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WALKING AND CYCLING IN THE UPPER CALDER VALLEY

An analysis of active travel accessibility and measures to improve it

by

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This Dissertation is submitted by the Candidate

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Executive Summary

Since the publication of the UK Social Exclusion Unit's Report, one of the UK Government´s ambitions has been to improve walking and cycling access to new opportunities and ensuring that everyone in society can get to work, school, healthcare, and affordable healthy food (Unit, S.E., 2003, p.v).

In urban areas this policy goal is easier to achieve as, provided they are sufficiently dense and mixed-use, everything is closer. In contrast, in rural communities people have to travel longer distances to reach services or activities, making these areas more dependent on motorised transport (Department for Transport, 2006, p.25).

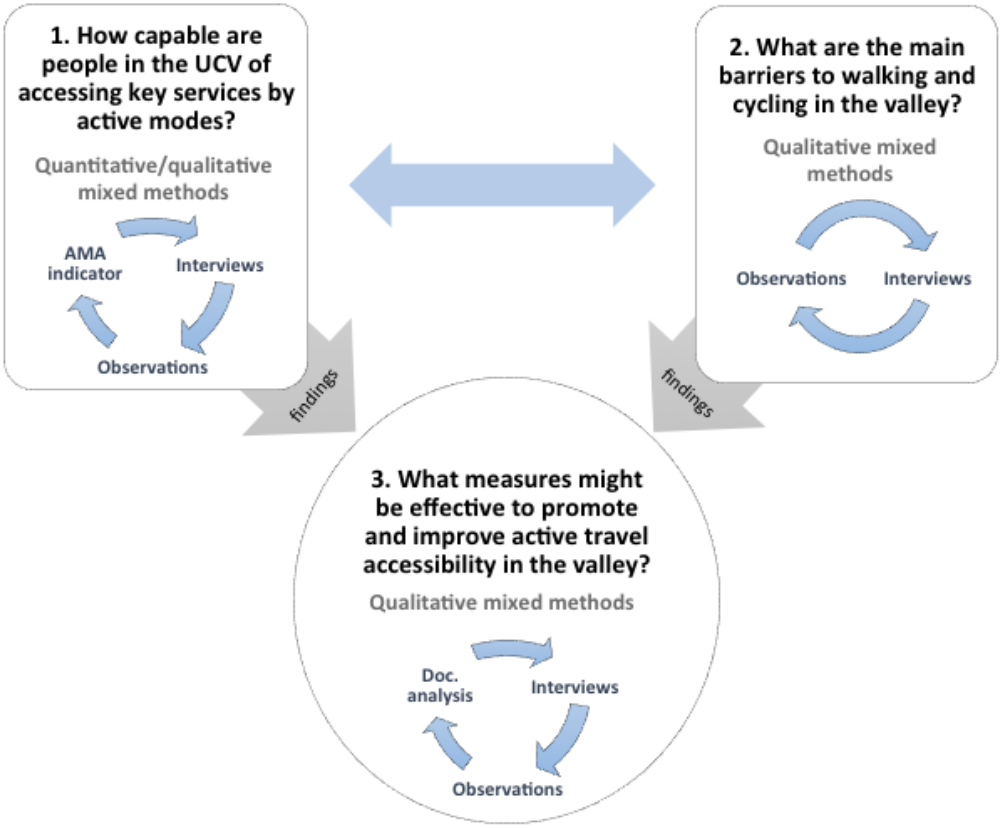
This study examines accessibility by walking and cycling (also referred to as active travel accessibility) in the Upper Calder Valley (Calderdale); a rural area in the Pennines that, in addition to the usual accessibility issues of rural communities, has a particularly steep topography that presumably further hinders people's access to basic services by walking or cycling.

Specifically the aims of the study are: (1) to analyse active travel accessibility in the Upper Calder Valley (to find out whether the assertion above is actually true) and (2) to research policy measures to improve it. To achieve these aims, the following research questions are answered:

1. How capable are people in the Upper Calder Valley of accessing key services by active modes?
2. What are the main barriers to walking and cycling in the valley?
3. What measures might be effective to promote and improve active travel accessibility in the valley?

The study combines a mixture of quantitative and qualitative methods. Firstly, an innovative indicator (the AMA indicator) was employed and its results were triangulated with observations and interviews to estimate the capability of the Upper Calder Valley population to reach key services by active modes, and then compare this with the results of the entire

Calderdale district. Secondly, observations and interviews were combined to identify the main barriers to walking and cycling in the valley. Finally, documentary analysis, observations and interviews were used in coordination to propose how to improve active travel accessibility and consequently, sustainability and social inclusion in the valley.



The main findings of the study are shown as follows:

1. How capable are people in the Upper Calder Valley of accessing key services by active modes?

According to the AMA indicator the capability of accessing key services in the Upper Calder Valley by active modes is two and a half times lower than that of Calderdale overall. This is due to a combination of a greater distance to key services (more than twice the average in Calderdale) and a reduced average daily distance that people are able to travel by active modes (mainly due to its steep topography). However, this capability should be slightly higher particularly for those who live in the valley bottom, as the flat infrastructure in that part of the valley makes it easier for them to reach key services.

Certain differences in capability levels have been detected in urban areas. Sowerby, followed by Luddenden Foot and Mytholmroyd, are the settlements with the highest levels, while Hebden Bridge and Todmorden are the ones with the lowest. This finding could help to determine and prioritise area-based accessibility policies.

A map created upon the proposal of the interviewees has demonstrated that over 50% of the population can reach railway stations by active modes. This shows great potential for promoting intermodality to increase capability in the valley.

2. What are the main barriers to walking and cycling in the valley?

The interviewees have identified eight main barriers to walking and cycling in the valley. The first is a fear of motorised traffic caused mainly by the lack of traffic-free route choices and the lack of priority for active modes in urban areas. The second one is hilliness, not such an issue for people living in the valley bottom, but decisive for those living in the valley sides and top-moor areas. The third barrier is the lack of facilities to carry out intermodal trips. This barrier is closely linked to the fourth: greater distances to work. Other constraints that were discussed less but are also important: the seasonal factor, a certain cultural or attitudinal barrier, a lack of facilities for cycling in the workplace and schools, and lack of political will.

3. What measures might be effective to promote and improve active travel accessibility in the valley?

The interviewees consider that the City Connect Scheme and the Calderdale Cycling Strategy, two initiatives currently being implemented by the administrations in Calderdale, could be very effective to promote cycling in the valley. However, they must be properly implemented. A lack of initiatives for pedestrians has been detected, despite walking being the main active mode in the area. In addition to these two initiatives, the respondents proposed what they considered to be the six most effective measures to promote and improve active travel accessibility in the valley. The first is the provision of safe active travel infrastructure. The improvements in the Rochdale Canal (included in the City Connect Scheme), but also in roads and urban zones, are seen to be essential in this sense. The promotion of intermodal travel is the second measure suggested given its potential, as mentioned earlier. The third is health-focused awareness campaigns – the most convincing

argument to achieve the modal shift according to the respondents. Other measures mentioned are wider availability of e-bikes/folding bikes, parking measures to discourage car use, and the provision of facilities and incentives to commute by active modes.

These findings are expected to foster a greater understanding of active travel accessibility among policymakers of the Upper Calder Valley to help them in future decision-making. With these results, Upper Calder Valley policymakers obtain a measure of the population's capability to access key services by active modes, as well as an analysis of the main barriers to walking and cycling, raising awareness of the scale of the problem. Finally, the findings on effective policies to improve active travel accessibility can help them to implement possible solutions.

This potential for policy impact can be transferred to other areas of England. The method would be particularly efficient for areas like the Upper Calder Valley, where specific factors can limit people's capacity to walk or cycle. Triangulating the indicator with local knowledge is always advisable to avoid simplifying assumptions and to obtain a more reliable result. The combination of qualitative methods to analyse barriers and improvement policies is also perfectly transferable.

1. INTRODUCTION

1.1 PURPOSE OF RESEARCH

Since the publication of the UK Social Exclusion Unit's Report, one of the UK Government´s ambitions has been to improve walking and cycling access to new opportunities and ensuring that everyone in society can get to work, school, healthcare, and affordable healthy food (Unit, S.E., 2003, p.v).

In urban areas this policy goal is easier to achieve as, provided they are sufficiently dense and mixed-use, everything is closer. In contrast, in rural communities people have to travel longer distances to reach services or activities, making these areas more dependent on motorised transport (Department for Transport, 2006, p.25).

This study examines accessibility by walking and cycling (also referred to as active travel accessibility) in the Upper Calder Valley (Calderdale); a rural area in the Pennines that, in addition to the usual accessibility issues of rural communities, has a particularly steep topography that presumably further hinders people's access to basic services by walking or cycling.

Combining quantitative and qualitative methods, the study analyses whether such an assertion is actually true, employing an innovative indicator (the AMA indicator) to quantify how capable people in the Upper Calder Valley are of reaching key services by active modes; it then explores what other underlying barriers could affect walking and cycling in the Upper Calder Valley; and finally, looks for solutions to improve active travel accessibility and consequently, sustainability and social inclusion in the valley.

1.2 AIMS AND RESEARCH QUESTIONS

The overall aims of the study are (1) to analyse active travel accessibility in the Upper Calder Valley and (2) research policy measures to improve it.

To achieve these aims, the following research questions are answered:

- How capable are people in the Upper Calder Valley of accessing key services by active modes?
- What are the main barriers to walking and cycling in the valley?
- What measures might be effective to promote and improve active travel accessibility in the valley?

1.3 RESEARCH SCOPE

Two considerations should be taken into account when demarcating the scope of this research:

- The research focuses on active modes of transportation, which means walking and cycling. However, being aware that accessibility planning needs to consider the entire journey chain from origin to destination (Department for Transport, 2006, p.7), intermodality with public transport has been considered to a certain extent.
- The research is based on accessibility to key services, that is to say, journeys carried out on a daily basis to multiple destinations which have in common their basic need for the population. This excludes walking and cycling for leisure purposes.

1.4 STRUCTURE OF THE REPORT

The report is structured as follows. The next section introduces the main literature used to back up the research. A description of the study area follows. The fourth section explains the methods used, how they have been combined, and the ethical issues considered. Section five then shows the results and findings of each of the research questions. The conclusions section brings all the findings together, mention the contributions of the work, the potential for policy impact, the problems and limitations, and finally proposes further work to be undertaken.

2. LITERATURE REVIEW

2.1 MOBILITY VERSUS ACCESSIBILITY

The differentiation between the concepts of mobility and accessibility has important implications for transport planning (Handy, S. 2005, p.131). Mobility has been defined as the potential for movement, the ability to travel, to get from one place to another, an ability to move around (Hansen, W.G. 1959, p.73; Handy, S. 1994, p.6). In contrast, accessibility can be defined as "an ability to get what one needs, if necessary by getting to the places where those needs can be meet" (Handy, S. 2005, p.132). Other definitions of accessibility are "the ease of reaching goods, services, activities and destinations, which together are called opportunities" (Litman, T. 2015, p.6) or "ease with which an individual can access desired services and facilities" (Philips, I. 2016, p.3).

The traditional and conventional approach of transport planning has been planning for mobility, in other words, to make it easier to get around. Planning for mobility focuses on the means without direct concern for the ends and answers the question: "can people move around with relative ease?" (Handy, S. 2005, p. 133). This approach generally analyses transport system performance focusing on motor vehicle travel conditions and using indicators such as roadway level-of-service, traffic speeds and vehicle operating costs (Litman, T. 2015, p.3), which tends to favour mobility over accessibility and automobile transport over other modes of transport.

However, a new planning approach with the aim of planning for accessibility has been gaining ground over the past few decades. This new approach understands that planning should be: making it easier to get where you want to go, instead of making it easier to get around. Planning for accessibility focuses on the traveller rather than on the system, and answers the question "do people have access to the activities that they need or want to participate in?" (Handy, S. 2005, p.134). As Litman, T. argues (2015, p.3) "since accessibility is the ultimate goal of most transportation activity, transport planning should be based on accessibility" but not on mobility. The new approach analyses the system in a more comprehensive way (Litman, T. 2015, p.5), encouraging the reduction of travel distances and the use of sustainable modes of transport.

2.2 ACCESSIBILITY PLANNING: A NEW APPROACH

In the UK, the introduction of this new approach of transport planning was strongly linked to other concepts such as social inclusion and social justice (Farrington, J. and Farrington, C. 2005, p.1), growing interest amongst UK academics and policy makers in the late 1990s and early 2000s (Lucas, K. 2012, p.105). The UK Social Exclusion Unit's Report published in 2003 had an immense influence on this subject and resulted in the acceptance of accessibility as a policy goal by the UK Government (Farrington, J.H., 2007 p.320; Farrington, J. 2004, p.1; Lucas, K. 2012 p.105). After that, transport policy guidance was published such as the Accessibility Planning Guidance and its advice was applied in the English Local Transport Plans set up.

The term "accessibility planning" is defined in the Accessibility Planning Guidance as the planning that "focuses on promoting social inclusion by tackling the accessibility problems experienced by those in disadvantaged groups and areas. These might include the availability, affordability and accessibility of local public transport, the design, location and delivery of non-transport services, and the ability of the community to reach those services by foot or cycle" (Department for Transport, 2006, p.7). According to this guidance accessibility should not stop at improving access to jobs, but should also consider essential public services. In addition, accessibility should not simply concern geographical barriers, but should also cover cost, personal safety and security, and other deterrents (Department for Transport, 2006, p.7).

Since then and up until now, accessibility has been consolidated as a target in transport policies from the UK and many other countries, and new theoretical perspectives or methodological approaches have been increasingly developed (Lucas, K. 2012, p.105).

2.3 METHODS OF MEASURING ACCESSIBILITY

There are three main types of quantitative methods of measuring accessibility: simple distance measures, cumulative opportunity measures and gravity measures (Amer, S. [no date]; Philips, 2016, p.7). Simple distance measures "operationalize accessibility as the straight-line distance between two locations in geographic space" (Amer, S. [no date]) (e.g.

distance from a given site to the nearest bus stop or rail station). Cumulative opportunity measures "count the number of opportunities - or number of potential customers -that can be reached within a given travel time or distance threshold. Accessibility increases if more opportunities can be reached within a given travel time or distance" (Amer, S. [no date]). (e.g. proportion of elderly within a 10 minute walk of the nearest GP). Finally, gravity measures stipulate that "the accessibility of a particular location is a function of its relative proximity to all alternative destinations in a given spatial system. Generally speaking, the more accessible a location is, the higher the potential of spatial interaction with surrounding locations becomes" (Amer, S. [no date]). The method used in this research to measure active modes accessibility (the AMA indicator) could hardly be classified in any of these types, since it is a more complicated and complex measure based on an individual-based model, which estimates the physical capacity of the population to make journeys by walking and cycling (Philips, I., et al, 2014) (see section 5.1).

2.4 BARRIERS TO ACCESS BY ACTIVE MODES

Four key articles about barriers to walking and cycling are used to achieve the first objective of this study, which is to analyse the accessibility to key services by active modes. Firstly, the Understanding Walking and Cycling Report (Pooley, C. et al, 2011) that examines the factors influencing everyday travel decisions. Key findings of this research are that "people who would like to engage in more active travel fail to do so due to a combination of factors: (1) concerns about the physical environment, particularly safety while walking or cycling, (2) the difficulty of fitting active travel into complex household routines, and (3) the perception that walking and cycling are not normal activities to do" (Pooley, C. et al, 2011, p.1). Secondly, the Pikora, T. et al (2003) paper on identifying the environmental determinants of walking and cycling, which states that there is an important differentiation between factors that influence recreational and transport behaviours as well as between modes, walking or cycling (Pikora, T. et al, 2003, p.1701). Finally, two articles, one by Rodriguez, D.A. and Joo, J. (2004) and the other by Saelens B.E. et al (2003), which examine the relationship between non-motorized mode choice and local physical environment. The former argue that "local topography and sidewalk availability are significantly associated with the attractiveness of non-motorised modes" (Rodriguez, D.A and Joo, J. 2004, p.151); the latter suggest that

"higher density, greater connectivity, and more land use mix are important determiners" (Saelens, B.E. et al, 2003, p.80).

Other relevant works on active travel barriers tend to centre on one specific mode of transport: walking or cycling; the sector of population; or to a specific type of trip or activity. Literature on barriers for pedestrians focuses mainly on journeys to school, such as Salmon, J. et al, 2007, Ahlport, K.N. et al, 2008, Martin, S. 2004, and Napier, M.A. et al, 2011; and elderly people such as Lockett, D. et al, 2005 and Marquet, O. et al, 2015. These are two of the main problems currently faced by transport planning: the dramatic drop of active modes to go to school, and the aging population and the challenges it presents for the future of transport in cities. On the other hand, literature on barriers to cycling is mainly focused on the journey to work. Heinen E. et al (2001) identifies the determinants for commuting by bicycle. Some of her key findings are that "bad and uncertain weather negatively affects a person's decision to cycle", as well as car ownership, (and) "that travel time and safety seem to be more important for cycling than for other modes of transport" (Heinen, E. et al, 2010, p.76).

2.5 POLICIES TO PROMOTE AND IMPROVE ACCESSIBILITY BY ACTIVE MODES

The literature used to attain the second objective of this research: to investigate policies to promote and improve accessibility by active modes, can be divided into two categories: the first focuses on policies to promote active travel and the second on measures to improve accessibility, although these are often intertwined. In terms of promotion, the Understanding Walking and Cycling report (Pooley, C. et al, 2011) is also one of the main references. This report suggests that "policies to increase levels of walking and cycling should focus not only on improving infrastructure (for instance through fully segregated cycle routes), but it must also tackle broader social, economic, cultural and legal factors that currently inhibit walking and cycling (Pooley, C. et al, 2011, p.1). A similar conclusion was reached by Pucher, J. and Buehler (2008 R. p.495), and Jones, T. (2012, p.148), who refer to cycling saying that "cycle routes alone appear to be insufficient in encouraging a shift from car travel to cycling for everyday practical journeys". Moreover, other authors suggest that not only "carrot" policies (measures to improve the attractiveness and use of active modes), but also "stick" policies (measures to make competing modes more difficult and expensive

to use) should be used (Rietvelt, P. and Daniel, V., 2004, p.545). Although “incentives for walking and cycling can work alone to some extent, combining them with policy sticks for car use has the potential to amplify the beneficial impacts of policy carrots” (Buehler, R. and Pucher, J. 2011 p.63). Policies such as introducing taxes and restrictions on car ownership, use and parking, have been key in countries such as the Netherlands, Denmark and Germany for the success of cycling (and walking) (Pucher, J. and Buehler, R. 2008, p.495).

As for policies to improve accessibility by active modes, the same authors argue that land-use policies to foster compact, mixed-use developments are crucial in order to reduce travel distances (Pucher, J. and Buehler, R., 2008, p.495). Other important measures to increase active travel accessibility is to boost the possibility of multi-stage trips or multimodality as Buehler, R. and Hamre, A. call it (2015, p.1081). Multimodality increases the ability to travel longer distances, allowing people to reach destinations that would not be possible by walking or cycling alone. Finally, another important measure to increase capability, particularly in areas with steep slopes, is the promotion of electrical bicycles. Gojanovic, B. et al (2011, p.2207) indicate that electrical bicycles can be used to promote physical activity in a sedentary population and can help to tackle “topographical and logistical” barriers to commute cycling. Cairns, S. (2017, p.327) argues that “when e-bikes are made available, they get used; that a proportion of e-bike trips typically substitutes car use; and that many people who take part in trials become interested in future e-bike use, or cycling more generally”.

2.6 CONCLUSION

From the moment it is understood that transport planning must be based primarily on accessibility and not mobility, the shift towards a more sustainable transport system with greater social inclusion will become closer. The new planning approach favours accessibility over mobility and sustainable modes of transport over the automobile; and fortunately this new approach is progressively surpassing the conventional one and being internalised by the governments of many countries on all scales: national, regional and local.

Simultaneously, research focused on new methods of measuring accessibility, analysing barriers, and investigating policy measures to improve accessibility and social inclusion have

been developed. However, it is considered that more research on walking and on a wider range of activities is needed. There are proportionally more articles about cycling than walking. Although it is true that bicycles are a mode of transport with greater potential to replace car trips as they can cover longer distances, walking will always be easier and more attainable for most people. Moreover, a lack of literature on accessibility has also been detected for a wide range of destinations given that most of the articles found focused on journeys to work (or school).

Overall, in spite of a certain lack of literature on walking and a wider range of destinations, considerable advances have been made in accessibility research over the past few decades and it is increasingly moving forward. This study aims to be a small contribution towards this.

3. STUDY AREA

The Upper Calder Valley (which will be referred to as " UCV " in this report) is defined for the purposes of this study as the western part of the Metropolitan Borough of Calderdale (West Yorkshire) covering the towns of Todmorden, Hebden Bridge, Mytholmroyd and Luddenden Foot, as well as smaller settlements such as Cornholme, Cragg Vale, Eastwood, Erringden, Heptonstall, Midgley, Portsmouth, Riponden, Sowerby, Soyland, Triangle, Wadsworth and Walsden[1].

With a population of 45,561 people (2011 Census) and occupying an area of 248.4 km^2, its population density is 183.4 people per km^2, which is relatively low compared with the England average (420 people per km^2).

Table 1 Headline statistics of the study area

Region	Yorkshire and the Humber
Metropolitan county	West Yorkshire
Metropolitan borough	Calderdale
Administrative centre	Halifax
Area	248.4 km^2
Population 2011 Census	45,561
Density	183.4/km^2

Source: Office for national statistics and Calderdale Council, 2017.

The topography of the area is particularly steep with heights ranging from 5 to 400 meters. The height at the valley bottom and sides is from 5 to 200 m, where the vast majority of the urban areas and small settlements are situated (Jennings, B. 1992, p. 6), from 200 to 300m in the moor edges, and from 300 to 400m in the moor top (see Figure 1).

[1] The Upper Calder Valley is not an official administrative area. The source of the boundary used is https://www.calderdale.gov.uk/v2/residents/schools-and-children/parental-support/early-intervention-support. See problems and limitations in section 6.4.

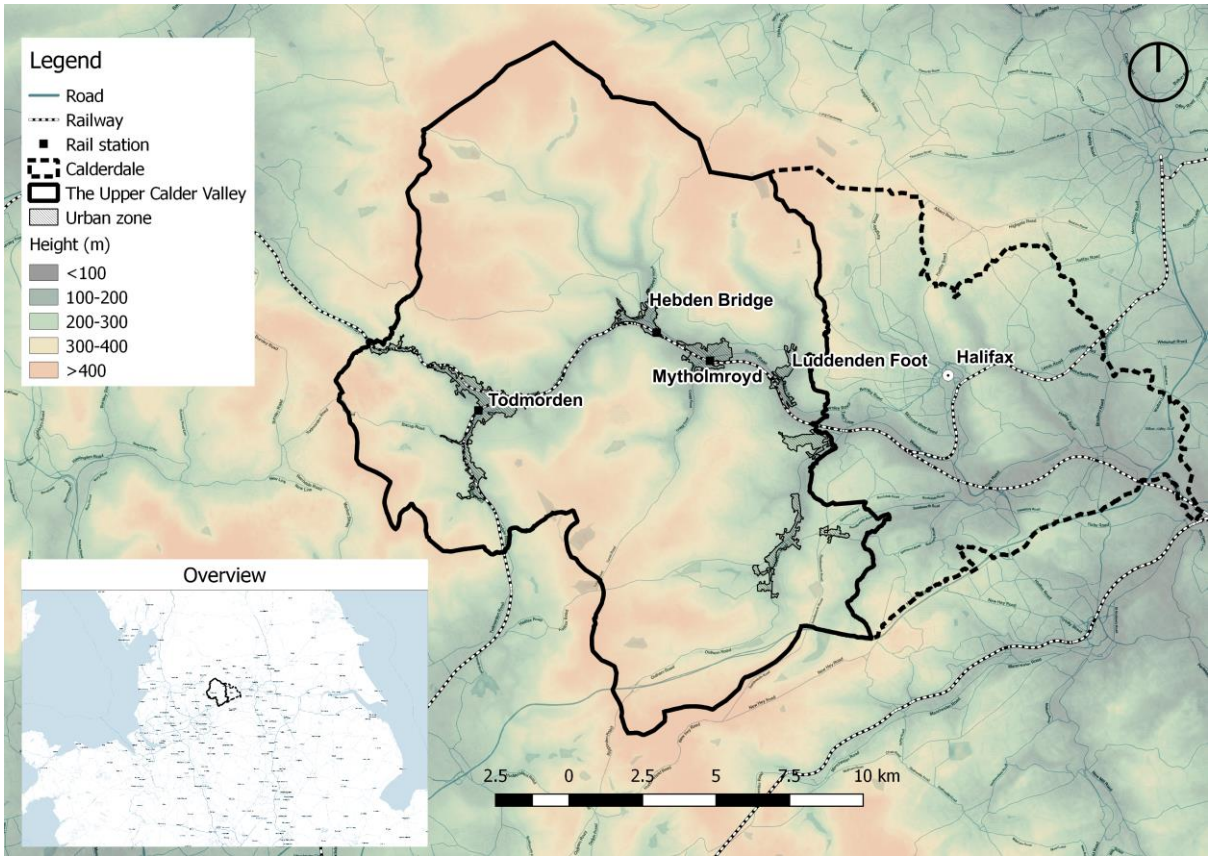


Figure 1 Overview of the study area
Source: Prepared by the author based on the ASTER Global Digital Elevation Map

The proportion of the population commuting out of the valley to work is remarkable. The proximity and good connectivity (by train and road) with the cities of Manchester and Leeds helps in this sense (Thompson, J & Partners, 2003, p.9). 34.9% of the working population travel more than 10km every day to the workplace (census 2011), which is six per cent above average in England (29.0%). Distances to other services are also higher than in other areas of the region as is described in later sections (see section 5.1.2.1).

Although the valley has traditionally high rates of sport cycling and hiking (Calderdale MBC, 2017, p.5-6) and an extensive network of routes for walking and cycling – mainly dedicated to leisure - (see map 1 in appendix 3), the levels of active travel as a daily means of transport are low. According to the 2011 census, the only data available, 9.6% of the UCV population go to work on foot and only 1.2% by bike. This is two per cent less than the national average on foot (11.3%) and almost one third of the national average cycling (3.1%) (See Figure 2).

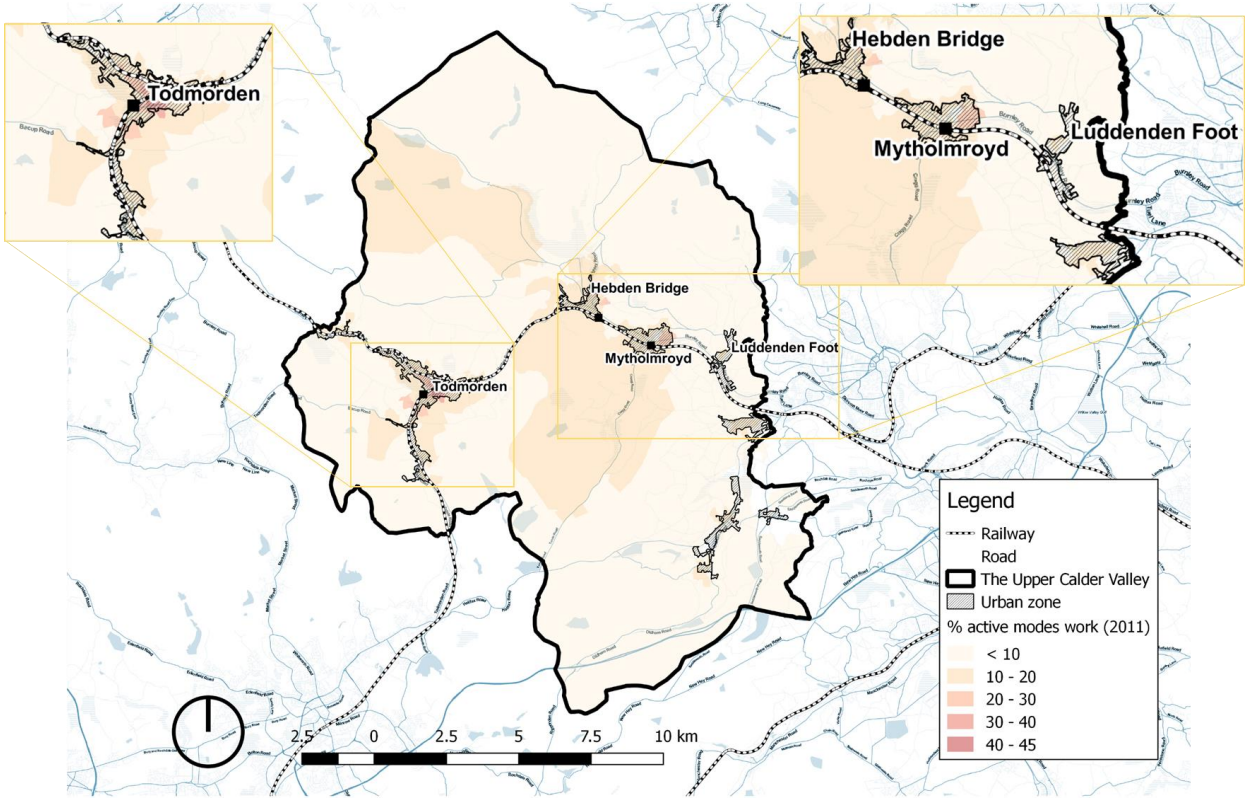


Figure 2 Proportion of active modes to work per Output Area
Source: Prepared by the author based on 2011 Census

Overall, due to all the determinants mentioned above (urban discontinuity, low population density, steep slopes and longer distances to work and services), it was presumed that the UCV population had greater accessibility difficulties by active modes than other areas in the region. This assertion is what gave rise to the idea of carrying out this study: based on a need to know to what extent these factors really affect people's capability of walking and cycling and consequently to reach basic services and activities by these modes of transport.

4. METHODOLOGY

This study uses a mixture of quantitative and qualitative methods. Secondary quantitative data has been provided in order to calculate people's capability to walk and cycle, while qualitative data have been collected using three different methods: observations, interviews and documentary analysis, for different purposes.

The following diagram illustrates what methods have been used in order to answer the research questions.

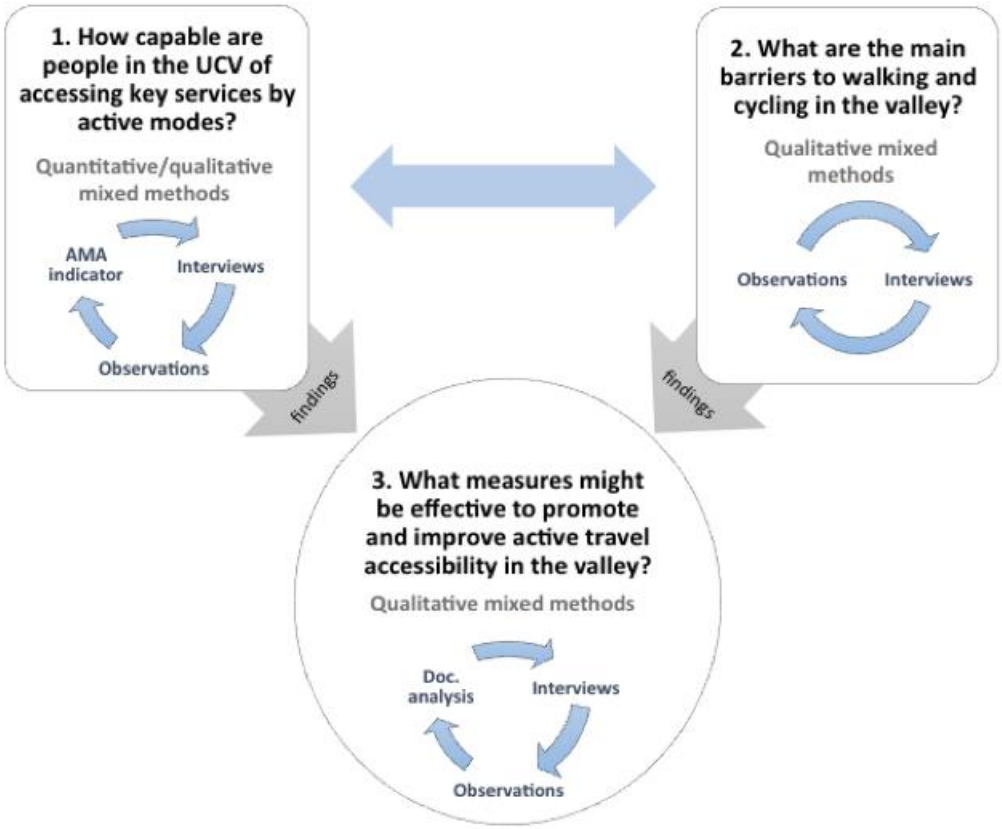


Figure 3 Diagram methods and data collection
Source: Prepared by the author

Each of the research methods used are described below, explaining how they were collected, analysed and the contribution they have made to the outcome of this project. This is followed by an explanation of how the different methods are combined. Finally, there is a description of the ethical issues considered to implement them.

4.1 QUANTITATIVE METHODS

Secondary quantitative data were provided from some of the previous research papers of the supervisor of this dissertation, Dr Ian Philips, in order to calculate an indicator called the Active Modes Accessibility (AMA) indicator. In particular, the following information was given:

- The daily mean maximum distance that the population of Calderdale are able to travel by active modes per Output Area (OA), obtained from the Individual Physical Capability (IPC) model.
- The average distance from each OA to eight key services in the Calderdale district, from the Department for Transport.

The AMA indicator has been calculated for each of the OA of the UCV, and mapped using QGIS in order to carry out a spatial analysis.

This quantitative analysis is triangulated with qualitative data, interviews and observations (see section 4.3), in order to give a more robust answer to the first research question: how capable is the population of the Upper Calder Valley of accessing key services by active modes? (see Figure 3).

4.2 QUALITATIVE METHODS

4.2.1 Observations

Four qualitative observations were undertaken to describe the study area and to understand (along with other methods) the main constraints of pedestrians and cyclists in the UCV. Photos of the area were taken to illustrate the observations in this report. The observations are helpful in combination with the quantitative data and the interviews to respond to the first research question (How capable are people in the Upper Calder Valley of accessing key services by active modes?) and the second (What are the main barriers to walking and cycling in the valley?) (see Figure 3).

4.2.2 Interviews

Six semi structured face-to-face interviews with key stakeholders were conducted. The approach chosen was semi structured because it was considered that standard questions with a certain extent of freedom and flexibility (Gillham 2000, p.69) was the most appropriate method for the research questions. This provided both a comparable set of data between participants and new interesting information that had not been previously considered. Plenty of attention was given to the selection of stakeholders in order to choose informants who had the necessary knowledge and experiences to answer the research questions. Two of them were expert transport professionals and the other four were representatives of community groups related to cycling or walking in the area. Although the idea was initially to interview local transport authorities as well, this was dismissed for two reasons. Firstly, because it was considered that the perspective of local authorities could be taken from documentary analysis, as explained below (section 4.2.3). Secondly, because it was thought that focusing on the external views of independent transport experts and citizen group representatives was more valuable to the research. In this way, the findings could help local authority officers to understand barriers to walking and cycling and to seek solutions to improve active travel accessibility. All informants were living or had been living in the area and had an in-depth knowledge of active modes due to their profession or the group community they represented.

One of the interviews could be classified as a “go-along” interview, a term introduced by Kusembach, M., (2003, p.455), which involves participating in movement while conducting the interview. It would be a hybrid between participant observation and qualitative interviewing (Kusembach, M., 2003, p.455). The interview was done riding a bike through the valley with one of the informants, in order to fully understand the real constraints of cycling in the UCV. It then continued in the Happy Days Cycles Café, a community based, social enterprise business comprising apart of a café, a bike shop and a bike “library”.

The interviews lasted for approximately one hour. They were recorded in order to aid data analysis and notes were taken. During the implementation of this project some follow-up questions and clarifications were sent to interviewees by email, who very kindly responded.

The interviews were partially transcribed, considering that word by word detail was not necessary (King, N. and Horrocks, C. 2010, pag.143), and the analysis was done together with comments taken from the literature. All names cited in the text are pseudonyms.

The interviews are used together with other methods to answer the three research questions of the project (see Figure 3).

4.2.3 Documentary analysis

Existing documents such as planning strategies or transport projects in the study area were used. They were obtained online or provided by local transport authorities. These documents helped to understand the current situation, describe the study area and to answer the third research question (What measures might be effective to improve accessibility by active modes in the UCV?).

4.3 COMBINING METHODS

The multiple methods described above have been linked in different phases of this project in order to provide better responses to the research questions. By combining methods it has been possible to overcome limitations, weaknesses or biases that each of them could have posed if being used on its own.

In the first question (How capable is the UCV population of accessing key services by active modes?), quantitative and qualitative data were linked. The AMA indicator was firstly calculated to quantitatively suggest how capable the population of the valley is of accessing key services by walking or cycling. Secondly, the outcomes of the indicator and the maps generated with it were shown to the participants of the interviews and an exercise of mapping interpretation was carried out. Finally, conclusions were reached with the indicator's outcomes and the respondents' contributions. In summary, this exercise of triangulation with qualitative data helped to overcome the shortcomes of the quantitative indicator, and that way achieved "a more detailed and balanced picture of the situation" (Altrichter et al. 2008, p.115).

In the second question (What are the main barriers to walking and cycling in the valley?) and the third question (What measures might be effective to improve accessibility by active

modes?), the mixed methods have all been qualitative. In the second question interviews and observations were used together to identify and analyse active travel accessibility barriers. In the third question, the methods combined were documentary analysis, observations and interviews. The interviewees gave their views on policy measures planned by local transport authorities (found in official documents) and propose ideas about effective solutions for the identified barriers.

Overall, linking methodologies has been a challenging and complex technique to apply, but it has given originality to the project and undoubtedly it has made the final findings more robust and well-founded.

4.4 ETHICAL ISSUES

The fact that this study involves human participation and participants' data through interviews, makes necessary to consider ethics in its design and in conducting it (Mullen, C. 2017, p.2).

The ethical issues taken into consideration in the research project are the following:

- consent to participate,
- protection of anonymity,
- safe storage of data,

The interviewees were assured that research ethics principals were being taken into consideration while conducting the research. Before starting the interviews, they were provided with an 'information sheet' (see appendix 1) in which they were told about the objectives of the research, what would be involved in the interview, and that they were going to be recorded. The information sheet also detailed how their data would be anonymised and that the information would be stored in accordance with the University's policy on data protection. Finally, they were given the option to withdraw if they decided not to take part in the research at any time.

Once participants understood this information, they were provided with the consent form (see appendix 2) to be signed in order to give their consent to take part in the research.

These forms, as well as the recordings and the transcripts of the interviews, were at all times securely stored in accordance with data protection policies.

There are a number of potential ethical concerns that can also arise with observational methods (Univ. Leeds Research Ethics, 2016, p.1). However, all the observations made for this research were carried out in public spaces and focused on the identification of potential barriers for walking and cycling accessibility in the area, rather than on particular individual's behaviour. Some photos were taken, but individuals were too far away to be recognised by others.

A fieldwork risk assessment was undertaken including the activities of site visits and interviewing. The use of a helmet and reflective vest while cycling were prevention measures used to avoid considered risks.

5. RESULTS AND FINDINGS

5.1 HOW CAPABLE ARE PEOPLE IN THE UPPER CALDER VALLEY OF ACCESSING KEY SERVICES BY ACTIVE MODES?

5.1.1 Introduction

The Active Modes Accessibility (AMA) indicator has been used to answer the first research question, together with observations and interpretation of the interviewees. The combination of quantitative and qualitative methods will result in the findings of this section.

5.1.2 The AMA indicator

The Active Modes Accessibility (AMA) indicator is an index that measures the capability that a given population has of accessing key services by active modes.

To calculate it three steps have to be undertaken:

- Step 1. Estimate the distance IPC.
- Step 2. Obtain the average distance to reach key services.
- Step 3. Divide the distance IPC (step 1) by the total average distance to reach the eight key services defined in step 2.

Step 1. Estimate the distance IPC

The distance IPC is the mean maximum distance that all individuals are able to travel by active modes on a daily basis given their home location. This estimation is obtained from the IPC model, a novel approach developed by Dr Ian Philips who has supervised this dissertation, to estimate a population's capacity to travel by active modes. In order to calculate it, the model considers the time budget, physical health and age characteristics of individuals, as well as the topography and headwinds in the area of their home location (Philips, I. et al 2014, p.1). It should be noted that for the estimation used in this research it is assumed that the entire population have a bicycle and do not have to escort kids on their journey. Therefore, the estimated distances IPC are understood to be entirely by bicycle and chained trips to escort kids has not been considered in its calculation.

Step 2. Obtain the average distance to reach key services

Eight destinations have been considered as basic needs for the population: primary school, general practitioner, food shops, employment, further education, secondary school, hospital and nearest town centre. Although the nearest town centre is not a service in itself, it has been considered as in rural areas access to the nearest town could mean access to services that do not exist in the town of origin. These data are obtained from the Department for Transport (DfT) and its calculation is based on the shortest routes.

Step 3. Divide the distance IPC (step 1) by the total average distance to reach the eight key services defined in step 2

Finally, the result of the indicator is obtained using the following equation:

$$AMA = \frac{dIPCi}{\sum_{i=1}^{8} dsij}$$

Where,

AMA is the Active Modes Accessibility indicator,

dIPCi is the maximum average daily distance people can travel by active modes, and;

dsij is the average distance to reach a service

The product of this division is the proportion of the distance to the eight key services that the average individual in an area could travel by active modes. The results for the UCV and for the whole Metropolitan Borough of Calderdale are compared below.

5.1.2.1 Results

Step 1. Distance IPC

According to the IPC model the maximum average daily distance that people from the UCV are capable of travelling by active modes is 4.6 km, 15% less than in the entire Calderdale district (5.3 km). The difference is mainly attributed to steeper topography.

Table 2 Distance IPC in the UCV vs Calderdale

	The UCV	**Calderdale**
Distance IPC (km)	4.61	5.32

Source: IPC model

The spatial distribution of the distance IPC per each OA of the UCV is shown in the following figure.

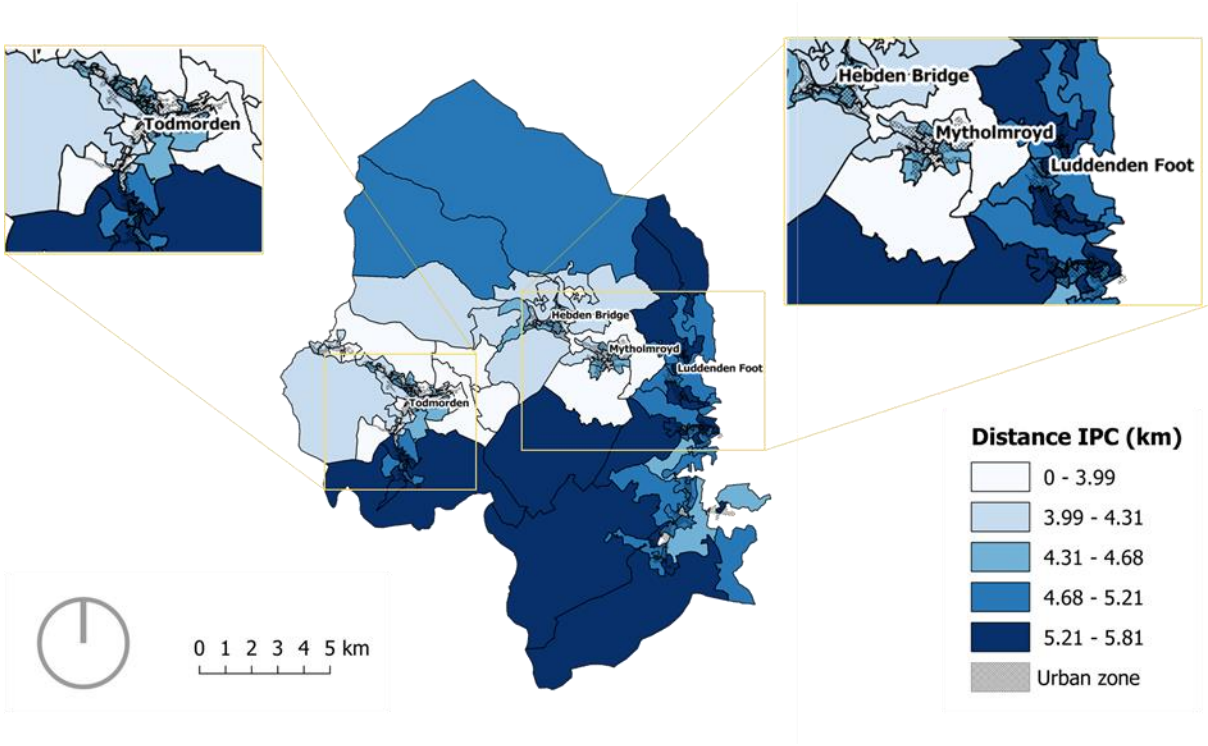


Figure 4 Distance IPC per OA
Source: Prepared by the author based on the IPC model

In general, a lower distance IPC is observed in the OAs of the west and central part of the valley bottom. On the contrary, in moor-top OAs the distance IPC is greater.

Step 2. Distance to key services

The total average distance to reach all eight key services in the UCV is 16.19 km, more than twice (+110%) that of the whole Calderdale district (7.71 km). The following table shows the average distances disaggregated by each of the services from lowest to highest.

Table 3 Average distances to key services in the UCV vs Calderdale

Average distances to specific services (km)	The UCV	Calderdale
Primary school	0.04	0.01
General practitioner	0.24	0.10
Food shop	0.39	0.13
Employment	0.56	0.23
Further education	1.28	0.56
Secondary school	1.29	0.54
Nearest town centre	2.50	1.81
Hospital	9.88	4.33
Total distance to reach all 8 services	16.29	7.71

Source: DfT

The distances to key services in the UCV are generally twice the distances in the entire Calderdale district. It should be noted that the distances to food shops and primary schools are three and four times longer respectively than in Calderdale.

The total average distance to reach all eight services per OA can be seen in the following map.

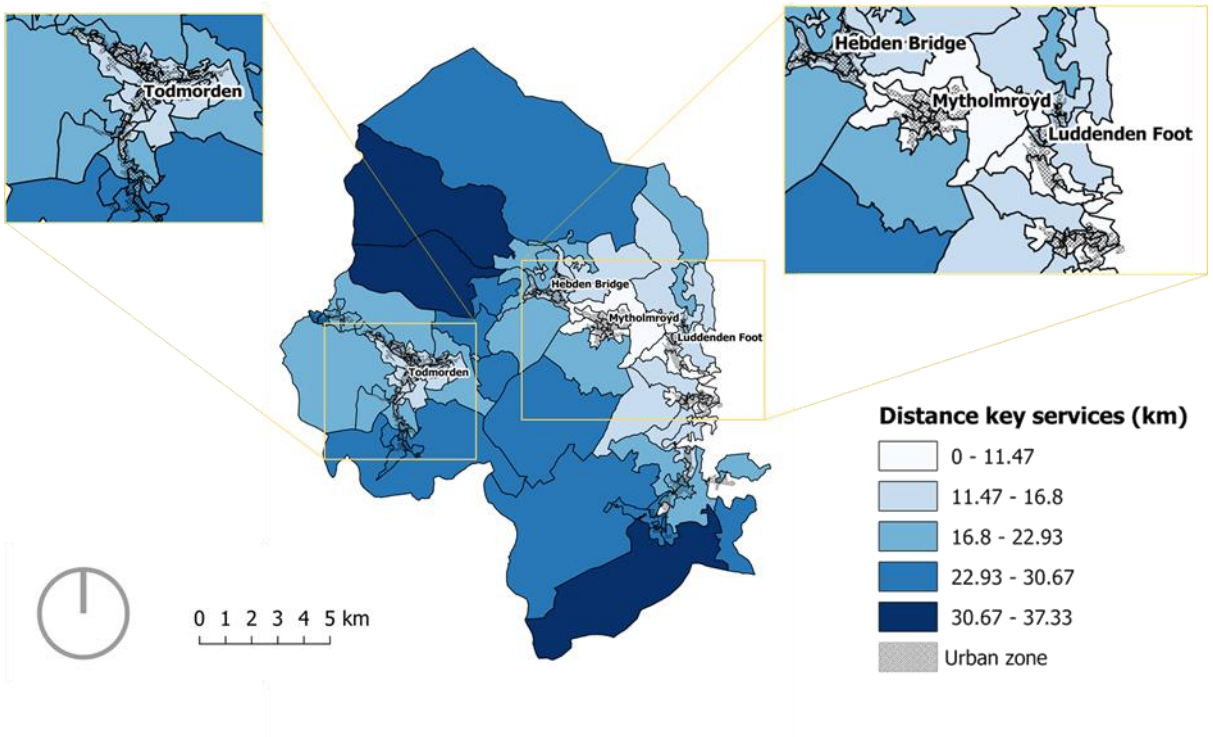


Figure 5 Total distance to reach all 8 services per OA
Source: Prepared by the author based on DfT data

It is clear that the closer one is to urban settlements, the lower the distance to key services. However, some difference can be observed between the OAs of the urban settlements of Mytholmroyd, Luddenden Foot and Sowerby, which are lower, and the distances in the OAs of the towns of Hebden Bridge and Todmorden. This fact could be attributed in part to the proximity of Halifax, the main pole of influence in the area.

Step 3. Result

Finally, to obtain the result of the indicator, the distance IPC is divided by the total average distance to reach the eight key services; being 28.44% for the UCV and 69.09% for the whole Metropolitan Borough of Calderdale.

Table 4 Results AMA indicator in the UCV vs Calderdale

	The UCV	Calderdale
AMA indicator (%)	28.44	69.09

Source: prepared by the author based on IPC model and DfT data

The spatial distribution of the AMA indicator per OA is shown in Figure 6.

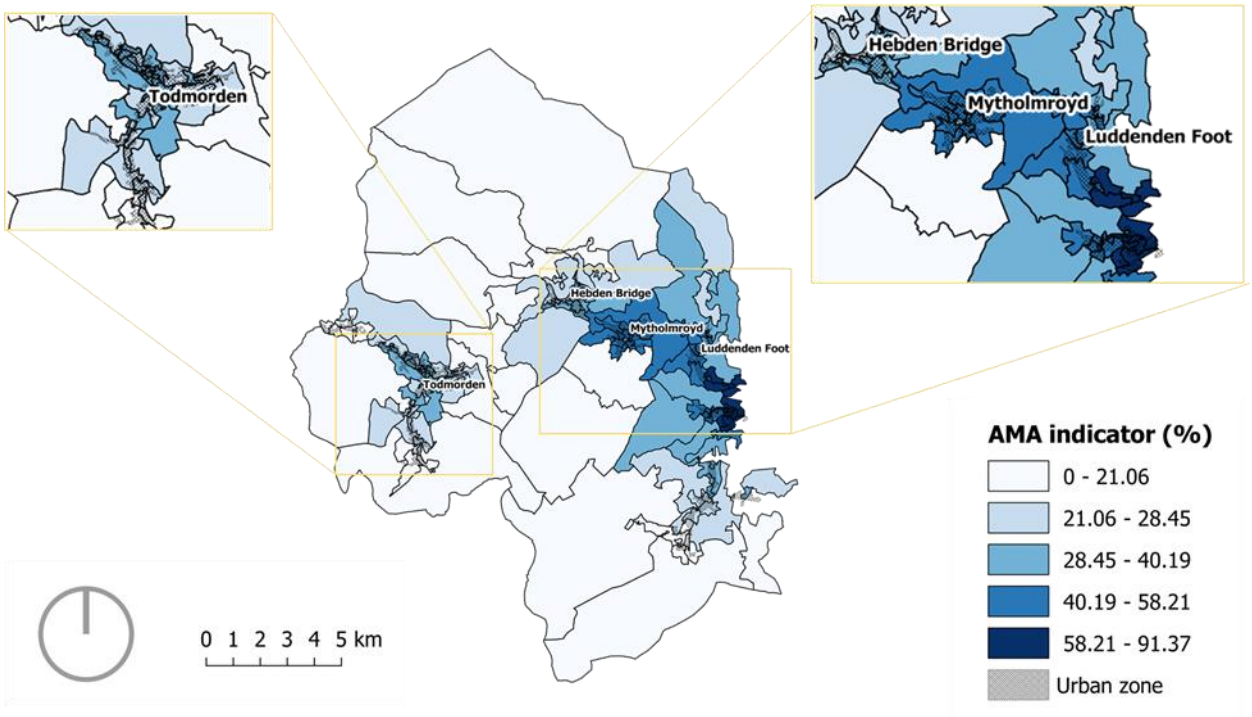


Figure 6 AMA indicator per OA
Source: prepared by the author based on IPC model and DfT data

Clearly, the OAs with a higher level of capability are in the urban settlements. There are, however differences between them. Some OAs in urban areas of Sowerby have over 58%, the majority of OAs in the urban areas of Luddenden Foot and Mytholmroyd have over 40%, and finally, the ones in Todmorden and Hebden Bridge have between 21 and 40%. As mentioned previously, the proximity of Halifax could explain the difference in part, as well as the higher levels of accessibility in the non-urban areas of the eastern part of the valley.

5.1.2.2 Conclusions

To summarise the results of the AMA indicator it could be said that:

- The potential for active travel accessibility in the UCV is two and a half times lower than that in the whole Calderdale district. This is due to a combination of a greater distance to key services (more than twice the average in Calderdale) and a reduced average daily distance that people are able to travel by active modes (mainly due to its steep topography).
- There are certain differences between accessibility levels according to urban areas. Sowerby, followed by Luddenden Foot and Mytholmroyd, are the urban areas with a higher proportion, while Hebden Bridge and Todmorden are the ones with the lowest. Their proximity to Halifax could partly explain this.

5.1.2.3 Limitations

There are many methods to measure active travel accessibility (see section 2.3), but based on the data availability and the special characteristics of the area, the AMA indicator has been considered the most appropriate and accurate to use for this study. However, like all methods of measure it has limitations, which are outlined as follows:

- The IPC model from which distances IPC are obtained is origin-constrained (Philips, I. 2014, p.240). Therefore, it does not take into account the network characteristics of the area.
- The IPC model includes an estimation of individual population attributes. Some calibration and validation tests were undertaken, but simplified assumptions are made in this sense.

- The IPC model employed uses 2001 census data (Philip, I. 2014b, p.240). It should therefore be updated, however the 2011 model has not been calibrated, so it is a much more exploratory result.
- The distances to key services from the DfT are based on the shortest routes, without taking into account the existence (or lack) of network facilities for active travel. This could influence active modes route choices.

5.1.3 Interviewees interpretation

Once the quantitative analysis was completed, the interviewees participated in an interpretation exercise with the results and maps generated. The local knowledge and expertise of both walking and cycling group representatives and transport professionals helped to interpret the quantitative outcomes and to offer a more realistic vision of the situation. Observations were also useful in this regard.

5.1.3.1 Interviewees contribution

The feedback provided and concerns raised by the participants during the consultations were the following:

- Most participants considered reasonable the distance IPC that people can do in the UCV, as well as its difference with the Calderdale results. They agreed that the steeper topography would mainly explain the difference.
- However, the spatial distribution of the distance IPC was criticised. The fact that most OAs in the bottom of the valley had a lower distance IPC than OAs in the moor top (see Figure 4) surprised the participants. According to them (and also to the observations made), the distances IPC in the valley bottom should be longer than in the top moor areas. The infrastructure along the valley bottom provides relatively flat access to key services; while people living at the top of the moor have to make more effort to reach services (located 300m below). Simplified assumptions of the model might lead to an underestimation of the distance people can travel by active modes in the valley bottom. The main one being the fact that the IPC model is not based on a network and demand model, as mentioned previously. Nevertheless, it should not be forgotten that the calculation of the distance IPC is made using area

attributes, but also with individual characteristics, so low levels of physical fitness in the bottom of the valley could be partly responsible.

- The majority of participants considered that the distances to key services were reasonable, although some of them suggested that they look rather low, "probably reflecting that the densely populated areas are in small towns/villages and therefore close to services" (Jack, Hebden Bridge).
- Finally, as for the final result of the indicator, half of the participants agreed and the other half considered it to be too low. Olivia's argument was that "for those living in the urban centres, who are the majority, services are very close" and with no many major slopes. For Oliver "cycling in the UCV is not difficult given that most of the population live in and most of the facilities are located in the valley floor, which is well served by a traffic-free route, suitable for most cyclists".

In addition, one of the participants (Jack from Hebden Bridge) noted that apart from the accessibility to the eight key services, the study should analyse accessibility to public transport; and proposed to do an extra map showing how many people could reach a half-hourly public transport service by active modes. The resulting map is shown below.

5.1.3.2 Analysis of accessibility to rail stations

Intermodality, or journeys combining walking or cycling with public transport, increases the capability to travel longer distances, allowing people to reach destinations that would not be possible only on foot or by bicycle. Consequently, in order to measure the capability to reach services and accessibility this should be considered (Department for Transport, 2006, p.7). With this purpose, a map has been created showing the level of accessibility to reach rail stations by active modes in the UCV.

For adequate accessibility people should at least be able to go to the station and return home in the same day. The calculation has therefore been made by subtracting half the distance people are able to travel by active modes (half the distance IPC of each OA) from the distance to the nearest rail station (from each OA's centroid)[2], Thus, high accessibility means half the distance IPC is a third or less of the distance to the station, mid accessibility

[2] The distances from OAs' centroids to the nearest station has been calculated with the shortest routes provided by the QGIS Road Graph Plugin.

means half the distance IPC is between one and two thirds of the distance to the station, and low accessibility means half the distance IPC is between two thirds and the whole distance to the nearest station is considered that there is a lack of accessibility by active modes.

The spatial distribution of accessibility to rail stations per OA is shown in Figure 7.

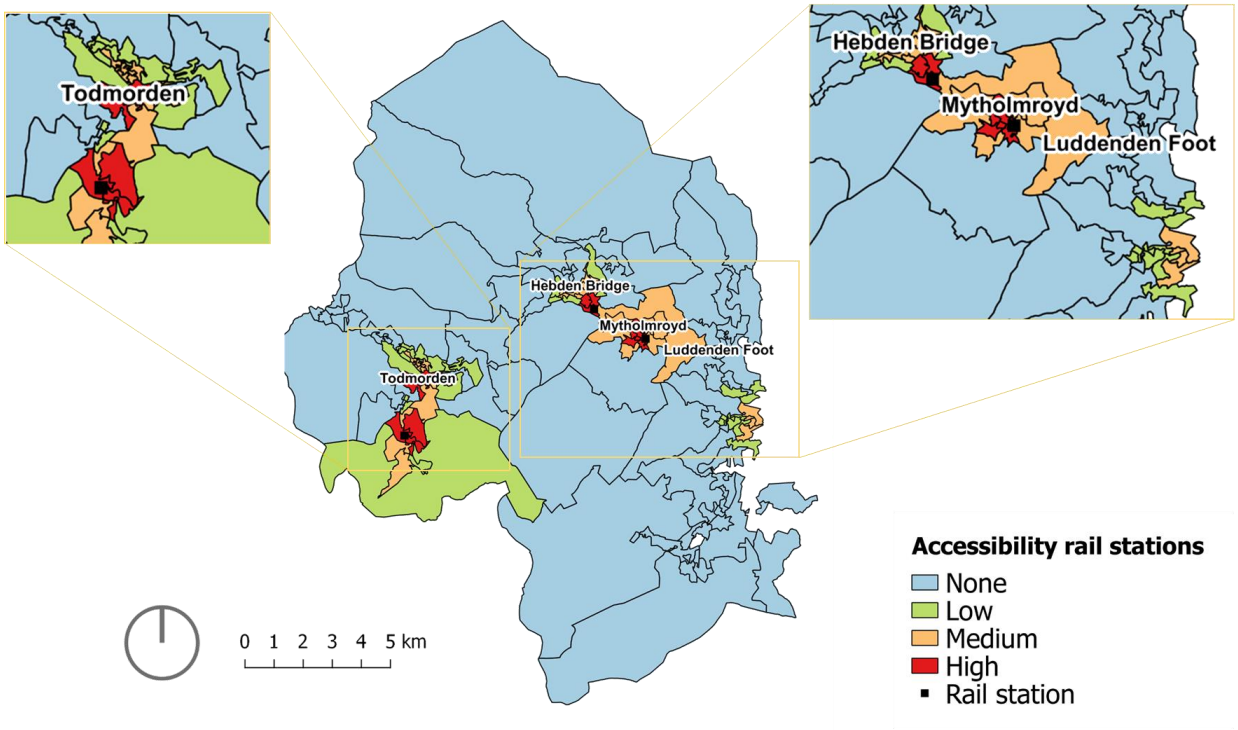


Figure 7 Accessibility to rail stations by active modes
Source: prepared by the author based on IPC model and QGIS Road Graph Plugin

Overall, 50% of the valley's population has accessibility to the railway station by active modes; 10% have high accessibility, 23% mid, and 17% low. The other half of the population is considered to live too far to access any train station daily (return journey) by active modes. Again the possible underestimation of the distance IPC in the valley bottom could be causing misleading outcomes in some areas connected by the Rochdale Canal, between Todmorden and Sowerby Bridge.

5.1.4 Findings

The key finding in the discussion about how capable people in the UCV are of accessing key services by active modes, are as follows:

- According to the AMA indicator the capability of accessing key services in the UCV by active modes is two and a half times lower than that of Calderdale overall. This is due to a combination of a greater distance to key services (more than twice the average in Calderdale) and a reduced average daily distance that people are able to travel by active modes (mainly due to its steep topography). Most participants (and observations) have put forward their view that the distance that people are able to travel by active modes in the valley bottom has been underestimated. The explanation for this would be that the model is not network-based and consequently does not consider the infrastructure along the valley bottom, providing relatively flat access to many key services. Bearing this in mind, one should conclude that the low level of capability to access key services suggested by the indicator should be slightly higher, particularly in the OAs of the valley bottom.
- Certain differences in capability levels have been detected in urban areas. Sowerby, followed by Luddenden Foot and Mytholmroyd, are the settlements with the highest levels, while Hebden Bridge and Todmorden are the ones with the lowest. The proximity of Halifax could be part of the explanation. This finding could help to determine and prioritise area-based accessibility policies.
- A map created upon the proposal of the interviewees has demonstrated that over 50% of the UCV population can reach railway stations (return journey) by active modes. This means that more than half of its population can increase their capability of accessing nearby locations where the eight key services are concentrated and other opportunities are available by making intermodal journeys. This shows, therefore, the great potential that promoting intermodality and improving access to stations has as a policy measure to increase capability and accessibility in the valley.

5.2 WHAT ARE THE MAIN BARRIERS TO WALKING AND CYCLING IN THE VALLEY?

5.2.1 Introduction

Interviews with key stakeholders and observations have been used to answer the second research question.

5.2.2 Results

The following table shows the main barriers to walking and cycling in the valley according to the respondents. They are ordered by the number of times they were mentioned in the interviews[3].

Table 5 Summary of barriers identified to walking and cycling

Barriers to walking and cycling	Number of respondents mentioning it
Fear of motorised traffic	6
Hilliness	6
Lack of facilities to make intermodal trips	5
Greater distances to work	3
Seasons, climate and weather	3
Cultural barriers/Attitudes and social norms	3
Lack of facilities at work/school	3
Lack of political will	2

Source: Prepared by the author based on responses to the interviews

5.2.2.1 Fear of motorised traffic

Contrary to what one might expect, the main barrier to walking and cycling in the UCV according to most interviewees is not the topography, but a fear of motorised traffic. This is not unique to the valley. One study based on qualitative and quantitative data research called *Barriers to Cycling* states that "the most prominent practical barrier perceived to be deterring potential cyclists (are) danger and safety (CTC et al 1997, 7, cited in Horton, D. 2007, p.133).

The main reason of the fear of motorised traffic for the respondents is the lack of route choice to avoid motor traffic. In terms of interurban mobility, the A646 road is the fastest route to travel between the different towns in the valley. However, it is very congested, busy and perceived as dangerous for pedestrians and cyclists. It has no cycle lanes and in

[3] Barriers that were raised by just one participant are not included in the table.

some interurban sections there are no pavements. The alternative to this route is the Rochdale Canal towpath (part of the National Cycle Route 66). It is an off-road route, shared between walkers and cyclists, which is flat and links all the towns of the valley from east to west (see map 1 in appendix 3). However, it is not as direct as the main road, not always well connected to town centres and in some points is not in a very good state. Puddles, damage to the surface and cobblestones are some of the difficulties observed, particularly since the Boxing Day flood in 2015. Other drawback highlighted by the interviewees is the feeling of insecurity, especially by pedestrians at night-time hours. In this sense, one of the findings in the Understanding Walking and Cycling Project (Pooley, C. et al, 2011, p.9) was that cyclists are usually more concerned about dangers from motorised traffic, while walkers worry more about threats from other people in poorly supervised urban environments. Finally, a certain conflict between pedestrians and cyclists sharing the space has also been mentioned.

In urban areas, the main concerns about road safety are the severance created by the A646 road and the difficulties to cross it, as well as the lack of priority for the active modes in general. Although some policy measures like the pedestrianisation of some urban centres and the recent implementation of the 20 mph zones have or are improving the situation, most of the space is still dedicated to cars and the traffic speed is still generally higher than recommended for urban areas. Respondents argue that in many streets the pavement is not wide enough and in some crossing is a difficulty for pedestrians (photo 1). The situation worsens the further you are from the urban centres. It should be considered that pedestrians' space is "significantly associated with the attractiveness of non-motorized modes" (Rodríguez, D.A. and Joo, J., 2004, p.151) and particularly significant in areas with an aging population like the UCV, as seniors require better conditions to avoid falls (Lockett, D. et al, 2005, p.49). As for safe urban cycling infrastructure, Harry from Hebden Bridge, argues that there are some urban bicycle lanes but they are not well designed, disconnected from one another and they often do not lead anywhere.

A selection of participants' comments on fear of motorised traffic is presented in Box 1.

The main barrier for me is road safety, because of the volume of traffic, the speed of the traffic, the behaviour of drivers… *(Amelia, Mytholmroyd).*

Sometimes the pavement runs out. And then, the pavement ends, particularly in the A646 (see photo 2 below). The pavement is not always in good condition and on both sides of the main road *(Olivia, Hebden Bridge).*

There are quite a few people who use the cycle path route 66 - mainly cyclists. It's very popular. Cyclists are scared of the main road (A646) *(Olivia, Hebden Bridge).*

The surface of the towpath (NCN 66) is not comfortable due to cobblestones, lack of lighting… *(Jacob, Halifax).*

Some parents do not want their kids to go to the school alone because they have to cross busy roads. Everything goes through the A road *(Amelia, Mytholmroyd).*

There is no room for cyclists and very little room for walkers, once you go out of the central (urban) areas *(Olivia, Hebden Bridge).*

Box 1 Participants' comments on fear of motorised traffic

Photo 1

Photo 2

Figure 8 Junction with no crossings in Hebden Bridge and road 646 where pavement ends
Source: Vidal, E. 2017

5.2.2.2 Hilliness

Slopes have a clear negative effect on walking and cycling according to the majority of authors (Rietveld, P. and Daniel, V., 2004, p.539; Rodríguez, D.A. and Joo, J., 2004, p.165; and Parkin, J. et al, 2008, p.93), and it is undoubtedly an important barrier in the valley. However, for some respondents it is not as significant as perceived from outside. Amelia and Oliver pointed out that although it can be an important constraint for those living in the

valley sides or in the moor top (photo 3), it is not such an issue for those who live at the bottom of the valley. In their opinion, urban centres where most people live and where services are located are relatively flat, or at least are not subject to significant topographical changes. Moreover, the Rochdale Canal towpath that connects the valley's different towns by active modes is also flat (photo 4). However, other respondents partially agree with Oliver and Amelia, but still consider topography to be a highly important barrier, particularly to engage new cyclists. In their view, the major effort involved because of the hilliness would make impossible to reach the daily cycling numbers of other flat areas such as Cambridge, Oxford or York.

This point arose when analysing people's accessibility by active modes in the previous section. As it was concluded there, the infrastructure along the valley bottom provides relatively flat access to key services meaning that topography is not such a significant barrier for people living in the valley bottom, who are the majority. However, for those living in the moor top or on the valley sides, it is a very significant constraint.

In any case, even if hilliness were more significant than considered here, as Parkin, J. et al (2008, p.107) demonstrates "while hilliness has a significant effect, it does not have a detrimentally compounding effect when linked with policy variables that may be adjusted to increase cycle use".

Some participants' comments on topography are shown in Box 2.

> ***That's the challenge, the gradient if you live above the Valley Bottom. However, if you live in an urban area the gradient is not such an issue*** *(Amelia, Mytholmroyd).*
>
> ***Most of the facilities are along the valley. You do not need to make a big gradient change between one point and the other unless you live on the moor top. Because all services and most of the houses are in the flattest part of the valley. If you make a map of the population distribution of the upper Calder Valley, the vast majority, I would say 80%, live within a mile either side of the river and canal*** *(Oliver, Halifax).*
>
> ***The topography is the key here and it is not only the fact that it is hilly but that it is steep. In terms of recruiting new people to do it, that's quite difficult*** *(Jacob, Halifax).*

Box 2 Participants' comments on hilliness

Photo 3

Photo 4

Figure 9 View of the valley from the moor top and the Rochdale Canal towpath
Source: Vidal, E. 2017

5.2.2.3 Lack of facilities to make intermodal trips

As Buehler, R. and Hamre, A. (2014, p.1081) argue intermodality is increasingly recognised as a means of reducing car dependence by shifting trips from cars to walking, cycling, or public transportation. However, five out of six respondents point out that the lack of facilities for intermodality is a barrier in the UCV. Jack from Hebden Bridge argues "the UCV is relatively well-served by public transport, with 2-3 trains per hour throughout most of the day, and a half-hourly bus service along the valley and an hourly service to most of the adjacent hill top settlements". But, there is a lack of coordination between buses and trains and although there are some facilities to make intermodal trips bicycle-train in the railway stations and carriages, more could be done in this regard.

Interviewees explain that when the train delays and even if this is minimal, passengers miss the bus and have to wait a long time to catch the next one. In rural areas where the frequency of public transport cannot be very high, coordination between public transport vehicles is essential.

As for intermodal bicycle-train journeys, they argue that there are parking facilities at the stations (bike & ride modality) but they are not safe, convenient or well maintained. To carry bikes on board the train (bike & carry modality) only two bicycles per train are allowed (photo 5). Finally, to take a bike once arrived at the station (ride & bike modality) there are Bike & go systems, but they are underused (photo 6). Possible reasons for this are that it is too expensive (or at least there is a penalty compared to car users who can park at the

station for free), bikes are too heavy for the area, and there is a lack of promotion. To overcome the lack of intermodal facilities, people in the valley opt for using folding bikes or, as Oliver from Halifax says, cheap bikes in origin or/and destination.

Here are a selection of comments on public transport and intermodal facilities.

> ***The train is a big asset in the Valley, two trains every hour - good train service*** *(Harry, Hebden Bridge).*
>
> ***The buses run just one per hour, they can't always link up with the train. And you quite often find that you get out of the train and the bus just left and then you have an hour to wait*** *(Jack, Hebden Bridge).*
>
> ***Very few people use the Bike & Go system. That hasn't been popular at all. Another constraint is that the policy of train companies allows just two bikes per train. People particularly use folding bikes.*** *(Harry, Hebden Bridge).*
>
> ***There are many commuters who have a cheap bike in Hebden Bridge and a cheap bike in the other station (Leeds or Manchester)*** *(Oliver, Halifax).*

Box 3 Participants comments on lack of facilities to make intermodal trips

Photo 5

Photo 6

Figure 10 Current facilities for intermodal bicycle-train journeys
Source: Vidal, E. 2017

5.2.2.4 Greater distance to work

Other barrier identified by three of the interviewees is the high level of out-commuting to work in the valley. As was mentioned in section 3, 34.9% of the working population in the UCV travel over 10 km every day to reach their work place (2011 census), six percent above average in England (29.0%). According to respondents two main reasons explain this fact: the limitation of employment in the area (generally to tourism and hospitality) and the good transport links with Leeds and Manchester (by rail and road). This fact makes that few people can go to work every day only on foot or by bicycle, being the combination of walking or cycling with transport public the only way of commuting without using their car; and this relates this barrier with the previous one.

5.2.2.5 Seasons, Climate and Weather

If respondents do not mention climate and weather as barriers, seasons are considered by three of them as an important factor. Weather and climate are also most likely influential factors (Parking, J., et al, 2008, p.93; Heinen, E., et al, 2010, p.76), as depending on the season the weather and particularly the climate change considerably. As for pedestrians there is a decrease in walkers in dark winter hours, particularly in lonely areas, for example in the Rochdale Canal towpath as previously mentioned. A clear difference can also be observed in the number of cyclists between the mild seasons and winter. Rain and darkness force pedestrians and especially cyclists to be prepared with certain equipment such as waterproof and reflective clothes, umbrellas or lights.

5.2.2.6 Cultural barriers/Attitudes and social norms

Half the respondents pointed out that there is a certain cultural constraint on walking and particularly on daily cycling in the UCV. As Pooly C. et al suggest (2011, p.16), walking and cycling “are in some ways abnormal things to do” in Britain. This is a fact that probably increases in rural areas, as people there are less prone to changes and care more about what others say. Jack comments that in the valley “people do not want to stand out from the crowd”. He also suggests that cycling is seen amongst lower income groups as not very aspirational, as something people do if they cannot afford to have a car; an attitude not that usual amongst more affluent people, in his opinion. Olivia wonders if there is a class factor also in walking. In her opinion “some people still think that only losers walk, like only losers take the bus. If you can afford a car, why should you walk or cycle around?”

5.2.2.7 Lack of facilities for cycling at work/school

Having no facilities at work has been cited as a reason not to cycle (Moritz, W.E. 1998, p.5), and this is another of the barriers in the UCV according to three of the respondents. Safe and convenient cycle parking, showers, lockers and drying rooms are all facilities to encourage employers to cycle to work or students to go to school. Jack gives an illustrative example about how important these kinds of facilities can be to encourage cycle commuting. He explains that where he previously worked, an office in a city close to the valley, there were more employers cycling every day when it was located out of town but had very good facilities for cyclists, than when it was located in town but with no facilities. So, in this case facilities to ride to work prevailed over the distance to cycle.

5.2.2.8 Lack of political will

Finally, two respondents identified the lack of political will as another significant barrier in the valley. Oliver from Halifax argues that in all the places where cycling is successful, there is a political drive behind it. “Look at London with Boris Johnson, and before him Livingston and subsequently Khan; they are all committed to cycling, and there cycling is increasing a lot”. In this regard, Harry from Hebden Bridge adds “we haven't seen a change in mind politically to make cycling a real alternative. I have heard councillors say cycling is never going to be popular in Calderdale because it is too hilly or too dangerous. The hills are there and you are not going to move them, but you can increase cycling usage considerably by making it safer and more attractive”.

Other barriers that were raised by just one participant were: difficulties to make link trips when compared to living in a city (Jack, Hebden Bridge), a lack of respect by motorised drivers towards pedestrians and cyclists (Amelia, Mytholmroyd), and poor prioritisation for pedestrians in urban areas (Olivia, Hebden Bridge).

5.2.3 Findings

The key findings on the second research question that identifies the main barriers to walking and cycling in the valley are the following:

- The respondents have identified eight main barriers to walking and cycling in the valley. Contrary to what was expected, and in line with the conclusions drawn from the interpretation of the AMA indicator, the principal barrier is not hilliness but a fear of motorised traffic. This is caused mainly by the lack of traffic-free route choices and the lack of priority for active modes in urban areas.
- Regarding hilliness, it could be said that for people living in the valley bottom, which is the majority, it is not such an issue because the infrastructure to reach key services is relatively flat. However, for people living in the valley sides or in top-moor areas it is decisive.
- The third barrier is the lack of facilities to carry out intermodal trips. Interviewees' opinion about the transport system in the valley is generally good, although most complain about the lack of coordination between buses and trains, and the lack of proper facilities to make intermodal trips in stations and vehicles. This barrier is tightly connected to the fourth: greater distances to work.
- And finally other constraints that are mentioned less but also important are: the seasonal factor, a certain cultural or attitudinal barrier, lack of facilities for cycling in workplaces and schools, and lack of political will for cycling.

5.3 WHAT MEASURES MIGHT BE EFFECTIVE TO PROMOTE AND IMPROVE ACTIVE TRAVEL ACCESSIBILITY IN THE VALLEY?

5.3.1 Introduction

Based on the previous findings on people's capability to access by active modes and on barriers to walking and cycling, this section answers the third research question about what measures might be effective to promote and improve active travel accessibility in the valley. A combination of interviews, observations and documents were used.

5.3.2 Background

In recent years, efforts have been made by the different administrations to improve active travel accessibility in the UCV. The pedestrianisation of urban centres, 20 mph zones, electrical bike schemes (We:cycle), the bike and ride systems (Bike & Go), free adult and schoolchildren cycle training programmes, and walking and health campaigns are the most noteworthy examples. Even so, the latest data available (2011 census) do not show an increase in active modes in the valley (Calderdale Council, 2016, p.24)[4].

However, two policy measures are about to be implemented that are expected to have a big impact on cycling in the entire Calderdale area:

- The City Connect Scheme
- The Calderdale Cycling Strategy 2016-2031

The City Connect Scheme consists of a number of projects funded by the DfT and delivered by the West Yorkshire Combined Authority (WYCA) to develop and improve cycle routes. The aim is to encourage more people to travel by bicycle (City Connect 2017). In the UCV its development would involve improvements on the Rochdale Canal towpath (NCN 66) mentioned earlier (see map 1 in appendix 3).

The Calderdale Cycling Strategy 2016-2031 is about to be launched, but at the time of writing this report, it is in draft form only. The draft contains a vision, an overview,

[4] It should be noted that some of the actions mentioned here were implemented after 2011 and therefore its effectiveness cannot yet be assessed.

challenges and opportunities, ambitious targets, and nine strategy components developed with a schedule for its implementation[5] (Calderdale MBC, 2017).

Both initiatives are considered by the interviewees as key to boost daily cycling. In their opinion, if local authorities carry them out correctly, they could mean a before and after for utility cycling in the area. However it should be stressed that although the first initiative considers pedestrians to some extent as it plans improvements of a shared cyclist/pedestrian path in the valley, no specific strategy has been envisaged for pedestrians, despite it being the main active mode used. Even though walking has possibly less potential to replace car trips due to its limitations in terms of distance, it should not be forgotten that it is the active mode that most people are capable of doing, particularly in areas with steeper topography like the UCV. Consequently, it should be considered whether a specific strategy for pedestrians or a joint active modes strategy is necessary.

These initiatives and other measures proposed by the stakeholders to tackle to the barriers identified earlier are discussed below.

5.3.3 Results

The following table shows a summary of the policy measures that the respondents considered to be more relevant or effective in order to improve active travel accessibility in the UCV. The measures are ordered by the number of times they were mentioned in the interviews[6].

Table 6 Summary of measures to promote and improve active travel accessibility

Measures that might be effective	Number of respondents mentioning it
Safe infrastructure	6
Promotion of intermodal travel	5
Awareness campaigns	4
Wider availability of e-bikes/folding bikes	3
Parking measures	3
Facilities and incentives to commute by active modes	2

Source: Prepared by the author based on responses to the interviews

[5] This document is not discussed in this study since the final version could still alter some important aspects.
[6] Measures mentioned by just one participant are not included in the table.

5.3.3.1 Safe infrastructure

All respondents agreed that the most fundamental measure in the valley is the provision of safe active travel infrastructure to tackle the fear of motorised traffic. Safe infrastructure is an important determinant for both modes, walking (Rodriguez, D.A. and Joo, J., 2003, p.151) and cycling (Buehler, R. and Pucher, J., 2012, p.426) and is essential to increase the number of utility walkers and cyclists.

Respondents also agreed that the Rochdale Canal is the valley's infrastructure backbone for utility active travel. Thus, according to them, if the City-Connect Scheme is carried out properly, the situation for active travel and particularly for cyclists, would improve considerably. To ensure a successful project, the route should meet the five requirements stated by Groot: cohesion, directness, safety, comfort and attractiveness (R. Groot, 2007, p. 30-32). Its connection to all urban centres, key services and public transport stations is considered crucial. "If places are well connected and it is easy to travel by bike or on foot between them, then levels of walking and cycling should increase" (Pooley, C. et al 2011, p.8). The project should also tackle the possible feeling of insecurity on the path and possible conflict arising between pedestrians and cyclists sharing the space.

Apart from the canal, also the A646 road should be improved in terms of road safety. Harry from Hebden Bridge proposes to increase maintenance on its surface as well as make safer the intersections. It was also suggested that the road should have pavement on both sides and in all sections, and that the average speeds of motorised vehicles should be reduced, particularly in urban sections.

In terms of urban mobility, giving higher priority to active modes is a necessity for Olivia from Hebden Bridge. From very basic and cheap measures such as salting icy pavements, or putting more speed limit signs along the road, to other more complex measures such as extending the time of traffic lights for pedestrians or extending the pedestrianised areas. With regard to the severance created by the A646, Olivia also suggests encouraging large vehicles to take the M62 instead of the A646, and to study the possibility of implementing shared spaces on the urban section of the road.

A selection of participants' comments on safe infrastructure is presented in the following box.

> ***Safe routes will hopefully get better when they (local authorities) make the improvements on the canal towpath. That would make a huge difference, having a safe alternative to the main road*** *(Harry, Hebden Bridge).*
>
> ***One of my priorities is to improve roads, there is a lot of poor road maintenance, and that is also a barrier. I do not like going (by bicycle) on certain roads as the road feels dangerous because it has got puddles and cracks on it and bad road junctions*** *(Harry, Hebden Bridge).*
>
> ***I would like to see the timing of traffic lights prioritised for pedestrians. More signs on the road surfaces. More 20 mph signs and enforcement*** *(Olivia, Hebden Bridge).*
>
> ***Something very cheap and simple, for example, they (local authorities) do not salt the pavements*** *(Olivia, Hebden Bridge).*

Box 4 Participants comments on safe infrastructure

5.3.3.2 Promotion of intermodal travel

The promotion of intermodal travel is the second measure demanded by respondents. As demonstrated in section 5.1.3.2, over 50% of the valley's population are capable to access train stations (return journey) by active modes. Consequently with the right intermodal travel facilities, more than half of the population could reach their workplace and other basic services and opportunities in nearby locations by combining walking-train or cycling-train in their journeys.

Three main actions are proposed to boost intermodal travel in the valley: (1) better coordination of public transport schedules, (2) the improvement of intermodality facilities, and (3) the connection of safe active travel infrastructure with the stations. An improved coordination of timing between public transport modes is crucial. All public transport vehicles should work together in order to increase reliability for passengers, and when there are delays the different vehicles need to adapt to one other. For instance, if there is a train delay, the bus connected should be informed and if possible wait until the passengers can

get on. Jack from Hebden Bridge suggested that an integrated fare system would also help with that. As for intermodality facilities, safer and more convenient cycling parking facilities in the stations are needed, as are better roller stock with more capacity to carry bikes on each train; buses could also include racks. Finally, the safe active travel network needs to be well connected to public transport stations and town centres (already mentioned in the previous measure).

A selection of comments on this measure can be seen in the following box 5.

> ***We have been actively campaigning for many years to have an integrated, transport hub at the railway station in Hebden Bridge. Unfortunately coordinating bus departures with train arrivals etc. has proved an almost insurmountable problem but we struggle on!*** *(Olivia, Hebden Bridge).*
>
> ***If we had better rolling stock on the trains we would be capable of carrying more bikes. In many countries in Europe, you can do it*** *(Harry, Hebden Bridge).*
>
> ***Improving walking and cycling access to public transport routes (and co-ordinating bus/train connections) would therefore be my policy priority*** *(Jack, Hebden Bridge).*

Box 5 Participants' comments on promotion of intermodal travel

5.3.3.3 Awareness campaigns

Walking and cycling have a direct positive effect on health (Pucher, J. et al, 2010, p.5; Woodcock, J., et al, 2009, p.1; Oja, P. et al, 1998, p.S87); and for five out of six of the respondents this is the main value that improving active travel accessibility would have for the valley.

Parkin, J. et al suggests (2007, p.15-16) that the cultural barriers about cycling (and this could be extended to walking) may change if the advantages that they have for maintaining health and fitness were more widely accepted. For many of the interviewees, the most convincing argument to achieve a modal shift from automobile to active modes is this: the benefits they provide for individual and community health. Therefore, more awareness campaigns in this line would be recommendable.

Box 6 shows a selection of comments on the proposal of heath awareness campaigns.

> ***I think the health message is very important. Signs on the pavements about how many steps you are doing, how much better for your health it is to walk/cycle. An initiative based on obesity, for instance.*** *(Olivia, Hebden Bridge).*
>
> ***Because it is always going to be more convenient to use a car, you need multiple motivations to get on a bike. You have to sell the journey as being very pleasant because the valley is nice. As a really pleasant experience; and that it is good for your health*** *(Jack, Hebden Bridge).*
>
> ***Because there is a kind of time penalty in walking and cycling or doing intermodal trips, the promotion based on health and fitness is a good way. Explaining the fact that (you exercise and) it doesn't take any extra time*** *(Jack Hebden Bridge).*

Box 6 Participants' comments on awareness campaigns

5.3.3.4 Wider availability of e-bikes/folding bikes

Electrical bicycles can be used to promote physical activity in a sedentary population and can help to tackle "topographical and logistical" (Gojanovic, B. et al, 2011, p.2207) issues. As participants argue, technology is improving and prices lowering, so "e-bikes could be a really good option for people living in the sides of the valley, or in the top-moor" of the UCV (Jacob, Halifax). For Jack, e-bikes "would not make a huge amount of people cycle, but it may encourage quite a few hesitant people who probably already cycle at the weekend, but do not commute by bike because it is inconvenient: it takes too much time or too much effort". Recently an e-bikes project was launched in the valley, the We:cycle scheme. It was one of the 12 DfT funded pilot projects encouraging community use of new cycling technologies. The scheme provided membership-based access by the hour as well as for longer durations, with bikes located at hubs in the communities to the north of Hebden Bridge. However, respondents explained that it was not very successful. Further work should be done to find out what went wrong with this project.

Folding bicycles are another viable hill solution for cyclists when combined with other modes as when folded they can be easily carried onto public transportation vehicles (SBMP,

2013, p. 10). So, the promotion of these kinds of bikes could be also a good policy measure to promote cycling and intermodal trips. Amelia from Mytholmroyd illustrated well how folding bikes can be useful for the UCV's population mobility with a specific case in the valley. "You know folding bikes? I met somebody who lives in the valley side and commutes to Manchester. Every morning he cycles down to the Hebden Bridge rail station with his Brompton (a brand of folding bikes) and in the evening his wife comes to pick him up by car".

5.3.3.5 Parking measures

"Carrot" policies to encourage active modes should be combined with "stick" policies to discourage the use of the automobile (Buehler, R. and Pucher, J. 2011 p.63). Parking policies is the most feasible "stick" policy in the UCV, as most interviewees agreed. So, parking prices at stations – together with improving public transport connections for those who cannot access them with active modes – would help to encourage intermodality. The price of parking at stations should be at least the same as the bus fare to the station (Jacobs comments) or the price of using a Go & Bike system bicycle (in Jack's opinion). For this reason, a study about the real need of parking and parking prices at the stations should be undertaken. Jack also asked for less parking on the street to improve public space and road safety in urban areas. Olivia suggested charging for parking at workplaces or the implementation of some kind of Workplace Parking Levy (WPL) – a charge on employers who provide workplace parking as the one introduced in Nottingham (Carse, A. 2013, p.6).

5.3.3.6 Facilities and incentives to commute by active modes

According to Wardman, M. et al (2007, p.339) the most effective policy for the promotion of cycling to work "would combine improvements in en-route facilities, a daily payment to cycle to work and comprehensive trip end facilities". In this sense, two of the respondents raised the possibility of implementing incentives for people who opt to go to work by bicycle (this could be extended to people going on foot or by public transport), such as paying cycle mileage or giving people extra time off. Regarding trip end facilities for cyclists, the respondents considered safe, secure and convenient cycle parking facilities to be the most important, although they also mentioned showers, lockers and drying facilities. This could also be extended to accessing schools by cycling.

Other proposals that were raised by only one participant were: to locate indoors sport facilities in Hebden Bridge as its inhabitants now have to move to Mytholmroyd or Todmorden to do so (Olivia, Hebden Bridge); and to replicate the global policy of having monthly Sunday car-free areas in towns for its citizens to enjoy walking, cycling or skating (Oliver, Halifax).

5.3.4 Findings

The key finding in the discussion of the third research question about what measures might be effective to promote and improve accessibility by active modes in the valley are the following:

- The interviewees consider the City Connect Scheme and the Calderdale Cycling Strategy, two initiatives currently being implemented by the administrations in Calderdale, could be very effective to promote cycling in the valley. However, they must be properly implemented. A lack of pedestrian-focused initiatives has been detected, despite walking being the main active mode used in the valley.
- In addition to these two initiatives, the respondents proposed what they considered to be the six most effective measures to promote and improve active travel accessibility in the valley. The first is the provision of safe active travel infrastructure. The improvements in the Rochdale Canal (included in the City Connect Scheme), but also in roads and urban zones, are seen to be essential in this sense.
- The promotion of intermodal travel is the second measure suggested given its potential, as mentioned earlier. Coordination of public transport schedules, the improvement of intermodality facilities, and the connection of safe active travel infrastructure with the stations are the three specific actions suggested in this sense.
- The third key suggested measure is health-focused awareness campaigns. In the opinion of respondents, the benefit provided by active travel for individual and community health is the most convincing argument to achieve the modal shift.
- And finally, other relevant policy measures mentioned were a wider availability of e-bikes/folding bikes, parking measures to discourage car use and improve public space and road safety, as well as providing facilities and incentives to commute by active modes.

6. CONCLUSIONS AND FURTHER WORK

6.1 SUMMARY OF FINDINGS

The aims of this study were (1) to analyse active travel accessibility in the UCV and (2) research policy measures to increase it; and both have been achieved by answering the three research questions. A summary of the answers to the research questions with the main findings are exposed as follows:

6.1.1 How capable are people in the Upper Calder Valley of accessing key services by active modes?

According to the AMA indicator the capability of accessing key services in the UCV by active modes is two and a half times lower than that of Calderdale overall. This is due to a combination of a greater distance to key services (more than twice the average in Calderdale) and a reduced average daily distance that people are able to travel by active modes (mainly due to its steep topography). However, this capability should be slightly higher particularly for those who live in the valley bottom, as the flat infrastructure in that part of the valley makes it easier for them to reach key services.

Certain differences in capability levels have been detected in urban areas. Sowerby, followed by Luddenden Foot and Mytholmroyd, are the settlements with the highest levels, while Hebden Bridge and Todmorden are the ones with the lowest. This finding could help to determine and prioritise area-based accessibility policies.

A map created upon the proposal of the interviewees has demonstrated that over 50% of the UCV population can reach railway stations by active modes. This shows great potential for promoting intermodality to increase capability in the valley

6.1.2 What are the main barriers to walking and cycling in the valley?

The interviewees have identified eight main barriers to walking and cycling in the valley. The first is fear of motorised traffic caused mainly by the lack of traffic-free route choices and the lack of priority for active modes in urban areas. The second one is hilliness, not such an issue for people living in the valley bottom, but decisive for those living in the valley sides

and top-moor areas. The third barrier is the lack of facilities to carry out intermodal trips. This barrier is highly connected with the fourth: greater distances to work. Other constraints that were discussed less but also important are: the seasonal factor, a certain cultural or attitudinal barrier, a lack of facilities for cycling in workplaces and schools, and lack of political will.

6.1.3 What measures might be effective to promote and improve active travel accessibility in the valley?

The interviewees consider that the City Connect Scheme and the Calderdale Cycling Strategy, two initiatives currently being implemented by the administrations in Calderdale, could be effective to promote cycling in the valley. However, they must be properly implemented. A lack of initiatives for pedestrians has been detected, despite walking being the main active mode in the area. In addition to these two initiatives, the respondents proposed what they considered to be the six most efficient measures to promote and improve active travel accessibility in the valley. The first is the provision of safe active travel infrastructure. The improvements in the Rochdale Canal (included in the City Connect Scheme), but also in roads and urban zones, are seen to be essential in this sense. Promotion of intermodal travel is the second measure suggested given its potential, as mentioned earlier. The third is health-based awareness campaigns – the most convincing argument to achieve the modal shift according to the respondents. Other measures mentioned are wider availability of e-bikes/folding bikes, parking measures to discourage car use, and the provision of facilities and incentives to commute by active modes.

6.2 METHODOLOGICAL CONTRIBUTIONS

Original methodological contributions were made while undertaking this study.

To answer the first research question, an innovative indicator, the AMA indicator, (calculated with data from the novel IPC model and from the DfT) was firstly used to measure the capability of people to access key services by active modes. Secondly, the outcome of this indicator was triangulated with the interviewees' interpretation and observations. This exercise of linking methods helped to obtain a more accurate picture of

the real situation and avoid simplifying assumptions made by the indicator. Finally, the map created in this section about active travel accessibility to railway stations (calculated with data from the IPC model and using the QGIS Road Graph Plugin tool) is also an original method to analyse active travel accessibility to public transport.

To answer the second and third research questions, qualitative methods were combined. This research was mainly based on interviewing participants with in-depth knowledge of the area and field of study; and the result was a participative reflective analysis on barriers and policies to improve active travel accessibility in the area.

6.3 POTENTIAL FOR POLICY IMPACT

The findings of this study are expected to foster a greater understanding of active travel accessibility among policymakers of the UCV to help them in future decision-making.

With the findings of this study, UCV policymakers obtain a measure of the population's capability to access key services by active modes, as well as an analysis of the main barriers to walking and cycling, raising awareness of the scale of the problem. Finally, the findings on effective policies to improve active travel accessibility can help them to implement possible solutions.

This potential for policy impact can be transferred to other areas of England. The method would be particularly efficient for areas like the UCV, where specific factors can limit people's capacity to walk or cycle. Triangulating the indicator with local knowledge is always advisable to avoid simplifying assumptions and obtain a more reliable result. The combination of qualitative methods to analyse barriers and improvement policies is also perfectly transferable.

6.4 PROBLEMS AND LIMITATIONS

A number of problems have been identified related to the availability of data:

- There were difficulties to find pedestrian representatives. There are organisations at national level such as Living Streets and Ramblers, but they did not have any representatives in the UCV. Only one out of four of the group representatives interviewed spoke on behalf of pedestrians. This leads to a lack of pressure to demand improvements in the area. In contrary to cyclists who are well organised in this respect.
- There is a lack of data to analyse the current usage of active modes. The only data available is the 2011 census so it is out-of-date, it only contemplates the journey to work, and only the longest leg in multi-leg journeys. This last fact particularly underestimates walking and cycling usage because they are usually shorter legs in this kind of journeys.
- There were difficulties delimiting the boundaries of the study area. The UCV is not an official administrative area and online information was very limited. The source of the boundary used is a Calderdale Council website[7] although it seems there are other possible delimitations as one of the interviewees suggested.

Apart from the limitations of the quantitative data seen in section 5.1.2.3, a limitation of the qualitative data has been identified. The fact that all interviewees were committed cyclists and pedestrians gives only one point of view of the situation. The inclusion of potential and recreational walkers and cyclists, and non-walkers and non-cyclists would have widened the perspective and help to better determine what would encourage them to use active modes more often (Pooley, C. 2011, p.19). Unfortunately, this was considered once the interviews were completed and time constraints did not allow for more interviews.

[7] https://www.calderdale.gov.uk/v2/residents/schools-and-children/parental-support/early-intervention-support,

6.5 FURTHER WORK

During the writing process of this study many ideas that could have improved and expanded the understanding of its aims emerged, but the three-month time restriction made it unfeasible. Some of the ideas or work that could be undertaken to go further with this research are described below.

6.5.1 Indicate priority areas for the implementation of accessibility policies

The maps generated in this study could be used to indicate priority areas for the implementation of accessibility policies. For example, if we had to prioritise, policies to increase people's capability to walk and cycle, such as promoting e-bikes or intermodal trips, are more necessary in Todmorden and Hebden Bridge, where the AMA indicator is lower, than in Mytholmroyd, Luddenden Foot or Sowerby, where it is higher.

6.5.2 Expand the analysis of accessibility to public transport

The analysis of accessibility to public transport undertaken in section 5.1.3.2 only focused on rail transport. To improve it the buses' network should be included, analysing at least the main interurban bus lines that can reach important poles of influences within, for example, 30 minutes (as Jack from Hebden Bridge proposed).

6.5.3 Analyse accessibility by type of facility and/or social group

Aggregate analysis can be problematic because people may be less willing to walk to one service/activity than another, or certain social groups may have more barriers than others. Analysing accessibility according to the type of facility and social group would enrich the study. For example the proportion of children who can get to school by active modes or the proportion of elderly people who could get to their GP on foot could be analysed. An accessibility analysis was intended for each of the services, but there was insufficient time to carry out such in-depth work (see appendix 3).

6.5.4 Expand the study to other services or activities

The study made the assumption that there are eight services or activities that might need to be 'accessed'. However, to effectively participate in society other kind of services or activities probably need to be accessed. The expansion of the range of services or activities would be another enriching line to pursue.

6.5.5 Analyse each active mode separately and in more depth

It is considered that although walking and cycling are modes of transport with many similarities, they are activities with specific particularities: more people can walk than cycle (Pooley, C. et al, 2011, p.1606), they can be influenced by different factors (Pikora, T. et al, 2003, p.1701), different solutions can be necessary, etc. Consequently, a separate analysis of each of them would be relevant.

6.5.6 Assess measures to increase capability carried out in past

Finally, further work should be done to find out why some initiatives to increase capability by active modes such as the Go & Bike Scheme or the We:cyle Project were not successful or less successful than expected. This assessment would help to improve the implementation of future policy measures.

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LIST OF REFERENCES

Ahlport, K.N., Linnan, L., Vaughn, A., Evenson, K.R. and Ward, D.S., 2008. Barriers to and facilitators of walking and bicycling to school: formative results from the non-motorized travel study. Health Education & Behavior, 35(2), pp.221-244.

Altrichter, H., Feldman, A., Posch, P. & Somekh, B. (2008). Teachers investigate their work; An introduction to action research across the professions. Routledge. P. 147. (2nd edition).

Amer, S. [no date] Common accessibility measures. Geohealth. University of Twente. [Online] [Accessed 01 August 2017]. Available from: https://www.futurelearn.com/courses/geohealth/0/steps/19272

Buehler, R. and Hamre, A., 2015. The multimodal majority? Driving, walking, cycling, and public transportation use among American adults. Transportation, 42(6), pp.1081-1101.

Buehler, R. and Pucher, J., 2011. Sustainable transport in Freiburg: lessons from Germany's environmental capital. International Journal of Sustainable Transportation, 5(1), pp.43-70.

Buehler, R. and Pucher, J., 2012. Cycling to work in 90 large American cities: new evidence on the role of bike paths and lanes. Transportation, 39(2), pp.409-432.

Cairns, S., Behrendt, F., Raffo, D., Beaumont, C. and Kiefer, C., 2017. Electrically-assisted bikes: Potential impacts on travel behaviour. Transportation Research Part A: Policy and Practice, 103, pp.327-342.

Calderdale Council. 2016. Calderdale Transport Strategy 2016-2031.

Calderdale Council. 2017. Statistics and information. [Online]. [Accessed 01 August 2017]. https://www.calderdale.gov.uk/v2/council/data-and-information/statistics-and-information

Calderdale MBC, 2017. Draft Calderdale Cycling Strategy 2016-2031.

Carse, A., Goodman, A., Mackett, R.L., Panter, J. and Ogilvie, D., 2013. The factors influencing car use in a cycle-friendly city: the case of Cambridge. Journal of transport geography, 28, pp.67-74.

City Connect 2017. City Connect. West Yorkshire Combined Authority [Online] [Accessed 12 August 2017]. Available from: https://cyclecityconnect.co.uk/about/

Department for Transport. 2006. Accessibility planning guidance. Full guidance. [Online] [Accessed 01 August 2017]. Available from: file:///C:/Users/ts16evt/Downloads/LowRiskObservationProtocol.pdf

Farrington, J. and Farrington, C., 2005. Rural accessibility, social inclusion and social justice: towards conceptualisation. Journal of Transport geography, 13(1), pp.1-12.

Farrington, J.H., 2007. The new narrative of accessibility: its potential contribution to discourses in (transport) geography. Journal of Transport Geography, 15(5), pp.319-330.

Gillham, B. 2000. The research interview.

Gojanovic, B., Welker, J., Iglesias, K., Daucourt, C. and Gremion, G., 2011. Electric bicycles as a new active transportation modality to promote health. Medicine & Science in Sports & Exercise, 43(11), pp.2204-2010.

Groot, R. 2007. *Design manual for bicycle traffic*. Ede: CROW.

Handy, S., 2005. Planning for accessibility: In theory and in practice. In Access to destinations (pp. 131-147). Emerald Group Publishing Limited.

Handy, S., van Wee, B., Kroesen, M., 2014. Promoting Cycling for Transport: Research Needs and Challenges. Transp. Rev. 34, 4–24. Doi:10.1080/01441647.2013.860204

Hansen, W.G., 1959. How accessibility shapes land use. Journal of the American Institute of planners, 25(2), pp.73-76.

Heinen, E., van Wee, B., Maat, K., 2010. Commuting by Bicycle: An Overview of the Literature. Transp. Rev. 30, 59–96. Doi:10.1080/01441640903187001

Horton, D. 2007. Fear of Cycling. Cycling and Society. ASHGATE.

Jennings, B. 1992. Pennine Valley: History of Upper Calderdale Dalesman Publishing Co Ltd.

Jones, T., 2012. Getting the British back on bicycles—The effects of urban traffic-free paths on everyday cycling. Transport Policy, 20, pp.138-149.

King, N. and Horrocks, C. 2010. Interviews in qualitative research. Sage Publications Inc.

Kusenbach, M., 2003. Street phenomenology: The go-along as ethnographic research tool. Ethnography, 4(3), pp.455-485.

Litman, T., 2015. Evaluating accessibility for transportation planning. Victoria Transport Policy Institute, Victoria, Canada.

Lockett, D., Willis, A. and Edwards, N., 2005. Through seniors' eyes: an exploratory qualitative study to identify environmental barriers to and facilitators of walking. CJNR (Canadian Journal of Nursing Research), 37(3), pp.48-65.

Lucas, K., 2012. Transport and social exclusion: Where are we now?. Transport policy, 20, pp.105-113.

Marquet, O. and Miralles-Guasch, C., 2015. Neighbourhood vitality and physical activity among the elderly: The role of walkable environments on active ageing in Barcelona, Spain. Social Science & Medicine, 135, pp.24-30.

Martin, S. 2004. Centers for Disease Control and Prevention, 2005. Barriers to children walking to or from school--United States, 2004. MMWR: Morbidity and mortality weekly report, 54(38), pp.949-952.

Moritz, W., 1998. Adult bicyclists in the United States: characteristics and riding experience in 1996. Transportation Research Record: Journal of the Transportation Research Board, (1636), pp.1-7.

Mullen, C. 2017. Research ethics in transport research. TRAN5911M Transport Dissertation [PowerPoint presentations]. Institute for Transport Studies. University of Leeds.

Napier, M.A., Brown, B.B., Werner, C.M. and Gallimore, J., 2011. Walking to school: Community design and child and parent barriers. Journal of Environmental Psychology, 31(1), pp.45-51.

Oja, P., Vuori, I. and Paronen, O., 1998. Daily walking and cycling to work: their utility as health-enhancing physical activity. Patient education and counseling, 33, pp.S87-S94.

Parkin, J., Ryley, T. and Jones, T., 2007. Barriers to cycling: an exploration of quantitative analyses. Cycling and society, pp.67-82.

Parkin, J., Wardman, M. and Page, M., 2008. Estimation of the determinants of bicycle mode share for the journey to work using census data. Transportation, 35(1), pp.93-109.

Philips, I. 2014b. The potential role of walking and cycling to increase resilience of transport systems to future external shocks (Creating an indicator of who could get to work by walking and cycling if there was no fuel for motorised transport)(phd). University of Leeds.

Philips, I., 2016. Measures of Accessibility for Sustainable Spatial Planning and Analysis. TRAN5115 Sustainable Spatial Planning Analysis [PowerPoint presentations]. Week 18, Institute for Transport Studies. University of Leeds.

Philips, I., Watling, D. and Timms, P., 2014, November. Improving estimates of capacity of populations to make journeys by walking and cycling: An individual modelling process applied to whole populations using spatial microsimulation. Leeds.

Pikora, T., Giles-Corti, B., Bull, F., Jamrozik, K. and Donovan, R., 2003. Developing a framework for assessment of the environmental determinants of walking and cycling. Social science & medicine, 56(8), pp.1693-1703.

Pooley, C., Tight, M., Jones, T., Horton, D., Scheldeman, G., Mullen, C., Chisholm, A., Stranto, E., Constantine, S., 2011. Understanding Walking and Cycling Summary of Key Findings and Recommendations. Universities of Lancaster, Leeds.

Pooley, C.G., Horton, D., Scheldeman, G., Tight, M., Jones, T., Chisholm, A., Harwatt, H. and Jopson, A., 2011b. Household decision-making for everyday travel: a case study of walking and cycling in Lancaster (UK). Journal of Transport Geography, 19(6), pp.1601-1607.

Pucher, J. and Buehler, R., 2008. Making cycling irresistible: lessons from the Netherlands, Denmark and Germany. Transport reviews, 28(4), pp.495-528.

Pucher, J., Buehler, R., Bassett, D.R. and Dannenberg, A.L., 2010. Walking and cycling to health: a comparative analysis of city, state, and international data. American journal of public health, 100(10), pp.1986-1992.

Rietveld, P. and Daniel, V., 2004. Determinants of bicycle use: do municipal policies matter?. Transportation Research Part A: Policy and Practice, 38(7), pp.531-550.

Rodríguez, D.A. and Joo, J., 2004. The relationship between non-motorized mode choice and the local physical environment. Transportation Research Part D: Transport and Environment, 9(2), pp.151-173.

Saelens, B.E., Sallis, J.F. and Frank, L.D., 2003. Environmental correlates of walking and cycling: findings from the transportation, urban design, and planning literatures. Annals of 56ehavioural medicine, 25(2), pp.80-91.

Salmon, J., Salmon, L., Crawford, D.A., Hume, C. and Timperio, A., 2007. Associations among individual, social, and environmental barriers and children's walking or cycling to school. American Journal of Health Promotion, 22(2), pp.107-113.

Seattle Bicycle Master Plan (SBMP) Update. 2013. Best Practices White Paper #3: Bicycling Solutions for Hilly Cities. February 2013.

Thompson, J & Partners, 2003. Upper Calder Valley Renaissance. Weaving it all together.

Unit, S.E., 2003. Making the connections: final report on transport and social exclusion: summary. [Online] [Accessed 01 August 2017]. Available from: http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_policy/---invest/documents/publication/wcms_asist_8210.pdf

Univ. Leeds Research Ethics. 2016. Low Risk Observation Protocol. Version 1.3. Last updated 23/09/16. [Online] [Accessed 01 August 2017]. Available from: file:///C:/Users/ts16evt/Downloads/LowRiskObservationProtocol.pdf

Wardman, M., Tight, M. and Page, M., 2007. Factors influencing the propensity to cycle to work. Transportation Research Part A: Policy and Practice, 41(4), pp.339-350.

Woodcock, J., Edwards, P., Tonne, C., Armstrong, B.G., Ashiru, O., Banister, D., Beevers, S., Chalabi, Z., Chowdhury, Z., Cohen, A. and Franco, O.H., 2009. Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport. The Lancet, 374(9705), pp.1930-1943.

LIST OF ABBREVIATIONS

Abbreviation	Term
AMA	Active Modes Accessibility indicator
DfT	Department for Transport (UK)
IPC	Individual Physical Capability
NCN	National Cycle Network
OA	Output Area
UCV	The Upper Calder Valley
WPL	Workplace Parking Levy
WYCA	West Yorkshire Combined Authority

APPENDIX 1: PARTICIPANTS' INFORMATION SHEET

Institute for Transport Studies

FACULTY OF ENVIRONMENT

UNIVERSITY OF LEEDS

Participant Information Sheet "Walking and cycling in the Upper Calder Valley" dissertation

You have been invited to take part in an interview as part of a research project carried out by Eugeni Vidal A MSc Transport Planning candidate at the University of Leeds. Please take time to read the following information carefully and decide whether or not you wish to take part. Please ask if there is anything that is not clear or if you would like more information.

The objectives of the project are to understand barriers of walking and cycling in the Upper Calder Valley and investigate policies to promote active modes. By taking part in this interview you will be making a valuable contribution to the research dissertation.

The interview would take around an hour and will be arranged at a time and location that suits you. With your consent I will be making an audio recording of our conversation which will be used for reference purposes.

The information that you provide will be anonymised and stored in accordance with the University's policy on data protection. In order to do that, personal details such as your name, job, tittle and contact will be stored securely and kept separate from the interview transcripts. Information such as names and other details which might identify you from the transcripts will not be recorded, instead pseudonyms will be used. This will allow data to be used in the research project, while taking care to ensure that you are identifiable. Nevertheless, for research involving people in a professional capacity, there can sometimes be a possibility that you might be identifiable because of the details of your insights and knowledge. If you have concerns about this at any point, I am happy to discuss this and to find ways to further mitigate risks of identification (e.g. by removing quotes, or by further generalisations). The transcripts will be stored securely at the University.

It is a completely up to you to decide whether or not to take part in this research. If you agree to take part now, you can change your mind at any point. You can ask for the data we have collected from you to be removed from the project at any point up until we begin to analyse it. If you do change your mind about taking part, you do not have to give any reason.

If you would like any further information or have any question now or later, please do not hesitate to get in touch.

Walking and cycling in the Upper Calder Valley	*Participant consent form*	*Version 1*	*16/05/17*

APPENDIX 2: PARTICIPANTS' CONSENT FORM

Institute for Transport Studies

FACULTY OF ENVIRONMENT

UNIVERSITY OF LEEDS

Consent to take part in the transport dissertation "Walking and cycling in The Upper Calder Valley"	Add your initials next to the statement if you agree
I confirm that I have read and understand the information sheet dated [/ /] explaining the above research project and I have had the opportunity to ask questions about the project.	
I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline. I am entitle to request the destruction of the data provided in case of withdrawal.	
I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports, papers or presentations that result from the research. I understand that my responses will be kept strictly confidential.	
I agree for the data collected from me to be stored and used in reports, papers and presentations that result from research.	
I understand that relevant sections of the data collected during the study, may be looked at by auditors from the University of Leeds where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records.	
I agree to take part in the above research project and will inform the lead researcher should my contact details change during the project and, if necessary, afterwards.	

Name of participant	
Participant's signature	
Date	
Name of lead researcher	
Signature	
Date*	

*To be signed and dated in the presence of the participant.
Once this has been signed by all parties the participant should receive a copy of the signed and dated participant consent form, the letter/ pre-written script/ information sheet and any other written information provided to the participants. A copy of the signed and dated consent form should be kept with the project's main documents which must be kept in a secure location.

APPENDIX 3: EXTRA MAPS AND GRAPHS

All these extra figures were created during the process of undertaking this research project. Some of them were used in the interviews, others were dismissed because they did not bring any new relevant information, or simply because it was thought that they could create more confusion rather than clarity in the discussion.

This is an approximation of the UCV active modes network. Notice that the Calderdale Way, the Pennine Way, the Nature Reserves and some other footpaths are not included.

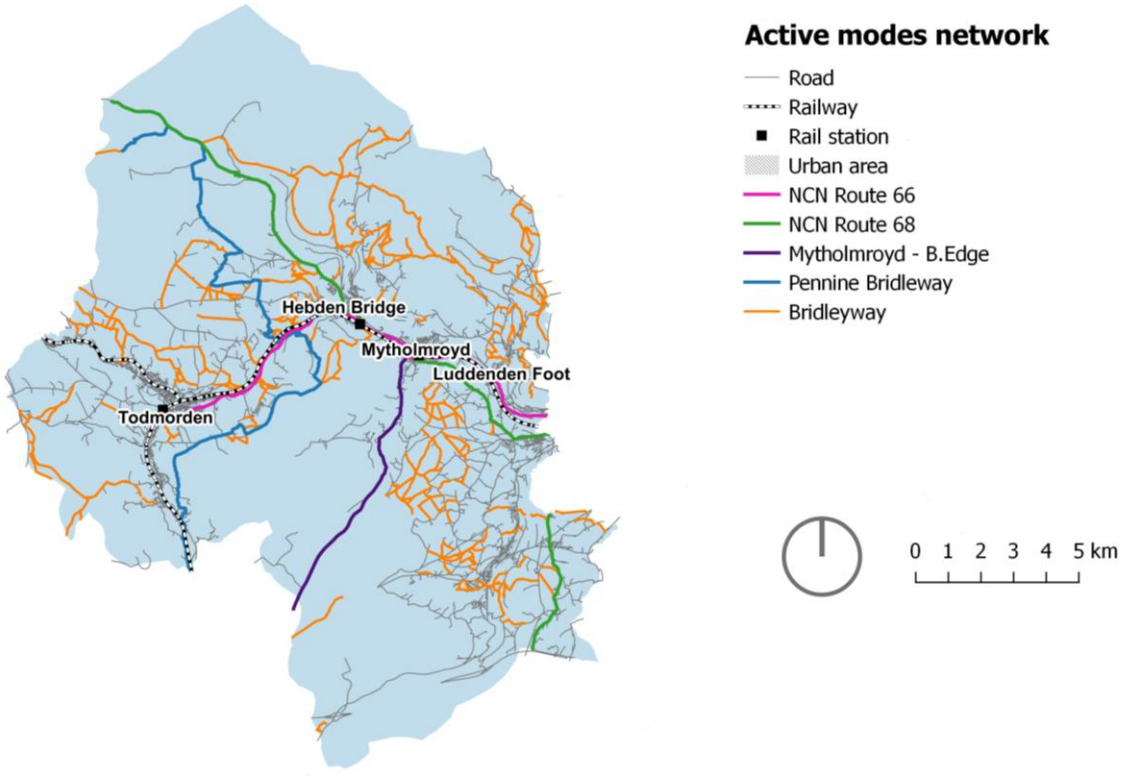


Figure 1 (Appendix 3) Active modes network
Source: Prepared by the author based on information provided by the Calderdale Council

This map shows the AMA indicator calculated only for pedestrians, or in other words the AMA indicator in the event nobody had access to bicycles.

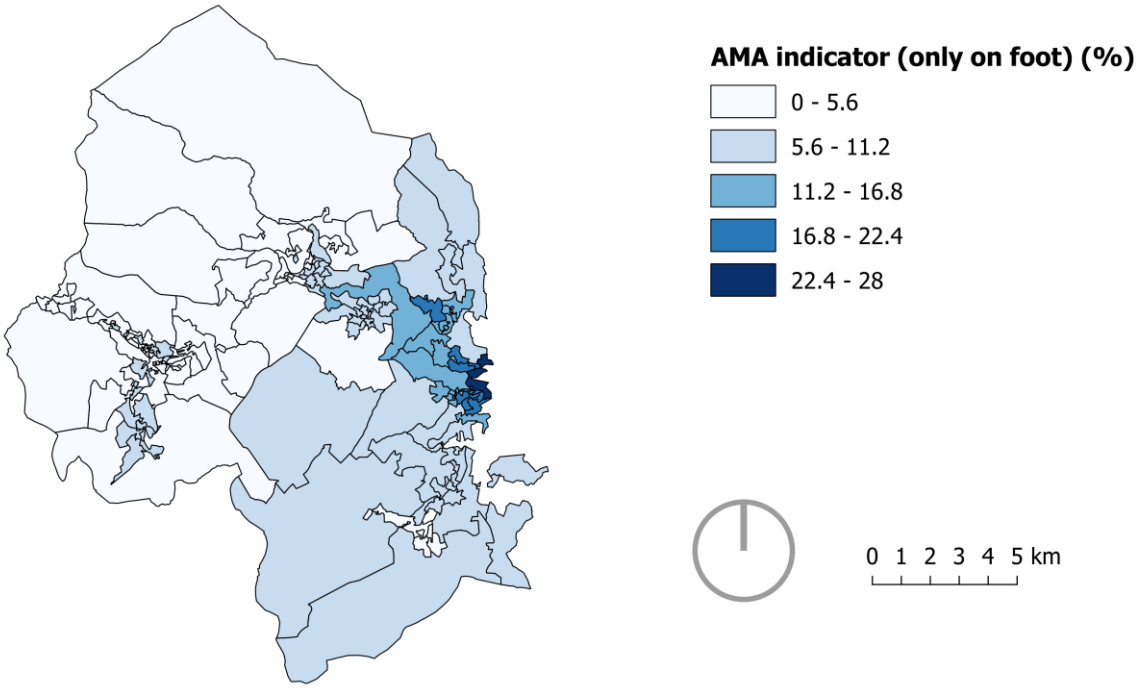


Figure 2 (Appendix 3) AMA indicator (only on foot)
Source: Prepared by the author based on IPC model and DfT data

These maps were created with the intention of analysing the AMA indicator according to the type of service or activity accessed. Ultimately they were not used in the spatial analysis of the study, as there was insufficient time to carry out such an in-depth analysis. In addition it was considered that the disaggregated data were probably less robust than the aggregated data.

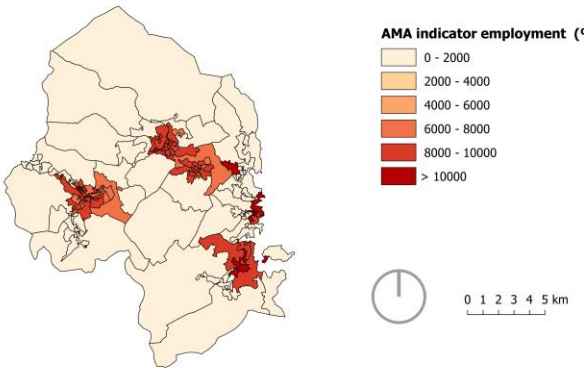


Figure 3 (Appendix 3) AMA indicator employment
Source: Prepared by the author based on IPC model and DfT data

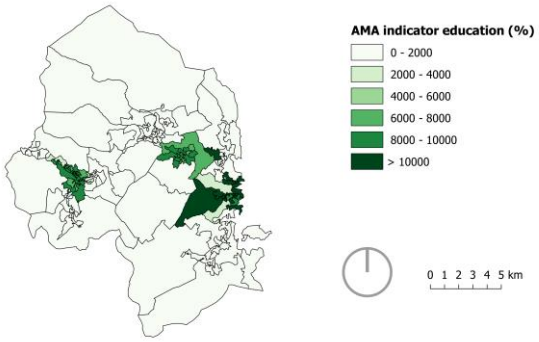


Figure 4 (Appendix 3) AMA indicator education
Source: Prepared by the author based on IPC model and DfT data

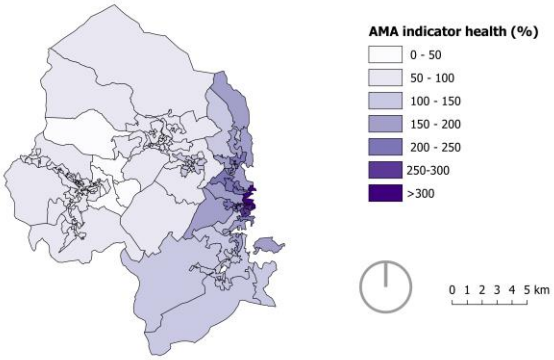


Figure 5 (Appendix 3) AMA indicator health
Source: Prepared by the author based on IPC model and DfT data

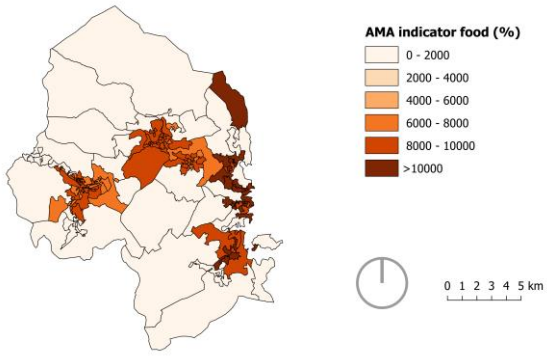
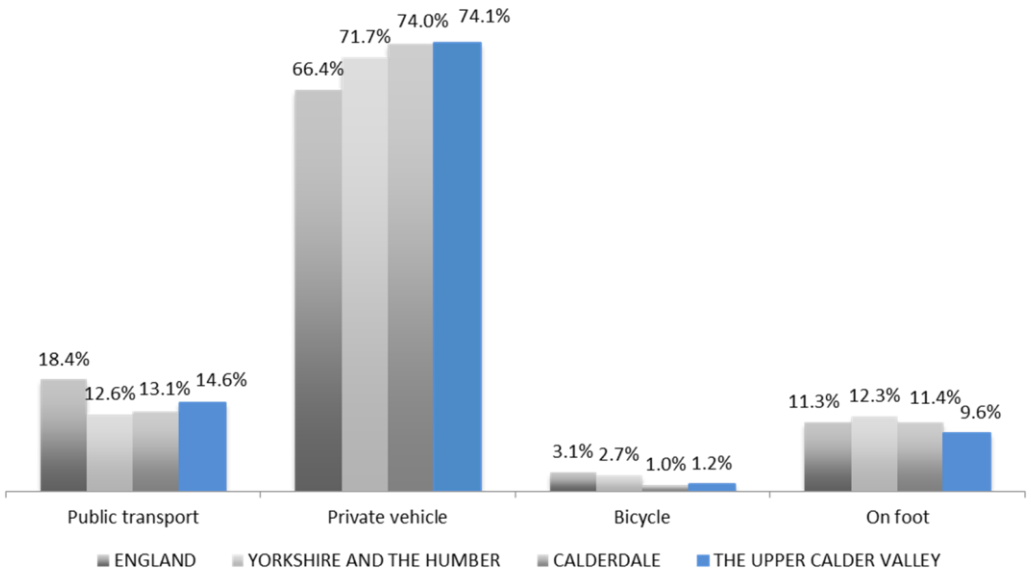


Figure 6 (Appendix 3) AMA indicator food
Source: Prepared by the author based on IPC model and DfT data

Method of travel in the UCV, Calderdale, West Yorkshire and England comparison (2011 census).



Distance travelled to work in the UCV, Calderdale, West Yorkshire and England comparison (2011 census).