



This is a non-peer-reviewed preprint submitted to EarthArXiv.

Accessibility and its many dimensions: why geographical accessibility should be named explicitly

Muukkonen, P. ^{1,*}

¹ *Department of Geosciences and Geography, University of Helsinki, Finland*

* Corresponding author

<https://orcid.org/0000-0003-4222-1349>

Department of Geosciences and Geography

Faculty of Science

University of Helsinki

P.O. Box 64

00014 University of Helsinki

FINLAND

petteri.muukkonen@helsinki.fi

Peer review status: Accepted for the *Fennia - International Journal of Geography*

Accessibility and its many dimensions: why geographical accessibility should be named explicitly

PETTERI MUUKKONEN

Abstract

In geography and transport research, accessibility is often defined and measured precisely, yet the term is frequently used as shorthand for geographical accessibility. This can reduce transparency in interdisciplinary contexts, where accessibility also refers to social, temporal, financial, informational, institutional, material, skills-related and experiential conditions of actual use. Geographical measures such as distance, travel time, travel cost, network connectivity and reachable opportunities remain indispensable, but they capture only one part of access. Drawing on a ten-dimensional accessibility model first developed in Finnish physical-activity planning, this review situates geographical accessibility within a broader vocabulary of access conditions. This review has two related aims. First, it argues that geographical accessibility should be named explicitly when spatial measures such as distance, travel time, travel cost or network connectivity are being analysed. Second, it situates geographical accessibility as one dimension within a broader multidimensional understanding of accessibility, which also includes social, temporal, financial, informational, institutional, material, skills-related and experiential conditions of use. Rather than proposing a universal theory of accessibility, the review uses the ten dimensions to relate geographical accessibility to conditions already discussed in transport, planning, disability, digital inclusion and public-service research. The contribution of this review is integrative and critical: the vocabulary is useful for research and planning only if its limits, overlaps and dependence on existing accessibility debates are made explicit.

Keywords: Accessibility, geographical accessibility, perceived accessibility, multidimensional accessibility, service access, spatial analysis

Introduction

Accessibility is a key concept and analytical perspective in geography and transport research. It has long been defined in relation to the ease of reaching opportunities, from Hansen's (1959) classic formulation of accessibility as the potential for interaction to later work that distinguishes land-use, transport, temporal, and individual components (Geurs & van Wee 2004). Accessibility-oriented planning has also become central to sustainable mobility debates, although recent work has cautioned that accessibility should not be treated simply as something to be increased without considering how it is produced, for whom, and with what trade-offs (Willberg et al. 2026). The starting point is a terminological and conceptual concern: when geographical scholars refer specifically to distance-, travel-time-, travel-cost-, or network-based accessibility, they tend to use *geographical accessibility* as a general term. While *accessibility* remains a useful concept here, it becomes imprecise when used as the default label for only one way of operationalising access. In this article, geographical accessibility refers to the ease of reaching opportunities from relevant origins through measures such as distance, travel time, travel cost, network connectivity and reachable opportunities. Throughout the article, the term is used specifically for this spatial dimension of access rather than for accessibility in its broader multidimensional sense.

The distinction matters because accessibility is not owned by geography as a discipline. Related debates address affordability and cost burdens, universal design and assistive technologies, stigma and help-seeking, administrative burden, digital inclusion, and information access (American Library Association 2019; Burgstahler 2014; Moynihan et al. 2015; Schnyder et al. 2017; Herd et al. 2023; Knology 2022; Litman 2025; Raihan et al. 2025). Taken together, these literatures show that multidimensional thinking is not absent from accessibility research. The argument of this review is more specific: when the unqualified term 'accessibility' is used for spatial or geographical operationalisations, it can become unclear whether the analysis concerns one dimension of access or accessibility as a broader condition of use.

The idea for this article arose from an insight developed in the multidisciplinary research project *Equitable physically active suburb (YLLI)*, which examined equality in opportunities for physical activity (see Muukkonen et al. 2022). In that work, accessibility became both an analytical concept and a practical planning concern. Discussions with researchers, municipal practitioners and other stakeholders showed that the term 'accessibility' was widely usable across fields but carried different meanings for different actors. The subsequent project *For*

equal opportunities for physical activity (YLLI 2.0) showed that municipalities recognised a practical need for tools that help distinguish different accessibility barriers in expert work (see Vanttinen & Muukkonen 2026). This insight provides a basis for extending the ten-dimensional accessibility model beyond physical-activity opportunities to other everyday services, places and activities, with attention to how geographical accessibility can be named, delimited and related to other access conditions (Muukkonen et al. 2022, 3, 19–27; Virmasalo & Hasanen 2022).

This discussion connects to recent work on *perceived* accessibility. Negm, De Vos, Pot and El-Geneidy (2025, 11) define perceived accessibility as “the perception of how easily one can access their desired destinations using a (range of) specific mode(s)”. Their review shows why terminology matters: calculated indicators do not translate automatically into perceived ease of use, and perceptions may be shaped by spatial knowledge, travel skills, attitudes, adaptation to local circumstances, and past experiences. The point is not that GIS-based indicators are unnecessary. Rather, calculated geographical accessibility should be named as such, and its scope should be made transparent when the research question concerns actual use, perceived possibility, or equality of access.

The purpose of this review is to situate the ten-dimensional accessibility model developed in the YLLI project within international accessibility scholarship and to clarify how geographical accessibility relates to other access conditions. Rather than proposing a new theory of accessibility, the review examines how a multidimensional accessibility vocabulary can support more precise use of concepts, measures and claims in geographical research and planning, particularly when accessibility is discussed in relation to the actual use of everyday services, places and activities.

Positioning the ten-dimensional accessibility model and the explicit naming of geographical accessibility

If geographical accessibility is used to refer to the spatial ease of reaching opportunities through measures such as distance, travel time, travel cost and network connectivity, accessibility in a broader sense covers social, temporal, financial, informational, institutional, material, skills-related and experiential conditions (cf. Geurs & van Wee 2004; Negm et al. 2025). The issue addressed here is terminological and operational: when a study that measures distance, travel time, cost or network impedance calls the result simply ‘accessibility’, the geographical scope of accessibility may be obscured.

More precise wording helps avoid the slippage from *measured* geographical accessibility to accessibility in practice. This is especially important in interdisciplinary work. In planning practice, public services, digital environments, disability studies, and health care, accessibility may refer to affordability, barrier-free design, comprehensible information, safety, institutional rights, or social inclusion. Semm and Palang (2010) make this point by arguing for a broadened concept of accessibility that is not limited to territorial access and by framing accessibility through an accessibility–inaccessibility opposition that foregrounds exclusion, segregation, and the production of social identities. Such work does not make geographical accessibility less important but shows *why* geographical accessibility should be named as one dimension within a wider vocabulary rather than left as an unmarked default.

This is also where transport geography literature on perceived accessibility provides a concrete bridge between spatial measures and lived reality. A recent review concludes that perceived accessibility is often defined and measured ambiguously, and that instruments may lack robust validation for capturing what ‘accessibility’ and ‘perception’ mean at the individual level (Negm et al. 2025). It also notes that commonly used “objective accessibility” indicators embed researcher choices and assumptions and, therefore, recommends the more transparent term “calculated accessibility” for conventional GIS-based measures. This concern with naming and scope leads to the broader question of how geographical accessibility can be related to other conditions that shape whether services, places and activities can actually be used.

In response to these concerns, the ten-dimensional accessibility model portrayed in Figure 1 was created in the YLLI project, in cross-disciplinary collaboration between geographers, physical-activity researchers and municipal practitioners. The project examined equality in opportunities for an active lifestyle, and its final report developed conceptual and practical tools for cross-sector physical-activity planning (Muukkonen et al. 2022). One of the key findings was that facility provision and geographical proximity alone did not explain why some residents remained physically inactive or unable to use available opportunities.

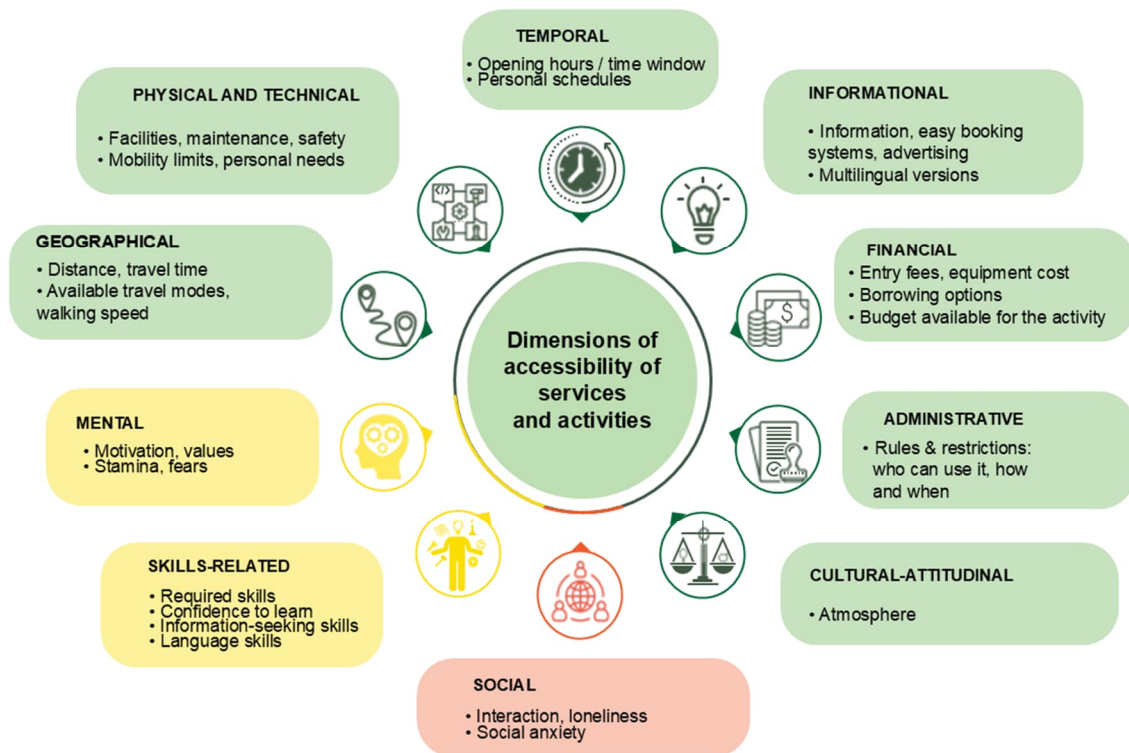


Figure 1. Ten dimensions of accessibility as a vocabulary for identifying barriers and enabling conditions of actual use. Geographical accessibility is one dimension among others, not accessibility as a whole. Adapted from Muukkonen et al. (2022, 19), published under a CC BY 4.0 licence.

The project gradually broadened its focus from spatial accessibility to a wider examination of barriers and enabling conditions through a cultural-accessibility framework, survey findings, equality workshops, stakeholder discussions and theoretical reflection. Commonly reported barriers included low mood or fatigue, lack of time, health limitations, lack of companions, lack of information and financial constraints. Many of these barriers were not primarily geographical, even where facilities and outdoor environments were nearby. This observation motivated a shift from improving facility provision towards identifying and removing barriers to participation. Figure 2 presents this shift as a situated process in which different access conditions may combine before, during and after a journey or service encounter.

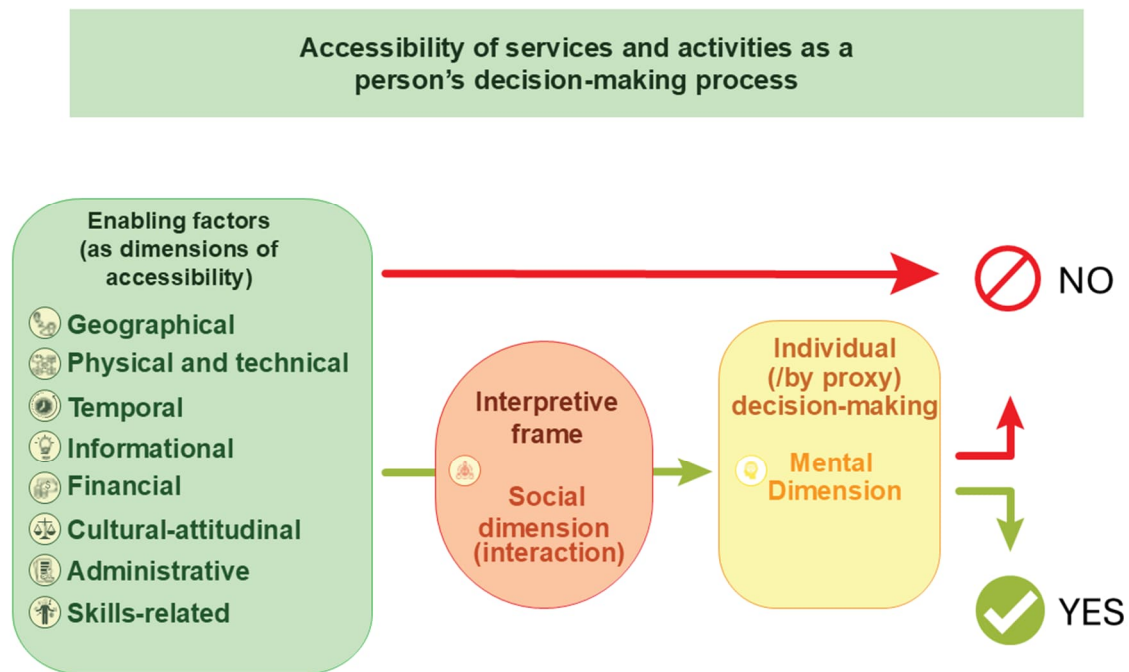


Figure 2. Accessibility as a situated process of becoming able to use a service or activity. The figure shows how access conditions may combine before, during and after a journey or service encounter. It is not a linear decision-making model. Adapted from Muukkonen et al. (2022, 27), published under a CC BY 4.0 licence.

The model is therefore treated not as a finished theory, but as a conceptual vocabulary for examining other services, places and activities. Its wider value depends on how the ten dimensions are related to debates on geographical accessibility, perceived accessibility, mobility and social exclusion, universal design, digital inclusion, administrative burden, affordability and access as a real opportunity to use services and places. The planning context explains why the model was developed, while the broader discussion clarifies what the ten dimensions may add to geographical research and planning, and what they do not add.

Conceptual descriptions of the ten dimensions of accessibility

A public library is used here as a case example because it combines physical premises, digital resources, information practices, social encounters, civic functions and institutional rules. The library example does not limit the model to libraries but is presented to illustrate how a single destination can involve several access conditions, and how a geographical measure can be

necessary but insufficient when the question is whether different people can actually use the service.

Geographical accessibility refers to the ease of reaching opportunities from relevant origins, such as home, work, school or other everyday locations. This builds on the classic view of accessibility as the potential for interaction and on later work that conceptualises accessibility through land-use, transport, temporal and individual components (Hansen 1959). Empirically, geographical accessibility is often operationalised through network distance, travel time, travel cost, transfers or other impedance indicators (Geurs & van Wee 2004). These measures become more informative when the whole trip and its constraints are considered. Time-geographical and person-based approaches show that access is shaped by daily activity sequences, temporal constraints and feasible opportunity sets, not only by destination locations (Hägerstrand 1970; Kwan 1998; Miller 1999).

Recent spatial accessibility research extends this tradition with multimodal and spatiotemporally detailed data on mode, time of day, network performance and the distribution of people and opportunities (Park & Goldberg 2021; Dianin et al. 2024). In the library example, a door-to-door approach includes walking to a stop, waiting, transferring, parking, locking a bicycle and the final walk to the entrance, not only the in-vehicle or in-network segment. Multimodality matters because the same library may be close by car, difficult by bus, easier by bicycle in summer than winter, or reachable during the day but not in the evening. Naming this as geographical accessibility makes the scope of the measure explicit before other dimensions are considered.

Cultural-attitudinal accessibility concerns the cultural meanings, norms and attitudes through which places become more or less recognisable as legitimate spaces of use. In the library example, proximity does not necessarily mean that users experience the place as being ‘for me’. Research on ethnic minority groups and public open spaces has shown that public environments are not culturally neutral: familiarity, representation, past experiences, perceived welcome and social norms shape whether people interpret a space as usable and meaningful (Rishbeth 2001; Gentin 2011). A similar issue arises in public libraries, which may be formally open to all but still require active attention to inclusion, outreach and recognition if excluded groups are to experience them as accessible institutions (Pateman 2025). Staff attitudes, narrow representations in posters or collections, norms of silence or surveillance, and previous exclusionary encounters can turn proximity into avoidance. In

contrast, small signals of inclusion, such as multilingual materials, diverse collections, or staff trained to support different users, can lower the threshold of use. In such cases, the barrier is not distance to the service, but the cultural and attitudinal conditions under which the service becomes recognisable as a place one can legitimately use.

Social accessibility means that a service is reached and used not only by individuals, but also through social relations, routines and forms of participation (Virmasalo & Hasanen 2022). In the library example, use may depend on social support; without it, newcomers may not enter even if the building is nearby. In this sense, social relations can function as resources that enable participation, a point that resonates with social capital literature (Bourdieu 1986). This dimension also connects with research on mobility, access and social exclusion, which emphasises that access is not only a matter of physical movement but also of the social relations and practices through which people are able to participate in everyday life (Cass et al. 2005; Lucas 2012). Public library research makes a parallel point: libraries may be formally open to all while still needing active outreach and recognition of excluded groups if they are to become socially inclusive institutions (Pateman 2025). Libraries can also function as meeting places and low-threshold social spaces, not only as service points for borrowing materials (Aabø & Audunson 2012). Conversely, loneliness, lack of local networks, or previous experiences of being out of place can make a nearby service socially distant.

Physical and technical accessibility concerns the material, sensory and technological conditions that make a service usable. In the library example, a nearby building may still be unusable if steps at the entrance, heavy doors, poor lighting, or the lack of quiet spaces restrict use. This dimension overlaps with universal design and disability-accessibility debates, in which access is understood as a design responsibility rather than as an individual exception to be accommodated afterwards. In library contexts, universal design concerns routes, entrances, shelves, signage, interaction with staff, events, printed material, electronic resources and assistive technologies (Burgstahler 2014). A recent landscape review of accessibility in libraries similarly shows how access depends on both physical conditions and technical arrangements, including large-print material, audiobooks, screen readers, magnification software, e-books and web accessibility (Knology 2022). In digital library services, ‘access’ may depend on devices, authentication, interface design, and compatibility with assistive technologies. A travel-time measure alone would not capture these barriers, which begin at the entrance, at the shelf, in the interface, or at the login screen.

Temporal accessibility concerns the timing and sequencing of access, including opening hours, waiting time and the fit between services and everyday schedules). In the library example, a nearby service can still be out of reach if opening hours follow a 9-to-5 rhythm, if evening or weekend hours are scarce, or if visiting requires a long uninterrupted time window. Time-geographical approaches have long shown that accessibility is constrained not only by space but also by the timing and sequencing of daily activities, obligations and travel opportunities (Hägerstrand 1970; Dodge & Nelson 2023). Studies of individual space-time accessibility further demonstrate that travel-time variation, congestion and facility opening hours can substantially alter individual access to opportunities (Weber & Kwan 2002; Delafontaine et al. 2011). In public service delivery, opening hours are therefore a constitutive part of accessibility: Neutens et al. (2012) show that service availability can change markedly when temporal constraints are incorporated into accessibility analysis. This can place shift workers and others living outside a conventional daily rhythm in a particularly difficult position. Queues for help desks or booked study rooms also turn proximity into waiting time. A geographical measure alone would not capture how opening hours, queues and daily schedules shape who can actually use the library.

Information accessibility concerns whether relevant information about a service is available, findable, understandable and actionable for different users). In service contexts, this means more than publishing information somewhere: people need to know that a service exists, whether they can use it, what it costs, what steps are required, and where to obtain help. This view resonates with health literacy research, where access depends not only on the availability of information but also on people's ability to understand and use it in decisions and action (Nutbeam 2000). In digital contexts, inequalities concern not only infrastructure or physical access to the internet, but also differences in use, skills and the capacity to benefit from online services (van Deursen & van Dijk 2014; Raihan et al. 2025). In the library example, users may need to understand how to get a card, book a room, access e-books, join events, or request accessible formats. Research on public libraries and digital inclusion shows that libraries can support public access by providing digital resources, connectivity, digital literacy support and assistance with education, employment, government services and civic participation (Jaeger et al. 2012). If instructions are available only in complex language, only online, or are poorly signposted in the building, access can fail despite geographical proximity. The problem, then, is not the absence of a nearby service but the absence of intelligible and actionable information about how to use it.

Financial accessibility concerns the direct and indirect costs that shape whether a formally available service can actually be used). In service research, affordability is recognised as a central dimension of access. In Levesque et al.'s (2013) patient-centred access framework, it concerns the economic capacity to spend resources and time to use appropriate services. Empirical evidence from primary healthcare similarly shows that out-of-pocket costs can reduce service use, while interventions that eliminate or reduce such costs can increase healthcare utilisation (Yee et al. 2024). In the library example, use may be free in principle, while still involving travel fares, printing fees, fines, replacement charges, or the need for a laptop, headphones, a data connection, or other equipment. For some users, small repeated costs or the risk of penalties may be enough to discourage use. In library debates, monetary fines have been explicitly criticised as barriers to equitable access because they can discourage low-income users from borrowing materials or returning to the library after accruing debt (American Library Association 2019). Transport-affordability debates make a parallel point for the journey itself: a service can be geographically available but financially out of reach if travel consumes too much of a household's limited resources (Litman 2025). Financial accessibility therefore concerns both the price of using a service and the cost of reaching it.

Administrative accessibility concerns the rules, procedures and eligibility conditions through which access is organised. In the library example, a nearby service may still be gated by proof of address, age limits, fines, bans, booking systems or municipal membership rules for e-resources. 'One-click' reservations can also exclude users if they presume digital IDs and constant connectivity. This dimension overlaps with administrative burden research, which conceptualises service use through learning, compliance and psychological costs in encounters with public institutions (Moynihan et al. 2015). These burdens are not neutral frictions: they can operate as mechanisms of inequality when they fall more heavily on marginalised groups (Herd et al. 2023). A systematic review further shows that burdens are consequential, distributive and constructed, and that frontline service delivery and government communication shape how they are experienced (Halling & Baekgaard 2024). Administrative rules define who is eligible, under what conditions and through which procedure; they can therefore make an apparently public service easier for some users to claim than for others. These institutional gatekeepers remain outside the analysis if accessibility is measured only through spatial proximity or travel time.

Skills-related accessibility concerns the competences needed to turn formal availability into actual use. In service contexts, these competences may include language skills, form-filling skills, digital skills, information literacy, confidence to ask for help, and familiarity with how an institution or activity works. A related formulation appears in health literacy research, where the ability to access, understand, appraise and apply information is treated as central to making decisions and acting in service-related contexts (Sørensen et al. 2012). In digital services, such skills are not secondary to access: digital inequality increasingly concerns differences in use, skills and the ability to benefit from online resources, not merely the availability of infrastructure (van Deursen & van Dijk 2014).

The original physical-activity context also points to a more embodied sense of skill, including perceived ability to take part in a sport or activity (Muukkonen et al. 2022, 24; Salmi et al. 2023). In sport and recreation, participation may depend on whether people feel able to perform the activity or learn the required movement practices; a systematic review of children's sport participation identified 'not being good at sport' and fear of being judged or embarrassed as recurring barriers (Somerset & Hoare 2018). In the library example, it may involve using catalogues, holds, e-books, self-service machines and help services. UNESCO frames media and information literacy as a set of competencies needed for critical participation in digital societies, not merely as technical device use (UNESCO 2023). If support is available only to those who already know how to request it, the barrier remains partly hidden. The obstacle lies not in distance, but in the competences required to turn formal availability into actual use.

Mental accessibility concerns affective and psychological thresholds that shape whether other access conditions become actionable. In the library example, anxiety, shame ('I don't belong here'), fear of asking for help, or worry about fines can block use even when the service is easy to reach. Complex service paths, such as cards, IDs and machines, can exhaust people before they begin. Mental accessibility should not be treated as a catch-all category for all perceived barriers. Rather, it refers to affective thresholds that may arise from stigma, uncertainty, fear of misunderstanding the service or earlier institutional encounters. Research on help-seeking shows that stigma, negative expectations and personal attitudes can reduce the use of formally available services (Henderson et al. 2013; Schnyder et al. 2017). Work on shame anxiety further suggests that anticipated shame can shape whether people avoid or delay contact with services (Dolezal 2022). By analogy, a public service can be

geographically nearby and formally open while still feeling difficult to enter or use. Other barriers may also become psychological thresholds: unclear information, social discomfort, administrative rules, or low digital confidence can prevent use despite geographical proximity.

Value, limits and applications of multidimensional accessibility

The ten dimensions are most useful as a multidimensional accessibility vocabulary, not as a new theory of accessibility. The phenomena named by the ten dimensions overlap with established literatures on geographical and transport accessibility, perceived accessibility, social exclusion and mobility, universal design, digital inclusion, affordability, administrative burden, and information or media literacy (Hansen 1959; Geurs & van Wee 2004; Cass et al. 2005; Lucas 2012; Burgstahler 2014; Moynihan et al. 2015; Herd et al. 2023; Knology 2022; Litman 2025; Negm et al. 2025; Public Library Association n.d.; Raihan et al. 2025; UNESCO 2023). The added value lies in bringing these partly separate discussions into one analytical language, helping researchers and planners ask which access condition is examined, what remains outside the analysis, and whether ‘accessibility’ is used too broadly for the evidence presented.

The vocabulary is therefore mainly integrative and pedagogical. It can support reviews, empirical designs and planning discussions by making clear that different questions require different evidence. Travel-time studies may require geographical and temporal measures, whereas non-use or equality-oriented analysis may require evidence on information, rules, skills, social relations and perceived thresholds. In planning practice, the vocabulary can support cross-sector dialogue by distinguishing between different kinds of access problems. The dimensions are therefore better understood as a tool for conceptual clarification than as a fixed classification system: they encourage authors to state what kind of accessibility they analyse and what other conditions may matter.

The limits of the vocabulary are equally important. The dimensions are not mutually exclusive, and they should not be treated as fixed boxes into which empirical material can always be neatly sorted. Travel cost, for example, is both a financial condition and part of geographical impedance; opening hours are temporal but also administrative; digital authentication may be technical, skills-related and administrative at the same time; and fear of exclusion may be cultural-attitudinal, social and mental. These overlaps are not

weaknesses if they are acknowledged. They become problematic only if the vocabulary is used mechanically, as if every study had to cover all dimensions or as if each barrier belonged to only one category.

This also means that the argument should not be read as a rejection of geographical accessibility. On the contrary, geographical accessibility remains indispensable for analysing the spatial distribution of opportunities, the transport systems that connect them, and the inequalities produced by land use and mobility arrangements. At the same time, accessibility is not a neutral good whose increase is always self-evidently beneficial: the effects of accessibility depend on whether access is produced through speed, proximity or other arrangements, and on the social, environmental and spatial trade-offs that follow (Willberg et al. 2026). The point is more modest and more precise: geographical accessibility should be named as such when it is the dimension being measured, and broader claims about accessibility should be supported by evidence that corresponds to the wider access conditions being discussed. A multidimensional vocabulary is useful only if it sharpens rather than blurs the relationship between concepts, measures and planning responses.

The accessibility model was originally developed in the context of physical activity and sport participation, where it was used to examine equality in opportunities for an active lifestyle (Muukkonen et al. 2022; Virmasalo & Hasanen 2022). When the scope of the model is widened, the ten dimensions can be used to examine everyday destinations and services that people may need or wish to reach, use or participate in, including public services, shops, workplaces, education, cultural facilities, health care, social activities, family and friendship networks, civic participation, and digital or hybrid services. Public transport is treated as part of the transport system that enables or constrains access, not as a destination type.

The dimensions help clarify two common shifts in meaning. First, planning and research communication may overemphasise proximity because it is visible, mappable and politically actionable, even when other access conditions matter. Second, travel time, distance thresholds, accessibility indices or network impedance may be presented as if they captured all relevant access conditions because they are calculable (Geurs & van Wee 2004; Negm et al. 2025). The dimensions therefore help researchers state what a measure captures, what it leaves outside and what further evidence is needed when the question concerns actual use or equality-oriented planning.

Perceived accessibility research clarifies why this matters. To explain use and non-use, location alone is insufficient; perceived ease of reaching destinations with feasible modes under real-life constraints also matters (Negm et al. 2025). Perceived accessibility is not identical to the ten dimensions used here, but it cuts across them: financial costs, information, opening hours, social comfort, skills and prior experiences can all shape whether a destination is perceived as reachable and suitable.

For empirical research and planning practice, this calls for more explicit specification. Studies should define which dimension or combination of dimensions they examine and distinguish geographical accessibility from other access conditions when needed. When geographical measures are used, their metric and scope should be explicit: distance, travel time, travel cost, door-to-door trip chains, modal constraints, time of day or other impedance factors. When the question concerns use, non-use, inclusion or equality, geographical measures may need evidence on rules, information, skills, costs, experiences or perceptions.

Conclusion

This review has advanced two related arguments. First, geographical accessibility should be named explicitly when spatial measures such as distance, travel time, travel cost or network connectivity are being analysed. Second, geographical accessibility should be understood as one dimension within a broader multidimensional understanding of accessibility.

Geographical research is especially strong in analysing the spatial distribution of opportunities, transport networks and inequalities produced by uneven land use and mobility systems. These strengths remain essential, but calculated spatial indicators can become conceptual shortcuts if their limits are not specified. Using ‘accessibility’ without clarification may privilege proximity, travel time or network connectivity while overlooking barriers related to information, skills, rules, prices, schedules, social relations and perceptions (Muukkonen et al. 2022, 13–17, 19–27; Virmasalo & Hasanen 2022; Muukkonen 2023; Muukkonen et al. 2023; Salmi et al. 2023).

The conclusion is therefore not that geographical accessibility is too narrow to be useful. It is indispensable, but it should be named and delimited when it is the dimension being measured. This makes room for other evidence when research concerns actual use, perceived possibility or equality of access. The ten-dimensional accessibility model helps make this distinction visible, especially when adapted carefully to different services, places and activities and

positioned within existing accessibility scholarship. For geographical research, the task is not to replace spatial measures with an expanding list of access conditions, but to align concepts, measures and claims more precisely. When accessibility means geographical accessibility, spatial and mobility components should be explicit; when it refers to actual use more broadly, social, temporal, financial, informational, institutional, material, skills-related and experiential dimensions also need appropriate evidence.

References

- Aabø, S. & Audunson, R. (2012) Use of library space and the library as place. *Library & Information Science Research* 34(2) 138–149.
<https://doi.org/10.1016/j.lisr.2011.06.002>
- Yee, B., Mohan, N., McKenzie, F. & Jeffreys, M. (2024) What interventions work to reduce cost barriers to primary healthcare in high-income countries? A systematic review. *International Journal of Environmental Research and Public Health* 21(8) 1029.
<https://doi.org/10.3390/ijerph21081029>
- American Library Association (2019) *Resolution on Monetary Library Fines as a Form of Social Inequity*. American Library Association, Chicago.
https://www.ala.org/aboutala/sites/ala.org.aboutala/files/content/governance/council/council_documents/2019_ms_council_docs/ALA%20CD%2038%20RESOLUTION%20ON%20MONETARY%20LIBRARY%20FINES%20AS%20A%20FORM%20OF%20SOCIAL%20INEQUITY%20Final.pdf
- Bourdieu, P. (1986) The forms of capital. In Richardson, J. G. (ed.) *Handbook of Theory and Research for the Sociology of Education*, 241–258. Greenwood Press, New York.
- Burgstahler, S. (2014) *Equal Access: Universal Design of Libraries*. University of Washington, Seattle. <https://www.washington.edu/doit/equal-access-universal-design-libraries>
- Cass, N., Shove, E. & Urry, J. (2005) Social exclusion, mobility and access. *The Sociological Review* 53(3) 539–555. <https://doi.org/10.1111/j.1467-954X.2005.00565.x>
- Delafontaine, M., Neutens, T., Schwanen, T. & Van de Weghe, N. (2011) The impact of opening hours on the equity of individual space-time accessibility. *Computers, Environment and Urban Systems* 35(4) 276–288.
<https://doi.org/10.1016/j.compenvurbsys.2011.02.005>
- Dianin, A., Gidam, M., Hauger, G. & Ravazzoli, E. (2024) Measuring public transport accessibility to fixed activities and discretionary opportunities: a space–time

- approach. *European Transport Research Review* 16 9. <https://doi.org/10.1186/s12544-024-00636-2>
- Dodge, S. & Nelson, T. A. (2023) A framework for modern time geography: emphasizing diverse constraints on accessibility. *Journal of Geographical Systems*.
<https://doi.org/10.1007/s10109-023-00404-1>
- Dolezal, L. (2022) Shame anxiety, stigma and clinical encounters. *Journal of Evaluation in Clinical Practice* 28(5) 854–860. <https://doi.org/10.1111/jep.13744>
- Gentin, S. (2011) Outdoor recreation and ethnicity in Europe: a review. *Urban Forestry & Urban Greening* 10(3) 153–161. <https://doi.org/10.1016/j.ufug.2011.05.002>
- Geurs, K. T. & van Wee, B. (2004) Accessibility evaluation of land-use and transport strategies: review and research directions. *Journal of Transport Geography* 12(2) 127–140. <https://doi.org/10.1016/j.jtrangeo.2003.10.005>
- Hansen, W. G. (1959) How accessibility shapes land use. *Journal of the American Institute of Planners* 25(2) 73–76. <https://doi.org/10.1080/01944365908978307>
- Hägerstrand, T. (1970) What about people in regional science? *Papers of the Regional Science Association* 24 7–24. <https://doi.org/10.1111/j.1435-5597.1970.tb01464.x>
- Henderson, C., Evans-Lacko, S. & Thornicroft, G. (2013) Mental illness stigma, help seeking, and public health programs. *American Journal of Public Health* 103(5) 777–780. <https://doi.org/10.2105/AJPH.2012.301056>
- Halling, A. & Baekgaard, M. (2024) Administrative burden in citizen–state interactions: a systematic literature review. *Journal of Public Administration Research and Theory* 34(2) 180–195. <https://doi.org/10.1093/jopart/muad023>
- Jaeger, P. T., Bertot, J. C., Thompson, K. M., Katz, S. M. & DeCoster, E. J. (2012) The intersection of public policy and public access: digital divides, digital literacy, digital inclusion, and public libraries. *Public Library Quarterly* 31(1) 1–20.
<https://doi.org/10.1080/01616846.2012.654728>
- Herd, P., Hoynes, H., Michener, J. & Moynihan, D. (2023) Introduction: administrative burden as a mechanism of inequality in policy implementation. *RSF: The Russell Sage Foundation Journal of the Social Sciences* 9(5) 1–30.
<https://doi.org/10.7758/RSF.2023.9.5.01>
- Kwan, M.-P. (1998) Space-time and integral measures of individual accessibility: a comparative analysis using a point-based framework. *Geographical Analysis* 30(3) 191–216. <https://doi.org/10.1111/j.1538-4632.1998.tb00396.x>

- Knology (2022) *Accessibility in Libraries: A Landscape Review*. Knology, New York.
<https://knology.org/article/enhancing-library-accessibility/>
- Litman, T. (2025) *Evaluating Transportation Affordability*. Victoria Transport Policy Institute, Victoria. <https://www.vtpi.org/affordability.pdf>
- Levesque, J.-F., Harris, M. F. & Russell, G. (2013) Patient-centred access to health care: conceptualising access at the interface of health systems and populations. *International Journal for Equity in Health* 12 18. <https://doi.org/10.1186/1475-9276-12-18>
- Lucas, K. (2012) Transport and social exclusion: where are we now? *Transport Policy* 20 105–113. <https://doi.org/10.1016/j.tranpol.2012.01.013>
- Miller, H. J. (1999) Measuring space-time accessibility benefits within transportation networks: basic theory and computational procedures. *Geographical Analysis* 31(1) 1–26. <https://doi.org/10.1111/j.1538-4632.1999.tb00408.x>
- Moynihan, D., Herd, P. & Harvey, H. (2015) Administrative burden: learning, psychological, and compliance costs in citizen-state interactions. *Journal of Public Administration Research and Theory* 25(1) 43–69. <https://doi.org/10.1093/jopart/muu009>
- Muukkonen, P., Ehnström, E., Hasanen, E., Hintsanen, L., Laakso, T., Nurmi, M., Pyykönen, J., Salmi, L., Salmikangas, A.-K., Simula, M., Virmasalo, I. & Vääntinen, L. (2022) *Matkalla kohti liikunnan yhdenvertaisuutta: työkaluja monialaiseen liikuntasuunnitteluun* [On the way towards equality in physical activity: tools for cross-sector physical activity planning]. Department of Geosciences and Geography C22. Helsingin yliopisto, Helsinki. <http://hdl.handle.net/10138/356119>
- Muukkonen, P. (2023) Liikkumisen ja aktiivisuuden esteitä tulisi poistaa lähiöissä [Barriers to mobility and physical activity should be removed in suburbs]. *Terra* 135(3) 153–156. <https://terra.journal.fi/article/view/136346/85930>
- Muukkonen, P., Ehnström, E. M., Hasanen, E., Hintsanen, L. K. M., Laakso, T., Nurmi, M. K., Pyykönen, J., Salmi, L., Salmikangas, A.-K., Simula, M., Virmasalo, I. & Vääntinen, L. (2023) *Policy brief: Liikunnan harrastamisen esteitä tulisi poistaa lähiöissä (3/2023)* [Policy brief: barriers to participation in physical activity should be removed in suburbs]. University of Helsinki, Helsinki. <http://hdl.handle.net/10138/357319>
- Negm, H., De Vos, J., Pot, F. & El-Geneidy, A. (2025) Perceived accessibility: a literature review. *Journal of Transport Geography* 125 104212. <https://doi.org/10.1016/j.jtrangeo.2025.104212>

- Neutens, T., Delafontaine, M., Schwanen, T. & Van de Weghe, N. (2012) The relationship between opening hours and accessibility of public service delivery. *Journal of Transport Geography* 25 128–140. <https://doi.org/10.1016/j.jtrangeo.2011.03.004>
- Nutbeam, D. (2000) Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International* 15(3) 259–267. <https://doi.org/10.1093/heapro/15.3.259>
- Park, J. & Goldberg, D. W. (2021) A review of recent spatial accessibility studies that benefitted from advanced geospatial information: multimodal transportation and spatiotemporal disaggregation. *ISPRS International Journal of Geo-Information* 10(8) 532. <https://doi.org/10.3390/ijgi10080532>
- Pateman, J. (2025) Open to all: social exclusion, inclusion or cohesion? In Pateman, J. & Vincent, J. (eds.) *Reimagining the Public Library*. Cambridge University Press, Cambridge. <https://doi.org/10.29085/9781783307333.004>
- Raihan, M. M. H., Ali, M. J., Khan, M. M. R. & Islam, M. R. (2025) Dimensions and barriers for digital (in)equity and digital divide: a systematic integrative review. *Digital Transformation and Society* 4(2) 111–127. <https://doi.org/10.1108/DTS-04-2024-0054>
- Rishbeth, C. (2001) Ethnic minority groups and the design of public open space: an inclusive landscape? *Landscape Research* 26(4) 351–366. <https://doi.org/10.1080/01426390120090148>
- Salmi, L. V., Hasanen, E., Simula, M., Virmasalo, I. & Muukkonen, P. (2023) Perceived barriers to physical activity in the social spaces of low socioeconomic status suburbs. *Wellbeing, Space and Society* 5 100164. <https://doi.org/10.1016/j.wss.2023.100164>
- Sørensen, K., Van den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z. & Brand, H. (2012) Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health* 12 80. <https://doi.org/10.1186/1471-2458-12-80>
- Somerset, S. & Hoare, D. J. (2018) Barriers to voluntary participation in sport for children: a systematic review. *BMC Pediatrics* 18 47. <https://doi.org/10.1186/s12887-018-1014-1>
- Schnyder, N., Panczak, R., Groth, N. & Schultze-Lutter, F. (2017) Association between mental health-related stigma and active help-seeking: systematic review and meta-analysis. *The British Journal of Psychiatry* 210(4) 261–268. <https://doi.org/10.1192/bjp.bp.116.189464>

- Semm, K. & Palang, H. (2010) Landscape accessibility: spaces for accessibility or spaces for communication? *Living Reviews in Landscape Research* 4 4.
<https://doi.org/10.12942/lrlr-2010-4>
- UNESCO (2023) *Media and Information Literacy and Digital Competencies*. UNESCO, Paris. <https://www.unesco.org/en/media-information-literacy>
- van Deursen, A. J. A. M. & van Dijk, J. A. G. M. (2014) The digital divide shifts to differences in usage. *New Media & Society* 16(3) 507–526.
<https://doi.org/10.1177/1461444813487959>
- Weber, J. & Kwan, M.-P. (2002) Bringing time back in: a study on the influence of travel time variations and facility opening hours on individual accessibility. *The Professional Geographer* 54(2) 226–240. <https://doi.org/10.1111/0033-0124.00328>
- Willberg, E., Tenkanen, H., van Wee, B. & Toivonen, T. (2026) Accessibility: can less be better? *Transportation Research Interdisciplinary Perspectives*.
<https://doi.org/10.1016/j.trip.2026.102160>
- Vänttinen, L. & Muukkonen, P. (2026) *Yhdenvertaisten liikkumismahdollisuuksien puolesta: YLLI 2.0 -hankkeen loppuraportti* [For equal opportunities for physical activity: final report of the YLLI 2.0 project]. Department of Geosciences and Geography C24. Helsingin yliopisto, Geotieteiden ja maantieteen laitos, Maantieteen osasto, Helsinki.
<http://hdl.handle.net/10138/637370>
- Virmasalo, I. & Hasanen, E. (2022) Defining the accessibility of physical activity: tracing the social dimension. *Contesti: Città, Territori, Progetti* 2022(2) 59–76.
<https://doi.org/10.36253/contest-14177>