Accessibility and the Capabilities Approach: a review of the literature and proposal for conceptual advancements

Giovanni Vecchio

Karel Martens

This is the pre-publication version of Vecchio, G., & Martens, K. (2021). Accessibility and the Capabilities Approach: a review of the literature and proposal for conceptual advancements. Transport Reviews, 41(6), 833-854.

Abstract

The Capabilities Approach, developed by Sen and Nussbaum, has recently gained increasing attention in the transport literature concerned with distributive justice. This paper investigates how the approach can generate consistent evaluative approaches to inform transport planning. The paper reviews the mobility literature that draws on the Capabilities Approach and identifies the opportunities and challenges of employing the approach as a basis for transport planning. The review highlights the different, and sometimes partial, ways in which the key notions of the approach have been conceptualised and operationalised. Discussing this growing but scattered literature, the paper embraces the emerging direction that understands accessibility as the capability that transport planning and policy should consider. Further refining this understanding, the paper proposes a twofold evaluative approach combining a top-down and a bottom-up component to capture the myriad of conversion factors shaping people's accessibility-as-capability and functioning. By systematically adopting the Capabilities Approach, transport planning and mobility policies will be directed to enhancing each person's freedom to pursue the life they have reason to value.

Keywords Capabilities Approach, Accessibility, Equity, Justice, Distributive Justice, Ethics, Transport Planning, Transport Policy, Accessibility

1. Introduction

Accessing opportunities is fundamental to take part in society. Hence, given the spatial dispersal of opportunities, being 'mobile' is necessary for, rather than a corollary to, the pursuit of one's most fundamental purposes. The importance of accessibility, understood as the potential for reaching spatially distributed opportunities and as being shaped by the interactions between land use, transport systems and individual features (cf. Hansen, 1959; Páez et al., 2012), is widely acknowledged by now. Yet, the prevalent approaches to transport planning and policy still tend to focus on the workings of the transport system(s), implicitly assuming that a system that works well implies accessibility to opportunities (Brown

et al., 2009). This approach, adopted since at least the early 1960s in many countries around the world, has indeed delivered (improvements in) accessibility for many, but has overlooked the situation of people poorly served by the existing transport system(s), with detrimental impacts for their accessibility to destinations and thus for their ability to fully participate in society, as a growing body of literature on mobility, transport, social exclusion and justice highlights (Lucas, 2012; Martens, 2017; Sheller, 2018; van Wee, 2011).

A promising perspective to reframe the practice of transport planning and policy draws on the 'Capabilities Approach' developed by Amartya Sen and Martha Nussbaum (Nussbaum, 2000, 2011; Nussbaum & Sen, 1993; Sen, 1985, 1999, 2009). The Capabilities Approach is a normative proposition, claiming that "social arrangements should be primarily evaluated according to the extent of freedom people have to promote or achieve functionings they value" (Alkire, 2003). Several authors have suggested that this approach can provide a conceptual framework to properly appraise the transport system as well as new transport projects, based on their contribution to individuals' opportunities and wellbeing. In comparison to other approaches focused on fairness in transport, the Capabilities Approach is particularly suited to account for the wide diversity of individuals, considering not only how mobility resources are distributed, but also how these differently affect people's opportunities depending on personal features, aspirations and choices.

The promises of the Capabilities Approach have been recognized by an increasing number of transport researchers, generating a growing literature that differently defines the same concepts and gives them varied (and often limited) operational applications. The paper builds on this work and investigates how the Capabilities Approach can serve as a basis for consistent evaluative approaches to inform transport planning and policies. The paper is structured as follows. Section 2 provides an overview of the Capabilities Approach, defining its structuring concepts. Section 3 highlights tendencies and challenges of the literature discussing how to conceptualise, analyse and plan mobility as a capability. Section 4 discusses accessibility as the capability that transport planning and policy should consider. Section 5 proposes a selective capabilities-based operational approach to transport planning and policy, based on the assessment of the basic accessibility that transport systems provide and on the analysis of the mobility practices that persons deploy. We end the paper with a conclusion and discussion (Section 6).

2. The Capabilities Approach: key terms

The Capabilities Approach, conceptualized by Amartya Sen and further developed by Martha Nussbaum, assumes as its starting point that the most important dimension of a person's life is their *freedom to choose* to lead one kind of life or another (Nussbaum & Sen, 1993). Despite some different conceptualisations between the two key thinkers (see Gasper, 1997 for a discussion), the Capabilities Approach converges on five features to understand a person's level of freedom: resources, conversion factors, capabilities, choices, and functionings:

- *Resources* are commodities and intangible goods available to a person. These depend on the person (including person's features and background) and the socio-spatial context in which the person is. Resources are considered as a "*means* to achievement" (Sen, 1992, p. 33).

- *Conversion factors* convey the personal, social, and environmental conditions that form the individual life experience. The factors determine what possibilities the person has for "the conversion of resources (…) into freedoms" (Sen, 1992, p. 33).
- *Capabilities* are the freedoms available to a person. Each capability is "whatever [people] are able to do and be in a variety of areas of life" (Nussbaum & Sen, 1993, p. 2). A capability conveys "the freedom that a person actually has to do this or be that – things that he or she may value doing or being" (Sen, 2009, pp. 231–232), that is to say, "the *choices* that the person does in fact have" (Sen, 1992, p. 38). All the capabilities available to a person constitute a set, made up of "the various combinations of functionings (beings and doings) that the person can achieve […] reflecting the person's freedom to lead one type of life or another" (Sen, 1992, p. 40).
- *Choice* refers to the person's decision in favour of a particular 'state' over another, selected from within their capability set (Sen, 1992, pp. 31–34).
- *Functionings* are what people actually achieve 'to be' or 'to do'. Each person puts into practice (or not) the capabilities available to her. For example, if persons have sufficient income (a resource) to be well-nourished (a capability), they can still vary substantially in the achievement of a healthy diet (a functioning). While capabilities are the 'beings' and 'doings' available to a person, functionings are what this person 'is' and 'does'. Therefore, "living may be seen as consisting of interrelated 'functionings'" selected from a set of capabilities (Sen, 1992, p. 39).

It is important to underscore the non-dichotomous nature of capabilities. Capabilities are not simply available or not. For instance, the ability to walk is available with different intensities to a toddler and a hiker. Moreover, the same toddler may grow, train, and become herself a hiker, a process that implies an evolution in time often not considered by capabilities-related theories (Gasper, 2007). Therefore, it is important to think of a person's capabilities in terms of probabilities and robustness (Robeyns, 2016), rather than as a static characteristic of a person.

3. Capabilities and mobility: tendencies and challenges of a growing literature

Mobility, understood as the ability to move from one place to another, is not explicitly discussed within the main theorizations of the Capabilities Approach. While Nussbaum's list of Central Human Capabilities contains one basic capability associated with mobility – i.e., "the ability to freely move from place to place" (Nussbaum, 2000, p. 78) – this capability is not explicitly linked to a transport dimension (see below), nor does it account for the rich understandings of mobility stemming from mobilities studies (Sheller & Urry, 2006, 2016; Urry, 2007).

In what follows we provide a brief review of the main papers that link the Capabilities Approach and mobility explicitly. This growing but not extensive literature on mobility as capability spans across heterogeneous sources and differently engages with Sen's or Nussbaum's perspectives. The literature discussed below was identified using Scopus (using the keys "mobility AND capability", "transport AND capability", and "accessibility AND capability", but excluding publications using the term "capability" as a synonym for "ability"). This resulted in the identification of 23 relevant publications. Using snowballing technique, an additional 12 resources were identified, bringing the total to 35 publications. The identified works are rooted in different disciplinary fields and are working in at least three directions, as briefly reviewed in what follows.

3.1 Conceptualising capability in the context of mobility and movement

The capabilities-based research on mobility draws on diverse theoretical conceptualisations of the Capabilities Approach, differences that are reflected in the diverse understandings of capability and the possible operational implications.

A first challenge is to assess *if* mobility is a capability. This issue requires considering if mobility is something that a person is able to do if he has reason to do so and that contributes to one's overall freedom. Mobility appears in the list of basic capabilities proposed by Nussbaum (2000, 2011) as well as other lists (e.g. Robeyns, 2003). However, it is vaguely defined as "the ability to move freely from place to place" (Nussbaum, 2000, p. 78) and is considered by Nussbaum as part of the more general capability of 'bodily integrity'. Such a perspective seems to understand mobility primarily as a negative freedom, as 'freedom from' arbitrary confinement (Berlin, 1958). The literature that has addressed mobility from an explicit capability perspective instead focuses on a positive freedom, a 'freedom to', developing three alternative approaches.

The first approach considers *mobility as a capability*. In this case, capability is conceptualised as an individual´s ability to be mobile. This line of thought considers mobility as "being physically, socially and financially able to move from one place to another and interact within the society or with different societies" (Beyazit, 2011, p. 123), an understanding that is close to the concepts of *motility* (Kaufmann, 2002) and *potential mobility* (Kellerman, 2012). This definition has been used in relation to specific groups such as youth (Goodman et al., 2014) and older people (Meijering et al., 2019; Ryan et al., 2019), while narrower definitions have referred to the ability to use public transport (Ryan et al., 2015) or shared bikes (Sherriff et al., 2020). In and of itself the ability to move can be significant for one's wellbeing, even without being put into practice, as it "enhances one's capability set and the freedom to make reasoned choices" (Nordbakke & Schwanen, 2014, p. 117). In this perspective, mobility is a prerequisite for other capabilities and, when put into practice, can contribute to fulfilling diverse needs and wants (Beyazit, 2011; Kronlid, 2008; Robeyns, 2003; Sen, 1990b; van Wee, 2011); whether this is actually possible depends on additional circumstances. Nonetheless, the focus remains on the ability to be mobile with little attention for the extent to which it is actually conducive to fulfilling diverse needs and wants, much in line with the traditional approach to transport planning briefly described above.

The second approach focuses on *accessibility as a capability*. In this perspective, accessibility is considered as a *capability* that expresses "persons' possibility of engaging in a variety of out-of-home activities" (Martens, 2017, p. 137). Consequently, persons' actual participation in such activities could be considered as a *functioning*. The concept of accessibility allows not to focus "merely on a person's ability to travel through space", but rather considers "the possibility of a person to translate the resource into something useful" (Martens & Golub, 2012, p. 202). Most works adopting a capabilities perspective follow this approach and consider mobility as a tool to reach places and participate in activities (Bantis & Haworth, 2020; Cao & Hickman, 2019a; Chen & Akar, 2017; Nahmias-Biran et al., 2017; Nordbakke, 2013; Oviedo & Guzman, 2020; Ryan et al., 2015; Smith et al., 2012; Vecchio, 2020). Others focus on the features thanks to which mobility allows performing certain activities, such as minimum standards for travel - in terms of maximum allowable temporal or monetary costs (Hananel & Berechman, 2016), or the experience of travel (Mella Lira, 2019). According to this dominant approach, accessibility is the concept that better conveys how mobility enhances the freedom of each person to lead one kind of life or another.

Recently, Randal et al. (2020) proposed a third approach, conceptualising "transport policy as a social conversion factor", in addition to its role in enhancing accessibility-as-a-capability (Randal et al., 2020, p. 8). They argue that a narrow understanding of capability as either accessibility or mobility "makes it harder to be cognisant of the other direct and indirect health, environmental and wellbeing impacts of the transport system" (p. 10). In contrast, conceptualising transport (policy) as a conversion factor underscores its role as a promoter of a wide range of capabilities, including "employment, education, access, health, and democratic participation, among others" (ibid.), while also highlighting its potential negative effects on people's health and wellbeing. Since conversion factors underscore people's constraints to convert resources into capabilities, as discussed above, a focus on these factors also makes it possible to address power structures and procedural fairness in transport policy, issues hardly addressed in much of the literature on capability and mobility.

In the following two sub-sections, devoted to analytical and appraisal approaches, we will focus on accessibility-as-capability, as this approach has received most attention in the literature. We will return to this choice and further defend our focus on accessibility-as-capability approach in Section 4.

3.2 Analysing accessibility as a capability

The empirical research that considers accessibility as a capability develops two main approaches: an aggregate one, focused on the evaluation of existing transport and land use systems; and an individualised one, adopting a person-based perspective. The existence of these two strands of research is in line with one of the main debates in the wider literature on the Capabilities Approach: the desire for aggregate analyses versus a strong awareness of their limitations in considering individual specificities (Comim, 2008a). This concern resulted in two main approaches that have not interacted much with each other, defined in the capabilities-based literature as 'distance assessments' versus 'grassroot explorations' (Ibrahim & Toiwari, 2014). The same distinction can be discerned in the literature linking transport and capabilities: a top-down, 'distant', approach encompassing accessibility-based analysis of transport and land use systems; and a bottom-up approach, based on a person's own assessment of perceived mobility-related capabilities and functionings.

Top-down approach: accessibility-based analysis of transport and land use systems. The first, aggregate, approach draws on the Capabilities Approach to assess to what extent transport infrastructures and services provide accessibility to valued opportunities, in line with traditional accessibility studies. Most studies in this strand focus solely on how transport and land use systems provide persons with accessibility to a basic set of opportunities within given thresholds, defined in terms of travel time (Martens, 2017; Vecchio, 2019), or monetary and temporal costs (Hananel & Berechman, 2016). These studies typically adopt simple assumptions regarding people's (possible) use of different transport modes. They also take people's place of residence as the anchor point for accessibility measurement, with little attention for the existence of other spatial anchors and typically ignoring the interplay between (lack of) residential choice and resulting accessibility levels. In this type of analysis, minimum thresholds of accessibility represent sufficient levels of capabilities (Nahmias-Biran et al., 2017) and allow identification of areas requiring priority interventions for achieving sufficient accessibility (Pucci et al., 2019). Some of these accessibility studies focus on specific opportunities, such as schools and jobs (Chen & Akar, 2017; Humberto et al., 2020), or on accessibility delivered by specific modes, such as walking (Blečić et al., 2015) or special bus services (Inoi & Nitta, 2005). A second line of top-down studies enriches the assessment of accessibility,

contrasting accessibility with realised trips by different modes (Bantis & Haworth, 2020; Oviedo & Guzman, 2020), considering both capabilities and functionings (in line with other studies not referring to the Capabilities Approach, e.g. Allen & Farber, 2020; Cheng et al., 2019; Fransen et al., 2018).

In synthesis, the top-down approach to accessibility evaluations shares a certain interpretation of the Capabilities Approach: accessibility – the ability to reach a valued activity – is considered a *capability*; reaching an activity is instead a *functioning*. In doing so, evaluations of accessibility tend to adopt a 'sufficientarian' approach in their evaluations. The transport services and infrastructures available are considered as *resources*. Interestingly, other key concepts of the Capabilities Approach – notably *conversion factors* – are rarely explicitly considered or operationalized (except by Nahmias-Biran & Shiftan, 2019, who develop a uniform conversion factor while assessing alternative transport scenarios).

Bottom-up approach: assessments of a person's perceived accessibility to opportunities. The second direction develops a bottom-up approach, that examines how each person values different activities and how mobility enhances or impedes participation in them. This direction is interested in how specific groups (especially disadvantaged ones) can differently participate in activities thanks to the accessibility provided by transport and land use systems. Groups are distinguished based on different, sometimes overlapping, features such as:

- *age*, focusing on older people (Ryan & Wretstrand, 2019) and preschool children (Muhati-Nyakundi, 2019);
- *income*, focusing on low-income groups (Hickman et al., 2017);
- *impairments*, for example cognitive ones (Cecchini et al., 2018).

The methods used to investigate persons include quantitative approaches such as surveys (Cao & Hickman, 2019a; Hickman et al., 2017; Mella Lira, 2017; Sherriff et al., 2020; Smith et al., 2012), which are sometimes also used ~~also~~ for ~~to guide~~ qualitative analyses~~pproaches~~ (Ryan & Wretstrand, 2019), as well as qualitative approaches such as focus groups (Cecchini et al., 2018), microstories of everyday experiences (Vecchio, 2020), and drawings (Muhati-Nyakundi, 2019). Assessments of persons' perceived accessibility focus on accessibility as a capability but develop more complete interpretations in comparison to top-down approaches, adopting two different analytical foci~~conceptualisations of capability~~approaches. The first ~~approach~~ is sequential, focusing on how capabilities are formed and used (Ryan et al., 2019; Vecchio, 2020). The second ~~approach~~ does not consider the formation of capabilities, but rather examines two parallel dimensions: mobility and wellbeing, focusing on the difference between expected accessibility and realised mobility (Cao & Hickman, 2019a).

Despite some exceptions (Vecchio, 2020), top-down and bottom-up two approaches do not seem to have significant reciprocal interactions, reflecting a tendency in the wider capabilities literature (Ibrahim & Toiwari, 2014) and the different disciplinary approaches in transport, in which quantitative and qualitative approaches often struggle to interact (Pucci & Vecchio, 2019). This tension obtains an additional layer as these methodological (and underlying epistemological) positions may shape the focus of evaluations, with some methods being (only) applicable for measuring capabilities while others are particularly suitable for analysing (experienced) functionings.

3.3 Appraising accessibility as a capability

Few scholars have considered what implications the Capabilities Approach could have for transport planning and policy, in part due to its presumed limited feasibility for applications in practice (Beyazit, 2011). A range of authors, both scholars adopting the mobility-as-capability approach and those focusing on accessibility-as-capability, proposes using the results of bottom-up analyses to complement traditional evaluations and orientate the appraisal of future projects (Cao & Hickman, 2019a, 2019b; Hananel & Berechman, 2016; Hickman et al., 2017; Meijering et al., 2019), but do not explore the translation of bottom-up approaches into new or adjusted appraisal frameworks or into normative policy indicators.

Another line of work does consider how to use the Capabilities Approach to revisit traditional transport appraisal tools (Wismadi et al., 2014) and Cost-Benefit Analysis (CBA) in particular. The benefits included in a typical CBA – notably travel time savings – are hardly in line with the Capabilities Approach. More aligned is the notion of 'option value', but it is rarely included in project appraisal in practice and, if included, only relates to the value of not-selected transport modes rather than to the value of (not-selected) destinations (Geurs & Wee, 2004; Roson, 2001). For this reason, some researchers have suggested adapting CBA to better capture the notion of capabilities. For instance, Martens (2006) proposes the use of accessibility gains. While he does not employ the Capabilities Approach as its theoretical underpinning, the notion of accessibility gains is in line with the approach, as it stresses the increase in persons' ability to give direction to their lives. Van Wee and Roeser (2013) suggest that the Capabilities Approach may contribute to a more justice-sensitive cost-benefit analysis by considering how different policy options impact different population groups. Neither of these authors proposes a practically feasible way to give a monetary value to any increases (or decreases) in 'capabilities', which would be required for merging capabilities into CBA. An advancement in this sense is provided by Nahmias-Biran & Shiftan (2019), who propose to estimate the "value of capability gains" within CBA by assessing the accessibility gains of different policy options for different persons and valuing them based on the principle of diminishing marginal utility.

3.4 Challenges for a Capabilities Approach to transport planning

The reviewed literature highlights how the Capabilities Approach has inspired different ways to conceptualise, examine, and appraise mobility and its impact on persons' freedoms (see Table 1 for a synthesis). While enriching mobility debates, the literature has fallen short in defining the operational implications of a capabilities perspective for transport planning and policy, leaving conceptual and methodological challenges for future work. A clear(er) conceptual stance may facilitate the development of a methodological approach, helping to define what features should be considered, in what terms, and with what methods. The next sections present a proposal in this direction.

	Key conceptualization	**Analytical focus**	**Appraisal of interventions**
Mobility as capability	Capability understood as being physically, socially and financially	Top-down: analysis of realised trips, based on (large-scale) surveys	Not (yet) developed

	able to move from one place to another and interact within the society	Bottom-up: persons' assessment of their mobility experiences; person's assessment of their appropriation of means of transport and their ability to be mobile	Call for inclusion of lived experiences in appraisal; specific methods not (yet) developed
Accessibility as capability	Capability understood as persons' possibility of engaging in a variety of out-of-home activities	Top-down: accessibility-based analysis of transport and land use system	Value of accessibility gains as key benefit to be included in cost-benefit analysis
		Bottom-up: persons' assessment of their achieved access and perceived accessibility	Call for enrichment of traditional appraisal methods; specific methods not (yet) developed
Transport (policy) as conversion factor	Transport (policy) as a conversion factor enhancing a wide range of capabilities, including employment, education, access, health, and democratic participation	Not (yet) developed	Not (yet) developed

Table 1. Synthesis of the tendencies in the reviewed literature

4. Towards a framework: Understanding accessibility as a human capability

The literature shows a diversity in the understanding and use of concepts from the Capabilities Approach, with different operational implications for planning and policy. While each of the approaches have their value, we argue that understanding accessibility as a capability is the most fruitful way forward. Being mobile is certainly a capability, but the limitations and risk of focusing on mobility have been well-documented in the regular transport literature (Kębłowski & Bassens, 2018), with pitfalls that a capabilities-based approach would not avoid. More than mobility, accessibility captures the prevalent concern of the Capabilities Approach with people's freedoms of being and doing what they have reason to value. Where mobility is a means, accessibility captures the possibility of each person to actually participate in valued activities. Such possibility typically requires physical movements, even though accessibility can also be obtained virtually (as in the case of remote working or telemedicine) (Lavieri et al., 2018) or by having someone else moves on one's behalf (as in the case of delivery services) (Kellerman, 2012). While the latter options are (increasingly) valuable, actual participation in out-of-home activities will remain of key importance in the foreseeable future and require explicit analysis.

The emphasis on physical accessibility intendedly provides a narrow priority aim for transport planning and policy and seeks to deepen the shift from mobility to accessibility as the focal concern of transport policy (Handy, 2020; Levine et al., 2019; Martens, 2019; Vecchio et al., 2020). We prefer this focused conceptualization above the broad perspective proposed by Randal et al. (2020), for three interrelated

reasons. First, while transport obviously impacts environmental quality and health, transport is only one factor among many shaping these domains of life. In contrast, transport fulfils a unique role in shaping each person's accessibility and for this reason accessibility deserves explicit attention. Second, while merging multiple concerns and dimensions into the single concept of conversion factors highlights the trade-offs to be made in transport policy, the approach provides little guidance on how to balance or prioritise transport's diverging impacts on the wide range of related capabilities. Third, we argue that transport policy can contribute more to the enhancement of people's freedoms by focusing on accessibility, while incorporating other concerns, including environment, health or democratic participation, as (very strict) boundary conditions for transport planning and policy.

Maintaining a focus on accessibility as a capability, in what follows we present a framework that may assist a more systematic employment of the key concepts of the Capabilities Approach within the context of mobility research, thereby reducing the ambiguity embodied in key concepts of the approach as well as in the literature reviewed above. In line with the very essence of the Capabilities Approach, the starting point for the framework and its composite concepts is the person.

Resources. The term resources can encompass a broad range of material and immaterial means that directly or indirectly shape a person's possibility for mobility and accessibility. For the development of the framework, it is important to underscore that there is no a priori distinction between resources and conversion factors (see below). Given the focus on mobility and accessibility, and in line with the accessibility literature, we suggest limiting the term resources to the key 'inputs' that jointly deliver accessibility: the transport system and the land use system. More precisely, we distinguish between private mobility resources, publicly available mobility resources, and activity opportunities.

Private mobility resources are owned in some way by a person. These may include a car, a private parking place, a bicycle, a shed for storing the bicycle, a pair of shoes, a public transport pass, and so on. Publicly available mobility resources include pavement, benches, bicycle paths, roads, parking places, public transport services, public transport stops, taxi services, shared mobility services, and so on. Publicly available mobility resources may be provided by the public sector, via the market, or in some other way; the term 'publicly available' refers to their essentially open nature. The distinction between private and publicly available mobility resources underscores that all persons are essentially dependent on non-privately owned facilities and services for their mobility and accessibility. In this sense, there is no such thing as 'private transport', there are only private mobility resources. The term activity opportunity captures the land use system and refers to any destination in which a person could employ an activity, whether it is simply sitting on a bench, obtaining work, buying groceries, or meeting other people. It reflects the location of activities, as well as other features of an opportunity, such as its quality, capacity or opening times. The land use system tends to offer an enormous set of opportunities, most of which will not be relevant for most people (see conversion factors).

The conversion factors. Conversion factors are the individual and contextual features that allow the conversion of resources into capabilities. In other words, conversion factors determine the extent to which a person can actually make use of available resources. Conversion factors shape the possibilities of a person to translate the three resources distinguished above into actual freedoms to act: to travel and access opportunities. Multiple conversion factors shape a person's ability to make use of private and publicly available mobility resources: a person's income, (physical) ability, concern over personal safety, skills, knowledge of the available transport services and related regulations (parking facilities, bus lines,

etc), a person's confidence level in using various means of transport, and so on (Meijering et al., 2019). For example, a person may live near a cycleway (a publicly available mobility resource), but may be unable to use it if he does not have a bicycle available (both a private mobility resource and a conversion factor) or if she does not have the physical ability to cycle (a conversion factor); or, a person may have a bicycle available but be unable to use it because the road infrastructure (a publicly available mobility resource) does not make him feel safe when cycling (a conversion factor). Jointly, the mobility resources and conversion factors determine people's motility: their ability to be mobile (Kaufmann et al., 2004).

Concerning activity opportunities, the conversion factors play a double role. First, they act as a selection mechanism, determining which of the wide range of activity opportunities is relevant for the person (Pereira et al., 2017). For instance, depending on a person's professional interests and passions, they may only consider a small subset of available employment opportunities as a potential job. Likewise, only a small set of leisure opportunities may be relevant, depending on a person's inclinations. At the same time, it should be underscored that this selection process is dynamic. Additional employment opportunities may become relevant as the person changes course; available opportunities for leisure may become relevant as a person's interests and preferences evolve. Second, the conversion factors shape which activity opportunities can actually be enjoyed. Knowledge about the available activity opportunities is a first, and essential, conversion factor. But many other factors play a role. For example, certain qualifications may be essential to obtain a particular job, while a form of membership may be necessary to take part in certain leisure activities.

Moreover, conversion factors are highly volatile and likely to change over time. Not only can knowledge about, and perceptions of, opportunities change rapidly, but a person's temporal constraints may also affect whether they can obtain access to activity opportunities, given the time slots in which these are available (Geurs & Van Wee, 2013). Furthermore, a key conversion factor is a person's ability and willingness to overcome distance, which in turn is shaped by (physical) ability, time constraints, (household) responsibilities, income, and so on. The larger a person's ability and willingness to overcome distance, the larger the set of relevant activity opportunities, defined as a subset of all activity opportunities. The combination of this broad range of conversion factors thus shapes which activity opportunities are actually available to a person.

In synthesis, conversion factors are fundamental to understand the extent to which available resources can be turned into capabilities by a particular person. The examples also show how diverse these conversion factors are and how they are strongly interrelated. Hence, it may be no surprise that most accessibility studies do not address them at all or only implicitly. More positively formulated, accessibility studies differ widely in terms of the conversion factors (implicitly) taken into account. Many studies only account for the (likely) availability of private mobility resources among a population (a private car, a private bicycle) and perceive these resources implicitly as a conversion factor enabling people to reap the accessibility benefits of publicly available mobility resources (roads, streets, bicycle paths). These studies often also assume that public transport services can be used by all, thereby ignoring the role of a range of conversion factors that may limit people's ability to use these services. Other studies (implicitly) account for a broader range of conversion factors, considering persons' income levels, (physical and cognitive) abilities, as well as (job-related) time constraints in the estimation of their accessibility levels. Some studies do not differentiate between job opportunities when estimating accessibility to employment, while others differentiate by salary or educational level. Given that conversion factors are highly personal, and may strongly vary over time, it is impossible to obtain a 'complete' understanding of conversion

factors for even a sample of the population. Each study into accessibility levels across a population can thus at best work with some set of proxies for these factors.

Capabilities. A person's capability set is the outcome of the combination of resources and conversion factors and translates into a person's level of accessibility. Accessibility as a capability is the degree to which persons have the possibility to move *and* access the available opportunities that they have reason to value. The *accessibility* available to a person depends thus on the interplay between the relevant, valued, activity opportunities and the person's capacity of overcoming spatial friction. Accessibility-as-capability is directly conducive to other (basic) capabilities. For instance, accessibility to food stores is key for bodily health as a capability, as it enhances the person's possibility to be well-nourished. Accessibility to family and friends, in turn, enables people to engage in meaningful social interaction, a core component of Nussbaum's basic capability of affiliation. Defining accessibility-as-capability thus automatically links the domain of mobility to multiple (more basic) capabilities (Randal et al., 2020).

A person's accessibility as capability is always a (small) subset of the available activity opportunities, as most opportunities will simply not be relevant for a person. At the same time, it should be underscored that a person has a constitutive interest in a broad range of opportunities, also if they are not relevant at a particular moment in time, as a person's needs and wants may change quite substantially over time.

This latter observation underscores that there is no 'perfect' way to measure a person's accessibility-as-capability. Indeed, no matter how much of the conversion factors are considered, any study across a (sample of the) population can only give an approximation of people's accessibility-as-capability. For studies that account for only few conversion factors (e.g., only people's access to different transport modes), the measurement of accessibility moves closer to the realm of resources. The more conversion factors are considered, the more an analysis will succeed in capturing accessibility-as-capability. Yet, any accessibility analysis will at best approximate persons' level of accessibility-as-capability. Indeed, as Sen underlines, any "estimation of what could be chosen is, by its very nature, problematic" (Sen, 1990a, p. 49). Ultimately, the very notion of capabilities remains elusive, even to individuals themselves, and so also to measurement – and this is no different for the measurement of accessibility-as-capability. This is also why Sen suggests that the measurement of functionings may be an important and even essential way to obtain an understanding of a person's capabilities.

Functionings. In line with the above, functionings are understood here as actually achieved access to a certain opportunity, consisting of the dual act of travel and activity participation. If the person accesses an opportunity, he makes the *choice* to transform the accessibility-as-capability into a *functioning*. Therefore, while accessibility is a capability, achieved access may be considered as its functioning. A person always selects a functioning from the capability set available to them; the larger the set, the larger the choice. Thus, where the term constraint is of key importance in the transfer from resources via conversion factors to capabilities, the term choice is key in the transfer from capabilities to functionings.

There is also an important feedback process here, as functionings understood as achieved access may shape conversion factors: the act of travelling will shape a person's ability to make use of available mobility resources, while the act of activity participation will shape a person's perception and appreciation of relevant activity opportunities. More 'successful' experiences are likely to enhance conversion possibilities, while negative experiences may reduce them. For instance, severe stress while driving may reduce a person's willingness to use available resources (a private car, a public road network), thereby de facto reducing their capability set. Likewise, positive experiences are likely to enhance conversion factors.

For example, regularly using a bicycle will increase a person's cycling skills and therefore the confidence to use such a resource, potentially increasing the person's perceived accessibility and subsequently their level of achieved access (Thigpen, 2019). Moreover, the act of traveling to a destination may make a person aware of other relevant activity opportunities that were not known, or of other ways to reach them, which both may increase a person's perceived accessibility. Kaufmann captures this dynamic in the notion of 'appropriation': a person appropriates the available (transport) resources by actually using them, thereby enhancing their motility (Kaufmann et al., 2004). In capability terms, the act of achieved access enhances the conversion factors and thus also perceived accessibility.

Well-being. While receiving less emphasis in the capabilities literature, the final element we consider is wellbeing. We include this element because it is receiving increased attention in the transport literature (e.g. Churchill & Smyth, 2019; Mokhtarian, 2019; Vos et al., 2013; Randal et al. 2020). From the perspective of the framework developed here, a person's wellbeing is shaped by both their accessibility-as-capability and their functionings. The relationship between the accessibility-as-capability set and well-being is at least twofold (Sen, 1990a). First, the higher a person's accessibility level, the larger the person's freedom to choose a functioning with a substantial positive impact on wellbeing. Second, even if the person does not always choose that 'best' option, the freedom embodied in a large choice set is in itself likely to enhance wellbeing. Thus, wellbeing related to travel can never be properly understood if the focus is only on the act of travelling, or on the act of access, itself; it will always have to include some understanding of the accessibility-as-capability set. Achieved access, in turn, contributes to well-being, firstly, because it allows participating in activities and therefore is conducive to other capabilities; and secondly, the movement realised to access a place may generate a positive experience (a person may enjoy the experience of riding a bicycle, or an older adult may feel more confident if able to undertake a trip autonomously). Furthermore, like functionings, a person's obtained level of wellbeing will feedback into the conversion factors. For instance, if the combined act of travel and activity participation enhances a person's wellbeing, this is likely to positively affect conversion factors and thus to assist in maintaining or enhancing the accessibility-as-capability set.

This framework for accessibility as a human capability (Figure 1) allows considering how each person builds and appropriates the possibility to move and access valued opportunities. In this sense, the approach can be useful to explain "why people with similar accessibility levels often experience differing [levels of] travel and activity participation" (Cao & Hickman, 2019b, p. 55). Therefore, the proposed framework can represent a first step towards an operational approach that examines accessibility considering the different elements that contribute to one's ability to access.

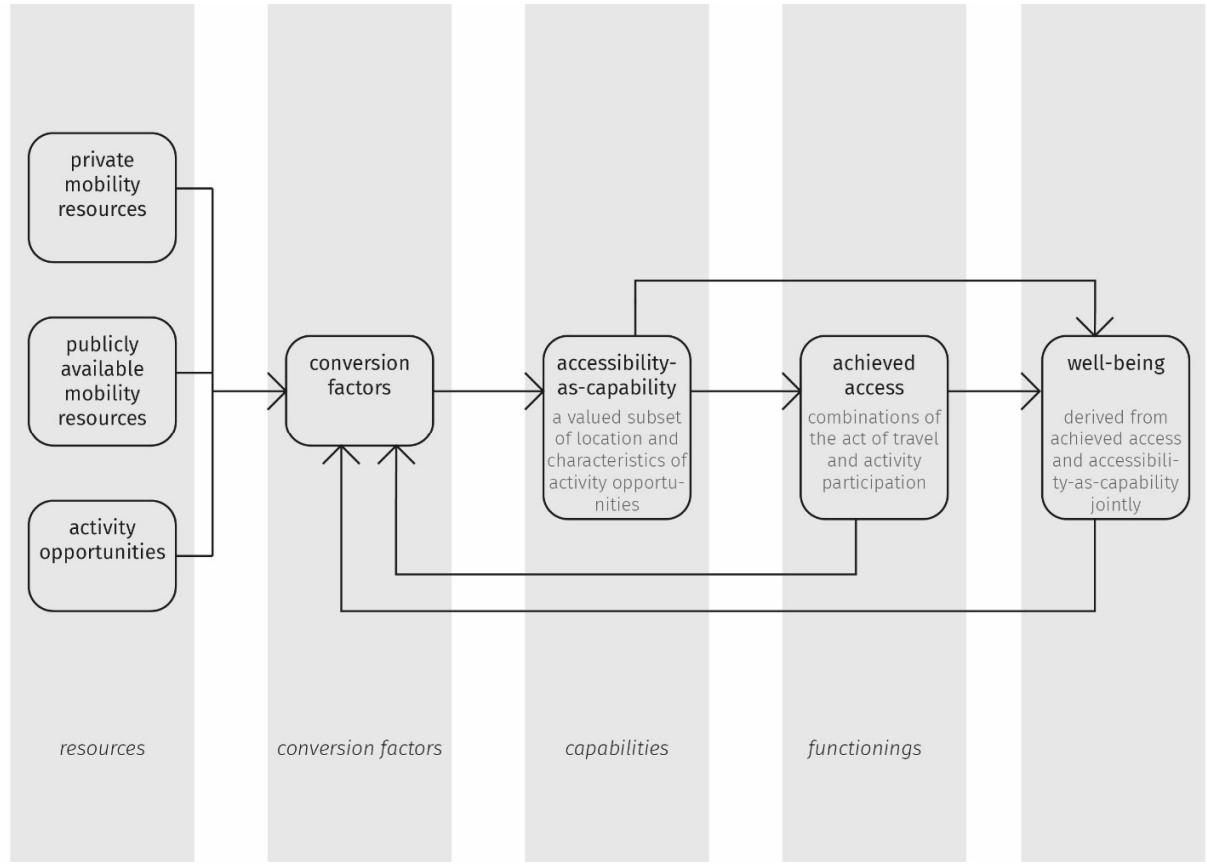

Figure 1. Accessibility as a human capability: a conceptual framework

5. Operational issues for evaluating accessibility as a human capability

By understanding accessibility as a capability the emphasis shifts from a generalized ability to freely move as an aim towards the ability to reach valued opportunities (also, but not exclusively, by moving). This approach allows a more 'pragmatic' policy application of the Capabilities Approach (Kronlid, 2008), working in two directions: assessing the situation of people based on their accessibility to valued opportunities, and evaluating how different policy interventions enhance or impede accessibility. Three issues emerge when considering an operational use of the Capabilities Approach in transport:

1. Should we evaluate capabilities or functionings?
2. Should we develop top-down or bottom-up evaluations?
3. How should we appraise projects based on the Capabilities Approach?

5.1 A twofold approach: capturing capabilities through analysis of accessibility and functionings

Considering capabilities *or* functionings (i.e., accessibility *or* realised access) is a primary concern for approaching urban mobility from the perspective of capabilities. First, the emphasis on a person's ability

to freely 'do' and 'be' what one has reason to value suggests a focus on a *potential*, that is, on accessibility and not on achieved access.

However, the analysis of achieved access as a functioning has substantial analytical advantages. Because persons differ greatly in terms of conversion factors, the measurement of accessibility will always be a rough approximation of people's ability to participate in valued activities. Accessibility analyses that seek to account for conversion factors will often have to rely on aggregate data, such as a population's socio-economic position, car ownership level, or household composition (Bocarejo & Oviedo, 2012). Moreover, even if (some) data are available at the household level, the interplay between the various conversion factors will still remain a black box. Hence, accessibility measurement that relies on such aggregate data can never completely convey the individual specificities that could significantly affect persons' perceived accessibility levels (Comim, 2008b). This relates to Sen's suggestion (1992) that measurement of functionings may sometimes be a better way to gain an understanding of the underlying capabilities, especially for capability types that are difficult to observe and measure. While there are multiple ways to measure accessibility, properly capturing a person's perceived accessibility remains elusive. Hence, and in line with Sen, the measurement of functionings may sometimes outperform the measurement of capabilities. This also applies to mobility, where detailed data are increasingly available on people's achieved access as a functioning, in particular through big data techniques. While not unproblematic in their use, the resulting detailed information on people's functionings can be used for developing more refined approaches to accessibility measurement or for indirectly identifying people facing limited capabilities. While neither relying on big data (but household travel survey data) nor the Capabilities Approach, a first step in this direction has been made by Allen and Farber (2020).

A capability-based approach to mobility should thus consider both capabilities *and* functionings, that is, accessibility *and* achieved access. As Sen (1992) mentions, while the focus should be on capabilities, functionings – as realised capabilities – can be a useful proxy for analysis. The measurement of accessibility may give a (rough) estimation of persons' ability to reach valued opportunities, by assessing the number of opportunities available in a territory, the extent to which different transport systems allow reaching them, and accounting for a (limited) set of conversion factors. Yet, analyses of realised access may provide insight into the type of opportunities people actually value or their actual, experienced, ability to reach them. Such analyses might reveal barriers that remain hidden when analysing accessibility, even when relatively sophisticated accessibility measures are used. Therefore, depending on the type of opportunities at stake and the data available, accessibility, achieved access, or both could be measured to gain an understanding of the extent to which the transport-land use system provides freedoms to differently positioned people.

5.2 Combining top-down and bottom-up analytical approaches

The literature on capabilities oscillates between two analytical alternatives: privileging persons' perspectives, calling for participatory processes (Sen, 2002) and bottom-up measurement of perceived capabilities and functionings (Alkire, 2008); or adopting top-down approaches, for example by assessing "central elements of truly human functioning that can command a broad cross-cultural consensus" (Nussbaum, 2000, p. 74). The proposed combined analysis of accessibility-as-capability *and* realised functioning still stays firmly within the latter realm. While top-down analyses can play a key role in identifying population groups and areas facing relatively limited freedoms "to do and be", such analyses

can only shed partial light on the causes for a lack of freedom. Indeed, precisely because of the multitude and interrelatedness of conversions factors, top-down analysis of capabilities and functionings is more suitable to signal problems rather than identify any problems beyond a lack of resources (i.e., private mobility resources, publicly available mobility resources, and activity opportunities). For instance, in case top-down analyses show that a particular population group enjoys a reasonable level of public transport-based accessibility (capability) yet shows a low level of activity participation (functioning), this raises questions. Since a low level of activity participation among an entire group is unlikely to be the result of mere choice, the explanation will have to be sought in conversion factors. Yet, top-down analysis may provide little insight whether high public transport fares, public transport timetables, concerns over social safety, distances to suitable destinations, or other factors are at work. Such a deep understanding can only be obtained through a bottom-up approach, i.e. an approach that starts from people and their everyday mobility experiences.

Such a combination of top-down and bottom-up approaches is particularly warranted among groups most likely to experience mobility difficulties. Such groups have been extensively identified in the literature, amongst others in studies on transport-related social exclusion, and can also be identified through top-down analyses that combine the measurement of accessibility and functionings. It is important that the complementary bottom-up analyses are not limited to population groups with 'objectively' low accessibility levels, but include at-risk groups seemingly well-served by the transport system. This is important because, as mentioned above, any accessibility measurement will necessarily be rough in nature and may fail to consider important conversion factors. For instance, even when using advanced measures of public transport-based employment that account for job types, job competition, fares, timetables, availability across the day and week, and access, egress and transfer times, such measures may still fail to capture important barriers for some individuals or groups, such as concerns over social safety when travelling or gendered labour market structures. They may also fail to employ relevant estimates of people's willingness to overcome distance (in transport terms: the impedance or distance decay function), which may vary not only between but also within socio-economic groups. Bottom-up approaches can reveal such conversion factors and their importance in shaping experienced accessibility and thus patterns of functionings.

This underscores that the application of the Capabilities Approach could benefit from combining both top-down measurement of accessibility and functionings, and bottom-up analyses of people's accessibility and mobility experiences. Such a bottom-up approach would also be in line with a fundamental trait of the Capabilities Approach, which emphasises "the person as a responsible agent" who decides what "he or she should achieve" (Sen, 1985, pp. 203–204).

5.3 The challenge of appraising transport interventions by using capabilities

Using the Capabilities Approach for the appraisal of alternative policy scenarios is a complex task. As the reviewed literature has shown, only a fraction of the academic works devoted to capabilities has attempted to do so. Two elements appear crucial here: the definition of suitable distributive principles for assessing policy alternatives, and the definition of suitable forms for including the approach in evaluation.

Sufficientarianism is a distributive principle that, according to some authors, may be a suitable reference for capability-based forms of appraisal. According to sufficientarian approaches, it is necessary "not that

everyone should have *the same* but that each should have *enough*" (Frankfurt, 1987, p. 21). This perspective is in line with the idea that it is important to secure people with the basic capabilities required for having enough freedom of choice over alternative lives (Sen, 1992). Adopting this approach, also Nahmias-Biran et al. (2017; 2019) consider that "a transport system should not create a barrier for persons to achieve a sufficient level of capabilities", allowing each person not only to reach essential activities (i.e., achieve sufficient functionings) but also providing a reasonable level of freedom to choose what they want "to do and be" (i.e., achieve sufficient capabilities). The Capabilities Approach thus suggests an accessibility sufficiency threshold that not merely prevents social exclusion, but one that actually guarantees a reasonable level of freedoms. Public policies should contribute to bringing people above this latter sufficiency threshold of accessibility, giving priority to interventions that enhance the accessibility-as-capability of people below the sufficiency threshold (Martens, 2017). Clearly, setting such a sufficiency threshold is no simple matter, not in the least because its level will have to vary across contexts. This line of reasoning thus leads to a doubly 'strong' sufficientarian approach in program and project evaluation (Casal, 2007): a high sufficiency threshold to guarantee freedoms and a near-complete priority for benefits flowing to people below that threshold.

Deviating from such a 'strong' sufficientarian approach is another proposal found in the literature: the notion of diminishing marginal value of accessibility improvements. In line with economic theory, some authors have proposed that the (monetary) value ascribed to increases in accessibility, i.e. to increases in persons' freedoms, should be dependent on people's current 'holdings': "the higher the current levels of accessibility of a group, the lower the value ascribed to the accessibility benefits reaped by that group" (Martens et al., 2014). This is a representation of a 'weak' sufficientarian approach (Casal, 2007), in which priority should be given to benefits flowing to people below the sufficiency threshold, while still systematically accounting for the improvements received by better-off population groups with substantial 'holdings' of accessibility-as-capability.

Irrespective of the sufficientarian approach that is adopted, the inclusion of capabilities elements in traditional appraisal tools appears to be quite complex. The mixed-method analytical approach proposed above is useful to assess the current accessibility-as-capability available to persons in a given setting, but does not allow a direct evaluation of alternative policies. The most structured attempt in this sense is developed by Nahmias-Biran & Shiftan (2019). Adopting a weak sufficientarian approach, they propose using a logsum function to assess persons' ability to reach activities, thus focusing evaluations on the number and quality of destinations that persons (especially but not only disadvantaged ones) can reach. They also suggest estimating a "value of capability gains" that should become part of cost-benefit analyses. These are steps in a promising direction, but the possible forms of including capability elements within traditional appraisal techniques still requires much exploration and is definitely a research path that needs to be further developed.

6. Conclusions: Towards transport systems supportive of capabilities

In this paper, we reviewed the academic literature that has linked the Capabilities Approach and mobility. Considering how the literature conceptualises, examines and appraises mobility from a capabilities perspective, we proposed a conceptualisation of accessibility as a capability, based on the key conceptsterms of the Capabilities Approach. Such a conceptualisation not only provides a more comprehensive take on the Capabilities Approach, but also poses the basis for a pragmatic employment

of the Capabilities Approach in transport planning. The main proposal consists of a twofold evaluative approach, composed of a top-down, aggregate component (addressing transport systems, land use configurations, infrastructural interventions and the accessibility that their interplay provides), and a bottom-up element (shedding light on conversion factors through an understanding of individual mobility practices, as a reflection of how mobility is appropriated to achieve opportunities). The two analytical approaches not only allow to consider both accessibility and achieved access, but also contribute to a rich, in-depth, analysis and understanding of the role played by a myriad of conversion factors that mediate persons' ability to transform accessibility into achieved access. This approach, while still in need of further development especially regarding the appraisal of policy alternatives, does provide a framework to systematically identify ~~the~~ populations and areas that deserve priority interventions, as well as ~~to identify~~ policies that might enhance either people's resources or conversion factors.

A capabilities-based perspective to mobility could help to address the growing importance of mobility to participate in social life and the limitations of current transport planning approaches to address the concerns of all people, but significant research and operational advancements are required. First, refined disaggregate evaluations of accessibility and accessibility gains are needed. These should be increasingly able to consider how conversion factors affect the accessibility of specific groups, accounting for potentially invisible mobility barriers that may question the results of accessibility evaluations. In doing so, different methods need to complement accessibility evaluations, requiring significant interdisciplinary efforts. Second, advancements in the assessment of the relationship between accessibility and activity participation are needed to capture the contribution of transport and land use systems to the freedoms of differently positioned people. Refined evaluations, using also new sources of information such as big data, could be helpful and also support the assessment of how accessibility contributes to one's well-being. Third, much work is needed to develop ~~relevant is also~~ project appraisal based on capabilities, considering the complexity of establishing indicators that may change according to the context, as well as the difficulty to modify established evaluative procedures. Nonetheless, the main challenging element is probably the very conceptualisation proposed by the Capabilities Approach, whose complexity proves fascinating ~~(~~as the continuous interest in the approach demonstrates~~)~~ but also elusive when trying to apply it. Continued study and experimentation, in research and practice, is essential to further develop the approach into a full-fledged alternative for the current practices of transport planning.

References

Alkire, S. (2003). *The Capability Approach as a Development Paradigm?* 3rd International Conference on the Capability Approach, Pavia.

Alkire, S. (2008). Subjective Measures of Agency. In L. Bruni, F. Comim, & M. Pugno (Eds.), *Capabilities and Happiness* (pp. 254–285). Oxford University Press.

Allen, J., & Farber, S. (2020). Planning transport for social inclusion: An accessibility-activity participation approach. *Transportation Research Part D: Transport and Environment*, *78*, 102212. https://doi.org/10.1016/j.trd.2019.102212

Bantis, T., & Haworth, J. (2020). Assessing transport related social exclusion using a capabilities approach to accessibility framework: A dynamic Bayesian network approach. *Journal of Transport Geography*, *84*, 102673. https://doi.org/10.1016/j.jtrangeo.2020.102673

Beyazit, E. (2011). Evaluating Social Justice in Transport: Lessons to be Learned from the Capability Approach. *Transport Reviews*, *31*(1), 117–134. https://doi.org/10.1080/01441647.2010.504900

Blečić, I., Cecchini, A., Congiu, T., Fancello, G., & Trunfio, G. A. (2015). Evaluating walkability: A capability-wise planning and design support system. *International Journal of Geographical Information Science*, *29*(8), 1350–1374. https://doi.org/10.1080/13658816.2015.1026824

Bocarejo, J. P., & Oviedo, D. (2012). Transport accessibility and social inequities: A tool for identification of mobility needs and evaluation of transport investments. *Journal of Transport Geography*, *24*, 142–154. https://doi.org/10.1016/j.jtrangeo.2011.12.004

Brown, J. R., Morris, E. A., & AICP, B. D. T. (2009). Planning for Cars in Cities: Planners, Engineers, and Freeways in the 20th Century. *Journal of the American Planning Association*, *75*(2), 161–177. https://doi.org/10.1080/01944360802640016

Cao, M., & Hickman, R. (2019a). Urban transport and social inequities in neighbourhoods near underground stations in Greater London. *Transportation Planning and Technology*, *42*(5), 419–441. https://doi.org/10.1080/03081060.2019.1609215

Cao, M., & Hickman, R. (2019b). Understanding travel and differential capabilities and functionings in Beijing. *Transport Policy*, *83*, 46–56. https://doi.org/10.1016/j.tranpol.2019.08.006

Casal, P. (2007). Why Sufficiency Is Not Enough. *Ethics*, *117*(2), 296–326. https://doi.org/10.1086/510692

Cecchini, A., Congiu, T., Talu, V., & Tola, G. (2018). Mobility Policies and Extra-Small Projects for Improving Mobility of People with Autism Spectrum Disorder. *Sustainability*, *10*(9). https://doi.org/10.3390/su10093256

Chen, N., & Akar, G. (2017). How do socio-demographics and built environment affect individual accessibility based on activity space? Evidence from Greater Cleveland, Ohio. *Journal of Transport and Land Use*, *10*(1), Article 1. https://doi.org/10.5198/jtlu.2016.861

Cheng, L., Chen, X., Yang, S., Wu, J., & Yang, M. (2019). Structural equation models to analyze activity participation, trip generation, and mode choice of low-income commuters. *Transportation Letters*, *11*(6), 341–349. https://doi.org/10.1080/19427867.2017.1364460

Churchill, S. A., & Smyth, R. (2019). Transport poverty and subjective wellbeing. *Transportation Research Part A: Policy and Practice*, *124*, 40–54. https://doi.org/10.1016/j.tra.2019.03.004

Comim, F. (2008a). Capabilities and Happiness: Overcoming the Informational Apartheid in the Assessment of Human Well-Being. In L. Bruni, F. Comim, & M. Pugno (Eds.), *Capabilities and Happiness*. Cambridge University Press.

Comim, F. (2008b). Measuring Capabilities. In F. Comim, M. Qizilbash, & S. Alkire (Eds.), *The Capability Approach: Concepts, Measures and Applications*. Cambridge University Press.

De Vos, J., Schwanen, T., Acker, V. V., & Witlox, F. (2013). Travel and Subjective Well-Being: A Focus on Findings, Methods and Future Research Needs. *Transport Reviews*, *33*(4), 421–442. https://doi.org/10.1080/01441647.2013.815665

Frankfurt, H. (1987). Equality as a Moral Ideal. *Ethics*, *98*(1), 21–43.

Fransen, K., Farber, S., Deruyter, G., & De Maeyer, P. (2018). A spatio-temporal accessibility measure for modelling activity participation in discretionary activities. *Travel Behaviour and Society*, *10*, 10–20. https://doi.org/10.1016/j.tbs.2017.09.002

Gasper, D. (1997). Sen's Capability Approach and Nussbaum's Capabilities Ethic. *Journal of International Development*, *9*(2), 281–302.

Gasper, D. (2007). What is the capability approach? *The Journal of Socio-Economics*, *36*(3), 335–359. https://doi.org/10.1016/j.socec.2006.12.001

Geurs, K. T., & Van Wee, B. (2013). Accessibility: Perspectives, measures and applications. In B. van Wee, J. A. Annema, & D. Banister (Eds.), *The Transport System and Transport Policy*. Elgar.

Geurs, K. T., & Wee, B. V. (2004). Accessibility evaluation of land-use and transport strategies: Review and research directions. *Journal of Transport Geography*, *12*, 127–140. https://doi.org/10.1016/j.jtrangeo.2003.10.005

Goodman, A., Jones, A., Roberts, H., Steinbach, R., & Green, J. (2014). 'We Can all just Get on a bus and Go': Rethinking Independent Mobility in the Context of the Universal Provision of Free Bus Travel to Young Londoners. *Mobilities*, *9*(2), 275–293. https://doi.org/10.1136/jech-2012-201753.101

Hananel, R., & Berechman, J. (2016). Justice and transportation decision-making: The capabilities approach. *Transport Policy*, *49*, 78–85. https://doi.org/10.1016/j.tranpol.2016.04.005

Handy, S. (2020). Is accessibility an idea whose time has finally come? *Transportation Research Part D: Transport and Environment*, *83*, 102319. https://doi.org/10.1016/j.trd.2020.102319

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

Hickman, R., Cao, M., Mella Lira, B., Fillone, A., & Biona, J. B. (2017). Understanding Capabilities, Functionings and Travel in High and Low Income Neighbourhoods in Manila. *Social Inclusion*, *5*(4), 161–174. https://doi.org/10.17645/si.v5i4.1083

Humberto, M., Pizzol, B., Moura, F., Giannotti, M., & Lucca-Silveira, M. P. de. (2020). Investigating the Mobility Capabilities and Functionings in Accessing Schools Through Walking: A Quantitative Assessment of Public and Private Schools in São Paulo (Brazil). *Journal of Human Development and Capabilities*, *21*(2), 183–204. https://doi.org/10.1080/19452829.2020.1745163

Ibrahim, S., & Toiwari, M. (2014). *The Capability Approach: From Theory to Practice*. Palgrave Macmillan.

Inoi, H., & Nitta, Y. (2005). The Planning of the Community Transport From the Viewpoint of Well-Being: Appling Amartya Sen 's Capability Approach. *Proceedings of the Eastern Asia Society for Transportation Studies*, *5*, 2330–2341.

Kaufmann, V. (2002). *Re-Thinking Mobility*. Ashgate.

Kaufmann, V., Bergmann, M. M., & Joye, D. (2004). Motility: Mobility as Capital. *International Journal of Urban and Regional Research*, *28*(4), 745–756.

Kębłowski, W., & Bassens, D. (2018). "All transport problems are essentially mathematical": The uneven resonance of academic transport and mobility knowledge in Brussels. *Urban Geography*, *39*(3), 413–437. https://doi.org/10.1080/02723638.2017.1336320

Kellerman, A. (2012). Potential Mobilities. *Mobilities*, *7*(1), 171–183. https://doi.org/10.1080/17450101.2012.631817

Kronlid, D. (2008). Mobility as Capability. In Uteng, Tanu Priya & T. Cresswell (Eds.), *Gendered Mobilities*. Ashgate.

Lavieri, P. S., Dai, Q., & Bhat, C. R. (2018). Using virtual accessibility and physical accessibility as joint predictors of activity-travel behavior. *Transportation Research Part A: Policy and Practice*, *118*, 527–544. https://doi.org/10.1016/j.tra.2018.08.042

Levine, J., Grengs, J., & Merlin, L. A. (2019). *From Mobility to Accessibility: Transforming Urban Transportation and Land-Use Planning*. Cornell University Press. https://www.jstor.org/stable/10.7591/j.ctvfc52mj

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

Martens, K. (2006). Basing Transport Planning on Principles of Social Justice. *Berkeley Planning Journal*, *19*, 1–17.

Martens, K. (2017). *Transport Justice: Designing Fair Transportation Systems*. Routledge.

Martens, K. (2019). Why accessibility measurement is not merely an option, but an absolute necessity. In C. Silva, L. Bertolini, & N. Pinto (Eds.), *Designing Accessibility Instruments. Lessons on Their Usability for Integrated Land Use and Transport Planning Practices*. Routledge.

Martens, K., Di Ciommo, F., & Papanikolau, A. (2014). Incorporating equity into transport planning: Utility , priority and sufficiency approaches. *XVIII Congreso Panamericano de Ingeniería de Tránsito, Transporte y Logística*.

Martens, K., & Golub, A. (2012). A justice- theoretic exploration of accessibility measures. In K. T. Geurs, K. J. Krizek, & A. Reggiani (Eds.), *Accessibility Analysis and Transport Planning: Challenges for Europe and North America*. Elgar.

Meijering, L., Hoven, B. van, & Yousefzadeh, S. (2019). "I think I'm better at it myself": The Capability Approach and Being Independent in Later Life. *Research on Ageing and Social Policy*, *7*(1), 229–259. https://doi.org/10.17583/rasp.2019.3678

Mella Lira, B. (2017). Measuring Central Human Capabilities in Transport As a Complementary Method for Appraising Transport Projects in the Context of Santiago De Chile. *Journal of Transport & Health*, *5*, S109–S110. https://doi.org/10.1016/j.jth.2017.05.271

Mella Lira, B. (2019). Using a capability approach-based survey for reducing equity gaps in transport appraisal: Application in Santiago de Chile. In K. Lucas, K. Martens, F. Di Ciommo, & A. Dupont-Kieffer (Eds.), *Measuring Transport Equity* (pp. 247–264). Elsevier. https://doi.org/10.1016/B978-0-12-814818-1.00016-0

Mokhtarian, P. L. (2019). Subjective well-being and travel: Retrospect and prospect. *Transportation*, *46*(2), 493–513. https://doi.org/10.1007/s11116-018-9935-y

Muhati-Nyakundi, L. I. (2019). Agency on journeys to school through urban slum terrains: Experiences of preschool OVC. *Vulnerable Children and Youth Studies*, *14*(1), 76–90. https://doi.org/10.1080/17450128.2018.1524189

Nahmias-Biran, B., Martens, K., & Shiftan, Y. (2017). Integrating equity in transportation project assessment: A philosophical exploration and its practical implications. *Transport Reviews*, *37*, 192–210.

Nahmias-Biran, B., & Shiftan, Y. (2019). Using activity-based models and the capability approach to evaluate equity considerations in transportation projects. *Transportation*. https://doi.org/10.1007/s11116-019-10015-9

Nordbakke, S. (2013). Capabilities for mobility among urban older women: Barriers, strategies and options. *Journal of Transport Geography*, *26*, 166–174. https://doi.org/10.1016/j.jtrangeo.2012.10.003

Nordbakke, S., & Schwanen, T. (2014). Well-being and Mobility: A Theoretical Framework and Literature Review Focusing on Older People. *Mobilities*, *9*(1), 104–119. https://doi.org/10.1080/17450101.2013.784542

Nussbaum, M. C. (2000). *Women and Human Development: The Capabilities Approach*. Cambridge University Press.

Nussbaum, M. C. (2011). *Creating Capabilities: The Human Development Approach*. Harvard University Press.

Nussbaum, M. C., & Sen, A. K. (1993). *The Quality of Life*. Clarendon.

Oviedo, D., & Guzman, L. A. (2020). Revisiting Accessibility in a Context of Sustainable Transport: Capabilities and Inequalities in Bogotá. *Sustainability*, *12*(11), 4464. https://doi.org/10.3390/su12114464

Páez, A., Scott, D. M., & Morency, C. (2012). Measuring accessibility: Positive and normative implementations of various accessibility indicators. *Journal of Transport Geography*, *25*, 141–153. https://doi.org/10.1016/j.jtrangeo.2012.03.016

Pereira, R. H. M., Schwanen, T., & Banister, D. (2017). Distributive justice and equity in transportation. *Transport Reviews*, *37*(2), 170–191. https://doi.org/10.1080/01441647.2016.1257660

Pucci, P., & Vecchio, G. (2019). Trespassing for mobilities. Operational directions for addressing mobile lives. *Journal of Transport Geography*, *81*, 102536. https://doi.org/10.1016/j.jtrangeo.2019.102536

Pucci, P., Vecchio, G., Bocchimuzzi, L., & Lanza, G. (2019). Inequalities in job-related accessibility: Testing an evaluative approach and its policy relevance in Buenos Aires. *Applied Geography*, *107*, 1–11. https://doi.org/10.1016/j.apgeog.2019.04.002

Randal, E., Shaw, C., Woodward, A., Howden-Chapman, P., Macmillan, A., Hosking, J., Chapman, R., Waa, A. M., & Keall, M. (2020). Fairness in Transport Policy: A New Approach to Applying Distributive Justice Theories. *Sustainability*, *12*(23), 10102. https://doi.org/10.3390/su122310102

Robeyns, I. (2003). Sen's Capability Approach and Gender Inequality: Selecting Relevant Capabilities. *Feminist Economics*, *9*, 61–92. https://doi.org/10.1080/1354570022000078024

Robeyns, I. (2016). Capabilitarianism. *Journal of Human Development and Capabilities*, *17*(3), 397–414.

Roson, R. (2001). Assessing the Option Value of a Publicly Provided Service: The Case of Local Transport. *Urban Studies*, *38*(8), 1319–1327. https://doi.org/10.1080/00420980120061043

Ryan, J., & Wretstrand, A. (2019). What's mode got to do with it? Exploring the links between public transport and car access and opportunities for everyday activities among older people. *Travel Behaviour and Society*, *14*, 107–118. https://doi.org/10.1016/j.tbs.2018.10.003

Ryan, J., Wretstrand, A., & Schmidt, S. M. (2015). Exploring public transport as an element of older persons' mobility: A Capability Approach perspective. *Journal of Transport Geography*, *48*, 105–114. https://doi.org/10.1016/j.jtrangeo.2015.08.016

Ryan, J., Wretstrand, A., & Schmidt, S. M. (2019). Disparities in mobility among older people: Findings from a capability-based travel survey. *Transport Policy*, *79*, 177–192. https://doi.org/10.1016/j.tranpol.2019.04.016

Sen, A. K. (1985). Well-Being, Agency and Freedom: The Dewey Lectures 1984. *The Journal of Philosophy*, *82*(4), 169–221.

Sen, A. K. (1990a). *Development as capability expansion* (By K. Griffin & J. Knight). Palgrave Macmillan.

Sen, A. K. (1990b). Individual freedom as social commitment. *India International Centre Quarterly*, *17*(1), 101–115.

Sen, A. K. (1992). *Inequality Reexamined*. Clarendon.

Sen, A. K. (1999). *Development as Freedom*. Oxford University Press.

Sen, A. K. (2002). Open and closed impartiality. *The Journal of Philosophy*, *99*(9), 445–469.

Sen, A. K. (2009). *The Idea of Justice*. Harvard University Press.

Sheller, M. (2018). *Mobility Justice. The Politics of Movement in an Age of Extremes*. Verso.

Sheller, M., & Urry, J. (2006). The new mobilities paradigm. *Environment and Planning A*, *38*(2), 207–226. https://doi.org/10.1068/a37268

Sheller, M., & Urry, J. (2016). Mobilizing the new mobilities paradigm. *Applied Mobilities*, *1*(1), 10–25. https://doi.org/10.1080/23800127.2016.1151216

Sherriff, G., Adams, M., Blazejewski, L., Davies, N., & Kamerāde, D. (2020). From Mobike to no bike in Greater Manchester: Using the capabilities approach to explore Europe's first wave of dockless bike share. *Journal of Transport Geography*, *86*, 102744. https://doi.org/10.1016/j.jtrangeo.2020.102744

Smith, N., Hirsch, D., & Davis, A. (2012). Accessibility and capability: The minimum transport needs and costs of rural households. *Journal of Transport Geography*, *21*, 93–101. https://doi.org/10.1016/j.jtrangeo.2012.01.004

Thigpen, C. (2019). Do bicycling experiences and exposure influence bicycling skills and attitudes? Evidence from a bicycle-friendly university. *Transportation Research Part A: Policy and Practice*, *123*, 68–79. https://doi.org/10.1016/j.tra.2018.05.017

Urry, J. (2007). *Mobilities*. Polity Press.

van Wee, B. (2011). *Transport and Ethics: Ethics and the Evaluation of Transport Policies and Projects*. Elgar.

Van Wee, B., & Roeser, S. (2013). Ethical Theories and the Cost–Benefit Analysis-Based Ex Ante Evaluation of Transport Policies and Plans. *Transport Reviews*, *33*(6), 743–760. https://doi.org/10.1080/01441647.2013.854281

Vecchio, G. (2019). Accessibility: Enablement by Access to Valued Opportunities. In P. Pucci & G. Vecchio, *Enabling Mobilities. Planning Tools for People and Their Mobilities* (pp. 11–26). Springer.

Vecchio, G. (2020). Microstories of everyday mobilities and opportunities in Bogotá: A tool for bringing capabilities into urban mobility planning. *Journal of Transport Geography*, *83*, 102652. https://doi.org/10.1016/j.jtrangeo.2020.102652

Vecchio, G., Tiznado-Aitken, I., & Hurtubia, R. (2020). Transport and equity in Latin America: A critical review of socially oriented accessibility assessments. *Transport Reviews*, *40*(3), 354–381. https://doi.org/10.1080/01441647.2020.1711828

Wismadi, A., Zuidgeest, M., Brussel, M., & van Maarseveen, M. (2014). Spatial Preference Modelling for equitable infrastructure provision: An application of Sen's Capability Approach. *Journal of Geographical Systems*, *16*(1), 19–48. https://doi.org/10.1007/s10109-013-0185-4