



Street mobility and network accessibility: towards tools for overcoming barriers to walking amongst older people

What do we mean by “community severance”?

STREET MOBILITY AND NETWORK ACCESSIBILITY SERIES

WORKING PAPER 04

August 2015

Paulo Rui Anciaes

on behalf of the *Street Mobility* research team¹

Abstract

This working paper collects definitions of community severance found in academic studies, government guidance documents, and reports produced in several countries. A new definition is proposed, based on the analysis of these definitions and on discussions held as a part of the *Street Mobility and Network Accessibility* research project.

Keywords

Community severance, barrier effect

1. Introduction

There is little agreement on the exact meaning of “community severance” even though this issue has been an object of concern for transport and urban planners since the 1960s. Researchers have proposed many different definitions of “community severance” and have used different concepts (such as “barrier effect”) to describe what is assumed

¹ The *Street Mobility* research team members are Jennifer Mindell, Nora Groce, Muki Haklay, Peter Jones, Shaun Scholes, Laura Vaughan, Shepley Orr, Paulo Anciaes, Jemima Stockton and Ashley Dhanani

Street mobility and network accessibility: towards tools for overcoming barriers to walking amongst older people

to be the same phenomenon. The development of further research on this topic, and its integration into transport planning, requires a clearer definition of the concepts used.

This working paper reviews a large number of different definitions of community severance and related concepts found in the literature, including academic studies, reports, and government publications from a variety of countries. Appendix 1 lists those definitions. Entries that are not originally in English are formatted in italics. The definitions in the original language are given in Appendix 2.

Section 2 of this working paper compares the concepts used in English-speaking countries and in other countries and the concepts used in definitions of “community severance” or “barrier effect”. Section 3 proposes a new definition of “community severance” based on the analysis of previous work and on discussions held as a part of an ongoing multidisciplinary project on the topic, the *Street Mobility and Network Accessibility* project, developed at University College London.

2. Previous definitions

Figure 1 and Figure 2 compare the terms used in studies in some English-speaking countries (UK, USA, Canada, Australia, and New Zealand) with those used in other countries (Brazil, Denmark, France, The Netherlands, Norway, Spain, Sweden, and Switzerland) and in international organizations in the definition of “community severance” or “barrier effect”.

The word clouds suggest that in English-speaking countries there is general agreement on the use of the term “community severance” to describe a phenomenon that is caused by “traffic”, “barrier(s)”, and “road(s)” and has “physical”, “psychological”, “local” and “social” effects on “people”, “pedestrians”, “movement”, and “access”.

Work in other countries places less emphasis on “severance” or related concepts (such as “separation”) and more emphasis on what is a “barrier” (“road” “traffic” and “infrastructure”), although the word “community” is also mentioned frequently.

Figure 3 and Figure 4 compare the terms used in the literature in all countries to define the concepts of “community severance” and “barrier effect” respectively. The

Street mobility and network accessibility: towards tools for overcoming barriers to walking amongst older people

words “community”, “communities”, “sever”, and “severance” were excluded from the former and the words “barrier”, “effect”, and “effects” were excluded from the latter.

The definitions of “community severance” are mostly related to the causes of the phenomenon (“traffic” “road(s)”, “barrier(s)”) but also with its effects on society (“separation”, “people”, “social”). The definitions also mention who is affected by the problem (“residents”, “pedestrian”) and how (“movement”, “physical” “psychological”). There is hardly any mention of transport infrastructure other than roads (such as railways) or of affected means of transport other than walking (such as cycling). “Health”, “cohesion” and “environmental” aspects are also rarely mentioned.

The definitions of “barrier effect” are mostly associated with the impact of “roads” and “traffic” on “pedestrians”. The main impacts are “physical” and are related to “crossing” (the road). Cycling is also mentioned. The definitions put little emphasis on social, health, and environmental aspects.

3. The Street Mobility definition

The definitions presented above suggest that “community severance” is caused by physical elements in the landscape, such as roads and road traffic, and have effects on the movement of pedestrians (usually defined as a “barrier effect”) and wider effects on local communities.

Discussions held as a part of the Street Mobility and Network Accessibility research project, documented in a previous working paper of this series (Anciaes, Boniface, Dhanani, and Groce, 2014) also identified three levels of severance:

- 1) The presence of a physical element in an area (roads, motorways, or motorised traffic)
- 2) What that physical element makes people do or not do (walking, or cycling, access places)
- 3) How that element makes people feel

Street mobility and network accessibility: towards tools for overcoming barriers to walking amongst older people

We then propose the following definition:

Transport-related community severance is the variable and cumulative negative impact of the presence of transport infrastructure or motorised traffic on the perceptions, behaviour, and wellbeing of people who use the surrounding areas or need to make trips along or across that infrastructure or traffic.

The definition is intentionally broad:

- The possible causes of severance include all elements of the transport system, not only busy roads.
- The effects are those on all users of the area including not only residents, but also workers, shoppers; and not only pedestrians but also cyclists and users of motorised transport (cars or buses).
- The definition considers the need to travel along or to cross the barrier, rather than assuming a set of destinations that people access.
- The effects are defined as “impacts on perceptions, behaviour and wellbeing”, which includes the effects of the barrier as a boundary to people’s notional neighbourhoods and the wider impacts of suppressed trips, pedestrian risk, and environmental effects on individual health and social networks.
- The emphasis on “variable” and “cumulative” impacts acknowledges the fact that the impacts differ on individuals with different needs (depending on age, gender, socio-economic status and other characteristics) and are potentially reduced with distance from the barrier (as the number of alternative destinations and routes increase) and with the time elapsed since the barrier was created (as people adapt their behaviour over time).

Street mobility and network accessibility:
towards tools for overcoming barriers to walking amongst older people

Figure 1: Word cloud of definitions of “community severance” or “barrier effect”: English-speaking countries



Figure 2: Word cloud of definitions of “community severance” or “barrier effect”: other countries



Appendix 1: Definitions of community severance and related concepts

| Authors | Year | Page | Country | Type | Concept | Definition |
|---------------------------|------|-------------------|-----------|-------------------|------------------------|---|
| UK MOT | 1963 | 223 (glossary) | UK | Report | severance | [Severance is] the undesirable division of an area of closely-inter-related uses by a road carrying a heavy traffic flow. |
| Urban Motorways Committee | 1972 | 13 | UK | Report | severance | Any new major road, unless it is aligned with an existing barrier like a railway, or all existing crossings are maintained, will interrupt movement across its line. It may, therefore, change the journeys of people going to work, to shop, to school, to local amenities, or to visit other people. The provision for this movement, and particularly pedestrian movement, is accordingly an important matter in deciding the route and design of a major urban road. |
| OECD Road Research Group | 1973 | 41 | (OECD) | Report | severance | [Severance is the] psychological, cultural, and physical [impacts] which can be magnified, or introduced for the first time into an urban area by a street improvement or a new road [including effects on neighbourhood cohesion, displacement and relocation of persons and families, access to education, community, and shopping facilities, and response patterns of emergency services]. |
| Lassière | 1976 | 11 | UK | Report | severance | The term severance is used [...] to denote the complex of perceptual, attitudinal and behavioural responses to the presence of a linear feature in the urban environment which inhibits communications across it. Examples of such features are railways, canals, rivers and roads. The inhibition may arise due to the detours involved in using infrequent crossing facilities and/or the aversive aspects which may be associated with the linear element, e.g. the accident risk, smell and ugliness associated with the traffic on a road. |
| Lee and Tagg | 1976 | 270 | UK | Empirical study | social severance | [Social severance is the sum of] all forms of human response to (or interaction with) a barrier in the environment. Attention should [...] be focused on the nature of these responses and on their measurement at various alternative levels; through perceptions of the barrier, through cognitions, through the structured organisation of these cognitions with motives and feelings (i.e. with attitudes) and finally, through behaviour. |
| Stanley and Rattray | 1978 | 141 | UK | Academic (review) | social severance | Social severance is seen as the rupture or impairment of relationships between people, relationships between people and institutions or relationships between people and places. |
| Korner | 1979 | 4-5 | Sweden | Report | <i>barrier effect</i> | <i>A barrier is a physical phenomenon with properties (tangible or intangible) that prevent, hamper or discourage cross-connections.</i> |
| Braddock | 1979 | 172-3 | Australia | Empirical | severance | [Psychological severance occurs] when despite the provision of crossings, people feel cut off from areas which were easily accessible before construction of a road or other barrier to movement [...] Physical severance of trips occurs when an impassable barrier is placed across an existing pathway. The degree of severance therefore depends upon existing patterns of trips in relation to the position of the barrier, and what the future pattern of trips might be in its absence. Points of severance depend on where people are travelling, their origins, destinations and pathways in relation to the proposed barrier. The amount of severance is the number of trips affected. The importance of severance in terms of social equity depends upon which people are affected, whether alternative destinations are available to them, and whether the extent of possible detours around the barrier will lead to trip suppression for the less mobile sectors of the population. |
| Planverket <i>et al</i> | 1981 | 28 | Sweden | Report | <i>barrier effects</i> | <i>Barrier effects refer to the impact of motorised traffic on the safety and accessibility of crossing pedestrian and bicycle traffic. It also covers the impact of motorised traffic on mobility, social contacts, and location.</i> |
| Borges <i>et al</i> | 1983 | 29 | Denmark | Report | <i>barrier effect</i> | <i>Barrier effect is the impact that occurs when the characteristics of the traffic prevent or hinder road crossings</i> |
| Grigg and Ford | 1983 | 1 | UK | Report | severance | The Urban Motorways Project Team have defined severance as the divisive effects a major urban road has on the inhabitants on either side of it. These divisive effects may be categorised as (a fall in the frequency of journeys made by households arising from an increase in journey time and a fall in household journey frequency arising from changes in environmental quality. The first category is sometimes called real severance and the second category perceived severance or psychological severance. |

| | | | | | | |
|------------------------|------|----------------------------|-------------|-----------------------|---------------------------|--|
| UK DOT | 1983 | Part B Section 4.1.1 | UK | Official guidance | community severance | Community severance is defined [...] as the separation of residents from facilities and services they use within their community, from friends and relations and, perhaps, from place of work as a result of changes in road patterns and traffic levels. Severance may result from the difficulty of crossing a heavily trafficked road at grade, from a physical barrier formed by cuttings or embankments or from the legal prohibition of access for pedestrians and others to motorways or for traffic to pedestrianised areas. |
| Lervåg | 1984 | 12 | Norway | Report | <i>barrier effect</i> | <i>Barrier effect is the collective term for the impact of road and traffic barriers on pedestrians. The need for pedestrians to cross the road depends on the location of their destination in relation to the barrier. The important destinations for children are schools, playgrounds, leisure areas, kindergartens, and friends' homes. The important destinations for adults are workplaces, grocery stores and local services.</i> |
| SACTRA | 1986 | 185 (glossary) | UK | Report | community severance | [Community severance is the] extent to which a road or proposed improvement cuts across established patterns of community activities or impedes their development. |
| De Boer | 1986 | 124 | Netherlands | Empirical | severance | [The impact which is labelled] barrier effect [or] severance [arises when] geographical links are cut off when a new road or railway is built. In urban areas especially residents are severed from their neighbours, children from their playgrounds, shops from their clients. The better the quality of the new infrastructure is with regard with regard to traffic speed and the more heavily it is used, the stronger the impact will be. The barrier effect of a railroad with a frequent service is stronger because its barriers are frequently down. |
| UK IHT | 1987 | 75 | UK | Report | severance | Severance has been defined as the sum of the divisive effects a major urban road or heavy traffic flow has on the inhabitants either side of it. These effects can be either physical (i.e. actual barriers to movement) or psychological (i.e. perceived impediments to movement). Actual severance results in reductions in pedestrian journey frequency arising from the feeling of being cut off due to adverse changes in environmental quality. |
| Clark <i>et al</i> | 1991 | 17 | UK | Report | community severance | Community severance is the sum of the divisive effects a road has on those in the locality. |
| Wolff and Gillham | 1991 | 222 | UK | Academic (review) | community severance | [Community severance]: New urban motorways, or merely an increase in traffic flows on existing roads certainly have a pronounced severing effect. Residents are reluctant to cross busy streets, and the busier the road then the fewer friends and acquaintances they have on the other side, and the lower their social support within the local community. (...) In addition, increased traffic volumes on existing roads lead to increased noise, pollution, visual intrusion and loss of accessibility/mobility, which deter individuals from using local shops. This may lead to a decline in shops within walking distance of homes, increases accessibility problems for the car-less and increases congestion and pollution as resident car owners are forced to use their cars to drive to 'out-of-town' retail outlets. |
| UK HA | 1993 | 5/1 | UK | Official guidance | community severance | Community severance is defined [...] as the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows. |
| Lahrmann and Leleur | 1994 | 424 | Denmark | Academic (methods) | <i>barrier effect</i> | <i>The barrier effect (danger of crossing the road) increases the vulnerability of some road users, who cannot cross the road unhindered and safely. It affects the possibility of walking, cycling, and generally, the ability to move in one's neighbourhood without hindrance from traffic, and reach shops, schools, and other facilities on the opposite side of the road. The feeling of danger can be so great as to discourage people from crossing the road. The barrier effect is thus partly a measure of the needs unfulfilled due to the presence of the road and traffic, and partly the delays, detours, and danger in crossing the road.</i> |
| Soguel | 1995 | 301 | Switzerland | Empirical study | traffic barrier effect | In urban areas, the barrier effect [...] affects pedestrians. The difficulty of crossing the road is influenced by the width of the roadway, the volume, speed and composition of the traffic, and any street environment adjustments (e.g. traffic lights, pedestrian crossings, pedestrian traffic islands). As the difficulty increases, the roadway appears like a barrier; pedestrians can no longer move around freely and social interaction can suffer. |
| Russell and Hine | 1996 | 16 | UK | Academic (methods) | traffic barrier | Traffic barrier is [...] the sum of inhibiting effects upon pedestrian behaviour resulting from the impact of traffic conditions; including physical (observable) and psychological (unobservable) impediments to pedestrian movement. |
| Tate | 1997 | 7 | New Zealand | Report | social severance | [Social severance:] The divisive effects that result from the provision and use of transport infrastructure. |

| | | | | | | |
|----------------------|------|----------------------|-------------|--------------------|---------------------|---|
| Watkiss <i>et al</i> | 2000 | xi | UK | Report | community severance | Community severance [...] arises when roads bearing high levels of traffic cut through housing areas. The physical presence of the traffic, particularly heavy goods vehicles, as well as the risk of accidents, presents a barrier to the community, limiting or disrupting interpersonal networks and reducing social contact. |
| Guo <i>et al</i> | 2001 | chapters 2.2; 2.3 | Australia | Empirical | severance | Static severance is caused by the introduction of a new highway with access control and high embankments where there are existing patterns of social interaction. A man made structure artificially divides an area into two separate parts so that it is difficult for one side to interact with the other. In divided communities severance becomes associated with detour journeys and an increase in the route factor, the need to construct pedestrian bridge crossings, and people giving up their previous connections. The direct effects of severance are trip diversion and suppression, poor accessibility and restricted personal mobility in the effected neighbourhoods. The indirect effects may be psychological, cultural and social severance [...] Dynamic severance is the time dependent barrier effect caused by conflicting streams of traffic movements among road users, derived from pedestrian activities and vehicles using the road. It results in divisive impacts on the surrounding environmental areas, including physical separation and psychological impediments [...] Dynamic severance focuses on pedestrian vehicle conflict, which includes pedestrian delay, diversion to other crossing points and accident risk. |
| Lucas <i>et al</i> | 2001 | 6 | UK | Report | community severance | In urban and suburban areas, the combination of road and junction design, traffic speeds, congestion and inappropriately parked vehicles can cause severance of communities and severely limit pedestrian activity. |
| Scottish Executive | 2001 | 10-10 | UK | Official guidance | severance | Severance deals with the positive or negative effects of a scheme on the ability to move around on foot, bicycle or horseback. It reflects in particular the improvement in or deterioration of the ability of the community to cross major road or rail links and thereby reach local destinations. |
| Read and Cramphorn | 2001 | 14 | New Zealand | Report | community severance | Community severance - the impacts on a community resulting from some of its features being severed by changes to roads, e.g. the variety of disruptive effects that new roads can have in a local neighbourhood or community, including changes in or loss of access to neighbourhoods, facilities or transport, changes to established patterns of activity, isolation of one area from another, changes to land use. |
| Saelensminde | 2002 | vi (English summary) | Norway | Report | barrier costs | Road traffic obstructs a realization of a "natural" amount of walking and cycling in the city areas. By "natural" amount of walking and cycling we mean that amount of walking and cycling that would have taken place if people could choose transport mode according to their preferences in a situation where road traffic did not cause insecurity and other inconveniences. [...] This non-realised benefit to the society is an estimate of the barrier costs caused by road traffic. |
| Handy | 2003 | 119 | USA | Academic (methods) | severance | Severance refers to separation or partitions between people, between people and places, or between two places. (...) Human communities are severed when a new facility, such as a freeway or a rail system, is built through an existing community and local streets are closed to accommodate the new facility. Natural communities may be severed when a new highway is built along a new alignment through an undeveloped area. Such impacts are often referred to as the "barrier effect," and may be as much psychological as physical, as much perceived as real. However, the barrier effect and severance are not quite the same thing. In a community that grows up around an existing highway or rail line, the transportation facility may serve as a barrier that impedes the creation of connections between people and places but it did not sever connections because none existed at the time it was built. Transportation projects can also contribute to severance by displacing residents and businesses, thus eliminating connections without necessarily creating a barrier. Severance can also be understood through its converse, at both a physical [connectivity] and a social [community cohesion] level. |
| Boon <i>et al</i> | 2003 | 4 | Netherlands | Empirical study | barrier effect | <i>Barrier effect is defined as the social effect which results from the movement and/or (potential) presence of vehicles on a section of infrastructure (or the presence of the infrastructure itself). This has a negative impact on the needs of the community, groups in the community, and relationships between these groups and individuals. It may be added that the needs can be satisfied at locations on either side of the infrastructure. Barriers plays a role at the neighborhood level, for example schoolchildren not being allowed to walk to school due to the presence of a busy road.</i> |
| Trafikministeriet | 2003 | 59 | Denmark | Official guidance | barrier effect | <i>The barrier effect is related to the perceived visual effects or risks caused by the construction or enlargement of infrastructure.</i> |

| | | | | | | |
|-------------------------|------|-----------------|-------------|-------------------------|--------------------------------------|--|
| Egan <i>et al</i> | 2003 | 1463 | UK | Academic paper (review) | community severance | [Community severance:] reduced access to local amenities and disruption of social networks caused by a physical barrier running through the community. |
| SEU | 2003 | 20 | UK | Report | impact of traffic on communities | Impact of traffic on communities: Busy roads can divide and damage local communities and restrict walking - especially amongst children and elderly people. Heavy traffic can cut people off from facilities because of fear of accidents. Some older people and disabled people can feel particularly intimidated by traffic. |
| Forkenbrock and Sheeley | 2004 | 351 (glossary) | USA | Report | barrier effect | [Barrier effect:] The reduction in mobility and safety of nonmotorized travel caused by the construction of new transportation projects such as those that increase traffic volumes and speeds on existing roads. |
| Mouette and Waisman | 2004 | 34 | Brazil | Empirical study | <i>barrier effect</i> | <i>[Barrier effect] is defined as the restrictions or inhibitions caused by traffic and by roads, which cause an impedance to the free movement of pedestrians across the two sides of the road. Besides the physical barriers caused by roads and motorised traffic, the mobility of pedestrians is also significantly reduced by the risk to which they are exposed when walking, especially when crossing the road.</i> |
| Hodgson <i>et al</i> | 2004 | 25 | UK | Academic (review) | severance | Severance: The divisive effects that infrastructure and traffic can have upon communities and upon the scope of individuals to move around within the urban area. |
| Rajé | 2004 | 269 | UK | Empirical study | community severance | Transport can damage health through community severance, producing a range of direct negative impacts on health, including reduced social support, reduced access to facilities and restricted access for disabled people. In addition, severance creates indirect health effects, for example disruption of social networks and reduced social support, thereby affecting health. |
| Noonan | 2005 | 1819 | USA | Empirical study | barriers | Barriers [...] refer to physical features that mitigate the disutility of proximity to members of a group by their position in between the two groups. Barriers might be thought of as having the properties of insulators or buffer zones between two groups. This physical effect distinguishes barriers from symbolic or legal boundary demarcations. Barriers often also serve other purposes as traditional public goods like highways or parks. |
| Ecoplan and Metron | 2005 | 68 | Switzerland | Report | <i>pedestrian separation effects</i> | <i>The separation effect of roads on pedestrians is usually defined as the time losses suffered by pedestrians when they want to cross a road.</i> |
| James <i>et al</i> | 2005 | 5 | UK | Report | community severance | New or existing transport schemes such as roads or railways can have detrimental social impacts on communities. If a large or increasingly busy road cuts through an area it can have the effect of driving a wedge through a community, or communities. This can limit people's ability or desire to move through that area, which in turn can reduce accessibility to key services (such as health, education and employment opportunities and quality food shopping) and damage local social networks and community 'cohesion'. |
| UK House of Commons. | 2005 | part 2, note 19 | UK | Report | community severance | Community severance describes the impact of high levels of traffic on the 'liveability' of a street. Where traffic dominates a street environment, the noise, danger, and physical obstacle of a 'river of traffic', can lower the quality of life and sense of community by preventing children playing outside, making it difficult for neighbours to meet, talk, and walk. |
| Thomson <i>et al</i> | 2008 | 2 | UK | Academic (review) | severance | Community severance: defined as reduced access to local amenities and disruption of social networks caused by a road running through a community. |
| NZTA | 2009 | glossary | New Zealand | Official guidance | severance | Severance: separation of people from facilities and services they wish to use within their community due to obstacles to access such as busy roads. |
| Dyett | 2010 | 7 | UK | Empirical study | community severance | [Community severance] can generally be described as the separation of residents from the places they visit within their community caused by a busy road or other transport link such as a railway. |
| CE Delft <i>et al</i> | 2011 | 68 | Netherlands | Report | separation effects | Road and rail transport infrastructure in urban areas lead to separation effects for non-motorised traffic. When crossing road and rail infrastructure, pedestrians have to wait (at traffic lights, crossings or railway crossing gates) and therefore lose time. These time losses can be regarded as external costs. |

| | | | | | | |
|-------------------------|------|-------------------|-------------|-----------------------|--|---|
| CROW | 2011 | 11 | Netherlands | Report | <i>infrastructur e barrier</i> | <i>An infrastructure barrier is defined as a road, railway or waterway that forms a physical and / or psychological obstacle for certain groups of the population present on one side of the obstacle.</i> |
| Héran | 2011 | 1 | France | Academic (methods) | <i>cut-off effect</i> | <i>The cut-off effect is a nuisance caused by transport infrastructures which cut through the land and limit local trips.</i> |
| Mindell and Watkins | 2011 | 7 | UK | Academic (review) | community severance | Community severance arises when roads bearing high levels of traffic cut through communities. The physical presence of the traffic, particularly heavy goods vehicles, as well as the risk of collisions and injuries presents a barrier to the community, dividing it into two. This limits or disrupts access to goods, services, and people. |
| Grisolia <i>et al</i> | 2011 | 1 | Spain | Empirical study | community severance | Community severance can be defined as the impact made by massive transport infrastructure going through populated areas dividing communities, disrupting their communication, reducing their accessibility and creating other environmental externalities. |
| Quigley and Thornley | 2011 | 15 | New Zealand | Report | community severance | [Community severance is the] separation of people from facilities, services and social networks they wish to use within their community; changes in comfort and attractiveness of areas; and/or people changing travel patterns due to the physical, traffic flow and/or psychological barriers created by transport corridors and their use. |
| Litman | 2012 | 1 | Canada | Academic (review) | barrier effect /severance | The barrier effect (also called severance) refers to delays, discomfort and lack of access that vehicular traffic imposes on nonmotorized modes (pedestrians and cyclists). Severance usually focuses on the impacts of new or wider highways, while the barrier effect takes into account the impacts of vehicular traffic. |
| Nørby and Melftofte | 2012 | 9 | Denmark | Empirical study | <i>barrier impact</i> | <i>The barrier effect is an overall measure of the nuisances experienced by pedestrians crossing a road, such as insecurity, psychological effects, delay, and decreased accessibility.</i> |
| Mindell and Karlsen | 2012 | 232 | UK | Academic (review) | community severance | Community severance occurs where road traffic (speed or volume) inhibits access to goods, services, or people. |
| NZTA | 2013 | 390 | New Zealand | Official guidance | community severance | Community severance is the dislocation and alienation a community feels as a result of roads which sever communities or hinder access. It includes the effect of traffic on security and mobility of people, particularly pedestrians and cyclists and the consequential effects on their movement patterns and interaction. |
| ECOPLAN and INFRAS | 2014 | 21 | Switzerland | Report | separation effects | Separation effects can be observed in urban areas, because pedestrians and cyclists must wait to cross roads and railways. |
| Bradbury | 2014 | 1 | UK | Academic (review) | community severance/tr affic barrier effect | Community severance, or the traffic barrier effect is a [...] phenomenon [...] where large or busy roads that pass through settlements can have the effect of driving a wedge through a community by limiting people's ability or desire to move through that area. This can reduce accessibility to key services and damage local social networks and community 'cohesion'. |
| UK DfT | 2014 | 18 | UK | Official guidance | community severance | Community severance is defined (...) as the separation of residents from facilities and services they use within their community caused by substantial changes in transport infrastructure or by changes in traffic flows. Severance will only be an issue where either vehicle flows are significant enough to significantly impede pedestrian movement or where infrastructure presents a physical barrier to movement. |
| Grisolia <i>et al</i> | 2015 | 298 (abstract) | Spain | Empirical study | community severance | Community severance refers to the separation of people from facilities, services, and social networks within a community, and/or people changing travel patterns due to the physical or psychological barriers created by transport corridors and their use. Separation of neighborhoods and reductions of accessibility are some of the main effects of community severance. |

Appendix 2: Definitions of community severance and related concepts (original language)

| Authors | Year | Page | Country | Type | Concept (original) | Definition (original) |
|-------------------------|------|------|-------------|--------------------------|-------------------------------------|---|
| Korner | 1979 | 4-5 | Sweden | Report | trafikanläggningars barriäreffekter | En barriär är en fysisk företeelse med egenskaper (materiella eller immateriella) som omöjliggör, försvårar eller avskräcker från tvärkontakter. Den fysiska företeelsen kan vara fordonshastighet, buller, mörk gångtunnel etc. |
| Planverket <i>et al</i> | 1981 | 28 | Sweden | Report | barriäreffekter | Med barriäreffekter menas biltrafikens inverkan på säkerhet och framkomlighet för den korsande gång- och cykeltrafiken. I begreppet ingår även biltrafikens inverkan på förflyttningsvanor, kontaktmönster och lokalisering. |
| Borges <i>et al</i> | 1983 | 29 | Denmark | Report | barriereeffekt | Barriereeffekt er de konsekvenser, som opstår i omgivelserne til et trafik anlæg som følge af egenskaber, der umuliggør eller vanskeliggør tværkontakter |
| Lervag | 1984 | 12 | Norway | Report | barrierevirkning | Barrierevirkning kan stå som en samlebetegnelse på veg- og trafikbarrierenes konsekvenser for fotgjengerne. Fotgjengerens behov for å passere barrieren avhenger av hvor deres mål ligger i forhold til barrieren. For barn er skoler, lekeplasser, fritidstilbud, barnehager og venner viktige mål, mens arbeids plasser, dagligvareforretninger og nærservice er viktige for voksne og eldre. |
| Lahrmann and Leleur | 1994 | 424 | Denmark | Academic paper (methods) | barriereeffekt | Barriereeffekten (utryghed på tværs af vejen) omfatter de bløde trafikanters mulighed for uhindert og trygt at krydse vejen. Dvs. muligheden for ved gang, cykling mv. at kunne bevæge sig i nærheden af sin bolig og kunne nå butikker, skoler og andre tilbud på den modsatte side, skoler og andre tilbud på den modsatte side af vejen uden hindring fra trafikken. Utryghedsfølelsen vil kunne blive så stor, at den held afholder folk fra at krydse vejen. Barriereeffekten er således et mål for, dels de behov, der undertrykkes af vejens og trafikken tilstedeværelse, dels den forsinkelse, omvej og utryghed, der opstår i forbindelse med krydsning af vejen. |
| Boon <i>et al</i> | 2003 | 4 | Netherlands | Empirical study | barrièrewerking | Barrièrewerking is gedefinieerd als een sociaal effect als gevolg van de beweging en/of (potentiële) aanwezigheid van voertuigen op een stuk infrastructuur (of de pure aanwezigheid van de infrastructuur), die in een negatieve sfeer invloed uitoefent op de behoeften van de gemeenschap, groepen in de gemeenschap, relaties tussen deze groepen en individuen. Daaraan kan worden toegevoegd dat de behoeften kunnen worden bevredigd op locaties die aanwezig zijn aan weerszijden van de infrastructuur. Barrièrewerking speelt onder andere een rol op buurniveau: het gaat dan bijvoorbeeld om schoolkinderen die niet alleen naar school mogen lopen vanwege de aanwezigheid van een over te steken, drukke autoweg. |
| Trafikministeriet | 2003 | 59 | Denmark | Official guidance | barriereeffekten | Barriereeffekten knytter sig til oplevede visuelle effekter eller risici ved anlæg eller udvidelse af infrastrukturen. |
| Mouette and Waisman | 2004 | 34 | Brazil | Empirical study | efeito barreira | Definiu-se o termo efeito barreira para denotar as restrições ou inibições ocasionadas pelo tráfego e pela via de circulação, gerando uma impedância ao livre movimento dos pedestres entre os dois lados da via. Além das barreiras físicas decorrentes do tráfego de veículos e da via, o risco ao qual o pedestre está exposto ao caminhar, sobretudo no momento de efetuar a travessia da via, constitui outro elemento significativo à queda de mobilidade dos pedestres. |
| Ecoplan and Metron | 2005 | 68 | Switzerland | Report | trennungseffekt fussgänger | Unter dem Trennungseffekt von Strassen für Fussgänger versteht man meist die Zeitverluste, die Fussgängern entstehen, wenn sie eine Strasse überqueren wollen. |
| CROW | 2011 | 11 | Netherlands | Report | infrastructurele barrière | Een infrastructurele barrière is gedefinieerd als een weg, waterweg of spoorweg die een fysieke en/of psychologische hindernis vormt voor bepaalde groepen van de bevolking aanwezig aan een zijde van deze hindernis. |
| Héran | 2011 | 1 | France | Academic (methods) | effet de coupure | L'effet de coupure est une nuisance des transports provoquée par les infrastructures qui découpent le territoire et limitent les déplacements de proximité. |
| Nørby and Møltofte | 2012 | 9 | Denmark | Empirical study | barrierevirkningen | Barrierevirkningen er et samlet mål for de gener i form af utryghed, mental belastning, ventetid og mindske tilgængelighed som fodgængerne oplever ved krydsning af en vej. |

Street mobility and network accessibility: towards tools for overcoming barriers to walking amongst older people

References

- Anciaes, P. R. (2014) Initiating dialogue between stakeholders and establishing a common language for community severance through crossdisciplinary workshops. Street Mobility and Network Accessibility Working Paper Series, 1. University College London, London. Retrieved from https://www.ucl.ac.uk/street-mobility/docs/ucl_streetmobility_paper01
- Borges, P., Thost, P., and Herrstedt, L. (1983) *Fodgængere i Bytrafik*. Vejdatalaboratoriet, Vejdirektoratet, Herlev.
- Bradbury, A. (2014) Understanding community severance and its impact on women's access and mobility in African countries – Literature review. Report for the African Community Access Programme. Retrieved from <http://r4d.dfid.gov.uk/Output/201023>
- Braddock, M. (1979) Evaluation of the severance effects of a proposed rapid transit corridor. Paper presented at the 1979 Australian Transport Research Forum, Sydney. Retrieved from http://www.atrf.info/papers/1979/1979_Braddock.pdf
- CE Delft, INFRAS., and Fraunhofer ISI (2011) External costs of transport in Europe - Update study for 2008. CE Delft, Delft. Retrieved from http://www.cedelft.eu/publicatie/external_costs_of_transport_in_europe/1258
- Clark, J. M., Hutton, B. J., Burnett, N., Hathway, A., and Harrison, A. (1991) *The Appraisal of Community Severance*. Contractor Report 135. Transport and Road Research Laboratory, Crowthorne.
- CROW (2011) *Barrièrewerking van Lijninfrastructuur* [Barrier effects from linear infrastructure]. Publicatie 299. CROW, Ede. [in Dutch].
- De Boer, E. de (1986) Estimating severance caused by roads., in H A Becker and A L Porter (Eds.) *Impact Assessment Today. Volume I* Research Group on Planning and Policymaking, Utrecht., Ch.8, pp.123-139.
- Dyett, L. (2010) Community severance on the A4 Great West Road. Unpublished Msc. thesis, University of Westminster.
- Ecoplan-INFRAS (2014) Externe effekte des verkehrs 2010: Monetarisierung von umwelt-, unfall- und gesundheitseffekten [External effects of transport 2010: Monetization of environmental, accident and health effects]. Report to the Swiss Federal Office for Spatial Development. Retrieved from <http://www.are.admin.ch/themen/verkehr/00252/00472/index.html?lang=en> [in German].
- Ecoplan and Metron (2005) Kosten-nutzen-analysen im Strassenverkehr [Cost benefit analysis for road projects]. Bundesamt für Strassen, Bern. Retrieved from <http://www.ivt.ethz.ch/vpl/publications/ek102/2000342.pdf>

Street mobility and network accessibility: towards tools for overcoming barriers to walking amongst older people

- Egan, M., Petticrew, M., Ogilvie, D., and Hamilton, V. (2003) New roads and human health: A systematic review. *American Journal of Public Health* **93** (9), 1463-1471. doi: 10.2105/AJPH.93.9.1463
- Forkenbrock, D. J., and Sheeley, J. (2004) Effective methods for environmental justice assessment. National Cooperative Highway Research Program Report 532. Transportation Research Board, Washington. Retrieved from <http://www.nap.edu/catalog/13694/nchrp-report-532-effective-methods-for-environmental-justice-assessment>
- Grigg, A. O., and Ford, W. G. (1983) *Review of Some Effects of Major Roads on Urban Communities*. Transport and Road Research Laboratory, Crowthorne. Retrieved from http://www.trl.co.uk/online_store/reports_publications/trl_reports/cat_traffic_and_transport_planning/report_review_of_some_effects_of_major_roads_on_urban_communities.htm
- Grisolía, J M., López, F. (2011) Valuing amenities to reduce community severance. Presented at the EAERE (European Association of Environmental and Resource Economists) 18th Annual Conference, 29 June-2 July 2011, Rome. Available from <http://www.webmeets.com/eaere/2011/m/viewpaper.asp?pid=972>
- Grisolía, J. M., López, F., and Ortúzar, J de D. (2015) Burying the highway: The social valuation of community severance and amenity. *International Journal of Sustainable Transportation* **9** (4), 298-309. doi: 10.1080/15568318.2013.769038
- Grudemo, S., Ivehammar, P., and Sandsröm, J. (2002) Beräkningsmodell för infrastrukturinvesteringars intrångskostnader [Calculation model for the encroachment costs of infrastructure investments] (VTI meddelande 939 - 2002). Linköping :VTI. Retrieved from <http://www.vti.se/en/publications/calculation-model-for-encroachment-costs-of-infrastructure-investments> [in Swedish].
- Guo, X., Black, J., and Dunne, M. (2001) Crossing pedestrians and dynamic severance on urban main roads. *Road and Transport Research* **10** (3), 84-98.
- Handy, S. (2003) Amenity and severance., in D. A. Hensher and K. J. Button (Eds.) *Handbook of Transport and the Environment*. Elsevier, Amsterdam., pp.117-140.
- Héran, F. (2011) *La Ville Morcelée. Effets de Coupure en Milieu Urbain* [The fragmented city: Barrier effects in urban contexts]. Economica, Paris. [in French].
- Hodgson, F. C., Page, M., and Tight, M. R. (2004) A review of the factors which influence pedestrian use of the streets. Working Paper 581. Institute of Transport Studies, Leeds. Retrieved from <http://eprints.whiterose.ac.uk/2337>
- James, E., Millington, A., and Tomlinson, P. (2005) Understanding community severance Part 1: Views of practitioners and communities. Report for the UK Department for Transport. Retrieved from http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/adobepdf/163944/Understanding_Community_Sev1.pdf

Street mobility and network accessibility: towards tools for overcoming barriers to walking amongst older people

- Korner, J. (1979) Trafikanläggningars barriäreffekter [The barrier effects of traffic facilities] Rapport 1979:1. Avdelningen för Trafikplanering, Chalmers Tekniska Högskola, Göteborg. [In Swedish].
- Lahrmann, H., and Leleur, S. (Eds.) (1994) *Vejtrafik: Trafikteknik & Trafikplanlægning* [Road traffic: Traffic engineering and planning]. Polyteknisk Forlag, Lyngby [in Danish].
- Lassière, A. (1976) *The Environmental Evaluation of Transport Plans*. UK Department of Environment, [S.I.].
- Lee, T., and Tagg, S. (1976) The social severance effects of major urban roads., in P. Stringer and H. Wenzel (Eds.) *Transportation Planning for a Better Environment*. Plenum Press, New York., pp. 267-281.
- Lervåg, H. (1984) Vegene som barriere for fotgjengere: Metodebeskrivelser [Roads as barriers for pedestrians: A description of methods]. NIBR Report 1984:13. NIBR, Oslo. Retrieved from http://urn.nb.no/URN:NBN:no-nb_digibok_2012062608144 [in Norwegian].
- Litman, T. (2012) Barrier effect., in *Transportation Cost and Benefit Analysis: Techniques, Estimates and Implications* (2nd ed.). Victoria Policy Transport Institute, Victoria., Chapter 5.13. Retrieved from <http://www.vtpi.org/tca/tca0513.pdf>
- Lucas, K., Grosvenor, T., and Simpson, R. (2001) Transport, the environment and social exclusion. Report for the Joseph Rowntree Foundation. York Publishing Services, York. Retrieved from <http://www.jrf.org.uk/publications/environment-and-equity-concerns-about-transport>
- Nørby, L. E., Meltofte, K. R. (2012) Over vejen: Vejen som trafikal barriere for fodgængere [On the road: The road as a traffic barrier for pedestrians]. Msc. thesis. Aalborg University, Aalborg, Denmark. Retrieved from <http://projekter.aau.dk/projekter/da/studentthesis/over-vejen%281a8858f4-bc06-4d2f-ad62-addf968104da%29.html> [in Danish].
- Mindell, J. S., and Karlsen, S. (2012) Community severance and health: what do we actually know? *Journal of Urban Health* **89**, 232-246. doi: 10.1007/s11524-011-9637-7
- Mindell, J. S., and Watkins, S. J. (2011) Stress, social support and community severance., in J. S. Mindell, S. J. Watkins, and J. M. Cohen (Eds.) *Health on the Move 2: Policies for Health Promoting Transport. The Policy Statement of the Transport and Health Study Group* (2nd Ed.). Transport and Health Study Group, Stockport., Chapter 5. Retrieved from http://www.transportandhealth.org.uk/?page_id=32
- Mouette, D., and Waisman, J. (2004) Proposta de uma metodologia de avaliação do efeito barreira [A proposed method for evaluating the barrier effect]. *Revista dos Transportes Públicos* **102**, 33-54. Retrieved from http://www.antp.org.br/_5dotSystem/download/dcmDocument/2013/01/10/B9BD823A-1D2B-4ED2-80F9-A44BB52404F6.pdf [in Portuguese].
- Noonan, D. S. (2005) Neighbours, barriers and urban environments: Are things 'different on the other side of the tracks'? *Urban Studies* **42** (10), 1817-1835. doi: 10.1080/00420980500231720

Street mobility and network accessibility: towards tools for overcoming barriers to walking amongst older people

- NZTA (New Zealand Transport Agency) (2009) *Pedestrian Planning and Design Guide*. New Zealand Transport Agency, Wellington. Retrieved from <http://www.nzta.govt.nz/resources/pedestrian-planning-guide>
- NZTA (New Zealand Transport Agency) (2013) *Economic Evaluation Manual*. New Zealand Transport Agency, Wellington. Retrieved from <http://www.nzta.govt.nz/resources/economic-evaluation-manual/economic-evaluation-manual/eem.html>
- OECD (Organisation for Economic Co-operation and Development) (1973) *Effects of Traffic and Roads on the Environment in Urban Areas*. OECD, Paris.
- Planverket, Trafiksäkerhetsverket and Vägverket (1981) *Stadens trafiknät* (Bilen i Stadens Trafiknät). [Urban transport network (The car in the urban transport network)] Statens Planverk, Stockholm. [in Swedish, with English summary].
- Quigley, R., and Thornley, L. (2011) Literature review on community cohesion and community severance: Definitions and indicators for transport planning and monitoring. Report for the New Zealand Transport Agency). Quigley and Watts, Wellington. Retrieved from <http://www.nzta.govt.nz/resources/community-cohesion-and-community-severance>
- Rajé, F. (2004) Engineering social exclusion? Poor transport links and severance. *Municipal Engineer* **157**, 267-273. doi: 10.1680/muen.2004.157.4.267
- Read, M. D., and Cramphorn, B. (2001) Quantifying the impact of social severance caused by roads. Research Report 201. Transfund New Zealand, Wellington.
- Russell, J., and Hine, J. (1996) The impact of traffic on pedestrian behaviour - 1. Measuring the traffic barrier. *Traffic Engineering and Control* **37**, 16-18.
- SACTRA (Standing Advisory Committee on Trunk Road Assessment) (1986) *Urban Road Appraisal*. Stationery Office, London.
- Sælensminde, K. (2002) Gang-og sykkelvegnett i norske byer nytte: Kostnadsanalyser inkludert helseeffekter og eksterne kostnader av motorisert vegtrafikk [Walking and cycling track networks in Norwegian cities - Cost- benefit analyses including health effects and external costs of road traffic]. TØI rapport 567/2002. TØI, Oslo. Retrieved from <https://www.toi.no/publications/walking-and-cycling-track-networks-in-norwegian-cities-cost-benefit-analyses-including-health-effects-and-external-costs-of-road-traffic-article17775-29.html> [in Norwegian, with English summary].
- Scottish Executive (2001) *Scottish Transport Appraisal Guidance*. Scottish Executive, Edinburgh.
- Stanley, J., Rattray, A. (1978) Social severance., in D W Pearce (1978) *The Valuation of Social Cost*. Allen and Unwin, London., Chapter 7, pp.141-163.
- SEU (Social Exclusion Unit) (2003) Making the connections: Final report on transport and social exclusion. Stationery Office, London. Retrieved from http://www.ilo.org/emppolicy/pubs/WCMS_ASIST_8210/lang-en/index.htm

Street mobility and network accessibility: towards tools for overcoming barriers to walking amongst older people

- Soguel, N. C. (1995). Costing the traffic barrier: A contingent valuation survey. *Environmental and Resource Economics* **6**, 301-308. doi: 10.1007/BF00705983
- Stanley, J., and Rattray, A. (1978) Social severance., in D. W. Pearce (Ed.) *The Valuation of Social Cost* Allen and Unwin, London., pp.141-163.
- Tate, F. N. (1997) Social severance. Research Report No.80. Transfund New Zealand, Wellington.
- Thomson, H., Jepson, R., Hurley, F., and Douglas, M. (2008) Assessing the unintended health impacts of road transport policies and interventions: translating research evidence for use in policy and practice. *BMC Public Health* **8**:339. doi:10.1186/1471-2458-8-339
- Trafikministeriet [Danish Ministry of Transport]. (2003) *Manual for Samfundsøkonomisk Analyse: Anvendt Metode og Praksis på Transportområdet* [Manual for socio-economic analysis: Applied methods and practices in the transport sector]. Trafikministeriet, København. Retrieved from http://www.trm.dk/~media/Files/Publication/2003/samfundsokonomisk_analyse.pdf [in Danish].
- UK DFT (UK Department for Transport). (2014) Social impact appraisal (TAG Unit A4.1). Retrieved from <https://www.gov.uk/government/publications/webtag-tag-unit-a4-1-social-impact-appraisal>
- UK DOT (UK Department of Transport) (1983) *Manual of Environmental Appraisal*. Department of Transport; Assessments, Policy and Methods Division, London.
- UK IHT (UK Institute of Highways and Transportation) (1987) *Roads and Traffic in Urban Areas*. Stationery Office, London.
- UK HA (UK Highways Agency) (1993) Pedestrians, cyclists, equestrians and community effects., in *Design Manual for Roads and Bridges*. Stationery Office, London., vol. 11, section 3, part 8. Retrieved from <http://www.dft.gov.uk/ha/standards/dmrb/vol11/section3/11s3p08.pdf>
- UK House of Commons (2005) Select Committee on Transport Seventh Report. Retrieved from <http://www.publications.parliament.uk/pa/cm200405/cmselect/cmtran/218/21802.htm>
- UK MOT (UK Ministry of Transport) (1963) *Traffic in Towns: A Study of the Long Term Problems of Traffic in Urban Areas*. Stationery Office, London.
- Urban Motorways Committee (1972) *New Roads in Towns*. Report to the Secretary of State for the Environment. Stationery Office, London.
- Watkiss, P., Brand, C., Hurley, F., Pilkington, A., Mindell, J., Joffe, M., and Anderson, R. (2000) Informing transport health impact assessment in London. Report for the NHS Executive London. Retrieved from <http://www.apho.org.uk/resource/item.aspx?RID=44168>
- Wolff, S. P., and Gillham, C. J. (1991) Public health versus public policy? An appraisal of British urban transport policy. *Public Health* **105** (3), 217-228.

All webpages accessed on 24 August 2015.