 93–111. <https://doi.org/10.3390/smartcities4010006>
- Müller, J. M. (2026). Living labs: A systematic review of success parameters and outcomes. *Buildings and Cities*, 7(1), 92–109. <https://doi.org/10.5334/bc.624>

- Murray, L., & Cortés-Morales, S. (2019). Children's mobilities: Interdependent, imagined, relational. Palgrave Macmillan. <https://doi.org/10.1057/978-1-137-52114-9>
- Nelischer, C. (2025). Moving, Mapping, Imagining: Youth-Centered Methods for Understanding and Envisioning Mobility. *Journal of Planning Education and Research*. <https://doi.org/10.1177/0739456x251339411>
- O'Brien, M., Jones, D., Sloan, D., & Rustin, M. (2000). Children's independent spatial mobility in the urban public realm. *Childhood*, 7(3), 257–277. <https://doi.org/10.1177/0907568200007003002>
- Omwamba, J., Rotaris, L., & Longo, G. (2025). An assessment of proximity in the 15-Minute City: A systematic literature review. *Urban Transitions*, 3, 100012. <https://doi.org/10.1016/j.ubtr.2025.100012>
- Ozbil Torun, A., Akin, I. Z., Bingol, H., Defeyter, M. A., & Severcan, Y. C. (2024). Children's perspectives of neighbourhood spaces: Gender-based insights from participatory mapping and GIS analysis. *Urban Planning*, 9, Article 8499. <https://doi.org/10.17645/up.8499>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- Plaza-Herrera, D., & Mercadé-Aloy, J. (2025). Inclusive 15-minute cities: An age-sensitive assessment of active accessibility in the metropolitan area of Barcelona. *Cities*, 165, 106091. <https://doi.org/10.1016/j.cities.2025.106091>
- Prout, A., & James, A. (1997). A new paradigm for the sociology of childhood? Provenance, promise and problems. In A. James & A. Prout (Eds.), *Constructing and reconstructing childhood: Contemporary issues in the sociological study of childhood* (2nd ed., pp. 7–33). Routledge. <https://doi.org/10.4324/9780203362600>
- Quadrado Mussi, A., Fernanda Nercolino Deon, L., Castioni Isele, P., & Bavaresco, F. (2021). Co-design in public spaces for children: The design process of a pocket park. *Journal of Civil Engineering and Architecture*, 15(10). <https://doi.org/10.17265/1934-7359/2021.10.003>
- Riazi, N. A., Wunderlich, K., Yun, L., Paterson, D. C., & Faulkner, G. (2022). Social-Ecological Correlates of Children's Independent Mobility: A Systematic Review. *International journal of environmental research and public health*, 19(3), 1604. <https://doi.org/10.3390/ijerph19031604>
- Rinne, T., Moll, V., Alderton, A., Berg, P., Hakala, P., & Pesola, A. J. (2026). Fare-free public transport supporting children's independence and ease of using public transport. *Children's*

- Geographies, 24(1), 46–61. <https://doi.org/10.1080/14733285.2025.2589977> [Note: cited in the text as Rinne et al. (2025), the advance-online year – please harmonise to one form.]
- Riádigos-Couso, X., García-Vinuesa, A., & Gradaílle, R. (2025). Citizen participation of childhood and adolescence in local government: A systematic review. *Children and Youth Services Review*, 170. <https://doi.org/10.1016/j.childyouth.2025.108141>
- Rodela, R., Nejadi, O., & Falk, E. (2025). Talking about my future city: Engaging young voices through persona-based participation. *Futures*, 173, 103680. <https://doi.org/10.1016/j.futures.2025.103680>
- Shaw, B., Watson, B., Frauendienst, B., Redecker, A., Jones, T., & Hillman, M. (2013). Children's independent mobility: A comparative study in England and Germany (1971–2010). Policy Studies Institute.
- Shaw, B., Bicket, M., Elliott, B., Fagan-Watson, B., Mocca, E., & Hillman, M. (2015). Children's independent mobility: An international comparison and recommendations for action. Policy Studies Institute.
- Sheller, M., & Urry, J. (2006). The new mobilities paradigm. *Environment and Planning A*, 38(2), 207–226. <https://doi.org/10.1068/a37268>
- Skelton, T. (2009). Children's geographies/geographies of children: Play, work, mobilities and migration. *Geography Compass*, 3(4), 1430–1448. <https://doi.org/10.1111/j.1749-8198.2009.00230.x>
- Smith, M., Hawley, G., Mackay, L., Hosking, J., Mackie, H., Ikeda, E., Egli, V., Ellaway, A., & Witten, K. (2020). Impact of changing road infrastructure on children's active travel: A multi-methods study from Auckland, New Zealand. *Journal of Transport & Health*, 18, 100868. <https://doi.org/10.1016/j.jth.2020.100868>
- Stafford, L., Adkins, B., & Franz, J. (2020). Bounded at the driveway's edge: Body-space tensions encountered by children with mobility impairments in moving about the neighbourhood street. *Children's Geographies*, 18(3), 298–311. <https://doi.org/10.1080/14733285.2019.1635992>
- Steen, K., & van Bueren, E. (2017). The defining characteristics of urban living labs. *Technology Innovation Management Review*, 7(7), 21–33. <https://doi.org/10.22215/timreview/1088>
- Tayefi Nasrabadi, M., García, E. H., & Pourzakarya, M. (2021). Let children plan neighborhoods for a sustainable future: A sustainable child-friendly city approach. *Local Environment*, 26(2), 198–215. <https://doi.org/10.1080/13549839.2021.1884668>

- Teeuwen, R., Bozzon, A., & Psyllidis, A. (2025). Children's access to urban greenspace: a survey of factors and measures. *Cities & Health*, 9(2), 298–318.
<https://doi.org/10.1080/23748834.2024.2387931>
- UNICEF Innocenti. (2025). Why participation matters: The evidence for involving children and youth in policy and decision-making. UNICEF Global Office of Research and Foresight.
https://www.unicef.org/innocenti/media/11491/file/UNICEF-Innocenti-Discussion-Paper-Beyond-Being-Heard_2025.pdf
- Vidal, D. G., & Castro Seixas, E. (2022). Children's green infrastructure: Children and their rights to nature and the city. *Frontiers in Sociology*, 7, 804535.
<https://doi.org/10.3389/fsoc.2022.804535>
- Wang, X., Huang, J., Qin, Z., Gan, W., He, Z., & Li, X. (2025). Is the Children's 15-Minute City an Effective Framework for Enhancing Children's Health and Well-Being? An Empirical Analysis from Western China. *Buildings*, 15(2), 248. <https://doi.org/10.3390/buildings15020248>
- Williams, G. C., Borghese, M. M., Janssen, I., & Chaput, J.-P. (2018). *Neighborhood walkability and objectively measured active transportation among 10–13 year olds*. *Journal of Transport & Health*, 8, 202–209. <https://doi.org/10.1016/j.jth.2017.12.004>
- Wilson, K., Clark, A.F. & Gilliland, J.A. Understanding child and parent perceptions of barriers influencing children's active school travel. *BMC Public Health* **18**, 1053 (2018).
<https://doi.org/10.1186/s12889-018-5874-y>
- Wilson, K., Coen, S. E., Piaskoski, A., & Gilliland, J. A. (2019). *Children's perspectives on neighbourhood barriers and enablers to active school travel: A participatory mapping study*. *The Canadian Geographer / Le Géographe canadien*, 63(1), 112–128.
<https://doi.org/10.1111/cag.12488>
- Xing, R., Rachele, J. N., Matolic, T., Loh, V., Cerin, E., Jiao, J., Huang, W. Y., & Pedisic, Z. (2025). Associations between parental perceptions of neighbourhood environment and physical activity in children and adolescents: A systematic review including 149 studies. *International Journal of Behavioral Nutrition and Physical Activity*, 22(1), 70.
<https://doi.org/10.1186/s12966-025-01733-8>
- Yin, Li & Patterson, Kelly & Silverman, Robert & Wu, Laiyun & Zhang, Hao. (2020). Neighbourhood accessibility and walkability of subsidised housing in shrinking US cities. *Urban Studies*. 59. 323-340. 10.1177/0042098020962413.
- Zeng, E., Hino, K., & Bessho, A. (2025). Key factors of independent active school travel in Chiba, Japan: Focusing on crime safety and community initiatives. *Travel Behaviour and Society*, 40, 101036. <https://doi.org/10.1016/j.tbs.2025.101036>

Zhou, X., Li, D., & Larsen, L. (2016). Using Web-Based Participatory Mapping to Investigate Children's Perceptions and the Spatial Distribution of Outdoor Play Places. *Environment and Behavior*, 48(7), 859–884. <https://doi.org/10.1177/0013916515571732>

Annex I [Selected Papers]

RQ1: Proximity and Mobility Link		
Authors	Article Title	Publication Year
Wang, X.; Huang, J.; Qin, Z.; Gan, W.; He, Z.; Li, X	Is the Children's 15-Minute City an Effective Framework for Enhancing Children's Health and Well-Being? An Empirical Analysis from Western China	2025
Maté Sánchez-de-Val, A. P., Maté Sánchez-de-Val, M., & López Hernández, F. A.	Are 15-minute cities for children? Exploring the socio-economic factors in Madrid	2025
Ikeda, E; Hinckson, E; Witten, K; Smith, M	Assessment of direct and indirect associations between children active school travel and environmental, household and child factors using structural equation modelling	2019
Ito, K; Reardon, TG; Arcaya, MC; Shamsuddin, S; Gute, DM; Srinivasan, S	Built Environment and Walking to School Findings from a Student Travel Behavior Survey in Massachusetts	2017
Li, M; Wang, YP; Zhou, D	Effects of the built environment and sociodemographic characteristics on Children's school travel	2023
Loh, V; Sahlqvist, S; Veitch, J; Walsh, A; Cerin, E; Salmon, J; Mavoa, S; Timperio, A	Active travel, public transport and the built environment in youth: Interactions with perceived safety, distance to school, age and gender	2024
Xing R.; Rachele J.N.; Matolic T.; Loh V.; Cerin E.; Jiao J.; Huang W.Y.; Pedisic Z.	Associations between parental perceptions of neighbourhood environment and physical activity in children and adolescents: a systematic review including 149 studies	2025
Mandic, S; Sandretto, S; Hopkins, D; Wilson, G; Kidd, G; Bengoechea, EG	School choice, distance to school and travel to school patterns among adolescents	2023
Andersen, OK; Gebremariam, MK; Kaupang, OB; Lien, N; Kolle, E	Built for movement: Neighborhoods and adolescent physical activity behaviors, and the moderating role of socioeconomic position and gender	2024
Plaza-Herrera D.; Mercadé-Aloy J.	Inclusive 15-minute cities: An age-sensitive assessment of active accessibility in the metropolitan area of Barcelona	2025

Williams G.C.; Borghese M.M.; Janssen I.	Neighborhood walkability and objectively measured active transportation among 10–13 year olds	2018
Gorrini, A; Presicce, D; Messa, F; Choubassi, R	Walkability for children in Bologna: Beyond the 15-minute city framework	2023
Khanian, M., Łaskiewicz, E., Kronenberg, J., Baró, F., & Khmara, Y.	Greenery in the 15-minute city: Children's walking accessibility and visual exposure to greenery in urban zones	2026
Bulloch, M., & Olsen, J. R	Exploring young people's views of their local area related to the 20-minute neighbourhood policy: a national cross-sectional study	2024
Omwamba, J., Rotaris, L., & Longo, G.	An assessment of proximity in the 15-Minute City: A systematic literature review	2025
RQ2: Participatory Approaches in CYP		
Authors	Article Title	Publication Year
De Iorio, A. G. D., Le Pira, M., Giuffrida, N., & Ignaccolo, M.	Fostering active citizen participation and co-design of evidence-based sustainable mobility solutions: a case of Italian schools	2026
Wilson, K; Coen, SE; Piaskoski, A; Gilliland, JA	Children's perspectives on neighbourhood barriers and enablers to active school travel: A participatory mapping study	2019
Legorburu, I; Mondragon, NI; Alonso, I; Berasategi, N	Why are you allowed to go to school on your own? Exploring children's voices on independent mobility	2022
Berasategi Sancho, N., Eiguren Munitis, A., Legorburu Fernandez, I. L., & Idoiaga-Mondragon, N. I.	Children's Active and Autonomous School Journeys and Their Implications: An Investigation Using Drawing Methodology	2026
Zhou, X. L., Li, D. Y., & Larsen, L.	Using Web-Based Participatory Mapping to Investigate Children's Perceptions and the Spatial Distribution of Outdoor Play Places	2016
Michail, N., Ozbil Torun, A., & Parnell, R	Towards child-friendly and walkable cities: Children's insights on neighbourhood design	2025
Colacios, R	Citizen science for healthier and more inclusive environments: co-creating public play spaces with autistic children	2025

Rodela, R., Nejadi, O., & Falk, E.	Talking about my future city: Engaging young voices through persona-based participation	2025
Tayefi Nasrabadi, M., García, E. H., & Pourzakarya, M.	Let children plan neighborhoods for a sustainable future: a sustainable child-friendly city approach	2021
Charalambous, N., Panayi, C., Mady, C., Augustinčić, T., & Berc, D.	Youth engagement in urban living labs: tools, methods and pedagogies	2025
Rashid-Irfan, J., & Mir, H	Perspectives of Children and Youth in Urban Planning: Emerging Evidence	2023
Cordero-Vinueza, V. A., Niekerk, F., & van Dijk, T.	Making child-friendly cities: A socio-spatial literature review	2023
Winge, L., & Lamm, B.	Making the red dot on the map - bringing children's perspectives to the city planning agenda through visible co-design actions in public spaces	2019
Nelischer M.	Moving, mapping, imagining: Youth-centered methods for understanding and envisioning mobility	2025
Krishnamurthy, S.	Reclaiming spaces: child inclusive urban design	2019
RQ3: Barriers and Facilitators of Integration		
Authors	Article Title	Publication Year
Rinne, T; Moll, V; Alderton, A; Berg, P; Hakala, P; Pesola, AJ	Fare-free public transport supporting children's independence and ease of using public transport	2026
Smith, M; Hawley, G; Mackay, L; Hosking, J; Mackie, H; Ikeda, E; Egli, V; Ellaway, A; Witten, K	Impact of changing road infrastructure on children's active travel: A multi-methods study from Auckland, New Zealand	2020
Wilson, K; Clark, AF; Gilliland, JA	Understanding child and parent perceptions of barriers influencing children's active school travel	2018
Zeng, ER; Hino, K; Bessho, A	Key factors of independent active school travel in Chiba, Japan: Focusing on crime safety and community initiatives	2025
Stafford, L., Adkins, B., & Franz, J.	Bounded at the driveway's edge: body-space tensions encountered by children with mobility impairments in moving about the neighbourhood street	2020
Burford, K. G., Salvo, D., Kohl, H. W. III, Ganzar, L. A., Bauer, C. X.,	Examination of Traffic Safety in Neighborhoods Associated With Active Commuting to School in Austin, Texas	2026

Resendiz, E., Zhang, Y. Z., & Hoelscher, D. M.		
Jafari, M., Delbosc, A., & Currie, G	Factors associated with public transport use to school and non-school destinations among adolescents	2025
Wales, M., Mårtensson, F., & Jansson, M.	You can be outside a lot': independent mobility and agency among children in a suburban community in Sweden	2021
Alqasem, Q.	Best Practice Child- and Youth-friendly Cities - Development of an Integrated and Comprehensive Framework through a Systematic Review	2026
Agarwal, M. K., Sehgal, V., & Ogra, A.	Creating a Child-Friendly Environment: An Interpretation of Children's Drawings from Planned Neighborhood Parks of Lucknow City	2021
Allam, Z., Bibri, S. E., Chabaud, D., & Moreno, C.	The Theoretical, Practical, and Technological Foundations of the 15-Minute City Model: Proximity and Its Environmental, Social and Economic Benefits for Sustainability	2022
Allam, Z., Khavarian-Garmsir, A. R., Lassaube, U., Chabaud, D., & Moreno, C.	Mapping the Implementation Practices of the 15-Minute City	2024

Table 2: Overview of Selected Papers Grouped by Research Question and Source