

University of Groningen

## Accessibility of Shared Space by Visually Challenged People

Melis-Dankers, Bart J.M.; Havik, Else M.; Steyvers, Frank J.J.M.; Petrie, Helen; Kooijman, Aart C.

*Published in:*

"Enabling Access for Persons with Visual Impairment" : Proceedings of the International Conference ICEAPVI Athens, Greece, February 12-14, 2015

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*

Publisher's PDF, also known as Version of record

*Publication date:*

2015

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Melis-Dankers, B. J. M., Havik, E. M., Steyvers, F. J. J. M., Petrie, H., & Kooijman, A. C. (2015). Accessibility of Shared Space by Visually Challenged People. In G. Kouroupetroglou (Ed.), "Enabling Access for Persons with Visual Impairment" : Proceedings of the International Conference ICEAPVI Athens, Greece, February 12-14, 2015 (pp. 120-128)

### Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

### Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

# Accessibility of Shared Space by Visually Challenged People

Bart J.M. Melis-Dankers<sup>1</sup>, Else M. Havik<sup>1</sup>, Frank J.J.M. Steyvers<sup>2</sup>,  
Helen Petrie<sup>3</sup> and Aart C. Kooijman<sup>1</sup>

<sup>1</sup>Royal Dutch Visio, Centre of Expertise for Blind and Visually Impaired People, Huizen, The Netherlands  
BartMelis@visio.org

<sup>2</sup>University of Groningen, Department of Psychology, Groningen, The Netherlands  
f.j.j.m.steyvers@rug.nl

<sup>3</sup>University of York, Department of Computer Science, York, United Kingdom  
Helen.Petrie@york.ac.uk

## ABSTRACT

Shared Space is a concept that comprises the design of a public space. There are concerns about the accessibility of Shared Spaces for people who are visually challenged. In this paper we give a systematic overview of the appearance of Shared Spaces in the Netherlands and the consequences that these spaces may have for the independent mobility of visually challenged persons. Environmental characteristics of ten typical Shared-Space locations in the Netherlands were registered. Possible problems that these characteristics could cause for visually challenged users of these spaces were judged by a group of experts in the field of orientation and mobility. In addition, compliance of the selected locations with existing guidelines for accessibility was assessed. None of the selected Shared-Space locations were free of potential problems for people with a visual impairment [1]. Based on these results we introduce a Shared-Space guide to assist authorities, designers and architects in developing accessible Shared Spaces.

*Keywords:* accessibility, navigation, orientation and mobility, public realm, shared space, visual impairment.

## 1. INTRODUCTION

Shared Space is a relatively new approach to the use and design of the public space. Essential to this approach are the democratic involvement of future users and an interdisciplinary working method [2]. The aim of Shared Space is to create high-quality public spaces that facilitate human interaction and social behaviour, without restricting or banishing motorized traffic [3].

With respect to the design of streets and traffic junctions, Shared Space aims at a natural integration of fast and slow traffic with other forms of human activity. By removing conventional structures like signs, traffic lights, and delineations between the various road users, a certain amount of deregulation is intentionally created (Figure 1). As a result, Shared Spaces gently force road users to behave cautiously and to reduce speed. Diverse

traffic flows mingle and traffic behaviour becomes humanized: road users have to negotiate their right of way and take all other road users into account, e.g. by making eye contact.



**Figure 1.** Example of Shared Space in the Netherlands. All traffic flows (e.g. cars, bicycles and pedestrians) mingle.

Shared Spaces are usually realized at dynamic urban places with mixed functions, like village centres. These areas differ greatly from traffic areas that are designed for rapid-transit movements (e.g. motorways) which require a totally different design and behaviour [3]. Hamilton-Baillie and Jones [4] argued that a maximum speed of 30 km/h is required for a Shared Space environment to facilitate the adaptive and interactive traffic behaviour that is necessary when sharing a street.

The Shared-Space concept has been developed in the Netherlands, but became popular during the past two decades and is implemented with increasing regularity throughout Europe and beyond. The interest of policy makers in the concept is growing rapidly because it offers good prospects for efficient traffic circulation, enrichment of the public realm [2], meeting the desires of the public, and the economic revitalization of town centres [5]. Although not the primary intention of Shared Space, increased road safety has also been mentioned as a

benefit. Available evidence of this, however, is limited [6].

Some aspects of Shared-Space areas, such as lower speeds, a reduced emphasis on motorized traffic, and increased recognition of the importance of attentiveness to other road users, can be beneficial to visually challenged persons. However, the fact that a Shared-Space environment is (intentionally) less predictable, with a less-structured traffic flow, may cause persons with a visual impairment to feel unsafe. Shared-Space design often results in open areas, which resemble a square more than a street. This can be very difficult to navigate for people who are visually impaired. In particular, the removal of conventional infrastructure like kerbs and crosswalks, which visually challenged persons and also guide dogs are trained to use, can lead to problems in orientation and navigation. Moreover, the expected (visually guided) social interaction is often unfeasible without sufficient sight. For these reasons, Shared Spaces may imply a serious disadvantage and may prove problematic, if not dangerous, for visually challenged persons. In the Netherlands, there are over 300,000 individuals with a visual impairment [7]. Currently comprising about 1.8 percent of the total population and increasing in number because of the aging population, this group of road users cannot be ignored.

With the growing utilization of Shared Space, various European communities representing individuals with visual impairment (e.g. [8], [9]) have expressed their concerns about the implementation of “Shared Surface Streets” [10]. To date, however, little objective and systematic research has been undertaken on the topic. Moreover, the involvement of a wide variety of areas, traffic situations, designers, and communities has led to such diversity in the implementation of the Shared-Space concept, that Dutch Shared Spaces may not be fully comparable to those in other countries. Also, the terminology used is not consistent throughout different countries. The aim of the present study [1] was to provide a systematic overview of the appearance of Shared Spaces in the Netherlands, and the possible consequences of Shared Space for visually challenged persons. The authors registered the environmental characteristics of ten typical Shared-Space locations in the Netherlands, and assessed the level of hindrance these characteristics can cause for visually impaired users. In addition, they determined compliance of the selected locations with existing Dutch guidelines for accessibility. Based on these results they developed an Open Access Shared-Space guide (accessible through [www.visio.org](http://www.visio.org)) with practical information concerning the design of Shared Spaces in relation to visually challenged people.

## 2. METHODS

The ten Shared-Space locations that were selected for this study were put forward by co-workers of the Shared Space Institute (incorporated in the Knowledge Centre

Shared Space, Noordelijke Hogeschool Leeuwarden, Leeuwarden, the Netherlands; [www.nhl.nl/sharedspace](http://www.nhl.nl/sharedspace)) as representing “typical Shared-Space locations”. The selection included only locations that were likely to be visited by visually impaired pedestrians and that represented an actual mixture of slow and fast traffic modalities.

Environmental characteristics were registered on-site. The inventory included some important general characteristics that describe the design of the public spaces under review (e.g. the presence of traffic lights and crossing points) as well as characteristics that are specifically relevant for visually impaired users (e.g. the presence of guidance paths and obstructing obstacles). Details on all locations and characteristics can be found in paper [1]. The characteristics that are specifically relevant for visually impaired users were formulated in conformity with the accessibility guidelines that were selected from the leading standard works for the general accessibility of outdoor spaces and buildings in the Netherlands [11, 12]. Three of the authors (Havik, Melis-Dankers, and Steyvers) judged independently and on-site whether the accessibility guidelines were met (on a 3-point scale). These judges were fully sighted persons who have years of experience in working with visually impaired people, specifically with regard to mobility and accessibility issues.

Next, all of the general and specific characteristics in the inventory were judged with regard to their accessibility to visually impaired persons. The review panel comprised an expert group of 11 specialists: seven orientation and mobility (O&M) specialists (including one blind and one partially sighted person), a guide dog instructor (Royal Dutch Guide Dog Foundation, [www.geleidehond.nl](http://www.geleidehond.nl)), a consultant from the Dutch network organization for partially sighted persons ([www.viziris.nl](http://www.viziris.nl)), and a consultant from the Dutch Deafblind Network ([www.Dooftblindennetwerk.nl](http://www.Dooftblindennetwerk.nl)). The members of this expert group were asked to imagine each characteristic in a general street or environment with a speed limit of 30 km/h (the instructions did deliberately not mention Shared Space), and to assign the characteristic a score on a scale of 1 to 5, where 1 indicated that the characteristic could theoretically cause no hindrance and 5 indicated insurmountable hindrance to the orientation and the independent mobility of visually challenged persons and their feeling of safety when walking in the environment.

The specialists were not informed about the observed frequency of the characteristics in Shared Space, nor were they aware that their judgments would be used to assess the accessibility of Shared Spaces. There were also three questions regarding the importance of indicating the entrance to/exit from a Shared-Space area. Because these three questions could not be judged without mentioning Shared Space, they were written on a separate page at the end of the questionnaire.

Since all observed characteristics had to be judged on the same scale, they were all formulated as possible

problems. This entailed presenting the review panel with negative formulations of characteristics derived from the accessibility guidelines. The observed frequency, therefore, indicates the number of locations that did not meet these guidelines.

### 3. RESULTS

Within the set of selected Shared-Space locations a diverse range of sites was represented [1]. Some comprised only a single crossing or roundabout, whereas others included the main street of a village. All locations were in the northern part of the Netherlands and were frequented by a diverse mix of slow and fast(er) traffic. Traffic intensity varied between locations from ca. 2,600 to ca. 24,000 motorized vehicles per 24 hours.

Common to all locations were the absence of traffic lights, kerbs, sufficient luminance contrasts marking the walking route, and separate areas for cars and cyclists. There was sufficient free passing space and there were sufficient unobstructed lines of sight at oncoming traffic. The presence of most other characteristics varied between locations and will be discussed per category. For details see [1].

#### 3.1 Street arrangement / walking route

Demarcations between different parts of the street were realized at eight out of the ten locations, using different colours of paving material. The brightness contrast between the carriageway and what could be considered pavement or a walking route was not sufficient at any of these locations: i.e. differences in reflectance factor were below the prescribed minimum of 0.3 [11]. Special zones were realized for pedestrians around a square or roundabout at two locations. These zones were marked with differently coloured paving or by an upstanding edge. At only three locations the walking route was completely free of obstacles, such as bicycle racks, shop displays, terraces, etc. Obstacles on walking routes were never marked with warning signs. Eight locations included areas where cyclists could be expected to ride in the same area that was used by pedestrians (e.g. Figure 2).

#### 3.2 Route guidance

At two locations there were tactile guidance paths, leading to a zebra crossing. Traditional guidance cues were sufficient at only one location. At six locations traditional guidance cues were usable only at some stretches within the location.



**Figure 2.** Sneek (Prins Hendrikkade). A dotted line indicates the position of a grey surface line between dark red bricks, forming the suggested, unofficial separation with the carriageway. The cyclist on the left is riding in a zone where pedestrians are also expected to walk.

#### 3.3 Crossings

Zebra crossings (without traffic lights) were present at four locations, while there were also four locations with alternative informal crossings marked by bollards or differently coloured paving material (e.g. Figure 3). At three locations there was no crossing indicated at all. The beginning and end of the zebra crossings and the informal crossings were not (sufficiently) marked in a visual way, and tactile warnings were present at only two locations.



**Figure 3.** Sneek (Prins Hendrikkade). In the front there is a crossing suggestion, marked by grey stones amongst dark red paving.

#### 3.4 Parking policy

Parking policy was either quite lax, i.e. permitting short-term parking or loading/unloading at places where parking is not formally allowed (thus no strict law enforcement, at four locations), or completely absent, i.e. parking was not prohibited and in principle possible anywhere.

### 3.5 Marking of the entrance to a Shared-Space area

The entrance to Shared-Space areas was always marked by the disappearance of kerbs and bicycle paths (if present), and in most cases also by a change in paving structure. This change usually involved a transition from black asphalt to brick paving, which was mostly red, complemented by grey or black lines or edges. In six cases a striped speed ramp marked the entrance, and in one case there was an (unofficial) traffic sign signaling the need to take other traffic participants into account. The panel of O&M experts considered a clear demarcation of the entrance to a Shared-Space area, perceivable by both fully sighted and visually impaired individuals, to be very important (median of 4, on a scale of 1 [not important at all] to 5 [crucial, of vital importance]).

### 3.6 Compatibility with accessibility guidelines

None of the locations met all of the selected accessibility guidelines. The guidelines for the unobstructed width and height of passageways and an unobstructed line of sight at approaching traffic were rarely violated. However, the guidelines for a clearly marked and obstacle-free walking route, sufficient route guidance, tactile warnings, and warnings for height differences were rarely entirely complied with.

### 3.7 Problems associated with Shared Space

Characteristics that were observed in at least 50 percent of the locations, and that were also assigned a median rating of 3 (considerable hindrance), 4 (severe hindrance), or 5 (insurmountable hindrance) were considered as accessibility problems that can be associated with Shared Space with regard to visually challenged persons. These characteristics were:

- Absence of kerbs or any other demarcation between stretches of road that can be perceived in a tactile way.
- The possibility of cyclists riding on the section used by pedestrians.
- A walking route that is not marked by a sufficient brightness contrast (difference in reflectance factor less than 0.30).
- Absence of tactile warnings (e.g. blister paving) in dangerous situations, e.g. crossings or stairs.
- Absence of usable traditional guidance cues or guidance paths.
- Absence of designated parking places and/or parking that is possible anywhere.

## 4. DISCUSSION

The first aim of the inventory presented in this study was to describe the “general appearance” of Shared Spaces in the Netherlands. Given the results, however, it is not possible to present a strict definition of the general

appearance of a Shared-Space location. Each application of the concept leads to a different streetscape. There are no universally applicable rules with regard to the design of a Shared Space. Designers are free to give their own touch to the concept depending on the specific local demands and situation.

Although more differences than resemblances were observed between the ten locations selected for this study, a number of common characteristics were perceived. These included the absence of traffic lights and kerbs, and the absence of separate areas for cars and cyclists. At all but two locations, separation between vehicles and pedestrians was either absent or only marked visually (i.e. not perceivable in a tactile manner). All locations had unobstructed lines of sight of oncoming traffic and sufficient free walking space.

The second aim of the inventory was to assess the consequences that a Shared-Space street layout can have for the accessibility for visually challenged persons. Assessment of compatibility with the accessibility guidelines showed that none of the locations met all of the selected accessibility guidelines relevant for visually impaired persons. Guidelines that were violated at nearly all locations included a clearly marked and obstacle-free walking route, sufficient route guidance, and tactile warnings. Moreover, the expert group judged the level of hindrance the registered characteristics could cause to the orientation and independent mobility of visually challenged persons and their feeling of safety when walking in the environment. Based on these judgments, and on the observed frequency of the characteristics, the authors were able to identify several accessibility problems for visually impaired persons that can result from the implementation of a Shared-Space design.

None of the locations were free of any such accessibility problems. The identified accessibility problems and the findings from the accessibility-guidelines compatibility check show that the accessibility for visually impaired people may indeed be seriously at risk in Shared Space. The most important accessibility issues that came forward from the results are grouped around some central themes and are discussed below

### 4.1 Kerb edges and demarcation

For visually challenged individuals, kerb edges are highly important cues for orientation. They use kerb edges to verify whether they are in a pedestrian area or in an area where motorized traffic and cyclists can be expected. Kerb edges also have significant value for orientation when crossing streets: they help the visually impaired individual to cross in a straight line and to know when the other side of the road is reached. They are also important for guide dogs: these animals are trained to walk on the kerb. In the absence of a kerb, guide dogs will lead their owners to the place with the least obstacles, which will usually be the carriageway. Because a dog owner cannot perceive that he has left a pavement area, the absence of



kerbs may result in the unwanted situation of the dog owner not being aware that he is walking on the carriageway. For these reasons, it is important that in the absence of traditional kerbs, alternative structures are put in place that can be detected by visually impaired persons, with either the foot or the long cane. Ideally, the alternative demarcation will also be detectable by guide dogs.

#### 4.2 Cyclists

Ideally, a Shared-Space area should prompt correct social behaviour among all street users, including cyclists, in such a way that they slow down, anticipate situations, and take other users into account. This enables pedestrians to feel safe in the entire area. In practice, however, this effect may not always be reached. Cyclists passing too closely can be experienced as very uncomfortable or even frightening. This yields not only for visually impaired persons but also for other pedestrians, because one can usually not hear the cyclist approaching. This can be exacerbated by the unexpectedness of a cyclist's behaviour, e.g. quickly veering around obstacles such as parked cars. The introduction of "safe zones", "safe spaces" or "comfort spaces" for pedestrians has been recommended to avoid this potential problem [13, 14]. These "safe spaces" are described as zones that are strictly reserved for pedestrians; although not delineated by a traditional kerb, they should be clearly detectable by visually impaired users. They still facilitate a sharing of the larger part of the street area by users who feel comfortable to do so.

#### 4.3 Usable guidance cues and guidance paths

Traditional guidance cues were often absent or difficult to use. For example, some of the locations had an irregular building line with many openings and side roads or with many obstacles placed next to it, which made the line unusable as a guidance cue. When there are detectable differences in a surface, they should be applied consistently in order to be used as a guidance cue. In the absence of usable traditional guidance cues, i.e. according to accessibility guidelines, guidance paths should be provided.

#### 4.4 Clearly detectable and marked places to cross

At most of the selected locations, crossings lacked tactile warnings and demarcation between the street and the pedestrian zone was insufficient. Detectable, tactile markings of places to cross are highly important for visually impaired persons, not only to denote the beginning and the end of a crossing, but also to guide them towards the crossing. Before a visually impaired individual can start to cross the street, he needs to have an idea about the configuration of the crossing, decide about an appropriate location to cross, recognize where the street to be crossed actually starts, and establish the

correct direction to cross. To facilitate these sub-activities, a detectable demarcation between the pedestrian area and the street in a traditional or alternative way is required. Moreover, guidance towards the crossing should be provided. Tactile warnings are not only relevant at crossings; it is also important that height differences and stairs are clearly marked.

#### 4.5 Parking

When drivers are free to park their car anywhere unpredictable and chaotic situations can arise (Figure 4). While parked cars as such are not a problem for visually impaired persons, predictability and structure are very important for them to maintain orientation. Therefore a clear parking policy with either carefully designated parking places or a no-parking zone should be part of the Shared-Space design [15, 16].



**Figure 4.** Haren (Rijksstraatweg). Three parked cars, indicated by white arrows, lead to a chaotic situation.

#### 4.6 Entrance of a Shared-Space area

Even though visually challenged persons do not have to behave differently themselves in a Shared-Space area, it can be helpful to know that they are no longer walking on a traditional kerb and that other people will (supposedly) pay more attention to them. Therefore the entrance and exit of a Shared-Space area should be clearly detectable.

While the main focus of this study was on problems that Shared Space can impose upon the accessibility for visually challenged persons, some positive consequences of the implementation of Shared Space for this specific group of road users were also found. These include low speed limits, spaciousness, and good lines of sight that accommodate a good overview of the situation. This latter point implies that visually impaired pedestrians are visible for other road users. Moreover, a good line of sight can also be helpful for those individuals who have some remaining vision. This overview can, however, be disturbed by parked cars, as discussed above.

Importantly, it is not said that the problems identified by this study cannot be found at conventionally designed

locations as well. Furthermore, there certainly are conventionally designed areas that do not meet all accessibility guidelines. However, an important accessibility problem that was present at all Shared-Space locations in this study and that is most likely to be less frequently found at conventional locations, is the absence of kerb edges and a clearly recognizable demarcation between road parts.

In the UK, this phenomenon of a street surface without any demarcation between the footway and the carriageway, where pedestrians and vehicles share the same surface, is referred to by the term “shared surface” or “level surface” [14, 15]. It is also a feature of many Shared-Space schemes in the UK and a major concern of the Guide Dogs for the Blind Association [17, 18].

Even though the findings of this study are limited to the selected locations, the identified and discussed accessibility issues warrant serious consideration when developing and designing Shared-Space areas at any other place. It has to be noted that the accessibility problems were identified by experts in the field of visual impairment and mobility, most of whom were fully sighted. Whether these problems are experienced as a real difficulty in practice by people who are visually impaired depends on the specific situation as well as on the abilities of the visually impaired individual. Controlled research in real-life situations is needed in order to obtain greater insight into these issues and to discover what can be done to overcome the identified potential problems.

In order to assist policy makers, designers and architects in developing accessible Shared-Space areas we developed a Shared-Space Guide. This guide is available for free by stakeholders (E-mail: [VisioZichtOpToegankelijkheid@visio.org](mailto:VisioZichtOpToegankelijkheid@visio.org)) and is also freely accessible through the internet ([www.visio.org](http://www.visio.org) or <http://www.eccolo.nl/shared-space>) in both English and Dutch. It provides practical information with respect to designing Shared Space areas which are also accessible by people with a visual impairment. Furthermore it contains a checklist of important issues during the design process.

## 5. CONCLUSIONS

The diversity of the observed environmental characteristics of Shared Spaces in this study does not allow for a definition of the general appearance of a Shared-Space location in the Netherlands. Importantly, none of the selected Shared-Space locations were free of accessibility problems for visually challenged persons and their accessibility thus indeed be at risk in Shared Space. The study resulted in a list of the most important problems related to accessibility for visually impaired persons that can be encountered in Shared-Space areas. To further assess the experiential value of the identified accessibility problems, more research with visually challenged individuals in real-life situations is needed. By offering free access to a Shared-Space guide we hope to

assist stakeholders to develop Shared Spaces that are independently accessible by visually challenged people.

## Acknowledgments

This project was financed by The Netherlands Organization for Health Research and Development (ZonMW-InZicht: project number: 94307003). We like to thank the co-workers of the Knowledge Centre Shared Space, Noordelijke Hogeschool Leeuwarden, Leeuwarden, the Netherlands for their co-operation ([www.nhl.nl/sharedspace](http://www.nhl.nl/sharedspace)).

## REFERENCES

- [1] E.M. Havik, B.J.M. Melis-Dankers, F.J.J.M. Steyvers and A.C. Kooijman, “Accessibility of Shared Space for visually impaired persons: An inventory in the Netherlands.” *BJVI*, vol. 30, no. 3, pp. 132-148, 2012.
- [2] B. Hamilton-Baillie, “Towards Shared Space”. *Urban Design*, vol 13, 130–138.
- [3] Keuning Institute & Senza Communicatie. *Shared Space: Room for everyone: A new vision for public spaces* (A publication in the framework of the Interreg IIIB project “Shared Space”). PlantijnCasparie, Groningen The Netherlands, 2005.
- [4] B. Hamilton-Baillie and P. Jones, “Improving traffic behaviour and safety through urban design”. *Civil Engineering*, vol 158, 39-47, 2005.
- [5] R. Imrie and M. Kumar, *Shared Space and sight loss: Policies and practices in English local authorities*. Thomas Pocklington Trust, London, UK, 2011.
- [6] S.Reid, N. Kocak and L. Hunt, *DfT Shared Space Project, Stage 1: Appraisal of Shared Space*. Department for Transport, London, UK, 2009. Retrieved from <http://assets.dft.gov.uk/publications/sharedspace-appraisal/dft-shared-space-project-stage-1.pdf>
- [7] H. Limburg, *Epidemiologie van Visuele Beperkingen en een Demografische Verkenning* [Epidemiology of Visual Impairment in The Netherlands]. The Netherlands Organization for Health Research and Development (ZonMW/Inzicht), The Hague, the Netherlands, 2007. Retrieved from: [http://www.vision2020.nl/contents/InZicht\\_rapport.pdf](http://www.vision2020.nl/contents/InZicht_rapport.pdf)
- [8] The Royal Dutch Guide Dog Foundation, Shared Space, Samen Delen? [Shared Space, Sharing Together?] *Ten Geleide*, vol. 96, 4–5, 2009.
- [9] Joint Technical Committee on Environment and Transport (2008). *Minimum requirements for designing mixed traffic spaces based on the “Shared*

*Space” concept. GFUV, Berlin, Germany, 2008.*  
Retrieved from  
[http://www.dbsv.org/fileadmin/dbsvupload/Worddateien/GFUV/Shared\\_space\\_requirement\\_paper.pdf](http://www.dbsv.org/fileadmin/dbsvupload/Worddateien/GFUV/Shared_space_requirement_paper.pdf).

- [10] The Guide Dogs for the Blind Association. *Guide dogs take legal action against the Royal Borough of Kensington and Chelsea Council*, 2009. Retrieved from  
<http://www.guidedogs.org.uk/news/2009/guide-dogstake-legal-action-against-the-royal-borough-of-kensington-and-chelsea-council/>
- [11] M. Wijk M., *Handboek voor Toegankelijkheid. Over de Ergonomie van Buitenruimten, Gebouwen en Woningen* [Accessibility Manual. On the Ergonomics of Outside Spaces, Buildings and Residences]. Reed Business, Doetinchem, the Netherlands, 2008.
- [12] CROW (Technology platform for transport, infrastructure and public space), *Richtlijn integrale toegankelijkheid openbare ruimte* [Guidance Inclusive Accessibility Public Space]. CROW, Ede, the Netherlands, 2002.
- [13] Ramboll Nyvig, *Shared Space > Safe Space: Meeting the requirements of blind and partially sighted people* (Research report). The Guide Dogs for the Blind Association, Reading, UK, 2007.
- [14] Department for Transport, *Manual for Streets*. Thomas Telford Publishing, London, UK, 2007.
- [15] Department for Transport, *Local Transport Note 1/11. Shared Space*. TSO, London, UK, 2011. Retrieved from  
<http://www.dft.gov.uk/publications/ltn-01-11>.
- [16] Gesamtverband der Deutschen Versicherungswirtschaft e.V.. *Gemeinschaftsstraßen – Attraktiv und sicher*. GDV e.V., Berlin, Germany, 2011.
- [17] The Guide Dogs for the Blind Association, *Shared surface streets perceived as “no go” areas by blind and partially sighted people says new National Survey, 2010..* Retrieved from  
<http://www.guidedogs.org.uk/news/2010/shared-surface-streets-perceived-as-no-go-areas-by-blind-and-partially-sighted-people-saysnew-national-survey/>
- [18] TNS-BMRB, *The impact of shared surface streets and shared use pedestrian/cycle paths on the mobility and independence of blind and partially sighted people* (Report JN:197369), 2010. Retrieved from [www.guidedogs.org.uk/sharedstreets](http://www.guidedogs.org.uk/sharedstreets)