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Discussing Equity and Social Exclusion in Accessibility Evaluations

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Ex ante evaluations of transport policy options (including infrastructure plans) are generally based on cost-benefit analyses (CBA). Accessibility changes are included in such analyses indirectly, via a utilitarian perspective. But accessibility is broader than is assumed by this perspective and also incorporates equity and related distribution effects as well as social exclusion. This paper aims to give an overview of the relevance of distribution effects and equity, and social exclusion for accessibility, based on the literature. The most important conclusions of our paper is that the two subjects are poorly addressed in transport appraisal in general, and in CBA in particular. Additional ethical theories could add value to the utilitarian perspective, egalitarian theories being a major competitor. Equity analysis is however complex 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. And such analysis requires normative judgements, in addition to simply presenting distribution effects. Several options are available to express distribution effects. Important choices to be made if such effects need to be reported relate to the unit of comparison (e.g. the household versus the individual), the indicator to be used, and the value of each unit to be compared (e.g. accessibility) for all units of comparison (e.g. households). We also conclude that CBA is not suitable for evaluating social exclusion policies. Based on this overview we propose an agenda for potential future research in the area of ethics and accessibility.

1. Introduction

A paramount goal of transport policy is to improve accessibility: the transport system should allow people to travel and participate in activities, and firms to transport goods between locations (from mining, via stages of production, to distribution centres, and finally clients such as shops or other

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firms). Accessibility can be defined and operationalised in many ways and has taken on a variety of meanings. It is a topic widely discussed in academic literature (see section 2). Several transport policy options, including building new infrastructure, aim to improve accessibility. This paper focuses on two ethically relevant aspects of the accessibility evaluations of transport projects and policies: equity and related distribution effects, and transport related social exclusion[3]. These topics have not received much attention, exceptions including the overview of accessibility indicators by Geurs and Ritsema van Eck (2001), Litman (2002) and Rietveld *et al.* (2007), equity effects of road pricing (see, for example, Ramjerdi, 2006, Condeço-Melhorado *et al.*, 2011; see Levinson, 2010, for an overview), and spatial inequalities (see, for example Martín *et al.* 2004; 2007, who studied the impact of high speed rail in Spain on city and regional accessibility inequalities).

Accessibility can be viewed as a product of land use and transport systems. Focusing on passenger transport, we use our earlier definition of accessibility as the extent to which land-use and transport systems enable individuals to reach activities or destinations by means of a combination of transport modes (Geurs and Van Wee, 2004). Following this definition, accessibility measures are well suited to describing the distribution effects of transport projects and policies e.g., describing the relative access to spatially distributed social and economic opportunities across the population, or for a specific population groups (e.g. by income or region). However, it is not common to include accessibility as an indicator in ex ante evaluations of transport projects and policy. In particular, in a cost-benefit analysis (CBA) only the monetary benefits (expressed in travel time savings) are included. Including monetary valuations of accessibility changes is very valuable for a CBA, but the decision maker might also be interested in the level of accessibility as an indicator *in itself*. This is especially important if the decision maker is interested in changes in accessibility that are not or not properly included in the way these changes are included in a CBA. This is true for social exclusion effects. Furthermore, even if accessibility changes are properly included in a CBA the decision maker might be interested in, for example, the distribution of accessibility changes over income groups or regions. CBA is often criticized for ignoring distribution effects in general (e.g. Thomopoulos *et al.*, 2009; Rietveld *et al.*, 2007), and therefore also for ignoring accessibility-related distribution effects. These effects can play a major role in decision making and some might be considered as unfair, in which case equity is included in the equation. The word equity can best be equated with 'fairness' or 'justice'. It implies moral judgement. The term 'equality' refers to the distribution of a particular good (income, accessibility, etc.), irrespective of moral judgement. A situation can be equitable, yet unequal. One can think of the impacts of potential policy options on particular income groups or regions. However, it is important to realize that CBA does not exclude reporting distribution effects, e.g. over income classes or regions. So the criticism mainly relates to the use of CBA in practice, and to the utilitarian basis of CBA that assumes that utility can be summed over all units. Accessibility studies can also be criticized because so far little attention has been given to how accessibility changes affect different people or groups of people, or stakeholders such as inner city shop owners.

This paper aims to discuss the relevance of distribution effects and equity, and social exclusion for accessibility, based on the literature. The focus is on the ex ante evaluation of transport policy options (including infrastructure plans). Based on the overview we propose an agenda for potential future research in this area.

Section 2 gives a brief overview of the literature on accessibility. Section 3 argues that it may be important if a low level of access to opportunities results from voluntarily made choices or not. Section 4 discusses equity and related distribution issues of accessibility. Section 5 places social

[3] If we use the term 'social exclusion' we limit ourselves to transport related social exclusion, even though the concept is wider.

exclusion in the context of ethics and accessibility. Section 6 summarizes the most important conclusions and Section 7 presents suggestions for a research agenda in the area of accessibility and ethics.

2. Accessibility[4]

Several authors have written review articles on accessibility measures, often focussing on a particular category of accessibility, like location accessibility (e.g. Song, 1996; Handy and Niemeier, 1997), individual accessibility (e.g. Pirie, 1979; Kwan, 1998) or the economic benefits of accessibility (e.g. Koenig, 1980; Niemeier, 1997), or with the aim of being more or less complete (Geurs and van, Wee 2004). In addition, several contributions to improve the methods for calculating levels of accessibility have been made, related to improving person and activity based indicators (Dong *et al.*, 2006; Neutens, 2010), including the option value of accessibility (Geurs et al., 2006), using the logsum of utility/based discrete choice models as an indicator (e.g. De Jong *et al.*, 2007), or improving the inclusion of ICT in accessibility measures (see Van Wee *et al.* in press, for an overview). Here we use the review of Geurs and Van Wee (2004), (from here on GvW), as a point of departure. This review differs from other review articles, firstly because accessibility measures are reviewed from different perspectives (land use, transport, social as well as economic impacts), instead of focusing on one specific perspective. Secondly, measures are reviewed according to a broad range of relevant criteria – (a) theoretical soundness, (b) interpretability and communicability, (c) data requirements, and (d) usability in social and economic evaluations. We consider this approach as a useful point of departure to understand the relationships between ethics and accessibility. GvW define accessibility - as far as persons are concerned - as the extent to which land-use and transport systems enable individuals to reach activities or destinations by means of a combination of transport modes. We exclude goods transport in this paper, and therefore also do not present a definition of accessibility related to goods transport.

We use the review of GvW as a point of departure for our discussion on social exclusion and accessibility (section 4). GvW distinguish four components of accessibility that they derive from the literature:

- The land-use component describing the spatial distribution of activities.
- The transportation component describes the transport system, expressed as the disutility experienced by an individual when covering the distance between an origin and a destination; included are the amount of time (travel, waiting, parking), costs (fixed and variable) and comfort-related variables (such as reliability, level of comfort, accident risk, etc.).
- The temporal component reflects the temporal constraints, i.e. the availability of opportunities at different times of the day, and the time available for individuals to participate in certain activities (e.g. work, recreation). Note that this temporal component has enjoyed a rapid increase in popularity amongst academics in transportation and geography (e.g. Ettema et al., 2007; Schwanen & Kwan, 2008; Neutens, 2010).
- The individual component reflects the needs (depending on age, income, educational level, household situation etc.), abilities (depending on people's physical condition, availability of travel modes etc.) and opportunities (depending on people's income, travel budget, educational

[4] This section on accessibility is largely based on Geurs and van Wee (2004) and recent reflections on that paper as presented in Van Wee *et al.*, forthcoming.

level, etc.) of individuals. These characteristics influence a person's level of access to transport modes (e.g. being able to drive and borrow/use a car) and spatially distributed opportunities (e.g. having the skills or education to qualify for jobs near their residential area), and may strongly influence the total aggregate accessibility result.

GvW state that these four components interact. For example, the impact of temporal constraints, such as the opening times of shops, on an individual might be less important if she belongs to a household with another member who can do the shopping. Next, GvW state that an accessibility measure that aims to express accessibility as defined above should ideally take all components and elements within these components into account, although in practice applied accessibility measures focus on one or a selection of components only.

3. Voluntary versus non-voluntary choice

An important question in the discussion of both social exclusion and the distribution of access to opportunities is whether the exclusion or relatively low level of access results from voluntarily made choices or not (e.g. Loader and Stanley (2009). For example, imagine a person who has lived in a rural town all her life, where over the past two decades the schools, shops, and services have all disappeared. Next, imagine another person who has recently moved voluntarily to that same town. Both persons could face the same level of accessibility to shops, schools, and services, and could be equally socially excluded. However, contrary to the first person, the second person faces social exclusion voluntarily. She might prefer living in the countryside and accept the low level of accessibility. Would that make a difference? To make the discussion even more complex: imagine two people who have lived in the town since they were born. Person A has a high income and could afford to move to a bigger town or city but chooses not to do so, person B does not have the financial possibilities to do so. Should the same level of exclusion be valued equally negatively in both cases? Freedom of choice is at stake here – ethical literature defines freedom as a very important value. To go one step further in the imagined scenario: suppose two persons A, A1 and A2, both have the financial resources to move but A1 has an unhealthy mother who relies on A1´s help, making it difficult for A1 to move, whereas A2 does not have such family related constraints. Would that make a difference? Coming back to the first comparison we imagined someone who moved to the town voluntarily. One could even debate whether she faces social exclusion at all. Indeed, accessibility to, for example, shops and services is poor, but the choice is made voluntarily. We defined social exclusion as the fact that some people or population groups are excluded from a certain minimum level of participation in location based activities, in which they wish to participate (see section 5). The question is: how strong should this wish be? If it were very strong, our imagined individual would probably not have moved to the town anyway. Maybe she would have preferred to have a supermarket nearby, but her wish is not that strong because she works in a city and can do her shopping after work. One could even debate whether she then is socially excluded at all. The question then is: how important should the wish be for participation in the definition in order to label the poor level of access as social exclusion? It is beyond the scope of this paper to discuss this question. But we can conclude that it is highly relevant whether individuals face high levels of social exclusion or low levels of access voluntarily or not.

4. Equity and distribution effects

Equity strongly relates to distribution effects. People, groups of people and regions inevitably do not have equal access to destinations, such as shops, jobs, or medical services. The unequal access is not necessarily problematic, but some distributions can be considered as 'unfair'. But for moral judgements (what is fair?) it is not only the distribution of access to destinations that matters, but in some cases also the absolute level of access of those who are worse of. So, 'equity', contrary to 'distribution', includes a moral judgement, and is broader than being only related to distributions.

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 (Litman, 2002). In this section we firstly discuss which equity aspects are relevant from the perspective of accessibility. Secondly, we elaborate on the distinction between intended and unintended equity effects and equity of the opportunity and outcome. Thirdly, ethical theory and the relevance for the inclusion of equity issues in accessibility is described. Fourthly, and finally, we discuss indicators for distributions and their relevance for accessibility.

Which equity aspects are relevant for accessibility?

Based on a literature review Thomopoulos et al. (2009) give an overview of equity categories that could matter in ex ante evaluations of transport policies, projects and plans, and considerations from an equity point of view. Examples include equity between individuals, groups and regions..

Other examples of transport related equity types that are discussed in the literature relate do the equity aspects of using income-dependent Values of Time (e.g. Grant-Muller *et al.*, 2001 Mackie *et al.*, 2003, Martens, 2006), the distribution effects of public transport policies (e.g. Bureau and Glachant, 2011), the spatial equity of transport infrastructure projects (e.g. Bröcker *et al.*, 2010; de Almeida *et al.*, 2010) and the differences in accessibility between transport modes (e.g. Kawabat and Shen, 2007).

Some equity types can be split up into different subtypes. Litman (2002), for example, distinguishes two types of vertical equity (equity related to disadvantaged people, groups of people or regions – in the case of Litman, related to (groups of) people only): (a) vertical equity with regard to income and social class and (b) vertical equity with regard to mobility need and ability. The former (also called social justice, environmental justice and social inclusion) is concerned with the distribution of impacts between individuals and groups that differ in abilities and needs, in this case, by income or social class. The latter is concerned with the distribution of impacts between individuals and groups that differ in transportation ability and need, and therefore the degree to which the transportation system meets the needs of travelers with special constraints. This type of vertical equity has a clear link with accessibility as it assumes that everyone should enjoy at least a basic level of access, even if people with special needs require extra resources and subsidies. A basic level of access implies that people can obtain goods, services and activities that are considered valuable to society, such as emergency services, medical care, education, employment, food and clothing.

The two distinctions often made from the perspective of equity and accessibility are those between income classes (social equity) and regions (spatial equity). This may be particularly relevant politically if low income categories or poor regions 'lose' and high income categories or regions 'win'. In fact, it could even be a barrier for the implementation of related policies.

These different types of equity often overlap and conflict. A particular decision may seem equitable when evaluated one way but inequitable when evaluated another. For example, horizontal equity requires users to bear the costs of their transport facilities and services, but vertical equity often

requires subsidies for disadvantaged people. As a result, the evaluation of transport equity impacts can lead to conflicting outcomes, depending on the type of equity evaluated, or simply dismissed as "intangibles," with the implication that they are considered to be unmeasurable and can be ignored (Litman, 2002).

Intended versus non-intended equity effects

Rietveld *et al.* (2007) emphasize that it can be important to explicitly distinguish between the intended and unintended effects on equity of policies to support poor regions, for example providing additional infrastructure being an example of intended equity impacts. On the other hand, policies with other aims, such as road pricing policies, may have unintended accessibility impacts (leading to increases or decreases in levels of accessibility that may be considered as 'unfair'). We agree with the distinction of Rietveld *et al*. Moreover, if policies have specific aims or targets, such as the reduction of inequity, ex ante evaluations should always report on these aims or targets, and not only report expected effects the way this is usually done in a CBA. So, if a policy aims to reduce regional inequity, explicitly reporting those effects is needed.

Explicitly reporting effects on equity might be very helpful, even for unintended equity impacts (or at least changes in accessibility across groups of the population or regions – distribution effects – without moral judgement as required in the case of equity) and for both increases as well as decreases in inequality. Such effects may, for example, play a major role in the political debate as well as in the wider society. Another important example is road pricing. Feelings of a lack of fairness are often a barrier for the successful introduction of road pricing. Distribution and the related equity effects of road pricing have been studied by several authors (e.g. McMullen *et al.*, 2010; see for an overview Levinson, 2010). The distribution effects of road pricing can be included in (ex ante) evaluations in multiple ways. Firstly, these effects can be calculated using accessibility indicators, such as location-based accessibility measures or utility-based measures (see Tillema *et al.*, in press, for a paper that explicitly compares the accessibility effects of road pricing policies using multiple indicators). In addition it is important to realize that road pricing not only affects the accessibility of people, but also generates income for the government. How the revenue is used can also have distribution effects. For the distribution effects of, for example, a road pricing scheme, it is important whether the revenues are used for building more motorways, or for reducing taxes equally for all income categories, or for mainly high or low income categories. Revenue use related distribution effects can be addressed with intelligent designs (Levinson, 2010). Not only the distribution effects but also the acceptability of such policies can strongly be influenced by revenue use (Schuitema and Steg, 2008).

To conclude: the distinction between the, intended and unintended, distribution or even equity effects of policies can be very relevant. This is also true for accessibility related effects.

Equity of opportunity and outcome

There seems to be a general agreement that transport plays a role in achieving "equity of opportunity". Equity of opportunity is a form of vertical equity meaning that disadvantaged people have adequate access to education and employment opportunities. A study conducted by the UK Social Exclusion Unit concluded for example that transport is a significant contributing factor in the exclusion of many low-income groups and communities. It identified lack of transport as a significant barrier to the take-up of employment for many job seekers, and leads to failed health appointments and associated delays in medical intervention (SEU, 2002).

There is less evidence on the "equity of outcome" and the role of transport investments. Equity of outcome is a form of vertical equity implying that society ensures that disadvantaged people actually succeed in, for example, getting an education or a job. There have been, for example, evaluations of the contribution of improved transport services to these outcomes. Some evidence, however, does suggest that some targeted transport initiatives have been successful in enabling people to access new employment opportunities and facilitating other important activities, such as health visits, educational attendance and leisure and social activities (Lucas et al., 2009)

Ethical theories

At least three theories on ethics are relevant for transport and accessibility evaluations: utilitarianism, egalitarianism and sufficientarianism. Utilitarianism, more specifically: act consequentialism, "is the claim that an act is morally right if and only if that act maximizes the good, that is, if and only if the total amount of good for all minus the total amount of bad for all is greater than this net amount for any incompatible act available to the agent on that occasion" (Stanford Encyclopedia of Philosophy - http://plato.stanford.edu/ - Zalta, 2011). Utilitarianism is strongly related to CBA: a CBA lists all pros and cons as much as possible in monetary terms and compares alternatives using indicators like benefits minus costs, benefit to cost ratio, and return on investments.

Egalitarian theories are an influential category of theories on ethics. Egalitarians hold the premise that all people should be treated equally (Sen, 1992). Egalitarian theories differ from utilitarianism. An important theory in this category is the theory of justice of Rawls (1971). It differs from utilitarianism firstly because Rawls argues that justice should focus not on welfare but on the provision of certain kinds of goods he labelled 'primary' for all persons. Secondly we should not strive for the maximum of the sum of some index, but for 'the greatest benefit of the least advantaged members of society' (Stanford Encyclopedia of Philosophy). To the best of our knowledge Rawls did not label 'accessibility' as a primary social good. But his ideas inspired us – we think it is defendable to argue that a basic level of access to some destinations could be labeled as a 'primary social good'. If we applied the theory of Rawls (or egalitarian theories in general) this could imply firstly that there is a case for not only valuing the utility of accessibility, but also accessibility itself. One could even argue that what matters primarily is access to some basic destination categories, such as shops that sell food and other daily needed goods, schools, and medical services. In addition, from the perspective of egalitarian theories it could be useful to focus on the levels of accessibility of those who have the lowest level of accessibility. From such a perspective the benefits of providing bus services to a remote rural area with low income households could be valued higher compared to the traditional way of valuing those services based on the Willingness To Pay (WTP) of potential clients, especially for a non-voluntary choice – see section 3.

Egalitarian theories focus on differences, not on absolute levels of well-being. Sufficientarianism assumes that everybody should be well off. This implies that there is a threshold expressing what is 'sufficient'. In the case of 'weak sufficientarianism' it is important to improve the well-being of people if their well-being is below the threshold. In the case of 'strong sufficientarianism' absolute priority should be given to the improvement of well-being of people whose level of well-being is below the threshold. The lower their welfare, the more important it is to improve peoples' well-being (Meyer and Roser, 2009; see also Wolf, 2009). From the perspective of sufficientarianism what would be of particular interest in evaluating the accessibility effects of policy options is the absolute level of accessibility of those who are worse off. This level should not be below a certain threshold. An

example of an operational criterion could be that households should have a shop selling food within reach of a certain non-care based travel time interval.

We think that in many cases important distribution or equity issues are absent and then there is nothing wrong with the traditional way of evaluating transport benefits founded in utilitarianism. But if distribution or equity effects are at stake (intended or not – see above) there could be a case for the use of accessibility indicators as suggested above.

Indicators for distributions and equity issues and their relevance for accessibility

Let us assume the policy maker is interested in distribution or other equally relevant aspects of accessibility. An important question then is: how should these aspects be included? A first choice to be made is the unit of comparison. Rietveld *et al.* (2007) discuss the equity issues related to transport. They state that if equity was explicitly included at the level of people (or even when comparing regions) it is important to choose the level of aggregation: this can be the individual or the household. Their position could also be applied to accessibility because household members can interact if accessibility is at stake. For example, a person might have temporal constraints that can be solved by other members of the household (see Ettema *et al*. (2007) for a recent empirical study on this topic).

A second choice to be made relates to the indicator of choice. A simple way to express equity could be to simply present the indicators that are used anyway for distinguished groups of people/households, or regions (or another unit of comparison). A more advanced way to express equity is the use of a statistical distribution measure, well-known examples being the Gini coefficient, the Theil index and the coefficient of variation (Marshall and Olkin, 1979, cited in Rietveld *et al.*, 2007). As an example, to show that it is possible to express levels of equality, the Gini coefficient and the related Lorenz curve will be discussed here. The Gini coefficient has been applied in the literature to assess the level of equality of accessibility, e.g. Geurs *et al.* (2001), Ramjerdi (2006), Juan *et al.* (2008) and Delbosc and Currie (2011). The Lorenz curve will be explained first. The Lorenz curve graphically shows the cumulative distribution of a group of people (or regions or another unit of comparison) (from 0 to 100%), ordered from a low to a high value of an indicator, such as income, on the x-axis, and the value of that indicator for these groups of people on the y-axis.

The Gini coefficient is the ratio of the area between the line that would result from a perfectly equal distribution (often a 45 degree line) and the Lorenz curve, divided by the triangle between this 'equal distribution' line, the x-axe and the y-axe (see Figure 1). The value ranges from 0 to 1, 0 expressing a perfectly equal distribution, and 1 a very unequal distribution.

The Gini coefficient is generally used to express levels of equality in income distributions, but theoretically can easily be used for any other unit such as accessibility levels of distinguished regions or groups of people as long as an interval or ratio indicator is used. The Theil coefficient is based on the concept of entropy from the information theory. Compared with the Gini coefficient, the Theil coefficient is more sensitive in measuring changes at the ends of a distribution. Rietveld et al. further discuss the use of the Gini index (or alternatives like the Theil or Atkinson index – see Theil, 1967; Atkinson, 1970) in a welfare function.

The use of equity considerations in the area of transport is complicated by the fact that it is not only income (or money) that plays a role, but also other outcomes of interest that matter, such as environmental pressure, travel time, and – most relevant for this paper - accessibility levels. Of course one could argue that such outcomes of interest could be converted into monetary terms, but this is not always straightforward. From the perspective of this paper – equity and accessibility – it is

important to realize that if accessibility-related equity effects are calculated, these are only a part of the wider equity discussion.

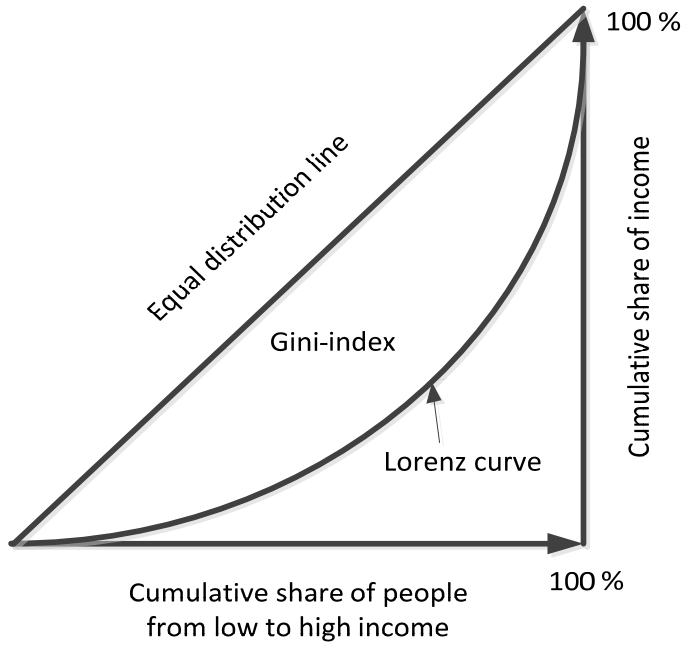

Figure 1. the Lorenz curve and the Gini coefficient.

Source: Silber (1999)

A third choice to be made relates to the value of each unit of the variable of comparison. Equity issues are not only related to the equality or distributions of a variable such as accessibility or income, but also the value of each unit for distinguished (groups of) people. For example, access to jobs is probably not at all relevant for a retired person, but very relevant for a recently graduated student who is looking for a job. Access to medical services might on average be more important for the elderly than for younger persons, not only because the elderly might need to visit those services more frequently but also because the barrier of travel might be higher for them. From a utilitarian perspective the value of each unit of benefit for each person counts equally. For decision making, however, it might be important who benefits and to what extent, and who loses and to what extent.

5. Social exclusion

Introduction

One of the most frequently studied ethical issues in mainstream transport literature is the subject of social exclusion. The term social exclusion emerged as an important policy concept in France in the 1970s in response to the growing social divides that resulted from new labour market conditions and the inadequacy of the existing social welfare provisions to meet the changing needs of more dispersed populations (Luxton, 2002; cited in Rajé, 2003). As explained above we define social exclusion as *the fact that some people or population groups are excluded from a certain minimum level of*

participation in location based activities, in which they wish to participate. In the words of Rajé (2003), who presents an overview of definitions and concepts related to social exclusion: "*it is a process, which is understood to be multi-dimensional, and prevents individuals or groups from participating in normal activities of their society. It is linked to inaccessibility of goods and services, which contributes to a feeling of not belonging*". An important element is firstly that the persons excluded would prefer to be included. In other words, there are barriers that prevent inclusion, income levels probably being the most often mentioned barrier in the literature (e.g. Sanchez, 2008). A second element is that the barriers are beyond the control of the excluded persons. A third element is that there is some minimum level of participation. This minimum is very difficult to define (see below) – this in itself is an ethical issue. Below that level people face social exclusion.

Social exclusion has mainly been studied over the last decade. Currie et al. (2009) investigated associations between transport disadvantage, social exclusion, and well-being in Metropolitan, Regional and Rural Victoria, Australia. Preliminary findings show that the number of households that have Forced Car Ownership (FCO) is higher than the number of households without a car. FCO households were found to be highly car dependent (80% of trips were made by car). They also found that for households without a car walking dominates travel (58% of trips), emphasizing the importance of accessibility by foot. Loader and Stanley (2009) found that bus service improvements in Melbourne, Australia, are likely to reduce the risk of social exclusion for significant numbers of people. Lucas et al. (2001) concluded that between 1991 and 1999 the number of UK households living more than a 27-min walk from a shopping centre doubled, from around 40% to 90% of all households. For a doctors' surgery the number of households living within that 27-min walk dropped from 72 tot 40%. Cartmel and Furlong (2000, cited in Stanley and Vella-Brodrick, 2009) found rural youth to be more likely to experience social exclusion than urban youth, due to an inability to access basis activities such as health services, education and employment.

Social exclusion has often been linked to the concept of accessibility, and some researchers have explicitly studied the link between social exclusion and levels of accessibility. For example, Scott and Horner (2008) calculated accessibility indices to investigate whether cities are designed in such a way that the locations of opportunities vary between socio-economic groups. They found that accessibility levels of those groups that are generally considered to be at risk of social exclusion, are not lower than average, people living in rural areas being the exception.

Linking social exclusion to policy and CBA

The general idea of both policy makers as well as scholars studying equity is that a certain level of options to participate in activities (social activities, work, retail and medical services, education etc.) should be available for all persons, regardless of factors such as their income, age, and also for persons who either do not have a car nor have a car available (or even do not have a drivers licence). It is generally considered to be an ethical question that a certain level of options to participate in activities is to be guaranteed. This level is threatened, especially in remote rural areas. The combination of the 'free market forces' and transport policies might result in a situation in which some individuals have access levels below what is supposed to be 'fair'. In this sense social exclusion often has its theoretical foundation in egalitarian theories as presented above.

A major problem is that it is not at all easy to define the level of accessibility that people (or regions) should have (Farrington and Farrington, 2005) and below which implies that a problem exists legitimating or necessitating policy – although defining such a level is required to come to moral judgement (e.g. Department for Transport, 2002). This, at least to some extent, is a political issue, a political choice. The choice may vary over place and time, and between persons with different

political preferences. Therefore, for ex ante evaluations it is easier to report on levels of social exclusion than to come to a moral judgment of these levels.

An important notion to be made is that social exclusion has an absolute and a relative dimension. The absolute dimension is independent of the level of social participation of others in society (e.g. a community, a region, a country), whereas the relative dimension relates to differences between individuals, households, or groups of people. The absolute level relates to sufficientarianism (see above), whereas the relative level relates to considerations concerning distributions.

Are social exclusion effects properly included in the practice of CBAs? CBA takes the Willingness to Pay (WPT) of consumers as the point of departure to monetize effects. A problem might occur if the utility of changes in levels of social exclusion is based on WTP, especially in the case of the potential social exclusion of people on very low incomes. Because of their low income their WPT for, for example, additional bus services, is probably low, simply because they do not, or hardly, have the money for it. Consequently, using the WTP in order to evaluate the pros and cons of options to reduce social exclusion could be problematic. We conclude that CBA is not suitable to evaluate social exclusion policies.

The link between social exclusion and accessibility

Social exclusion is strongly related to the concept of accessibility. As a result the components of accessibility, as presented by GvW, can be used to derive causes for social exclusion. Below we reflect on those causes and their mutual interactions, starting with the transport system:

The transport system. Important characteristics of the transport system from a social exclusion perspective relate to infrastructure (availability and locations of roads, railway lines, bus lines, railway stations, bus stations, airports, etc), time tables (for public transport), and prices (e.g. costs of vehicles, parking, fuel, tariffs of public transport and airplanes), and other barriers such as access to trains platforms and high entrances of busses (the latter two being important for specific categories of disabled persons), safety and security (e.g. Stanley and Vella-Brodrick, 2009).

The land use system. The land use system is partly the result of spatial planning. The disappearance of shops and services due to scale increases are a cause for social exclusion.

The individual component. The changing needs and wants of people can have an impact on their level of social exclusion. The same applies to changes in their constraints and capabilities. For example, it is possible that a person is unable to drive a car (safely) anymore, due to old age, illness or because she becomes disabled. Changes for the better can also occur. For example, due to an increase in income a person may be able to purchase a car, reducing her constraints.

The time component. The level of social exclusion can change due to changes in the temporal match between the wants and needs of persons, and the options for access provided by the land use and transport system. For example, opening hours of local shops can be extended, allowing a person to do shopping after work.

Note that the components interact: all four dimensions interact in all directions, and potential social exclusion as a result of one dimension can be compensated by another dimension. For example, the disappearance of the last shops in a village can be compensated by better public transport options to travel to shopping areas in a nearby town.

The explicit distinction between the four components allows for analytically understanding changes in social exclusion levels. The impact of each component on an aggregate indicator for social

exclusion can be calculated. In addition designing policies to reduce levels of social exclusion can focus on all four components.

What is the relevance from the discussion on social exclusion for accessibility? For social exclusion it could be interesting to add to the indicators as presented by GVW indicators related to *minimum* distance, travel time, or generalized transport costs from residential locations to activity locations. For example, the distance to the nearest supermarket, grocery, primary school, or health care centre could be relevant. This category of indicators can also include not only the nearest choice options, but a minimum number of choice options, an example being the distance or travel time to three primary schools. In addition it could be an option to report the share of population that faces social exclusion (according to predefined indicators for the minimum levels of access below which a person is considered to be socially excluded). More generally speaking we think that accessibility measures are very useful to ex ante evaluate changes in levels of social exclusion.

We conclude that social exclusion is strongly related to accessibility, including all four components as distinguished by GvW. In addition, in line with others who came to the same conclusions (see, for example Sarewitz et al., 2003) the traditional CBA way of evaluating the benefits of transport policy options is not sufficient to understand changes in social exclusion. Dedicated indicators are needed. If such indicators are to be included, several choices need to be made, choices that are not at all straightforward. The study by Stanley *et al.* (2011) is an example of a study that values reductions in social exclusion. They found that the willingness to pay for additional trips and related activities to reduce social exclusion increases if income decreases, and is much higher than the value as generally included in CBA. They explain the difference, referring to CBA valuing small changes, whereas an additional trip and activity for socially excluded people on a very low income is a major change.

6. Conclusions and a research agenda

The most important conclusion of our paper is that the subjects of distribution effects and equity, and social exclusion are poorly addressed in transport appraisal in general, and cost-benefit analysis in particular, but could be relevant for the decision maker.

CBA is based on the utilitarian perspective, but other ethical theories could add value to this perspective, egalitarian theories being a major competitor. Equity analysis is however complex 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.

It is easier to report on distribution effects - several options are available to express these effects. Important choices to be made if such effects are to be reported relate to the unit of comparison (e.g. the household versus the individual), the indicator to be used, and the value of each unit to be compared (e.g. accessibility) for all units of comparison (e.g. households).

Social exclusion can be of major importance for policies in the areas of land use and transport (and even other areas such as related to the opening hours of shops and services). CBA is not an evaluation method that is directly suitable to evaluate social exclusion related policies.

Based on the discussion above we think that there are a number of subjects that would be interesting to study to further our understanding of the relationships between accessibility and distribution effects / equity, and social exclusion. They include:

Indicators for distribution effects

Indicators that explicitly include distribution effects should be further explored, developed, selected, and applied. Examples could be indicators based on the Gini or Theil index, expressing levels of (in)equity. These indicators will express the distribution of accessibility and changes in this distribution due to policies, across population groups and regions. The indicators can firstly be used for the overall population. Secondly, in line with ideas of egalitarians the indicators could also express the level of accessibility of, for example, the 10 or 20% of people who (or regions which) have the lowest level of accessibility. Accessibility could relate to, for example, jobs, schools, medical and other services. We distinguish between accessibility to destinations that could be labelled as 'primary social goods', a term introduced by Rawls, which might include medical services, food shops and schools. The development of combined indicators including access to multiple destination categories might also be of interest. In that case weighting is needed to calculate aggregate accessibility. Note that the use of equity considerations in the area of transport is complicated by the fact that it is not only accessibility that plays a role, but also income (or welfare or well-being) and other outcomes of interest that matter, such as environmental pressure or risks.

Indicators for social exclusion

The importance of social exclusion in both research as well as policy is widely addressed, but there is no consensus about how to express social exclusion; which indicators applied to which people should express social exclusion levels? If certain minimum levels of accessibility of destination categories are to be included, what are the minimum levels? Should meeting these levels be included as a 0-1 variable, or should a form of distance decay or other weighting be added? How should access to different destination types be compared? Can access to these destination types be aggregated, and if so, how?

Methods to value distribution effects and social exclusions

Maybe distribution effects and levels of social exclusion should be presented, regardless of any valuation. On the other hand, if one would prefer to include outcomes in an evaluation framework, in particular CBA or a combined CBA-MCA, several challenges show up. How then to value the indicators related to social exclusion or distribution effects? Should those indicators be treated as normally done in an MCA framework? If the answer is 'yes' the question of setting the weights becomes relevant. If not: what to do then?

Analysis of the impact of components of accessibility on distribution effects and social exclusion

Following the components of accessibility the impact of these components on distribution effects on the one hand, and social exclusion effects on the other hand, can be analysed, both analytically as well as for real world cases. In addition, the effect of policy options on these components, and the distribution effects and social exclusion, can be analysed. Such insights are both relevant for scientific reasons as well as for policy reasons: they can help design policies that efficiently decrease inequality and social exclusion, considering political preferences.

Physical access and ICT

ICT increasingly could be a substitute for physical travel. Maybe ICT could be a means to reduce social exclusion, e.g. because of the options for online shopping and education, and because of advances in communication technologies. It would be interesting to further explore options for the

development and application of indicators that combine physical and virtual access (see Van Wee *et al*. forthcoming).

Indicators for slow modes

Literature so far has almost completely overlooked accessibility by slow modes, particularly the accessibility benefits of land use and infrastructure planning for slow modes. However, especially in the area of social exclusion it is generally recognized that access to some basic destinations by foot (and in some countries also bicycle) is extremely important to provide people with a basic level of access (e.g. Currie et al. (2009). For slow modes it is important to include the rapidly increasing marginal disutility of longer trips. For example, above a threshold of 5-10 km the disutility of cycling rapidly increases. Geurs et al. (2010) showed, using a logsum accessibility benefit measure, that land use planning (e.g., urban densification) may lead to significant accessibility benefits – arising from changes in trip origins – for slow transport. It might be challenging to combine accessibility by slow modes with the ideas on distribution effects and primary destinations as presented above.

Local accessibility characteristics

Research into the distributions of levels of accessibility not only needs a high level of detail in population segmentations but may also imply analysis at a high spatial resolution. Accessibility analysis is typically based on geographical units such as postcodes or Transport Analysis Zones from transport models. Differences in local land use characteristics and transport facilities within these geographical units, e.g. street design, parking, walking and bicycle facilities, are typically not addressed. Local characteristics can however be relevant in explaining differences in people's level of access to shops and social and economic opportunities, particularly for users of slow modes and public transport. Studies have for example shown that characteristics of the local living environment are important explanatory factors for travel behaviour patterns (e.g. Meurs and Haaijer, 2001). We are not aware of similar studies on accessibility. GSM/GPS-based methods of data collection may be important here to collect high-resolution travel behaviour data, which would allow, for example, analysis of the effects of street design and other transport characteristics on travel times and accessibility.

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