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► To cite this version:

Sylvie Fol, Caroline Gallez. The role of social data in investment assessment: current practice and potential improvements. Volvo Research and Education Foundations (VREF) Workshop: Financing Urban Access, May 2012, Bellagio, Italy. halshs-00780245

HAL Id: halshs-00780245

<https://shs.hal.science/halshs-00780245>

Submitted on 23 Jan 2013

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Financing urban access

VREF Workshop, May, 7-11th, Bellagio, Italy

The role of social data in investment assessment: current practice and potential improvements

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Abstract

In the field of transport studies, research on “urban access” generally deals with this notion in a narrow sense. Most of the time the issue of access is analyzed in terms of transportation network performance, using economic models that were designed to assess infrastructure efficiency. In this paper we argue that the social characteristics of space and those of individuals, along with the provision of urban amenities in a given urban environment are also essential elements in the complex notion of urban access. Therefore, it should be analyzed not only in terms of transportation networks but also from the perspective of spaces and individuals. We begin with a review of studies measuring urban access through *accessibility* in the field of transport studies, without restricting our analysis to transportation networks and transport policies, nor urban public transport financing. By rejecting a narrow definition of “urban access”, we seek to broaden reflection on measuring social access inequalities and their implications for public policy. We will then examine policies implemented to improve accessibility, focusing on those policies that emphasize the social dimension of urban access, and offering a critical review of the models and indicators used to assess transportation investments and policies. Finally, we will suggest some possible explanations for the lack of emphasis on social accessibility and offer suggestions to help overcome current difficulties.

Introduction

Since the 1990s, the existence of a link between transport and social exclusion has been recognized (Gaffron, Hine and Mitchell, 2001) and come to the forefront in several countries¹. This connection has been the subject of growing interest in research and policy. In the United Kingdom, for example, the creation of the Social Exclusion Unit in 1997 was a starting point for the development of many studies analyzing the various factors behind social exclusion. Lack of access to facilities and services has been listed among the components of social isolation (SEU, 2003). As a result, the notion of accessibility has received new attention in studies aiming to understand the transportation or (more generally speaking) spatial dimension of social exclusion.

¹ The role of transportation in social exclusion processes was recognized quite recently, compared to other services like health or education.

Similarly, in the US and in France the implementation of welfare-to-work policies has placed new emphasis on the necessity for job seekers to access employment. At the same time, the transportation field has also changed its focus from policies addressing a wide range of destinations to strategies targeting deprived areas (Harzo, 1998; Sanchez, 2008). However, despite this growing interest in accessibility and its relationship with social exclusion processes, there has been more recognition of this issue than progress in evaluating its components, effects, and applications to public policy.

Accessibility is indeed a complex notion, “a multifaceted concept” (Curtis and Scheurer, 2010). It is related to the spatial dimension of social exclusion and questions the role of place and location in poverty (Farrington, 2007). However, the role of space in social exclusion is not clear and still under debate (Hodgson and Turner, 2003). While most studies emphasize the fact that spatial segregation reinforces social exclusion, some authors argue that other factors like race play a more important role than space in social exclusion processes (Elwood, 1986). Another difficulty in dealing with the notion of accessibility is its proximity to that of mobility. The two terms are often used together without clear distinction. According to Handy (2002), there is a strong relationship between the two ideas, which probably explains the confusion: mobility refers to a potential for movement while accessibility can be defined as a potential for interaction (Hansen, 1959). Moseley (1979, quoted by Farrington and Farrington, 2005) insists that accessibility must be focused on “opportunities, not behavior”, which probably expresses the distinction between accessibility and mobility. Farrington (2007) underlines that “there should be no simple conceptualization which sees mobility deriving from person characteristics, with accessibility being solely an attribute of place. Accessibility is at least as much about people as places”. As mobility reflects the ability to reach a destination, policies to increase mobility will generally increase accessibility (Handy, 2002). However, this is not always the case. In the US, the focus on mobility in transportation planning has contributed to a decrease in accessibility by encouraging sprawl and a scattered pattern of urban development. “To plan for accessibility, in contrast, is to focus on the ends rather than the means and to focus on the traveler rather than the system”: to Handy (2002), accessibility planning includes a much broader range of strategies, which do not necessarily imply increasing travel. For Curtis and Scheurer (2010), “while mobility is concerned with the performance of transport systems in their own right, accessibility adds the interplay of transport systems and land use patterns as a further layer of analysis”. As a result, mobility planning has traditionally been concerned with the movement of motor vehicles, people and goods, while accessibility planning includes the land use / transport connection (Litman, 2003). However, as Farrington (2007) states, “a mobilities discourse does not conflict with an accessibility concept, which recognises the significant role that mobility plays, and will continue to play, in achieving the spectrum of people’s needs for reaching and participating in activities, services and opportunities”. Thus, current reflections on accessibility converge with those of authors like Urry (2003) or Cass et al. (2005), which are more focused on mobility issues. The two concepts should be seen as complementary (Farrington, 2007).

Another point to bear in mind when dealing with accessibility issues is the fact that “accessibility is only one aspect of social exclusion, and the existence of a high level of accessibility does not necessarily imply that people are able to benefit from it” (Church,

Frost and Sullivan, 2000). In addition, to understand the various components of accessibility, it is necessary to distinguish between direct and indirect accessibility. According to Hine and Grieco (2003) individuals with low levels of direct accessibility can gain actual access through their social networks. It is therefore important to take interpersonal interactions and involvement with the local community into account, since exclusion from mainstream society does not necessarily mean exclusion from local networks (Stanley and Vella-Broderick, 2009). At the same time, certain individuals' social isolation is likely to worsen their accessibility situation (Hine and Grieco, 2003). Social interaction is thus an important dimension of access, as underlined by Cass et al. (2005): "appreciating the networked nature of social life makes the notion of access more complex and less locally focused".

Certain groups are more likely to experience accessibility-related disadvantages: low-income, women, the elderly, the disabled, and (more generally) carless individuals are the most hurt by the lack of access (Hine and Mitchell, 2001; Social Exclusion Unit, 2003; Hine and Grieco, 2003). Unfortunately most of the accessibility measures currently used are areal and space-based (Hine and Grieco, 2003). Additionally, current accessibility planning is not very sensitive to issues such as gender, age, disability and ethnicity (Preston and Rajé, 2007).

Finally it is important to recognize that accessibility is a component of social justice. As Farrington (2007) pointed out, constrained access is "making more difficult the achievement of social justice". Accessibility is thus "a pre-condition for social inclusion, itself a pre-condition for social justice". The accessibility discourse should take the relationship between accessibility needs and accessibility rights into account (Farrington and Farrington, 2005). It necessarily engages reflections on equity (Young, 1994) and spatial justice (Soja, 2010). An accessibility perspective is part of "the project of inserting explicitly the notion of space into the understanding of social justice" (Farrington and Farrington, 2005). This cannot happen without integrating the various dimensions of accessibility planning. While transport policies are of course critical to achieve better accessibility, they can be viewed as a "fire-fighting" solution (Farrington and Farrington, 2005).

Within the current framework of accessibility planning, the integration of land-use and transport has become a key policy objective (Hine and Grieco, 2003). It has led to the development of new approaches to measuring accessibility. However, accessibility-enhancing policies are difficult to enact and there are many barriers to their implementation. Some of these barriers are technical in nature but most of them involve political choices and the way in which priorities are defined. In this paper, we first review the various definitions of the notion of accessibility, as well as measurement techniques that have been proposed in the literature. The second section examines policies intended to improve accessibility, focusing on those that emphasize the social dimension of urban access. A critical review of models and indicators used to assess transportation investments and policies is then provided. Finally, based on our conclusion that the social dimension of accessibility is not sufficiently accounted for in both evaluations and policies, the last section of this paper will suggest possible explanations for this situation and propose new directions to overcome these current difficulties.

1. Accessibility: definitions, measures, and observations

Though accessibility is a major topic in geography, urban planning, and transport engineering, it is also “a slippery notion (...) one of those common terms that everyone uses until faced with the problem of defining and measuring it” (Gould, 1969). As noted by Dalvi and Martin (1976), the “conceptual nature” of accessibility makes it difficult to propose a satisfactory measure, and complicates its usage as a variable in travel demand or urban interaction models. Examining the state of the art in the fields of transportation and urban planning studies, our paper will first review different perspectives on measuring accessibility. Then, focusing on the relationship between accessibility and social inequality, we will evaluate the usefulness and limitations of accessibility indicators as social indicators. Finally, we will discuss a number of empirical results concerning the social dimension of accessibility.

1.1. Definitions of accessibility

Since the end of the 1950s, accessibility has been defined in different manners for different purposes. According to Vandenbulcke, Steenberghen, and Thomas (2009) there is no consensus on the definition and formulation of accessibility. Hansen (1959) defines it as “the potential of opportunities for interaction”. Most of the early definitions of accessibility reference the “get-at-ability” of a destination (Hillman, Henderson and Whalley, 1973, quoted by Hine and Grieco, 2003). Burns and Golob (1976) thus refer to “the ease with which any land-use activity can be reached from a location using a particular transport system”. According to Burns (1979), accessibility represents “the freedom of individuals to decide whether participate or not in different activities”. For Ben-Akiva and Lerman (1979), it could be defined as “the benefits provided by a transportation/land-use system”. These different definitions concur on one point: in its simplest sense, accessibility is related to the interaction between land use and transport systems. It is thus important to underscore that accessibility is not only a question of transport. Indeed, accessibility is determined “by the spatial distribution of potential destinations, the ease of reaching each destination, as well as the magnitude, quality and character of the activities found there” (Vandenbulcke et al., 2009). Accessibility is “a function of the mobility of the individual, of the spatial location of activity opportunities relative to the starting point of the individual and of the times at which the activities are available (...). Accessibility therefore depends on the transportation available to individuals, the temporal and spatial distribution of activities and the social and economic roles of individuals that determine when, where and how long they must pursue various activities” (Okodi, Kerali and Santorini, 2001). Bhat, Handy, Kockelman, Mahmassani, Chen and Weston (2000) define accessibility as “a measure of the ease of an individual to pursue an activity of a desired type, at a desired location, by a desired mode, and at a desired time”. According to a recent definition, “accessibility refers to the ability of individuals to easily reach desired goods, services, activities and destinations at appropriate times using an integrated transport system without being restricted by physical, financial or safety concerns” (Wixey, Jones, Lucas and Aldridge, 2005). This definition points out the various components of accessibility. Finally, most definitions agree on four main determinants of accessibility: a land-use component, a transport component, a temporal component, and an individual component (Vandenbulcke et al., 2009).

According to Geurs and Van Wee (2004), the *land-use component* of accessibility not only reflects the amount, quality, and spatial distribution of opportunities, but also the demand for these opportunities and the confrontation between opportunity supply and demand. The *transportation component* refers to the transport system, expressed as the disutility for an individual to cover the distance between an origin and a destination using a specific transport mode (which depends on the confrontation between infrastructure and transport service supply and demand). Since accessibility is related to the role of land use and transport systems in society, which “gives individuals the opportunity to participate in activities in different locations” (Geurs and Van Wee, 2004), we must consider the influence of two other components: the *temporal* component and the *individual* component. The former refers to the availability of opportunities at different times of the day and the time available to participate in activities in different locations. The latter relates to the needs, abilities and opportunities of individuals, which depend on several characteristics such as age, income, household situation, physical condition, availability of travel modes, etc.

To summarize, an accessibility measure should ideally take these four components into account. It should be sensitive to changes in the transport system and the land-use system, to temporal constraints or opportunities (like changes in the schedules of public services) and account for individual characteristics such as income, sex, age, or qualifications that could influence access to travel modes, jobs, or housing. These four components are not independent. For instance, the distribution of activities influences travel demand and may also introduce time constraints, influencing people's opportunities. The individual component interacts with the three other components: a person's sex or age determines his or her time constraints, needs, access to travel modes, and relevant activity types. As stated by Farrington (2007), *accessibility is at least as much about people as places*: “A place is not just ‘more’ or ‘less’ accessible, but accessible relative to people in all their different circumstances: people experience more, or less, access to places”. Accessibility is also related to social groups, which vary in their needs and ability to access different goods and services (Wixey et al., 2005). In practice, accessibility measures generally focus on one or more of the four components, depending on the perspective adopted (Geurs and Van Wee, 2004).

1.2. Practical measures of accessibility

As underlined by Weber (2006), the history of accessibility is “the history of particular measures, such as topological, cumulative opportunity, population potential or space-time”. From a literature review in the field of transport and urban planning (see for instance Handy and Nimeier, 1997; Geurs and Ritsema van Eck, 2001; Kwan and Weber, 2003; Vandenbulcke et al., 2009), we have identified three basic perspectives² on measuring accessibility:

² Unlike Geurs and Van Wee (2004), we do not consider simple infrastructure-based measures (evaluating the performance of the transport system, such as congestion level or the average speed on the road network) as reflecting accessibility. In our opinion, accessibility is a transversal notion, resulting from interaction between at least the land-use and the transport systems.

(1) *Location-based measures* analyze accessibility at locations. The measures describe the level of accessibility to spatially distributed opportunities. They are typically used in urban planning and geographical studies. This category includes several types of indicators, which have been improved over time, such as (Geurs and Ritsema van Eck, 2001):

- Distance measures, which are the simplest ones. For instance Ingram (1971) defines “relative accessibility” as the degree to which two places on the same surface are connected, and “integral accessibility” as the degree of interconnection for a given point with all other points on the same surface. This type of measure assumes that space is undifferentiated with respect to the distribution of opportunities, and mainly estimates the connexity of locations resulting from the characteristics of the transport network.

- Contour measures, also known as isochrone measures or cumulative opportunities, evaluate the quantity of opportunities from a particular point within a certain time distance or travel-cost range (Wachs and Kumagai, 1973; Dalvi and Martin, 1976). These measures include elements of land use and transport component are taken into account, but fail to evaluate their combined effects.

- Potential accessibility measures have been designed to differentiate the attractiveness of opportunities by considering their distance from the origin point. In other words, in these measures accessibility decreases gradually as the travel time to destinations increases. Hansen (1959) was the first author to use the potential concept, derived from the social physics school, to describe accessibility. Adjustments to Hansen’s formulation have been proposed, using alternative decay functions of distance or cost and weighting the potential accessibility measure according to the total number of opportunities in the zone of origin (see for instance Dalvi and Martin, 1976).

- Inverse balancing factors, derived from gravity models, explain the level of spatial interaction between locations (Wilson, 1971; Geurs and Ritsema van Eck, 2001 and 2003).

(2) *Individual-based measures* analyzing accessibility at the individual level were first developed in the time-space geography of Hägerstrand (1970). They evaluate the activities that an individual can participate in at a given time, considering temporal constraints such as the location and duration of activities, the time budget for activities, and the travel speed allowed by the transport system (see for instance Dijst and Vidakovic, 1997).

(3) *Utility-based measures* analyze the utility (benefits) that people derive from access to spatially distributed activities. The primary assumptions of this approach are found in Koenig (1974, 1980). Accessibility is measured at the individual level and takes user characteristics (income, demographic variables) into account, in addition to modal or link characteristics (speed and travel costs) (see for instance Banister and Berechman, 2000).

1.3. Accessibility as a social indicator: some methodological problems

While our literature review reveals the existence of a wide range of accessibility definitions and measures, it is important to note that most of them give little importance to the social dimension of accessibility. Moreover, since accessibility has been defined primarily in terms of public transport access to key destinations, its measurement is

mostly based on aggregate and unimodal approaches “when a more disaggregate, multimodal approach is required” (Preston, 2009). We will now review practical measures of accessibility, questioning (from a methodological point of view) their ability to be used as social indicators.

(i) Location-based measures represent accessibility from one location to all other destinations, and do not account for individual characteristics that influence access. This drawback can probably be overcome by disaggregating measures among different population groups (see for instance Handy and Niemeier, 1997). Nevertheless, these measures present several shortcomings in accounting for individual disparities. First, neither distance, contour nor potential measures include competition effects, i.e. they do not account for the tension between opportunity supply and demand. Although this problem was resolved with inverse balancing factors, these measures are rarely used because they are complex to interpret and to estimate, as they result from an iterative process (Geurs and Van Wee, 2004). Furthermore, location-based measures do not account for temporal constraints.

(ii) Individual-based measures seem to be more appropriate when evaluating social access disparities, as they analyze accessibility from the viewpoint of individuals. The main purpose of the space-time geography founded by Hägerstrand (1970) was to re-introduce the individual and time into spatial models, questioning how individuals' or households' activity programs could be carried out given time restrictions. Space-time prisms were used to describe patterns in space and time, identifying the potential areas within which opportunities could be reached given predetermined time constraints. Individual-based measures have great theoretical advantages: in particular, they allow more sensitive assessment of variations in accessibility, such as gender or ethnic differences, and account for the “lived experience of individuals” (Kwan and Weber, 2003). Highlighting the need for new concepts and methods in accessibility research, Kwan and Weber state that “the effect of distance on the spatial structure of contemporary cities and human spatial behavior has become much more complicated than what has been conceived in conventional urban models and concepts of accessibility”. However, these measures have several shortcomings for the evaluation of land use and transport investments. First, they do not account for competition effects, as they do not include capacity constraints on supplied opportunities. Second, current activity-based measures focus on short-term behavioral responses, and do not include the effects of long-term land-use change on daily household activities and travel patterns. Third, these measures are difficult to operationalize. Recent developments in space-time measures have been made using network-based GIS (see for instance Kwan, 1998). Despite advances in GIS and spatial modeling, many difficulties remain, including the detailed individual activity-travel data required and the lack of feasible operational algorithms (Kwan, 1998). Furthermore, as data on individuals' time budgets are not available in standard travel surveys, applications are often restricted to relatively small areas and subsets of the population, resulting in problems extrapolating to population groups at a higher geographical scale.

(ii) Utility-based measures

The utility-based approach asserts that accessibility should be measured at the individual level and computed by including individual characteristics (Banister and Berechman, 2000). Utility-based measures interpret accessibility as the outcome of a

set of transport choices. The computation of individual utility takes user characteristics (income, residential location, demographic variables) into account in addition to the quantity of opportunities at the destination place (measuring each person's freedom of choice) and transport characteristics (speed, travel costs) (Koenig, 1974, 1980; Banister and Berechman, 2000). Two main types of measures are present in the literature (Geurs and Ritsema van Eck, 2001). The first one is based on random utility theory (the logsum model) and its main advantage is that it can be connected with microeconomic theory, allowing consumer surplus calculations. The second is based on a doubly constrained entropy model including competition effects, but this measure cannot be interpreted in terms of consumer surplus or welfare without strong restrictions. To summarize, utility-based measures satisfy most of the theoretical requirements for accessibility measurement except for temporal/schedule constraints. Furthermore, because they capture the non-linear relationships between accessibility improvements and changes in utility, they can express diminishing returns. As a result, a utility-based measure may indicate that it is more desirable to improve accessibility for individuals at locations with low accessibility than at locations already benefiting from higher levels (Koenig, 1980; Geurs and Ritsema van Eck, 2001). This is clearly relevant when performing social or economic evaluations of transport and land use projects. The major disadvantage of these measures is the difficulty of interpreting and disseminating them, due to their roots in relatively complex economic theory (Koenig, 1980).

1.4. Incorporating the social dimension in accessibility measures: empirical results

According to many authors (Church and Frost, 1999; Gaffron et al., 2001), few studies have produced useful indicators for analyzing the link between social exclusion and transport. In the field of social exclusion analysis, “there are relatively few studies which directly attempt to assess levels of transport or accessibility as part of their indicators” (Church and Frost, 1999). By the same token, in the transportation field there is a paucity of empirical data available to analyze the link between transport and social exclusion.

However, the social dimension of accessibility has been extensively studied and documented since the end of the 1990s due to increasing concern over social exclusion and its determinants. Since that time, lack of mobility and insufficient access to urban services and resources have been counted among the factors that can prevent certain social or ethnic groups from fully participating in society. These studies can be roughly divided into three categories:

(i) A significant number of studies have been dedicated to social disparities in mobility, based on individual indicators. Most of these studies analyze the relationship between individual characteristics (household income, race, gender, age, etc.) and various indicators, such as travel patterns (number of trips, distance traveled, travel modes), car ownership, or the possession of a driver's license. These studies show that in the US (Murakami & Young, 1997; Pucher and Renne, 2003), in Great Britain (SEU, 2003) as well as in France (Mignot and Rosales-Montano, 2006; Orfeuil, 2004; Paulo, 2006), low-income households travel less and make shorter trips than their richer counterparts. Similarly, in the three countries mentioned, the rate of car ownership is much lower among low-income households, which are therefore more dependent on public transit

and walking. Much lower mobility among low-income households is thus a common characteristic of these three countries. As Pucher and Renne (2003) pointed out, this might be interpreted as fundamental inequity in the transportation system. Although they do not make direct reference to accessibility, these results are relevant to its study. They show that many low-income households experience restrictions on individual accessibility because they cannot reach those parts of metropolitan areas that are only accessible by car. This brings us to a second category of studies, which go beyond mobility to address the notion of accessibility.

(ii) Many studies have focused on the unequal access to job opportunities among different social or ethnic groups³. The considerable amount of research on this topic generally combines various accessibility components and indicators: land-use (location of residence and job opportunities), transportation (availability of transportation modes) and individual (income, social or ethnic group, gender, etc.) A growing number of studies have shown that the uneven residential distribution of social and ethnic groups combined with the spatial distribution of employment opportunities create strong accessibility inequalities between groups. First developed in the US after the seminal work of John Kain (1968), the “spatial mismatch” literature has grown in importance since the Welfare Reform. Within the spatial mismatch literature, four types of approaches can be distinguished (Ihlanfeldt and Sjoquist, 1998): those that compare commuting time or distances between different ethnic or social groups, those that aim to measure the impact of job accessibility on obtaining and maintaining a job and on wages, those that compare the integration of inner-city and suburban residents in the job market, and those that examine the differences between inner city and suburban job markets. While most authors conclude that the suburbanization process has helped strengthen residential segregation and job access inequality, there is no consensus on the weight of the spatial mismatch factor in explaining certain social or ethnic groups' employment difficulties. Taylor and Ong (1995) show that barriers to employment opportunities for ethnic minorities are related less to spatial mismatch than to the use of slow forms of transportation: individual members of ethnic minorities have longer commute times because they use public transit more frequently and not because their jobs are further away. They conclude that the problem is one of ‘automobile mismatch’ rather than ‘spatial mismatch’. A body of related research has shown that car use tends to be positively correlated with a wider range of destinations, higher employment rates and salaries, and reduced disparities in inter-ethnic levels of unemployment (Ong, 1996; Blumenberg, 2002). According to Raphael and Stoll (2002), low-income people with access to a car have a better chance of finding and retaining a job than their carless counterparts.

The spatial mismatch debate has raised various interesting questions related to the role of space and access in the exclusion of certain individuals and groups from the job market. However, the conclusions are still controversial and several studies have shown that other factors like racial discrimination (Elwood, 1986), lack of qualifications (O'Regan and Quigley, 1999), or time constraints can also play a major role in the employment difficulties of certain groups. As a consequence “decades of empirical tests

³ In the context of the Workfare policies implemented in many industrialised countries, recent analyses have stressed the importance of access to employment opportunities for poor households. The ability to get around is presented as an important factor in maximizing the employability of poorer people.

have resulted in widely divergent results, with contradictory evidence that both supports and refutes the existence of spatial mismatch” (Grengs, 2010). These disappointing results can be explained not only by the use of oversimplified measures of job access but also by the fact that the concept of spatial mismatch is “ill-defined” (Grengs, 2010). Therefore, the enormous amount of research produced on the topic contrasts with a lack of consensus on the relevant variables to take into account and the limited policy response to the issue of job access. Actually “because scholars have been vague in defining the relevant independent variables in spatial mismatch studies, policy makers have interpreted the primary problem as geographic distance. But a person’s prospects depend on the land-use arrangements of housing and jobs, the location of competing workers in filling a job, the availability of a car, and the effectiveness of transportation infrastructures and services. In other words, the problem is one of accessibility rather than distance itself” (Grengs, 2010). Another problem with the spatial mismatch debate is the fact that it tends to reduce the problem of accessibility to the sole issue of job access, and the discussion on social inclusion to integration in the job market⁴. However, there has been a recent movement toward a “wider ‘access to services’ understanding” of social exclusion processes (Hodgson and Turner, 2003), leading to a broader understanding of accessibility.

(iii) A recent range of studies has attempted to measure lack of access to a wide range of services as a component of social exclusion. Studies in this category use a larger set of indicators than those in the previous category, especially regarding the land-use component (location of various urban resources and opportunities). As low-income households are often concentrated in locations with sparse facilities and poor public transit service, the question of accessibility for residents living in deprived neighborhoods has been emphasized. However, while research on social and racial inequalities in access to employment has flourished in many countries, studies taking accessibility to a wider range of urban resources into account remain rare in France (Caubel, 2006; Motte, 2006) and other countries (Farrington 2005, 2007).

In Great Britain, the appearance of the Social Exclusion Unit in 1997 created opportunities to analyze the various dimensions of social exclusion, as well as the relationship between mobility and social exclusion (Church et al., 1999, 2000; Hine & Mitchell, 2001; SEU 2003; Grieco, 2003; Lyons, 2003; Lucas, 2004). Church et al., (2000) list seven types of transport-related exclusion: physical exclusion, geographic exclusion, exclusion from facilities, economic exclusion, time-based exclusion, fear-based exclusion, and space exclusion. Wixey et al. (2005) list six main types of transport exclusion: spatial, temporal, personal, financial, environmental, infrastructural and institutional. Although these typologies help us better understand transportation-related social exclusion processes, they must produce empirical measures in order to be operationally useful.

⁴ It is indeed problematic to reduce social integration to the sole issue of access to the job market, and to reduce employability to a question of mobility and transportation. While the lack of adequate transportation is a significant barrier to employment, there are other obstacles that probably have a stronger impact on the employment outcomes of disadvantaged individuals: racial discrimination (Elwood, 1986; Massey & Denton, 1993) or individual characteristics like education and qualification (O'Regan & Quigley, 1999) are among the key barriers to employment. Policies aiming at improving physical access to job opportunities would probably be more efficient if they were complemented by strategies tending to improve access to health, childcare, education and training facilities.

Among the indices of local deprivation created by the Social Exclusion Unit is a measure of accessibility. However, as Grieco (2003) points out, the Index of Multiple Deprivation introduced by the SEU has a very limited accessibility component considering only four items: access to a food store, primary health care, a primary school, and a post office. Moreover, this kind of measures is restricted to “identifying outcomes without identifying the processes which produce them” (Grieco, 2003). Another weak point in current accessibility measures is the paucity of data on the cost of transportation and its effects on accessibility (Preston and Rajé, 2007), which again demonstrates the lack of interest in the topic.

Several studies have suggested that indicators using GIS databases be developed. For example, Church et al. (1999, 2000) proposed a method of local access mapping based on the location of facilities (post offices, shops, etc.) and transport infrastructures. Their approach involves identifying areas with high levels of deprivation based on the Index of Local Deprivation devised by the Social Exclusion Unit. By calculating the average time needed to travel to specific destinations from a given area (using a mapping tool called CAPITAL), a cumulative indicator identifies the time needed to access a range of facilities and services. While this type of area-based accessibility indicators are very interesting, they do not take the individual dimension of accessibility into account. As Hine and Grieco (2003) pointed out, the fact that people have access to opportunities does not necessarily mean that they will be able to take advantage of them. In addition, while the mapping technique is very useful for identifying and measuring a lack of accessibility within spatial clusters of individuals affected by social exclusion, it does not help detect more scattered manifestations of the process (Hine and Grieco, 2003; Preston and Rajé, 2007). Consequently the current focus on area-based measures rather than individual measures may be considered as a problem.

As a result of the complexity of these measures (2001), “examples of the actual use of accessibility measures in planning are relatively scarce” according to Handy and Clifton. Traditional measures do not take some characteristics of the local environment into account, though they might have a major impact on transportation mode choice. In fact, accessibility assessment incorporating these characteristics would require data that are very difficult to collect. There is a gap between the data required to obtain a satisfactory measure of accessibility and the data available to planning departments. In addition, “the more complex the measure the more data and analysis skill required, limiting the ability of most planning departments to develop such measures” (Handy and Clifton, 2001). It is thus a major methodological challenge “to make the bridge from theory to practice” (Preston, 2009) and to find “the right balance between a measure that is theoretically and empirically sound and one that is sufficiently plain to be usefully employed in interactive, creative plan-making processes where participants typically have different degrees of expertise” (Bertolini et al., 2005). According to Bertolini et al. (2005, cited by Curtis and Scheurer, 2010), “in order to be useful for practical planning purposes, an accessibility measure must meet two basic requirements: it must be consistent with the uses and perceptions of the residents, workers and visitors of an area, and it must be understandable to those taking part in the plan-making process”. This emphasizes the need to build a common language between the different actors intervening in the planning process, be it policy-makers, technicians or citizens.

2. Transport policy and social inequalities

Historical studies show that the way in which social inequalities have been addressed as a subject for public policy in general (Castel, 1995; Paugam, 1996) and for transport policy in particular (Gallez, 2011) has changed over time. At the national and local levels, policy priorities targeting transportation reflect those changes. In the 1960s, transport policies in most European countries focused on the development of road infrastructure, in order to meet expected growth in transport demand and individual mobility. In France at the beginning of the 1970s, the priority given to the development of urban public transport networks was a response to different concerns: preventing a loss of attractiveness in urban centers, ensuring access to the city center (in the context of rapidly increasing car traffic), providing access to urban amenities for the many (especially for those without a car). During this period, prior to the growth in suburbanization, transport studies paid little attention to the problem of socio-spatial inequalities. Many authors have pointed out that similarly, much literature on social exclusion (or inclusion) had long neglected its spatial or mobility-related aspects (Kenyon, Rafferty and Lyons 2003, cited by Farrington, 2007; Church et alii, 2000).

Over the last four decades, the policy discourse on social issues gradually evolved from the fight against social inequalities to the problem of social exclusion (Jones and Smyth, 1999; Levitas, 2000). At the same time, the dimension of transportation and accessibility has slowly found its place among the factors contributing to social exclusion. As a result, instead of aiming to provide extensive access, transportation policies have been more and more focused on specific territories, targeting the needs of the most deprived neighborhoods which are seen as being particularly sensitive to social exclusion processes. Since the 1990s, improving urban access for disadvantaged groups has become a component of strategies put in place to tackle social exclusion, partly through Workfare policies.

Similarly, the question of social inequalities in access has been reformulated since the 1960s, influencing the design and application of models and indicators used in the assessment of transport and land-use investments. Despite growing concern over social exclusion and recognition that a lack of accessibility can prevent people from taking part in social activities, equity considerations are still poorly integrated in the *ex-ante* evaluation of transport investment projects. On the other hand, an analysis of recent transport-specific policies in different countries shows their limited success in the fight against social exclusion, emphasizing the need for cross-sector policies.

In this section, we first review policies intended to improve urban access, focusing on policies that have been implemented since the 1990s to tackle social exclusion through improved accessibility. Then we examine the various tools used to assess transport policies and their limitations. Finally we discuss social access as a policy priority.

2.1 Tackling social exclusion through accessibility policies

Over the last twenty years, the perceived link between low accessibility to urban resources and the risk of social exclusion resulted in specific policies in most countries. In France since the 1990s, policies have been implemented to promote improved

access to public transit in disadvantaged areas (Harzo, 1998). In the UK, since the Social Exclusion Unit was established, lack of access to various services has been identified as a factor behind social exclusion. Many studies have enumerated the various dimensions of social exclusion that limit “access to basic necessities of life” (Strategy Action Team, 1999, quoted by Gaffron et al., 2001). The 2003 Report of the Social Exclusion Unit states that “recent years have seen a growing recognition that transport problems can be a significant barrier to social inclusion” (SEU, 2003). As a result, the UK has introduced policies to improve access to public transit in socially deprived areas. However, the main innovation is the introduction of “accessibility planning” (SEU, 2003). In 2004, the Department for Transport published a guidance note which required framework accessibility strategies to be included in Local Transport Plans. A five-step approach was recommended: strategic accessibility assessment, local accessibility assessment, option appraisal, accessibility plan preparation, performance monitoring and evaluation (Preston and Rajé, 2007). As a result, while developing their 2006-2010 Local Transport Plans, local transport planners had to work with land-use planners, service providers and agencies, the private sector and major employers: “the key aims for accessibility planning are to ensure that local decision-makers have improved information on the areas where accessibility is poorest and the barriers to accessibility from the perspective of the people who are living there. It is also designed to create a more transparent, integrated and equitable process for transport and land-use decisions. Transport planners are encouraged to ‘think out of the box’ and work more collaboratively with their partner agencies, so that a wider range of solutions to accessibility problems can be identified and greater value for money achieved through their combined and synchronized efforts” (Lucas, 2006).

In the US, transportation policy started addressing social justice goals in the 1990s, in a break with what has been called the “Interstate era” of highway-building (Jakowitsch, Ernst, 2004). A landmark measure, the Intermodal Surface Transportation Efficiency Act (ISTEA) was passed in 1991, and helped balance investment between roads and public transport infrastructure (Goldman, Deakin, 2000). Improved access for disadvantaged groups and individuals was to be achieved “through intermodal connections between people and jobs, goods and markets, and neighborhoods” (Bullard, 1996, cited by Sanchez, 2008). It also made cooperation with citizens and transportation bodies compulsory. The Transportation Equity Act for the 21st Century (TEA-21), which followed ISTEA in 1998, continued in the same vein making the travel needs of the poor and ethnic minorities a priority. The role of citizens and users in decision-making was strengthened. Meanwhile, the welfare system reform passed in 1996 emphasized the mobility needs of welfare recipients. Some of the “welfare-to-work” funds that were provided by the Federal Government were dedicated to improving transportation services. They were used to adapt public transit routes and schedules to the needs of welfare recipients, but also to create specific programs intended to improve access to employment.

Recently, due to the rising importance of “workfare” policies in most industrialized countries, the ability to get around is presented as an important factor in maximizing the employability of poorer people. Therefore, accessibility and transportation are now seen as key in getting people back to work (Gobillon, Selod and Zenou, 2007; Patacchini & Zénou, 2003). At the same time, mobility is increasingly considered to be a personal asset and resource. In this context, public policies increasingly target individuals through

dedicated tools like car ownership programs (Wachs and Taylor, 1998; Blumenberg & Waller, 2003) or targeted fare policies (Mignot and Rosales-Montano, 2006).

2.2. Social disparities, equity, and the appraisal of transport investments

Since the 1990s, the spread of sustainable development ideas raised the issue of environmental and social assessment of transport projects and their economic impact. While substantial efforts were made to include environmental impacts in the appraisal of transport projects, the social dimension has received far less attention. Recent studies examine the evaluation of transport's social impacts (Geurs, Boon and Van Wee, 2009) or equity considerations in transport infrastructure appraisal⁵ (see for instance Van Wee, 2012; Litman, 2011; Thomopoulos, Grant-Muller and Tight, 2009). Based on this review of current practices, we will first identify the limitations and advantages of the two main approaches to transport project evaluation, particularly their ability to take distributional impacts into account. Then, we will show that valuing mobility rather than accessibility in transport project appraisal may prevent better inclusion of the social dimension in transport and urban planning.

(i) Cost-Benefit Analysis

Cost-Benefit Analysis (CBA) is a method where the benefits of a given project are weighed against the costs of the same project. If the Benefit to Cost Ratio (BCR) is greater than one, the project is considered a worthy investment. One major advantage of the method (which probably explains its popularity) is that it allows multiple options to be compared on the basis of a single value: the BCR. Since Jules Dupuit⁶ laid down the principles of utility calculation, a basic concept in estimating the individual and collective advantages of transport infrastructure, this method has prevailed, and today CBA is the standard method of *ex-ante* transport project evaluation in most Western countries. Despite its popularity, CBA has often been criticized for several reasons (Thomopoulos et al., 2009; Grant-Muller, Mackie, Nellthorp and Pearman, 2001), some of them ethical and others technical. Here, we will focus on criticism of measuring social impacts and disparities, and the ethical basis of these methods.

CBA is currently criticized for *ignoring distribution effects*. The underlying theory of CBA, utilitarianism, does not distinguish between the different beneficiaries of a project – the aim is to maximize the total amount of welfare in society as a whole. Focusing on total welfare, it does not account for lost welfare among certain regions or population groups.

CBA aims to express all effects in monetary terms, but some social effects of transport projects are particularly difficult to monetize. In practice, only a very limited number of social impacts are included in CBA as monetary values. This is generally done through the estimation of compensation, after a willingness to pay (WTP) or a willingness to

⁵ The evaluation of social impacts and the question of equity are closely linked, although some authors recommend making a distinction between the measure (objective) and the interpretation (subjective) of social disparities. Questioning the social impacts of transport is related to estimating changes in a transport system that may (positively or negatively) affect the preferences, well-being, behaviour, or perceptions of individuals or groups (Geurs et alii, 2009). On the other hand, equity refers to the distribution of a project's impacts (benefits or costs) and whether that distribution is considered appropriate (Litman, 2002).

⁶ Emphasizing the utility resulting from the construction of new infrastructure, this French engineer developed a method allowing different projects to be compared, with respect to financial cost but also the advantages (*utility*) of the projects for consumers.

accept compensations (WTA) survey has been conducted. However, this type of a *posteriori* compensation does not take into account other prejudices, such as the relative loss of access for certain regions or population groups resulting from the choice of one option over another. In other cases, social impacts are either omitted or assessed using a qualitative appraisal (see for instance Geurs et al., 2009). The overall benefit of a particular project is highly sensitive to the chosen discount rate and the time horizon of benefits. Furthermore, these choices may have intergenerational equity implications.

Another limitation is that in most transport project evaluation methods, direct effects are estimated in terms of travel time savings (Metz, 2008; Geurs et al., 2009; CGPC, 2005; Grant-Muller et al., 2001). In Great Britain, for instance, travel-time savings have accounted for around 80% of the monetized benefits major road scheme CBAs (Metz, 2008). Several authors have criticized this methodological approach to benefits (see for instance Neuberger, 1971; Poulit, 1974; Koenig, 1974; Metz, 2008), emphasizing the fact that short-term improvements in transport conditions may not result in a long-term reduction in travel time, but rather an increase in mean or total travel time. The additional travel time resulting from new transport infrastructure has long been recognized as a result of “induced traffic”, which arises from increasing the capacity of the system (Goodwin, 1996). Since the seminal comparative study of Zahavi and Talvitie (1980) on travel time budgets, several works based on travel surveys have shown that over the long term, the average time an individual spends on daily travel has remained almost constant, while daily travel distance is increasing. This hypothesis of a near-constant time budget for daily mobility is known as the “Zahavi conjecture”. It is as if individuals and firms used the increase in travel speed resulting from improved transport conditions to increase their access (by choosing new locations, or reaching new opportunities) and not to gain time⁷. Based on these observations, some authors have highlighted the link between the improvement of transport conditions (which can be summarized as an increase in average speed) and urban sprawl (see for instance Bieber, Massot and Orfeuill, 1993; Wiel, 1999). As observed by Metz (2008), there is little or no empirical support for the idea that reduced travel time is the main benefit of transport infrastructure improvements, while the concept of access, which is central in transport and urban planning, has rarely been included in the traditional appraisal of transport projects.

(ii) Multi-Criteria Analysis

Multi-Criteria Analysis (MCA) is a multi-objective decision making process that was developed following criticism of the single-criterion CBA approach. Here, multiple criteria are taken into account simultaneously, and the goal is to optimize with respect to a set of socially based objectives defined by the decision-makers, e.g. maximize accessibility for certain population groups. Unlike with CBA, the achievement of given objectives can be assessed using both quantitative and qualitative measures (Grant-Muller et al., 2001). A project's various impacts are ranked on an intensity scale, and the comparative desirability of each project can be evaluated via an overall project score (the weighted sum of all impacts).

⁷ Of course this conjecture does not hold at a disaggregate level, but results from a combination of different individual situations.

MCA techniques have several advantages in estimating the indirect impacts of transport, especially those social and environmental impacts which often cannot be converted into monetary terms. The participation of decision makers in the appraisal process (rather than only technicians) is central to this approach, and can be viewed as a significant advantage when assessing equity considerations (Thomopoulos et al., 2009). MCA has seen new developments recently in Great Britain, where monetized effects are used as inputs to a partial CBA estimating cost/benefit ratios, which in turn are inputs to a MCA (Geurs et al., 2009). More generally, MCA has been used to assess projects' environmental impacts. According to Thomopoulos et al. (2009), MCA "has the potential to be an appropriate evaluation methodology to accommodate the equity considerations of large transport infrastructure projects".

A large number of MCA methodologies have been developed, according to the different needs of each context and discipline (Thomopoulos et al., 2009; Grant-Muller et al., 2001). Among the most commonly used is the Analytical Hierarchy Process (AHP), which was developed by Saaty (1980). The key input to this method is decision makers' responses to a series of pairwise comparisons of various alternatives. These responses, which may be either verbal or numeric, are coded on a nine-point intensity scale and used to derive weights for criteria and performance scores for different options. This method has faced some criticism over the use of a nine-point scale, which may not be compatible with all relevant pairwise comparisons, and the fact that the relative weight of criteria may be established by decision-makers before the measurement scale is set. Several improvements have been made to overcome these drawbacks, including decomposition of the process into several steps. The basic steps can be summarized as follows (Thomopoulos et al., 2009): (1) Establishing a hierarchy of objectives, where sub-objectives are linked to main objectives, (2) Eliciting responses to sets of pairwise comparisons from the decision-makers, (3) Deriving weights for each element using mathematical analysis of the pairwise decision matrix.

Criticism of MCA methods concentrates on their subjectivity and lack of robustness (Crozet, 2004; Olson, 1995). According to Grant-Muller et al. (2001), as "the choice and use of weights in a MCA may be somewhat arbitrary (...) there may be a sense that the MCA is *making the decision* rather than *supporting the decision-maker*". One way to overcome or lessen these potential problems is to contrast the pairwise comparison results with the project's predefined objectives (Thomopoulos et al. 2009). Additionally, a decrease in total welfare is not necessarily reflected in MCA outputs. This may be considered an acceptable risk when focusing on equity concerns (Thomopoulos et al., 2009).

(iii) Shortcomings of the use of mobility variables in transport modeling and appraisal
Current planning practices tend to assess the benefits of transport projects in terms of mobility rather than accessibility. A review of the recent urban studies literature shows that mobility variables are used more frequently than accessibility indicators to measure social disparities and risk of social exclusion. The focus probably falls on mobility because it is easier to measure than accessibility. However, it has major shortcomings.

Mobility variables are not sufficient to measure social inequalities, particularly when they refer to daily mobility patterns. In fact, a high level of mobility may correspond with a

large number of constraints, especially for certain job categories such as cleaning personnel (who are most often women) or precarious workers (Jouffe, 2007). On the other hand, low levels of daily mobility are often observed for high-income people who can afford central residential locations or intentionally reduce their travel time to work to preserve their quality of life. More generally, travel time budgets are not a direct function of social status. Disadvantaged social groups (immigrants, cleaning women, etc.) sometimes have longer travel times, but this is by no means a rule. On the contrary, many studies have shown that low-income individuals tend to travel less and make shorter trips than well-off individuals (Pucher and Renne, 2003; SEU, 2003; Orfeuil, 2004). One can hardly say that it is a relevant objective to reduce travel time, especially where poor people are concerned, because this could mean lower access to jobs or other urban opportunities. There is a contradiction between the short-term view (how to travel more easily or rapidly from one location to another) and the medium or long-term view (how to access better jobs and opportunities within a daily time constraint). Consequently, accessibility is a better indicator of social disparities in the sense that it accounts for land use patterns (i.e. the distribution of residences and destinations) as well as social and individual characteristics (including time availability).

In transport modeling, forecasts of future travel demand are based on current travel patterns. By doing so, transport models reproduce current imbalances in transport provision between population groups: “The models use the high trip rates among car owners in the present to predict high trip rates among car owners in the future. These predictions favor policies that cater to this growth through improved services for car owners (e.g. road building or investment in costly rapid rail)” (Martens, 2006). This inherent feedback loop was highlighted early by Dupuy (1978), who showed that by incorporating increasing motorization rates in the generation step, four-step models inevitably predicted an increase in transport infrastructure needs. As far as distributional impacts are concerned, such an analysis suggests that classical transport models tend to generate transport improvement plans that benefit highly mobile population groups at the expense of the mobility-poor (Litman, 2003).

By evaluating the benefits of transport infrastructure in terms of travel time savings rather than accessibility, traditional appraisal methods may also have negative consequences in terms of distributional mechanisms. First, these traditional appraisal methods are based on the hypothesis that land use organization remains unchanged. This means that two transport options are compared only on the basis of their intrinsic characteristics (average speed, maximum traffic threshold, frequency, etc.) but not in terms of the additional access they offer to urban amenities. However, experience shows that in the medium or long term, improvements to transport systems imply changes in residential or activity locations. Two transport options with comparable qualities may have different impacts, especially in terms of distributive effects, for instance depending on whether they serve poor urban neighborhoods or not. Second, classic appraisal methods are based on the hypothesis of a positive correlation between the total number of trips and the benefits generated by a transport improvement: the more trips forecast for a specific link, the more travel time savings can be accrued by improving that link and the greater the total benefits of this improvement (Martens, 2006). Several authors point out that this principle worked to the advantage of well-off population groups with high levels of car ownership (Martens, 2006; Litman, 2011).

As suggested early on by Wachs and Kumagai (1973), one reason that accessibility analyses have not frequently been included in social reports is “the common notion that the demand for movement is a ‘derived’ demand: movement is rarely considered an end in itself, but rather a cost which is normally born in order to achieve these objectives”. Because transport and physical accessibility systems were considered means to reach spatially distributed opportunities, accessibility has not been singled out in city or regional social reports. This probably explains why accessibility is still seen in terms of reducing distances, and addressed by transport policy rather than other fields of public policy.

2.3 Are current accessibility policies effective in tackling social exclusion?

Although social issues have appeared on transport policy agendas in most countries, the results of these policies are still disappointing or difficult to assess (Sanchez & Schweizer, 2008; Féré, 2011). Studies have tried to measure the impact of public transit on the social integration of low-income individuals and have produced mixed or even contradictory results (Sanchez, 1999; Cervero, Sandoval and Landis, 2002; Holzer, Quigley and Raphael, 2003; Sanchez, Shen and Peng, 2004; Kawabata & Shen, 2007). Research findings on how car ownership affects employment opportunities are more conclusive but their implications for public policy are very controversial (Ong, 1996; Raphael & Stoll, 2002; Ong, 2002; Blumenberg, 2002; Blumenberg & Waller, 2003). The first studies on “alternative programs” like car ownership programs show that while their cost is very high their results are rather uncertain and they often “miss their target” (Fol, Dupuy & Coutard, 2007; Féré, 2011). For example, demand responsive services are very expensive but do not offer the flexibility of other alternative means of transportation like taxis (Gaffron et al., 2001). Overall, the cost-benefit ratio of such programs is often questionable (Sanchez and Schweizer, 2008). According to Sanchez (2008), there is very little knowledge about these programs “creating opportunity or improving the well-being of families in the grip of poverty”. One explanation is the lack of resources to evaluate the effectiveness of programs with social implications. The scale and fragmentation of these programs, which are scattered among many private and public agencies, also do not facilitate comprehensive evaluations of their effects. In addition, most of them rely on fragile, non-guaranteed funding, which prevents a long-term view of their effectiveness (Fol, 2010; Féré, 2011).

Regarding accessibility planning as it has been implemented in the United Kingdom, the effects of these promising approaches are difficult to assess to date. According to Lucas (2006), “accessibility planning for social inclusion is still in its infancy in the UK and it will be some time before it will be possible to assess whether the aspirations for the method can be realized”. This lack of effectiveness raises the question of whether real political will currently exists to improve social access. It also reflects the lack of a common language shared by the different actors involved in the planning process.

2.4 Is social access really a priority?

Although the literature on the social dimensions of urban access has become quite abundant in the past few years, policy makers seem hesitant to make this issue a

priority. Unlike other urban networks, which have been the subject of innovative solutions to better serve poor households or deprived areas, the field of transport is still struggling with obvious difficulties in dealing with this issue. This can be partly explained by the complexity of the accessibility concept itself and the problems posed by its measurement, especially where the social dimension is concerned. In addition there are some specific characteristics of both transportation networks and accessibility planning that make it difficult to implement better and more efficient policies. Another possible explanation may be found in the distinct “technical cultures” of the transportation and urban planning fields. Transportation planning has long been structured around two main disciplines, economics and traffic engineering. Both emphasize the functioning of transportation networks in relation to the short-term (and obviously important) problem of organizing urban traffic flows. On the other hand urban planners, often coming from a social science background, are more inclined to adopt a long-term perspective and address “soft” issues like urban form and social disparities.

Transportation networks hold a distinct place among urban networks, and accessibility issues have never been addressed in exactly the same manner in the transportation field as in other sectors. The idea of “universal coverage” is common to most networks including transport, and based on continuous improvement of network supply through technical and economic progress and strong political will (Coutard, 1999). However, access to transportation does not carry the same weight and does not have the same implications as access to water networks, for example, which have been defined as basic human needs internationally (Jaglin and Zérah, 2010)⁸. While some innovative experiments in water or sewage services have attempted to reach poor populations in the developing world, the transportation field seems reluctant to renounce the network concept. For example, in the water services sector, ‘pro-poor’ solutions have been implemented, relying on the participation and work of the users themselves and not necessarily on a network connection (Jaglin and Zérah, 2010). Although these innovations are subject to strong criticism (Spronk, 2009), the emphasis placed on community participation and non-network solutions is interesting.

Another distinguishing point of transportation networks is their cost, which is very high compared to other networks, in terms of infrastructure investment as well as running costs. When investment choices are to be made, social concerns must compete with transportation's other goals. As observed and demonstrated by several authors, as long as the principles of welfare economics are applied, there is a major contradiction between the objective of efficiency (optimum allocation of resources) and the objective of equity (see for instance Martens, 2006; Bonnafous and Masson, 2003). The case of light rail line extension in Lyon (France) studied by Cécile Féré (2011) is very informative: instead of implementing a long-term extension project designed to serve one of the most deprived areas of Lyon's urban region (Vénissieux), local authorities decided to give priority to a new line serving a brand-new regeneration project (Lyon Confluence), despite the fact that the first plan was expected to carry a very significant number of passengers. Similarly, in the current discussion on ‘Greater Paris’ the final choice between the two public transportation options that were initially proposed is the one that has the weakest impact on the job accessibility for carless residents (Beaucire, 2012). Improving urban access for low-income individuals might not be a priority for

⁸ An obvious explanation lies in the fact that lack of access to water and sewage has direct implications on health.

some local actors if it means allowing young people from deprived neighborhoods to travel anywhere anytime...

Moreover, in recent years the rising importance of environmental issues has tended to lessen interest in social questions, though the social dimension of sustainable development and environmental justice should keep these issues alive. In some respects, there are even tensions and contradictions between social and environmental goals in the field of transportation (Féré, 2011). The 'rail versus bus' debate in Los Angeles is a good example of the potential contradictions that exist between limiting car use by expanding public transit for middle-class suburban commuters (the rail option) and better serving low-income and minority inner city residents (the bus option). In many cases, policy makers tend to favor pro-environment choices that can be detrimental to disadvantaged groups (Taylor, Wachs, Luhrsen, Lem, Kim and Mauch, 1995; Garrett and Taylor, 1999; Bullard and Johnson, 1997; Benit-Gbaffou et al., 2007; Fol and Pflieger, 2010).

Certain global trends have also weakened the effects of accessibility planning "good practices". Insufficient planning regulations have allowed residential, employment, retail and service sprawl to continue. In parallel, the "rationalization" of many public services like hospitals, health services, and post offices has resulted in longer travel distances for most users. This has been identified in the rural context, where the ongoing rationalization of public and private services as a result of globalisation processes has had a dramatic impact on accessibility (Nutley, 2003). But this is also the case in urban locations. As Lucas (2006) points out, "many planning decisions are taken out of the hands of land-use planners by the private sector or other more powerful public sector agencies (...), which do not include transport and accessibility in their location assessments. Moreover, the deregulation of transport systems, particularly in the UK, has led to a reduction in bus services" (Gaffron et al., 2001). The current context of an "underfunded and fragmented public transport network" (Lucas, 2006) does not favor better integration of land use and transportation. Grieco (2003) underlines a policy paradox where the role that transport and land-use organization can play in reducing social exclusion has been recognized just when the means of intervention (municipal transport, social housing, public sector employment) "have been subject to radical erosion".

However, we shall argue that these obstacles to a better understanding of accessibility and more efficient implementation of accessibility planning can be overcome.

3. How can the role of social indicators in accessibility assessment be improved? How can accessibility policies be improved?

A large number of recent studies have proposed new accessibility assessment methods that better account for the social component. These changes are occurring in pre-decision accessibility measurement, as well as the evaluation of accessibility policies themselves. Some improvements are possible (and have already been tried) in the planning process itself. We will first suggest some practical ways to better account for

social issues in the appraisal of transportation projects and policies. Then we will make some recommendations for improving the planning process.

3.1 How can social criteria be given greater weight in the appraisal of transport projects and policies?

As mentioned above, social issues are rarely included in transportation planning, despite the fact that transport decisions often have significant social and equity impacts. In this section, we suggest three ways to increase the weight of social criteria, all of which consider the improvement of social access as an explicit objective of the decision-making process. The first aims to clarify which type of equity is pursued, in order to choose adequate measurements of social or spatial inequality. The second emphasizes the importance of shifting from a demand-based transport planning approach to one based on needs. Finally, the third seeks to identify the losers and the winners in the implementation of transportation projects.

(i) Defining equity objectives in a comprehensive and effective way

Our first proposal is **to clearly define which equity objective(s) is (are) being pursued in order to clarify the types of indicators that may be used**. As underlined by Litman (2011), “transportation equity analysis can be difficult because there are several types of equity, various ways to categorize people for equity analysis, numerous impacts to consider, and various ways of measuring these impacts”. Different measures of social disparity correspond to different conceptions of social equity. According to Young (1994), three fundamental approaches reflect the main theories of equity (cited in Thomopoulos et al., 2009):

- Egalitarian: everyone has equal rights or benefits for a particular service or scheme
- Utilitarian: the aim is to maximize the total welfare of the society as a whole
- Rawlsian: the aim is to retain the existing status quo between those better- and worse-off, improving the situation for the worse-off as much as possible after everyone's fundamental rights are secured.

The utilitarian approach has prevailed in transport infrastructure appraisal through references to Welfare Economics and the use of CBA. As mentioned above, this approach takes little or no direct account of equity and social exclusion. Litman (2002) notes that the egalitarian approach has also been applied in various situations, but the Rawlsian approach has not yet been widely used. Talen (1998, cited by Apparicio and Seguin, 2006) defines four conceptions of equity that correspond to four types of accessibility: equity in terms of equality (everyone receives the same public benefit); equity in terms of needs (the distribution of public benefit is based on needs, which refers to a ‘compensatory equity’); equity in terms of demand (which would probably favor wealthy neighborhoods, where the expressed demand is greater); and market-based equity (where cost is a key factor determining the willingness and ability of users to pay).

Following Litman (2011), **we suggest that these various views of equity be grouped into three main types:**

- **Horizontal equity:** requires that public resources be allocated equally to each individual or group unless a subsidy is specifically justified. Furthermore, it requires that

consumers pay costs incurred by their activities as much as possible. Horizontal equity relates to the egalitarian theory of equity.

- **Vertical equity with respect to income and social class:** requires that disadvantaged people (according to the level of income or social class) be identified and given special consideration (or protection) in planning. People should be burdened according to their ability to contribute. Vertical equity relates to the Rawlsian theory of equity.

- **Vertical equity with respect to need and ability:** same as previous, except that people's disadvantages are not estimated in terms of income or social class, but in terms of needs and ability.

As Litman (2011) points out, equity evaluation is significantly affected by the chosen definition of equity (table 1), along with the categories used to measure social differences (demographics, income class, geographic locations, ability, etc.), the estimated social impacts of transport project or policy (prices, tax burdens, transport service quality, external costs, etc.) and the units used for these measurements (per capita, per vehicle-kilometer, per trip, etc.)

Table 1 - Equity evaluation variables

Types of equity	Categories	Impacts	Measurement units
Horizontal	Demographics (age, gender, race, ethnic group, family status, etc.)	Price or fare structure	Per capita
Vertical with respect to income and social class	Income class	Tax burdens	Per vehicle-mile or kilometer
Vertical with respect to need and ability	Geographic location	Transportation service quality	Per passenger-mile or kilometer
	Ability (physical disabilities, license driving, etc.)	External costs (crash risk, congestion, pollution, etc.)	Per trip
	Travel mode	Access	Per peak-period trip
	Vehicle type	Economic opportunity and development	Per dollar paid in fare or tax subsidy
	Industry (truckers, transit, taxis, vehicle manufactures, etc.)	Transport industry employment and business opportunities	
	Trip type and value		

Source: Litman, 2011

Note: in this table, we added "access" to the list of impacts in order to distinguish the accessibility improvements from "economic opportunity and development" and "business opportunities".

Acknowledging the fact that "there is no single correct way to evaluate transportation equity", **we recommend**, as suggested by Litman, **considering various perspectives, impacts and methods**.

(ii) Combining qualitative and quantitative methods

In practice, transportation planning processes involve trade-offs between different objectives including equity, cost efficiency, and environmental protection. As there is no single way to determine how much weight should be given to a particular objective, this weight should reflect community needs and values (Litman, 2011). To attain this goal, we suggest that **quantitative and qualitative methods of assessment be combined**.

While the use of quantitative data seems essential when measuring accessibility, qualitative approaches are necessary to understand the 'real experience' of deprived groups or individuals, the way they perceive their personal accessibility and that of their neighborhood, and what barriers matter most to them. To implement this kind of approach, **we suggest that focus groups be put in place**, with participants describing the types of activities they take part in, their location, the routes and transportation modes used, frequencies, costs, etc. (McCray, 2009). This could result in **the building of a detailed accessibility database by disadvantaged residents** themselves (Handy and Clifton, 2001). As Lyons (2003) pointed out, while levels of access are rather easy to measure through quantitative parameters, quality of access relates to the individual's experience, which implies that "the individuals under study should be consulted for their views". Many authors agree that it is necessary to combine an objective assessment of accessibility with a qualitative approach that reveals how individuals take advantage of the opportunities available to them (Church et al., 2000). Some barriers to access are not necessarily objective but can be subjective or cognitive (Beaucire, 2011) and it is important to capture these barriers, which could undermine the efficiency of policies aiming to improve accessibility. As Bertolini et al. State (2005, cited by Curtis and Scheurer, 2010), taking various kinds of expertise into account is critical "not just because of a generic democratic concern, but also because of the importance of mobilizing the (tacit) knowledge of different participants in the identification of problems and the search for solutions".

(iii) Basing transport planning on the principle of needs

Following Martens (2006), we state that given the importance of mobility and accessibility in current society, **transport-modeling approaches** – which are implicitly based on the distributive principle of demand – **should be based on the principle of needs**.

Many authors have underlined the importance of a needs-based approach to transport planning, derived from the Rawlsian idea of equity. Rawls (1971, 1982) discussed optimizing primary social goods as an alternative to optimizing welfare⁹. Sen (2009) disagrees with Rawls, arguing that it is important to take people's actual capabilities into account. More generally, there is an ongoing debate concerning the measurement of vertical equity. As underlined by Litman (2011), "there is general agreement that everybody deserves 'equity of opportunity', meaning that disadvantaged people have adequate access to education and employment opportunities. There is less agreement concerning 'equity of outcome', meaning that society ensures that disadvantaged people actually succeed in these activities". Considering the fact that transport affects equity of opportunity, it therefore meets the most 'conservative' test of equity, according to Litman. Following this principle, transport projects can be evaluated and prioritized according to the degree to which they provide basic access (Litman, 2011).

There are some practical barriers to evaluating present and future collective needs. For instance, it is necessary to define which types of goods, services and activities are considered essential. However, it may be difficult to define the level of access that is

⁹ According to Rawls, primary social goods include: basic liberties (freedom of association, liberty, etc.), freedom of movement and choice of occupation, powers and positions of responsibilities, income and wealth, the social bases of self-respect (quoted by Van Wee, 2012).

sufficient to avoid a reduction in life opportunities without making normative judgments (Martens, Golub and Robinson, 2012).

While we appreciate the difficulty of taking present and future collective needs into account in the assessment of transport projects and policies, we suggest that the following methodological and empirical changes be made in transport planning:

- Following Martens (2006) and other authors who emphasize the shortcomings of time savings as a criterion in transport benefit assessment (see for instance Litman, 2003; Metz, 2008), **we propose that travel time savings be replaced with accessibility gains as the key benefits of a transport project in classical CBA analysis.** By doing so, “the monetary value of accessibility gains is not related to income group dependent wage levels, but in large part to the existing level of accessibility of a person”. **Using a utility-based measure of accessibility** that incorporates the principle of diminishing marginal utility (see Koenig, 1980 for empirical applications), “an individual with a large choice set of destinations may be expected to attach a lower value to the addition of an extra destination, than a person with a relatively small choice of destinations, all else being equal.” The use of accessibility gains as the primary benefits of transport improvements would have two major advantages regarding equity principles: the first is to break the direct link between quantity of trips and benefits; the second is to direct attention in transport planning and cost-benefit analysis towards equity in terms of accessibility (Martens, 2006; Geurs and Ritsema van Eck, 2001)¹⁰. Martens (2006) observes that the challenge here is to develop a practically feasible method to assess accessibility gains in terms of monetary values.

- Among the various measures of accessibility, utility-based measures are probably the most satisfactory. However, their theoretical performance is the result of foundations in relatively complex theory (random utility theory or the doubly constrained entropy model) making them difficult to implement by non-specialists. Therefore, there is a need for measures that are usable by planners at the local level – relatively simple indicators that could be used alongside classical CBA assessment in a Multi-Criteria Analysis. **Place-based indicators are more readily accessible to local planners.** Compared to individual-based measures, which require comprehensive local surveys (whose results are difficult to generalize to a larger scale), this type of measurement is easy to conduct. However, it results in a rather rough measure of urban access: which places or resources are reachable from a given location in a given amount of time. To overcome its obvious limitations, **we suggest that this measure be disaggregated according to the needs** (access to employment, shops, schools, medical facilities, etc.) **of specific groups** (social, ethnic, gender, disabled, etc.). This method requires locally available

¹⁰ In classical CBA analysis, the more trips are predicted for a given link, the more travel savings can be accrued to this specific link and the higher the total benefits related to that improvement. This principle works to the advantage of populations with high levels of car ownership, since they have higher trip rates than people with lower car ownership (Martens, 2006; Litman, 2001). On the other hand, as Martens (2006) points out “the identification of accessibility gains as the prime benefit of transport investments has profound consequences for cost-benefit analysis. The monetary value of accessibility gains is not related to income group dependent wage levels, but in large part to the existing level of accessibility of a person. More specifically, the value of an additional destination that comes within reach due to a transport improvement will depend on the choice set of destinations already within the reach of an individual. Following the principle of diminishing marginal utility, an individual with a large choice set of destinations may be expected to attach a lower value to the addition of an extra destination, than a person with a relatively small choice set of destinations, all else being equal”.

place-based data (location of urban resources, transportation provision) to be combined with individual census data (income, social position, possession of a car). This combined method has been used in several studies (Handy and Niemeier, 1997; Wengleski, 2004; Preston and Rajé, 2007¹¹) and seems promising if not perfect.

(iii) Identifying the losers and the winners

Most transportation projects are based on the rather naïve assumption that they will benefit all users whatever their social position, income, neighborhood of residence, etc. The reality is of course different.

To change the current situation where the social dimension of accessibility is a low priority, Farrington (2007) suggests that “accessibility rights” be defined and placed on the urban and transportation actors’ policy agendas. This is particularly relevant in the present context where a sustainability discourse is developing. According to Farrington (2007), the accessibility concept “is capable of both making a significant contribution to the conceptual development of sustainability discourses, and also helping to articulate the social and economic dimension of sustainability and implementation”.

To take this principle into account, we suggest that **the fact that there are winners and losers when transportation projects are implemented should be admitted**. This recognition requires a significant amount of political lucidity and courage, and a willingness to submit the issue of cost/benefit distribution to public debate. The “rail versus bus” conflict in Los Angeles is an interesting counterexample. The Bus Rider Union sued the Metropolitan Transportation Authority over its extension of the rail system, arguing that this extension would mostly benefit the “white suburban commuters”. The allocation of resources to this project would therefore be detrimental to users of the inner city bus system, most of whom are low-income people and minorities. Garrett and Taylor (1999) argued that for carless, transit dependent people, bus transit was vital for access to jobs, schools, medical care and other necessities. They state that by “accommodating the political interests and desires of a more mobile, dispersed, and largely white, suburban-based electorate”, investment in the rail system would not increase accessibility but rather draw resources away from bus services that are vital for increasing low-income residents’ transportation choices. According to them, by failing to take transit ridership patterns into account, subsidy policies can reinforce existing segregation.

3.2 Improving the planning process by escaping the limits of transport-based approaches

As stated by Church et al., (2000), overcoming the access difficulties some groups and individuals face requires not only changes to the transport system, but also policies that tackle the factors behind this lack of access. In this last section we suggest that the planning process itself can be adapted, encouraging better integration of the various dimensions of accessibility planning, and promoting public and community participation.

¹¹ In their case studies of Bristol, Nottingham and Oxfordshire, Preston and Rajé (2007) have identified three criteria to assess accessibility-related exclusion: the level of travel in the area as a whole (area mobility); the level of travel made by particular individuals or groups (individual mobility) and the overall accessibility of the area.

(i) Coordinating transport and land-use policies

We suggest **promoting integrated transportation and land-use policies**. While this requires a multi-agency approach¹², we are convinced that this goal cannot be attained by institutional procedures alone. Better coordination of public transport services and various community transport operations is of course necessary (Hine and Mitchell, 2003). Overcoming the traditional divide between transportation agencies and land-use planning agencies is indeed a challenge (Handy, 2002). As Lucas (2006) points out, “a great deal of political will is needed, both within central and local governments and across all the relevant sectors” to achieve accessibility planning. In addition to improving connections between land use, service location, and transportation decisions, an integrated approach would “optimize scarce resource use” (Farrington, 2007), a necessity in the current context.

Beyond the limitations of transport policies themselves, the necessity to better coordinate different policy sectors derives from the need to regulate undesired impacts stemming from the improvement of transport systems, especially in terms of urban sprawl. The current separation of housing and transport policies, for instance, increases the risk of contradictory policy goals. In France, the creation of a zero-rate loan intended to facilitate homeownership for low-income households has had major urban sprawl repercussions, as low-income households are encouraged to buy homes in suburban areas where housing is more affordable than in the city center.

The idea that coordinated transport and land-use planning is a necessary condition for sustainable urban development has spread throughout academic and professional circles. During the last decade, abundant research has evaluated the links between land-use patterns and public transportation use, favoring compact cities, “transit cities” or “transit oriented development” (Cervero, 1998). Despite their focus on sustainability, these studies rarely take social inequalities into account (Jemelin et alii, 2007). In addition, key issues for coordination such as land policy, local taxation, or economic development are often neglected in the analysis (Gallez et alii, 2012). However, promising new planning tools have emerged that seem to allow for better coordination of transport and urban development. In France, these tools take the form of contracts between the State or regional authorities in charge of public transportation and the local authorities in charge of land-use planning. In accordance with the 2010 law on Greater Paris development, “territorial development contracts” (*contrats de développement territorial*) are being signed between the State and municipalities that will house future automated metro stations, in order to define quantitative residential and economic development objectives. The purpose here is to encourage increases in density around public transport stations. **We suggest that these procedures should include public housing objectives**, in order to allow as many people as possible to benefit from improved access to public transportation and urban opportunities.

(ii) Introducing accessibility indicators in the design of regeneration policies

We suggest **a stronger emphasis on the accessibility criterion in the design of regeneration policies**. In France, current policies implemented in disadvantaged

¹² According to Farrington (2007), this multi-agency approach “involves horizontal integration between the different sectors in which policy is made and delivered, as well as vertical integration between stakeholders and partners in community, governance and policy-making”.

neighborhoods mainly target transportation network improvement based on a simplistic diagnosis of spatial isolation. While it is necessary to improve the mobility of disadvantaged residents through transportation, we recommend that **accessibility should also be understood in terms of proximity**. This means that regeneration policies should account for the provision of services, shops, and jobs in the neighborhood or within a short distance. Similarly, social housing policies would benefit from coordination of residential location with urban resources.

(iii) Encouraging community participation in the planning process

We recommend **local or neighborhood-level transportation planning**, which would allow greater participation of the community and of the groups affected by accessibility issues (Hodgson and Turner, 2003). However, planning at the local level can “represent a challenge for a profession traditionally concerned at maintaining integrity of a transport network at as large a geographic scale as possible” (Hodgson and Turner, 2003). Some successful examples of this kind of planning practices already exist. In the US, the appearance of environmental justice in political debate and policy-making processes constituted a turning point (Fol and Pflieger, 2010). Not only does the issue of accessibility need to be explicitly addressed in transportation planning, it also must be discussed with the concerned groups. Beyond equal access to transportation networks and a fair distribution of transportation-related burdens, this means **the participation of communities in the planning process** (Cairns et al., 2003). The planning process can greatly benefit from **the citizens’ point of view, which must be recognized as a real form of expertise**.

Conclusion

Accessibility is a multidimensional and rather complex concept. This explains both its capacity to enrich reflection on the social aspects of spatial exclusion, and the difficulties encountered when using it operationally. The notion of accessibility should be distinguished from that of mobility, which is more focused on movement and transportation systems. Accessibility involves mobility as well as proximity, transportation as well as land-use planning. Accessibility is a component of social justice, and as a precondition for social inclusion it is part of the “right to the city”.

Based on the literature, we identified four dimensions in the definition of accessibility: the land-use dimension, which refers to the spatial distribution of opportunities; the transportation dimension, or the capacity to reach opportunities; the individual dimension concerning people's characteristics, needs, and abilities; and the temporal dimension, which refers to the availability of opportunities at different times and the time constraints individuals face. We also identified three different perspectives on measuring accessibility and analyzed their effectiveness at accounting for the social dimension of urban access. We reviewed various studies that seek to measure accessibility in relation to social disparities or social exclusion and segregation. Finally, we demonstrated that while some effort has been invested in building indicators, the measurement of accessibility is still a challenge for both academics and planners.

We analyzed the way that accessibility has been dealt with in transportation policies, and described the strategies that have been implemented in various countries to tackle

social exclusion through accessibility policies. We showed that although a link between low accessibility and risk of social exclusion has been widely recognized, policy results still seem disappointing and their effectiveness is difficult to assess. We reviewed the methods used for appraisal of transportation projects and showed that the social dimension of accessibility is still difficult to take into account. We then suggested a number of reasons why the social dimension of accessibility receives little attention.

Finally, we proposed ways to improve accessibility indicators and assessment methods. We recommended improvements in how social issues are accounted for in transport project appraisal, and suggested adaptations to the planning process that would favor improved accessibility.

In particular, we find that expressing the benefits of transport projects in terms of *potential access* is the best way to assess transport projects and their distributive effects. We suggest two possible ways to improve the appraisal of transport projects:

- (1) The first is to replace time savings in traditional CBA with utility-based access indicators, as it was done for instance in the work of Koenig (1974; 1980). Additional investigation will be needed to identify adequate methods and indicators that can be implemented and discussed by a large number of people.
- (2) Our second proposal is to use location-based measures of access that can be disaggregated according to different population groups, in addition to CBA calculations in multi-criteria evaluations. The challenge here is to apply an appropriate set of weights to these different indicators, with the BCR derived from both the CBA and the access indicators. All concerned stakeholders should be consulted.

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