

Dr Annabel Bradbury	Understanding Community Severance and its Impact on Women's Access and Mobility in African Countries – Literature Review
CONTRACT REF NO. AFCAP/GEN/127/J	Community severance, or the traffic barrier effect, is a well- established phenomenon of transport planning in developed countries but has not been explored in Sub-Saharan Africa. This literature review explores the concept of community severance for the rural poor in Sub-Saharan Africa, with an emphasis on women and vulnerable people.

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British Expertise International Awards 2013: Outstanding International Collaboration





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# List of Abbreviations

ADMARC	Agricultural Development and Marketing Corporation
AHRC	Arts and Humanities Research Council
CCTV	Closed Circuit Television
DFID	Department for International Development
EPSRC	Engineering and Physical Sciences Research Council
ESRC	Economic and Social Research Council
FIA	Federation Internationale de l'Automobile
G7	Group of Seven
ILO-ASIST	International Labour Organization Advisory Support, Information Services and Training
ITDG	Intermediate Technology Development Group
KENDAT	Kenya Network for Draught Animal Technology
UCL	University College London
VTPI	Victoria Transport Policy Institute

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# **1.** Introduction

Community severance, or the traffic barrier effect, is a well-established phenomenon of transport planning in developed countries 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'. In Sub-Saharan Africa, the community severance effects of high volume roads passing through communities on vulnerable people (women, young and elderly people) in both rural and urban settings have not been explored, and this is a vital area of research in understanding travel patterns and how planners can mitigate against these effects.

The objective of this literature review is to define the concept of community severance for vulnerable people in Sub-Saharan Africa, explore how rural communities experience community severance and identify mitigation methods that can be used to alleviate community severance.

New or existing transport schemes such as roads and railways can have detrimental social impacts on communities. Where an existing road has become busier over time the increased volume and speed of traffic may also create a real or perceived barrier to people in reaching important services and facilities. Transport infrastructure can impact on people's health and wellbeing by:

- Limiting access to key services (such as health, education, employment opportunities and markets for food)
- Limiting access to rural transport services
- Increasing the risk of road traffic accidents
- Reducing air quality and increasing dust particulates
- Increasing traffic noise
- Trip delay, trip diversion and trip suppression

Three key severance effects have been identified (Social Exclusion Unit, 2003):

- 1. Physical barriers
- 2. Psychological or perceived barriers i.e. perceived danger that prevents people from crossing the road
- 3. Social impacts such as the disruption of community cohesion and inhibition of social interaction

This report comprises a review of empirical research and theoretical literature defining and measuring community severance in developed and developing countries, and in particular the impacts on women and other vulnerable groups.

## 2. Review of Literature

The concept of community severance has received intermittent attention by the research community over the past decade, with academics and transport planning practitioners preferring to write about the impact of transport on *social exclusion*, which has been an area of great interest to researchers in the UK and other high income countries. In fact, the FIA Foundation commissioned a survey of the public policy stances taken towards transport and social exclusion in the Group of Seven (G7) industrialised nations (UK, Italy, Germany, Japan, USA, Canada and France). The study focused on a lack of access to a car as being the key determinant of social exclusion and examined the link between transport and social exclusion as it relates to low income and minority populations (Lucas, 2004; Lucas, 2003).

More recently, however, University College London (UCL) has been commissioned by three research councils (EPSRC, ESRC and AHRC), as part of the Lifelong Health and Wellbeing Cross-Council Programme, to develop tools to measure and overcome community severance. *Street Mobility and Network Accessibility: Towards Tools for Overcoming Barriers to Walking Amongst Older People* is a three year project which began in January 2014 and will develop methods to measure the extent of community severance at individual and neighbourhood levels. It will focus on older people's mobility and wellbeing, based on four case studies in London and elsewhere in the UK (UCL, 2014).

For low income countries, there is a paucity of research on community severance effects and a resultant lack of literature on the subject, even in urban transport planning where severance effects are more prevalent. Indeed, Lucas (2011) reports that 'the majority of studies which consider transport from a social exclusion perspective have been conducted in the context of the developed world where both income poverty and lack of transport are relative rather than absolute states.' The vast majority of poor people in both rural and urban areas of developing countries walk in order to access goods and services (see Porter, 2002), and yet the emphasis of the development agenda continues to be on growth through-large scale infrastructure provision and motorised transport (Anyanwu and Erhijakpor, 2009). It is no surprise then that the issue of community severance and the barrier effect has not been given much consideration in the low income countries of Sub-Saharan Africa, Asia and Latin America because pedestrians, cyclists and other non-motorised road users are largely ignored in transport and infrastructure planning, especially in rural areas.

The following sections examine the concept of 'community severance' in more detail and discuss its key determinants before exploring the available evidence for community severance in developed and developing countries.

#### **2.1** What is Community Severance

The UK transport assessment system defines Community Severance 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" (Highways Agency, 1993).

The concept of community severance usually refers to the barrier effect of linear transport infrastructure, such as roads and railways, on the mobility of pedestrians. Bicycle or bus traffic may also be affected by this infrastructure and can be included in an extended definition of severance. The concept can also be used to describe the effects of other transport and non-transport infrastructure, such as airports, ports and industrial areas (UCL, 2014).

Motorways and railways are a barrier to the movement of people, as they limit the number of points where pedestrians can cross. However, busy roads can also be a barrier, although less severe. In this case, pedestrians can cross in a relatively large number of locations, but the characteristics of the road may have a negative impact on pedestrian safety or be perceived as intimidating or unpleasant (UCL, 2014).

Research has indicated that the concept of community severance is much more multifaceted than simply the division of people from services. Community severance displays a complex range of impacts, from the psychological effects of traffic, the effects that traffic can have on quality of life and social cohesiveness, through to links to accessibility planning, planning for people with disabilities and wider links to mobility and social exclusion (Bradbury et al, 2007).

The concept of community severance has been recognised as an environmental impact of transport since the 1920s (Pigou, 1924). In the 1970s, the Urban Motorways Committee made a link between severance and pedestrian delay, which described the situation where vehicular traffic acts as a barrier to pedestrians crossing main roads away from designated pedestrian crossing facilities (Guo et al, 2001).

It has since been recognised that community severance can have physical, social and psychological dimensions:

- Physical barriers such as the introduction of new traffic infrastructure (Guo et al, 2001);
- Psychological or perceived barriers such as traffic noise or road safety fears (Social Exclusion Unit, 2003);
- Social impacts such as the disruption of 'neighbourhood lifestyle' (Clark et al, 1991) or inhibition of social interaction (Social Exclusion Unit, 2003).

More recently, a Report to the New Zealand Transport Agency suggests the following definition (Quigley and Thornley, 2011):

'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.'

In addition, there is a public health dimension to community severance, which relates to transport and resultant health effects (Egan et al, 2003; Watkiss et al, 2000). Appleyard and Lintell's seminal study of the residents of three urban streets in San Franciso found that reduced social contact caused by traffic resulted in poor health and higher morbidity and mortality (Appleyard and Lintell, 1972). Figure 1 shows a diagrammatic network of social contacts on three different streets in San Francisco; the lines denote where people walk to see friends and acquaintances, and the dots show where people gather on the street. The figure shows that the lightest trafficked street experienced the heaviest use by pedestrians and the most social cohesion.. Conversely, the most heavily trafficked street experienced far less pedestrian movement and social interaction (Appleyard, Gerson and Lintell, 1981).



Figure 1: Neighbouring and Visiting on Three Streets in San Francisco

A review of literature undertaken by Mindell and Karlsen (2012) investigated the mental and physical health outcomes in relation to community severance and found little evidence for the health and mortality impact of community severance, other than the effect of traffic on the 'livability' of streets, including road traffic collisions, perceived risk of injury, traffic generated pollution and curtailment of healthy behaviour (for example walking and cycling) (Davis, 1992; Adams, 1995).

#### **2.2** Causes of Community Severance

Barriers may be a result of numerous different conditions, and moreover may change over time. Severance is an outcome of one or more barriers. Barriers to accessibility have many possible sources, as shown in Table 1 (James et al, 2004).

Type of Barrier	Examples
Permanent physical barrier	Railway lines, canals, safety barriers, fencing, steps, narrowings, street furniture.
Temporary physical barrier	High traffic flow or speed, level crossing barriers, lifting bridges, settings on controlled crossings, inadequate peak capacity, footway parking.
Omission barriers	Failure to provide footways, failure to provide suitable crossing facilities where needed
Legal barriers	General prohibitions, e.g. motorways, or specific e.g. against cycling in road tunnels, licensing requirements to cycle on canal towpaths, lack of enforcement, one-way routes
Time barriers	Weather wind and flooding conditions. Fear of using certain types of infrastructure at night (e.g. subways).
Quality barriers	Surfaces poorly maintained, lack of lighting, facilities feel unsafe, networks not fit for purpose.
Attitudinal barriers	Fear of subways, personal or road safety fears leading to refusal to travel (or allow others, e.g. children, to travel),
Information barriers	Lack of knowledge as to how to use facilities, lack of knowledge of existence of facilities, information provided in wrong format (e.g. absence of tactile, audible, legible information).

#### **Table 1: Types of Transport Barrier**

#### 2.2.1 Physical barriers

The physical and psychological dimensions can be seen to relate to the development of barriers to an individual's movement (either real or perceived). The social dimensions relate to the impacts that a barrier has on the community as a whole.

Guo et al (2001) suggest that physical severance can be divided into two types of barrier:

1. Static severance: caused by the introduction of a new road with high embankments and controlled crossing points through an area 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".

2. Dynamic severance: caused by the traffic on a road creating a 'dynamic time-dependent barrier'. In essence, this means that pedestrians may experience an intermittent barrier to movement (across the road) caused by the flow of traffic.

Tate (1997) identifies the following impacts of physical barriers on individuals:

- Pedestrian or trip delay: the lengthening of a person's journey caused by the transport infrastructure (e.g. a road and the position of formal crossing points);
- Trip diversion: a person is diverted from taking the most desirable route (in terms of journey time).

#### 2.2.2 Psychological barriers

These are felt to be factors which affect how people perceive the experience of moving through an area. Research with pedestrians by Clark et al (1991) identified the following perceptual impacts of traffic which may contribute to a psychological barrier developing:

- Traffic noise: relating mainly to longitudinal severance, a situation where pedestrians or cyclists are deterred from travelling along a road because of the noise emitted by the traffic (due to its speed or volume);
- Traffic pollution: relating to the deterrent effect on pedestrians and cyclists travelling along or across a road due to poor air quality caused by heavy traffic;
- Perceived danger: the deterrent effect on pedestrians and cyclists due to the fear of being hit by speeding or heavy traffic.

A combination of either or both physical and psychological barriers can create:

• Trip suppression: resulting in an individual being partially or completely deterred from making a journey due to factors associated with the transport infrastructure.

Further research has shown that the cumulative effects of physical and psychological barriers on the individuals living in an area can have a social impact on the local residential community as a whole.

#### 2.3 Social Impacts of Community Severance

Previous research has emphasised the importance of this issue, stating that it is important to consider the needs and attributes of communities when assessing the severity of severance. The first major study to examine the effect of severance on community cohesion was that undertaken by Appleyard and Lintell (1972) in San Francisco. This study found a correlation between lower traffic flows/speeds and increased levels of community cohesion. Community cohesion was measured by such factors as the number of local friends and acquaintances, the number of interactions between neighbours, the amount of walking undertaken and the size of an area considered by people to be their home territory.

Studies have shown that severance affects community cohesion in a negative way. However, it has also been claimed that the level of community cohesion already present in a community can be identified as an underlying measure of the susceptibility of a community to further social severance.

One of the earliest studies into the barrier effects of roads was carried out by Lee et al (1975) using interviews, and cognitive mapping techniques. Their hypothesis was that major roads would act as a strong barrier to free movement, leading to smaller neighbourhoods and little 'bridging' (or crossing) behaviour. The effects were expected to diminish with distance away from the road line and to be relieved by crossings. Their study concluded that:

- People at major road sites did respond to the road line as a barrier and reduce their involvement with the opposite side;
- Accommodation of the road over time took the form of enlarging the neighbourhood, some degree of spatial shift from the road line, and the establishment of a firm and shared boundary at its limits. Social activity across the road line was attenuated;
- Mitigation measures such as pedestrian crossings did affect behaviour and increase crossing activity. Where neighbourhoods were close to crossing opportunities then they tended to be smaller, confirming that more barriers equate to larger neighbourhoods;
- Total trips were not reduced due to the enlargement of the neighbourhood, but there was less crossing of the major road; and

• Although 'bridging' of the road was reduced, it still took place. People living near a road conducted up to a third of their activities on the other side.

The UK's Highways Agency undertook research on severance as part of its Managing Integration initiative. The study analysed how perceptions of severance are formed and the extent to which this leads to changes in behaviour (Highways Agency, 2002a; Highways Agency, 2002b).

The project identified a number of severance effects that both inhibited movement and increased isolation such as:

- The development of residential areas into separate pockets divided by the road network, leading to no common informal meeting spaces;
- The general inability to socialise or go for a walk;
- Children not being allowed to play outside or cross the road;
- People shutting themselves off from their surroundings, modifying their lifestyles and working patterns to counter negative effects of congestion. This included changing shift patterns at work and using other areas for shopping and recreation;
- Railway lines were not often mentioned as a cause of severance but design of rail mitigation measures was an issue (e.g. the accessibility of bridges for people with mobility problems);
- An atmosphere of neglect can develop where the community has been divided; and
- Residents perceiving an impact of severance and traffic on house prices, and of bypass construction on the level of local trade.

Despite the provision of numerous bypass schemes through the years, many towns and villages still have trunk roads passing through their centres and these can create a physical and psychological barrier between separate parts of the community, causing people to use their cars for journeys they might otherwise make on foot or by bicycle. Furthermore, the ring roads and bypasses of yesteryear that were intended to relieve burgeoning inner city roads have now been subsumed into the urban fabric and are themselves causing community severance effects in the suburbs of these settlements (Highways Agency, 2002a).

#### 2.4 Are Mitigation Measures the Solution?

The trip diversion, delay or suppression caused by community severance can affect the ability of individuals to access key services and activities. Mitigation measures are available to alleviate the impacts, but often these do not meet the needs of all members of the community. For example, subways, overbridges and traffic-controlled junctions all have their own set of problems for various groups within a community (see Figure 2). Underpasses are generally disliked and are only successful where they are close to ground level, short, straight and well-used. Overbridges offer a very hostile environment in wet and windy weather, and often incur substantial extra trip distance in negotiating ramps and steps. In both cases users often avoid these measures, instead making direct road crossings.

![](_page_10_Picture_13.jpeg)

Figure 2: Underpass and Footbridge in Cirencester, UK

Many settlements on the trunk road network do not benefit from protected crossings, i.e. locations where the pedestrian has priority over traffic. Elsewhere the provision of protected crossings may only serve a few pedestrian desire lines (i.e. the desired route a person would wish to take when moving through an area).

There is a presumption that the provision of protected at-grade crossings will prejudice vehicle journey time reliability targets. However, consideration should also be given to the effects on the journey time of local residents and users, especially those with limited mobility. The limitations of people with limited mobility are often not recognised by planners, especially where the route includes ascents and descents (Bradbury et al, 2008).

The majority of mitigation measures available are mode-specific, physical infrastructure facilities, implemented to enhance the walking and cycling environment and reduce barriers to walking and cycling. These include footways, pedestrian, cycle and equestrian crossings, refuges and traffic calming (James et al, 2004). Whilst this is a component of severance, there are other factors which constitute severance and these are not covered by the available mitigation measures. The majority of mitigation measures only deal with the physical aspect of severance and do not consider the psychological and community aspects of severance.

In a study of community severance caused by the Lisbon Inner Ring Road in Portugal, Anciaes (2013) also refers to pedestrian crossing infrastructure (footbridges and overpasses) as a barrier to the movement of pedestrians due to the intimidation effect of the infrastructure and traffic at high speeds. The severance effect here is not only noticeable in the narrow commuting corridors into Lisbon, but also in some isolated semi-rural communities. Despite the construction of tunnels, in most areas the ring road is a severe barrier to the mobility of local populations where it crosses densely populated neighbourhoods. Anciaes (2013) calculated that the final 3km section of the ring road, which opened in 2011, had an effect on the potential walking routes of over 42,000 people, representing more than 135 million potential population interactions.

In Spain, Grisolía (2011; 2014) considers the option of burying the highway, which is the most expensive mitigation measure, allowing a vacant surface to be used for public gardens and streetscape design solutions to enhance social cohesion. He uses the ring road (GC-3) around the city of Las Palmas de Gran Canaria on the island of Gran Canaria as his example; this road caused severe barrier effects, separating the neighbourhood of Low Almatriche from Siete Palmas. Discrete choice modelling is used to determine people's willingness to pay for different options for utilising the overground space, and the study found a high willingness to pay for an underground highway that completely removes the community severance impact (Grisolía, 2011).

#### **2.5** Evidence from Developed Countries

A case study was conducted by TRL in 2004 in Cirencester, a small town in the South West Region of England with a population of 18,500 (James et al, 2004). A ring road, built in 1972, dissects the town centre and two largely residential areas, also containing a hospital, leisure centre and a large supermarket.

A number of severance mitigation measures were built during construction of the ring road in the early 1970s, and these included two pedestrian subways and a footbridge. Access from the case study area to the hospital on foot is only available via a footbridge over the ring road. There are no surface level crossings along the ring road. Since the ring road was constructed, no additional mitigation measures have been implemented to facilitate pedestrian access across the road.

Trip delay and trip diversion appear to be important factors for people, since frequent informal crossing of the ring road is evident. Focus group participants were able to identify a few well known informal crossing points suggesting that these are very regularly used. Mitigation measures such as subways are not popular with pedestrians even when they are placed along 'desire lines'.

Women and older people were found to be most concerned about travelling across the ring road (especially at night) due to fear of becoming a victim of crime in the subways or on the footbridges. Men also reported feeling concerned, but appeared more willing to run across the ring road to overcome the secondary severance of the mitigation measures. People generally felt safer travelling with a companion or in a group.

People with restricted physical mobility, wheelchair users and parents/carers pushing buggies experienced similar types of problem in using the mitigation measures. It was clear that the physical accessibility of the original mitigation measures (both the subways and footbridges) had not been properly considered at the time of construction and that retrofitting is now required to rectify these issues.

In addition, poor maintenance, including flooding of the subways or un-gritted surfaces, cause further difficulties for these groups. People generally seemed to use cars to overcome these issues, but there were instances where both buggy and wheelchair users did not have access to a car and were forced to use the footbridge and underpasses, despite them being poorly designed.

Children also appeared to be affected by the trip delaying effects of the mitigation measures and were often reported as seen running across the ring road to get to school more quickly. The focus groups felt that the mitigation measures were not situated along the desire lines for the quickest route to some of the schools. One driver stated that:

# "I've actually had to stop where kids have just run out [across the ring road], they don't look they just run straight across"

The study found that there are few pedestrian crossings that people are willing to use. Among the reasons for this are trip delay and trip diversion. In addition, there was found to be a range of 'secondary' severance effects caused by the ease and experience of using the mitigation measures themselves. Hence, the mitigation measure creates a barrier and, therefore, contributes to the severing effects of the road (see Figure 3).

![](_page_12_Picture_5.jpeg)

Figure 3: Entrance to Subway and Informal Crossing Point in Cirencester, UK

There are three main interlinked issues around the acceptability of the subways as mitigation measures for the ring road.

## Perceptual:

Many respondents felt intimidated by using the subways as they fear becoming a victim of crime whilst using them. This is partly due to structural issues regarding the design of the subways meaning that people feel isolated, trapped and obscured from road level view and, therefore, 'informal surveillance' by other people is not possible. Environmental issues also play a part as respondents felt that vandalism such as graffiti is not removed regularly enough by the local authority and this further contributed to a feeling of fear (especially as lighting in the subway had been blacked out by graffiti).

Fear of crime increases in the evening, meaning that informal crossing of the road is common at night. Respondents noted that people crossing the road at night were obscured from the driver's vision until the last minute due to the darkness and this increased fears around road safety.

#### Structural:

As well as making people feel isolated, the structural design of the subway also proved to be a problem in that it made accessibility difficult or impossible for some pedestrians. Factors such as the steepness of the ramps into and out of the subways were an issue for parents pushing buggies or prams, people with restricted physical

mobility and wheelchair users. Cycle lane barriers that run through the middle of the subway entrances were also raised as an issue when trying to manoeuvre buggies, prams or wheelchairs through them. Structural issues also contributed to some of the environmental problems.

#### Environmental:

The structural design of the subways meant that flooding occurred after heavy rain, preventing people from crossing without their feet getting submerged. Many people felt that the maintenance of the subways was poor in general and that graffiti, rubbish and even vomit were not being cleared away regularly enough. Lighting and convex mirrors to provide a view around the corners of the subway had been vandalised, fuelling the impression that the subways are hotspots for anti-social behaviour and increasing the perception and fear of crime.

In summary, the following can be concluded from this community dissected by a major road:

- Community members were able to identify a broad range of physical and psychological barriers caused by the
  road itself. In addition, 'secondary' severance occurred where a second barrier had been created by the
  inadequate mitigation measures in place. The result of the physical and psychological barriers meant that a
  perceptual boundary had been created between the two parts of the ward severed by the road. The severing
  effects of the road had not diminished over time and this appears primarily to be as a result of the poor
  mitigation measures put in place when the road was constructed in the 1970s;
- The impacts of severance on those living alongside the road varied at different times of the night and day. Heavy traffic caused problems during the day, and loud noise occurred at night, due to people speeding along the road;
- In order for mitigation to be effective it needs to take into account the ease and experience of using the subways and footbridge at different times of the day and for different social groups. Good design and maintenance would help to raise accessibility and acceptability levels and this is especially important for those people without access to a car. Designing-in good formal surveillance (for example CCTV) and lighting, in addition to reducing the visible existence of vandalism or poor maintenance, can help to reduce fear of crime.

Rajé (2004) examined severance on an estate in the town of Oxford, UK. The Barton estate was built in the postwar period and has a population of over 4,000. It is surrounded by dual carriageways, and the only route for residents to and from services outside the estate is via an underpass. At the time of writing, there were plans to introduce new traffic signals and bus priority measures, but the proposed scheme did not include any mitigation measures for pedestrians. For the low income residents of Barton, the traffic engineering has effectively cut the estate off from its parent city (Rajé, 2004).

Similarly, in North Sydney, Australia, an expressway built in the 1960s to provide to access the Sydney Harbour Bridge cut a swathe through the local community.. Further modifications to an expressway overpass called Falcon Street affected hundreds of residents who use this section of road to access parks, kindergartens, playgrounds and shops as well as public transport (a pedestrian traffic count found that there were over 300 pedestrians using Falcon Street in the peak hour). The issue here is that there are six signalised crossings, all phased separately. Without a pedestrian overpass or underpass, a serious accident seemed inevitable, with 77,000 vehicles travelling on Falcon Street each day. Eventually there was commitment from the North Sydney Council to provide a grade separated pedestrian solution, with a possibility for a new pedestrian and cyclist bridge over the expressway (Napier and Edwards-Davis, 2006). Whether these new facilities will cater to the natural desire lines of pedestrians remains to be seen.

Interaction with people in communities indicates that there is a clear need for local authorities to consider the wider impacts of engineering and transport planning schemes on different social groups, and one approach proposed by Rajé (2004), is to facilitate more inclusive planning through equity audits.

#### 2.6 Evidence from Developing Countries

The literature on community severance shows that residents living on busy streets have smaller social networks; also people with fewer social contacts have worse physical and mental health and are more likely to die younger.

All these effects are worse in older and other vulnerable groups, for whom mobility and social ties are fundamental to good health. The negative impact of community severance on social contacts and social cohesion increases social inequalities and exclusion, with consequent economic and social costs (UCL, 2014). The Victoria Transport Policy Institute says that these impacts tend to be particularly large for the following groups and under the following circumstances (VTPI, 2012):

- For children, who are less able to judge suitable crossing gaps;
- For people with physical disabilities, including the elderly, who tend to be slower crossing streets;
- Where major, high speed highways cross a village or town;
- In developing countries, where a major portion of residents rely on walking and cycling, and pedestrian accommodation is often lacking.

The barrier effect occurs when motorised traffic inhibits or prohibits social interaction and the use of nonmotorised modes. Children are especially affected by this externality while socialising and, from very early ages are informed that space doesn't belong to them but to motorised vehicles, which imposes a behaviour pattern that lasts a lifetime (Vasconcellos, 2001). Profound transformations are now taking place in developing countries which are adapting their urban space to the increasing use of motor vehicles, at the expense of the most vulnerable road users (Vasconcellos, 2001).

In developing countries, there is an emphasis on a social exclusion approach to accessibility and 'transport disadvantage', and consequently very little evidence exists on community severance either in an urban or rural context. Porter (2002) reported that transport poverty is not only associated with a lack of provision of transport infrastructure and motorised services and the monetary cost of travel but can also include the amount of time people spend accessing and waiting for transportation, the time they spend actually travelling and the overall time spent away from the home - all of which significantly reduces the potential for undertaking other life-supporting activities. It can also embrace the discomforts and risks experienced whilst travelling, such as exposure to accidents, crime, noise and pollutants.

In African cities, access to adequate urban services and infrastructure is frequently not equally available to everyone. Faced with a growing gap between rich and poor, urban authorities have to deal with the challenge of how to make cities more inclusive by making basic infrastructure and services available to all (Candiracci, 2010). Mobility is fundamental for the functioning of a city and a precondition for enhancing economic opportunity and the wellbeing of its residents. Candiracci (2010) reports that African cities have been experiencing rapid motorisation rates and imbalanced transport sector development, resulting in worsening traffic congestion, poor levels of service and management, inadequate infrastructure, and high levels of air contaminants.

In a study of pedestrian mobility in Dar es Salaam, de Langen (2005) found that the largest part of trips made by adults is on foot (47%), and that the large majority of all pedestrian trips are relatively short distance, over informal and unpaved walking routes with significant accessibility problems, particularly during the rainy season. He concludes his paper by suggesting that pedestrian traffic should be accepted as an overwhelming presence and has great economic and social importance in Africa: 'Ignoring or wishing away the pedestrians has never produced good results.' The emphasis of his paper was on the separation of pedestrians from vehicles on the carriageway rather than the impact of community severance per se, but nevertheless, he demonstrated that a large part of pedestrians to take more circuitous detours with longer distances between the same origin and destination (de Langen, 2005).

Also in Tanzania, despite road transport accounting for 80% of passenger traffic, planning for pedestrians has attained some importance with local authorities who are attempting to include pedestrian facilities in new construction (Mfinanga, 2014). Mfinanga's definition of a pedestrian facility includes walkways, highway shoulders, shared-use paths, pedestrian grade separations, and crosswalks. Zebra crossings and signalised pedestrian crossings are described as priority facilities, with overbridges and underpasses described as segregated facilities. In this study of 386 pedestrians, Mfinanga (2014) found that pedestrian crossings at ground level are the preferred type because less effort is required to cross the road, followed by raised rather than underground

crossings. Interestingly, female respondents were more comfortable with crossing above or below ground level than male pedestrians.

In Fushun, China, Tao et al (2010) found that pedestrian overpasses and underpasses are not well used since the Chinese public is unreceptive towards these types of pedestrian infrastructure. As in the UK, where policymakers do not understand pedestrian behaviour, they are prone to invest in expensive infrastructure that few people use.

Dimitriou and Gakenheimer (2011) also refer to the 'uncrossable street designs' in Bangkok and Jakarta where the threat of injury leads to community severance as people avoid using the street, with pollution and noise also playing a part. They emphasise that current trends of motorisation, especially in developing countries, are eroding social and community relations and that governments and city authorities accommodate this growth wherever possible. Consequently, communities are forced to reorganise their travel behaviour to adapt to these new conditions and the resultant traffic related impacts can profoundly constrain people's behaviour (Dimitriou and Gakenheimer, 2011).

In Nairobi, 48.2% of the population are dependent on walking and cycling for the transport of both people and goods. In addition to poor and deteriorating road conditions, there is a lack of other road infrastructure facilities such as footpaths for pedestrians (which would make walking safer), separate lanes for cyclists or non-motorised modes (Candiracci, 2010). Walking and cycling make up the vast majority of all urban transport trips in many African cities, but the provision for these modes is often neglected in the design and modernisation of new or existing urban transport infrastructure. Candiracci (2010) does not specifically allude to severance or the barrier effect, but she does say that in order to move towards sustainable urban mobility for everybody, private car use should be discouraged:

'Urban freeways, highways or flyovers do not solve traffic jams. Traffic is not just created by the number of cars, but also by the number and length of trips; and more, better and bigger roads mean additional and longer trips.'

Innovative and proper sustainable transport options with integrated land-use planning would reduce total demand for transport, without affecting mobility, and would lower traffic congestion, lower pollutant emissions and provide more liveable and inclusive cities (Candiracci, 2010).

Interestingly, the literature that does exist on community severance in developed countries commonly defines vulnerable pedestrians as being children, the elderly or people with disabilities or reduced mobility. In the main, they do not address the effects of severance on women as a distinct demographic group, even though women may be more affected by personal safety and security issues related to secondary severance caused by poor mitigation measures. In low income countries and especially in rural areas, there is sufficient evidence to suggest that mobility constraints have a greater impact on these vulnerable groups *including* women (Kwamusi, 2002; Porter, 2002; Porter, 2008; Porter, 2011; Turner and Fouracre, 1995; Urasa, 1990).

Kang (2006) comments on land use barriers (such as highway/railway corridors and the placement of cemeteries) being used in South Africa to systematically segregate different ethnic and income groups. Furthermore, she claims that urban land and transport planning in South Africa has circumscribed women's accessibility and mobility in the built environment (Kang, 2006):

"The impacts on cities of the gendered economic process of globalization have intensified gender differentiated transport needs and the needs will not be met unless urban and transport planning becomes more gender conscious."

Although the apartheid racial and patriarchal segregation ended almost two decades ago, the current spatial organization of Johannesburg exhibits the legacy of apartheid as well as the spatial impacts of the economic processes of globalization.

What is common to both developed and developing countries, is that severance issues which have limited impact where quality public transport links exist become overwhelming barriers to mobility and accessibility where walking or cycling are the only options (Rajé, 2004).

According to the literature, there appears to be a paucity of evidence suggesting the existence of the textbook definition of community severance in developing countries, particularly in rural areas. However, it is likely that the barrier effect and subsequent community severance impacts do exist and do divide communities where they are intersected by roads, railways and rivers. In the same way that road safety issues in rural Africa are underresearched because of limited data and low technical capacity, it is likely that the issue of community severance is not considered to be serious enough to warrant research, as evidenced by the scant amount of literature devoted to the subject.

Clearly, the transport planning emphasis in rural areas is on basic access for poor people, which is absolutely vital and well documented. Nevertheless, severance does affect basic access, and particularly for people with disabilities, young people, the elderly and *women*. Porter has written extensively on the subject of access and mobility for vulnerable groups in rural Africa. She refers to the gender dimension of access to school, commenting on the Coastal and Forest Zones of Ghana where routes which involve a stream crossing tend to be particularly hazardous for children in the rains, especially for girls who are commonly much less likely to know how to swim (Porter et al, 2011). Avotri et al (1999) also observed that parents are reluctant to allow girls to walk long distances, cross rivers, walk on major roads or unsafe paths to get to school.

The Nkone river bridge in the Meru district of Kenya has provided vital links between Keria and Karia which are located 3km apart when crossing the river, with alternative routes to the tarmac road being 8 to 15km long. The Nkone bridge has been destroyed by heavy rain and replaced many times, and during the rainy season Karia is virtually inaccessible. A study of the community undertaken by the International Labour Organization Advisory Support, Information Services and Training (ILO-ASIST), the Kenya Network for Draught Animal Technology (KENDAT), and the Intermediate Technology Development Group (ITDG) found that parents used stepping stones across the river to pass their children over, in order for them to get to school, and that several adults had drowned since the bridge had been absent (Kaumbutho, 2002). There is apparently great potential for agricultural production in Karia, but access by road and across the river is so poor that the potential for economic growth is severely diminished as a result.

Porter et al (2013a) also allude to the mobility constraints of older people when accessing key facilities and services, with long walks to access a transport route or to services presenting a 'serious hurdle to less fit/disabled older people, especially where the route crosses difficult terrain, or in the rainy season.' Hettige (2006) undertook case studies on rural roads in Sri Lanka, Indonesia and the Philippines where research found that the poor inhabit a localised, walking world, and as such make little use of medium or long-distance transportation links. Incremental benefits to them are more likely to come from accessing non-motorised transport and from the ability to cross waterways to help in their daily routine tasks.

In rural South Africa, there is a lack of public transport provision for low income households, leading to an overreliance on walking to access all out-of-home activities. This affects participation in the paid employment and formal economy, especially among women, resulting in their low uptake of healthcare and education opportunities (Lucas, 2011).

Pedestrians, users of public transport and non-motorised road users are often victims of road traffic collisions, and the poor are disproportionately represented in this group of road users. Poor children are particularly vulnerable to traffic danger (Ghee et al, 1997). Not only is the street likely to be a play area for them, but they are unlikely to have received much road safety education. Those children who work as street vendors are particularly exposed due to the hazardous nature of their work e.g. darting between cars (Barter, 1999). In developing countries the child pedestrian crash problem is generally more serious than in developed countries; a problem typically exacerbated in areas which experience low school attendance figures (Downing and Sayer, 1982). Furthermore, Mfinanga (2014) reports that in rural areas the percentage of accidents resulting in fatalities of pedestrians and cyclists is larger than the percentage resulting in slight injuries.

In 2004, TRL undertook a study for DFID promoting road safety through community education programmes in Bangladesh, India, Ghana and South Africa. In Bangladesh, the 2001 National Road Traffic Accident Report indicates 73% of road accident casualties occur in rural environments. The village of Betila, with a population of 3,063 and located beside a national highway approximately 40km from Dhaka, was selected as a case study

because road accident casualties repeatedly occurred here, there were no pedestrian facilities, and accident statistics were available. There were found to be 125 accident casualties in Betila between 2001 and 2003, with 3 fatalities during the same period (TRL, 2004). The foremost cause of accidents, as identified by respondents in Betila, was related to the poor design of roads and bridges, lack of pedestrian facilities, and absence of regular road maintenance.

India is predominantly a rural country. Villages can be located along national and state highways as well as on other categories of roads. Many highways pass through villages where a host of activities tend to take place on either side of the highway, giving rise to hazardous situations and sometimes serious accidents. Nuvem village is situated on National Highway 17 near Margao in the State of Goa. The village has 1,600 households and a population of 8,500. National Highway 17 passes through Nuvem for a distance of 3.4km and is a highly accident prone stretch of road due to the density of population and heavy traffic volume passing through it. Although it is part of the national highway, of the road through Nuvem consists of a narrow two lane carriageway with few facilities for pedestrians or stopping buses. Between 2000 and 2002 the Traffic Police reported 143 accident casualties in Nuvem, of which 44% occurred among young people under 25 years old. Among the top ten causes of accidents, villagers reported pedestrians crossing where there were no formal crossing points on the road and inadequate shoulders along the carriageway to accommodate pedestrians, along with other factors relating to the road geometry and driver behaviour (TRL, 2004).

While in more densely populated communities, the African case studies undertaken as part of the community road safety education project (TRL, 2004) also demonstrate a lack of provision for pedestrians and vulnerable road users. Ashaiman is a municipality of Ghana that had a population of over 150,000 in 2000. At the time of the study, Ashaiman was a deprived and marginalised settlement. There were no pedestrian facilities. The roads did not have any walkways for pedestrians. Hawkers, cart pushers and other pedestrians were competing for space on the road. The survey found there to be concerns about school children getting knocked down while crossing the road to school. The children also mentioned careless driving by motorists and an absence of zebra crossings on the roads as some of the problems of road safety. There were also concerns about vehicles, bicycles and trolleys knocking down elderly people. Petty traders and street vendors have taken over the road shoulders that are reserved for pedestrians.

In 2003, 4,086 pedestrians were killed as a result of road crashes in South Africa, of which 65% (2,660) occurred in rural areas. Leroro is a community adjacent to the R532 highway, approximately 40km outside of Graskop, located in the province of Mpumulanga in South Africa. It was selected as a community road safety education case study, with an emphasis on the younger demographic (15 to 24 years) who make up more than 70% of road fatalities – a far higher proportion than compared to their urban counterparts (TRL, 2004). In Leroro, in addition to the typical engineering, education and enforcement issues, there were added problems associated with the highway being upgraded from a gravel to a sealed road, such that traffic passes through the community at much higher speeds, but pedestrians continue to walk in the middle of the road and 'jay walk' across it, despite there being two pedestrian crossings (Figure 4). In addition, there is a social problem of drinking and drug taking in the community, and the location of bottle stores beside the highway cause pedestrians to cross the road while drunk.

![](_page_17_Picture_4.jpeg)

Figure 4: Pedestrian Movements in Leroro, South Africa

Coverage of children's road safety issues is sparse in the literature on African transport (Porter, 2013b), but these case studies undertaken by TRL are supported by other empirical studies, for example of child accident victims in Ilesa, Nigeria where 89% were pedestrians, 60% of which were injured while hawking at the roadside or on an errand (Adesunkanmi et al, 2000). In rural areas of Ghana, Mock et al (1999) found that children have a particularly high exposure to accidents. In Brong Ahafo, 46% of injured pedestrians and 30% of injured cyclists were children under 15 years old.

While there is some evidence of the impact of a highway severing rural communities in Africa and Asia, the TRL case studies are a decade old and have little connection to the community severance impacts that have been reported in developed countries. However, more recently, TRL has undertaken a fieldwork exercise as part of a Rural Transport Services Training Course in Malawi (TRL, 2013) and conducted some checklist interviews in rural communities at the Madziabango Trading Centre (Figure 5), approximately 20km from Blantyre on the road to Chikhwawa. Here, the highway bisects two villages, Kapalaliza and Kantimbanya.

![](_page_18_Picture_2.jpeg)

Figure 5: Madziabango Trading Centre, Malawi

An interview with the son of the Chief of Kapalaliza Village revealed that although they utilise the facilities in Kantimbanya Village on the other side of the road, including the secondary school, they don't consider the village across the road to be part of their community. When asked to draw a map of the village, the respondent only drew his specific village, and omitted any local services related to the village on the other side of the road (as shown in Figure 6).

The focus group discussions and interviews were undertaken as part of a training exercise, so the TRL team did not have the opportunity to explore the severance issues in more detail. However, when teachers from the Madziabango primary school were interviewed, they did mention that during that term alone, three pupils had been knocked down on the main road, one of whom died and the other two sustained serious injuries. Clearly, there are some serious road safety issues related to the highway that severs these two communities, and evidently the road inhibits social interaction between the two villages, even though there are shared amenities on either side of the road, such as the secondary school (in Kantimbanya), the district hospital (in Kapalaliza) and ADMARC (Agricultural Development and Marketing

![](_page_18_Picture_6.jpeg)

ADMARC (Agricultural Development and Marketing Figure 6: Community Map of Kapalaliza Village Corporation) (in Kapalaliza).

This interesting example warrants further investigation, and may provide more evidence for the existence of the traffic barrier effect and community severance impacts (physical, social and psychological), especially on

vulnerable groups (children, women and the elderly) who are most likely to make trips across the road to schools, the hospital and for agricultural marketing.

It is very likely that this example is not an uncommon occurrence across Sub-Saharan Africa (and Asia), especially as arterial roads connecting key growth centres are being upgraded and maintained to a higher standard, thus bringing about traffic growth and an increase in traffic speed. Meanwhile, villages such as Kapalaliza and Kantimbanya in Malawi, and Leroro in South Africa have to adapt to these changes in the absence of mitigating transport planning measures. Even where unpaved roads transect communities, there are likely to be severance effects caused by dust emissions, which can cause respiratory health problems, with women, children and the elderly having a higher risk of exposure (Greening, 2011; Greening and O'Neill, 2010).

The next section outlines some recommendations for further work to explore the causes and impacts of community severance in Sub-Saharan Africa and provide an evidence base for this phenomenon occurring in developing countries.

## **3.** Recommendations for Further Work

The previous section summarised some empirical evidence that community severance exists in rural and urban settlements of developing countries in Africa and Asia, but there is little published work to validate these assertions. There is, however, enthusiasm among transport practitioners to investigate the characteristics of community severance more thoroughly.

There are numerous gaps in evidence in the African context, but some of the key research questions might include:

- What are the impacts of community severance for different social groups?
- In what ways does community severance affect accessibility to key services?
- Do community severance effects create a higher risk environment for road traffic crashes among pedestrians?
- Does the traffic barrier effect exacerbate exposure to traffic generated dust and pollution?
- How can community severance effects be mitigated through design (i.e. pedestrian crossings and footbridges) or through community road safety education?
- What are the effects of poor mitigation design on different social groups and why?
- Do the effects of community severance decay, remain the same or increase over time (after a transport scheme has been implemented)?
- How can transport planning practitioners engage with vulnerable groups, other road users and transport service providers to reduce community severance and its effects on economic growth and social development?

## 4. Proposed Case Study Methodology

The next recommended step is to undertake some empirical research to identify the extent to which community severance effects inhibit development, growth and poverty reduction in rural Sub-Saharan Africa. A scoping study would be advised before embarking on a comprehensive impact study, and might include:

 Identifying a selection of transport practitioners in three African countries representing the West, East and Southern regions to investigate existing planning and engineering processes in preventing severance impacts in new schemes and mitigating against existing severance effects. This may involve some telephone interviews with a range of practitioners.

Output: interview responses and overview of any existing government guidance on severance mitigation.

• Identifying a severance 'hotspot' through talking with transport planning practitioners, and arrange a visit to the affected community to undertake some key informant interviews and a short questionnaire survey to explore the various dimensions of severance experienced, and ways in which the community overcome these

effects through trip diversion and other measures. The study would also require an understanding of the traffic volumes experienced along the road at different times of the day and week (using a 12 hour, 7 day manual traffic count), and some data gathering on road safety statistics for the stretch of road passing through the settlement.

 We recommend using the villages of Kapalaliza and Kantimbanya in Malawi for this case study, where there is already evidence of severance taking place, as well as physical, psychological and social impacts. TRL has established a good relationship with the Centre for Social Research at the University of Malawi, with whom we could partner to undertake this fieldwork.

Output: quantitative and qualitative evidence of severance occurring and recommendations for community based solutions.

As a scoping study it would provide the baseline information to support a follow up study that would explore whether planning and engineering interventions can reduce the severance effects, or whether they exacerbate it (as has been the case in the UK). It could also include a community road safety component which is not restricted to formal school education, comprising all demographic groups and accounting for illiteracy and other learning constraints.

A follow up study could explore the difference in severance characteristics between a heavily trafficked paved road where access to social services across the road is impeded and road safety is a key issue, and a more lightly trafficked unpaved road where other severance effects such as traffic generated dust are significant. Another community could also be selected where the settlement is transected by a seasonal stream or river that creates a barrier to accessibility, for instance the Karia community in Kenya where the Nkone river bridge is located (Kaumbutho, 2002). For each survey site, a control site would be recommended to factor out any 'non-severance' impacts on the communities.

# 5. Concluding Remarks

This study would provide much needed evidence that community severance is occurring across rural Africa, and that it has a detrimental effect on rural access and mobility, particularly for women, young people and the elderly. Through identification of the precise severance effects, disaggregated by social group, it would aid the transport planning process, and help identify *appropriate* mitigation measures that would themselves reduce the physical and psychological barriers to access and not aggravate them. The study intends to work with transport practitioners in Africa to emphasise community severance as a planning issue; for the community case study proposed, it would work with the relevant government department and the local community to highlight the evidence of the severance impacts and address them with suitable and sustainable solutions.

An Overseas Road Note on Community Severance Appraisal would be the recommended output of any follow up project to ensure that the engineers, planners and designers responsible for upgrading existing roads or constructing new roads that traverse rural settlements are cognisant of potential severance impacts and will mitigate against them *appropriately*.

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