International Transport Forum

Economic Benefits of Improving Transport Accessibility

Roundtable Report

OECD

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The International Transport Forum

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International Transport Forum
2, rue André Pascal
F-75775 Paris Cedex 16
contact@itf-oecd.org
www.itf-oecd.org

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Factors such as age, disability, and to a different extent travelling with young children or with heavy luggage, are a barrier to people's mobility and, in turn, their ability to access jobs, services, and other activities. Therefore a key objective of transport policy, planning and regulation should be to guarantee and enhance the accessibility of transport systems to all passengers, including those who are mobility-impaired and encumbered. However, the lack of a common framework to value the economic benefits of accessibility still constitutes a barrier to investment and regulatory decisions in this field. Therefore it is necessary to improve understanding of how accessibility benefits should be defined, quantified and incorporated in a consistent valuation framework. In March 2016, the International Transport Forum convened a roundtable discussion at the OECD headquarters in Paris. Participants from national and local administrations, research and academia, specialist consultants, as well as longstanding advocates of accessibility for all, brought their expertise and ideas to the roundtable.

What we found

The economic benefits of improved accessibility are often overlooked and almost always not explicitly valued in traditional transport appraisal and evaluation practices. While costs are often known, benefits are not clearly defined, quantified and documented. The lack of an economic appraisal framework makes prioritisation of accessibility improvements difficult and ad-hoc, and the cost of inaction often goes unaccounted. Decision-makers might also struggle to recognise that investment in accessible transport is beneficial to a large section of the population, and not just to those that are mobility-impaired at the time when investment decisions are made.

The rare examples of economic valuations undertaken to date demonstrate that the magnitude of potential benefits from improved accessibility is often large enough to offset the costs. This is the case across a variety of techniques used, ranging from conventional welfare benefits to the inclusion of cross-sector impacts (e.g. reduced health and social care costs) and broader economic impacts (e.g. increased participation to economic activities).

Nonetheless, both practical and methodological difficulties need to be addressed before a consistent framework for the appraisal of accessibility benefits can be developed and accepted widely. These include: understanding who benefits from accessibility improvements, and in which ways; the extent to which conventional appraisal methodologies are fit for purpose in this area, and; how emerging research from sectors other than transport can be integrated to ensure that cross-sector impacts are recognised.

What we recommend

Ex-post case studies of accessibility improvements can provide evidence on impacts

The current evidence base on the valuation of accessibility benefits needs to be widened by carrying out more analyses of impacts in places where accessibility has been improved. In order to do so, some key elements are: data availability (to a minimum on actual and unmet travel demand, and journey times, before and after the implementation of the accessibility measure); the ability to identify the discrete effects of accessible transport as opposed to other interventions which may be confounding factors, and; a clear identification of beneficiaries.

A large, ex-ante assessment of proposed measures to improve accessibility can shed light on the practical application of different methodologies

In a similar fashion to the work carried out on the benefits of "Tourism for all" by the European Commission in 2012, an international team of experts could be gathered with the goal of exploring different benefit estimation techniques and providing reference values for future work. Furthermore, this work could feed into the compilation of a 'manual case study' for benefits estimation. The accessibility intervention assessed could relate either to regulatory or investment measures. The techniques employed should reflect the diversity of approaches available, starting with a narrower focus (standard Cost Benefit Analysis [CBA]/ Economic Impact Assessment [EIA]) and progressively widening this scope to include disaggregated impacts, wider impacts and new methodological approaches

Accessibility research should be explicitly integrated with health and wellbeing research

Accessible transport contributes to broader objectives to do with health and wellbeing, however these benefits sit largely outside of those traditionally accounted for in transport project appraisal. The cross-sector links are broad, ranging from emerging evidence that links health benefits to active transport modes, and the importance of having access to healthcare and social support facilities. Examples of potential integration include the assessment of Quality Adjusted Life-Year (QALY) impacts from improved accessibility to public transport. Greater collaborative research efforts across sectors can strengthen the case for investment in accessibility.

Policy implications

Progress in this field relies on policy makers and regulators appropriately supporting research efforts to consolidate knowledge and provide case studies for different accessibility measures. This will involve not just providing the research funding needed, but also being open to incorporating findings in national appraisal frameworks and to recognising the cross-sector nature of these types of transport interventions. The inclusion of accessibility considerations in a consistent appraisal framework will support efforts by policy-makers as well as transport providers in enhancing accessibility for all.

Chapter 1
Summary and conclusions

Lorenzo Casullo
International Transport Forum, Paris, France

This chapter covers the key issues around the identification and estimation of economic benefits of improved accessibility to transport systems. Despite the increased codification of accessibility as a right in national and international laws, the lack of a common framework to value the importance of accessibility to a large proportion of people can act as a break on investment and regulatory decisions that promote better accessibility. Progress in this field can be promoted both by applying conventional transport analysis techniques to the estimation of accessibility benefits, and by strengthening cross-sector research efforts that capture the wide-ranging impacts of better accessibility.

Introduction

Background

Factors such as age, disability and sometimes travelling with young children or heavy luggage, have a detrimental effect on the ability of people to access public transport systems. Inaccessible transport is a barrier to mobility and its associated benefits. When a trip is foregone because of the limitations in accessing a bus, a station, or an airplane, the consequence is potentially the loss of access to services, jobs, or social interactions.

Global instruments and national laws that recognise the importance of accessible transport have been introduced over the past two decades. Notably at the international level, the United Nations Convention on the Rights of Persons with Disabilities (CRPD) signed by more than 150 countries and adopted by the U.N. General Assembly in December 2006, addresses the issue of affordable and accessible mobility for disabled persons. Some of the national laws include the 'Americans with Disabilities Act of 1990' in the United States, and the 'Loi n° 2005-102 pour l'égalité des droits et des chances, la participation et la citoyenneté des personnes handicapées' in France.

The European Union has also been active in this field with a range of Directives and Regulations aimed at achieving common access standards for vehicles (buses and trains) and at embedding the concept of passenger rights (across all modes).

In many ITF/OECD countries, legislators and governments have explicitly enshrined accessibility as a right and a legal requirement and have thus made it a key objective of transport policy; but progress in this field is slow and the implementation of accessibility-enhancing measures is constrained by a number of barriers. These include competing demands for investment and an unclear understanding of the economic benefits of improved accessibility. While costs are often known, benefits are not clearly defined, quantified and documented. The lack of an economic appraisal framework makes prioritisation of accessibility improvements difficult and ad-hoc.

The Roundtable on the economic benefits of improved accessibility to transport systems was organised to better identify, measure and quantify the benefits of accessible transport with all of their ramifications. By improving understanding of these benefits, better investment decisions can be made in this area of transport policy. The inclusion of accessibility considerations in a consistent appraisal framework can help policy-makers and transport providers improve outcomes by highlighting both the positive effects of making improvements and the costs of inaction.

Following a discussion of the rationale for advancing research in this area, the main objectives of this report are the following:

- To identify the main types of benefits arising from improving accessibility, and their respective beneficiaries;
- To set out approaches to measuring and valuing these benefits;
- To provide a framework for properly incorporating these benefits into decision-making; and
- To identify areas where further research is recommended, given the limited evidence available to date.

Scope

At the outset, it is necessary to clarify a number of concepts: accessibility, transport systems, and economic benefits.

First, the focus is on improving accessibility as a way to cater for a proportion of transport users (actual and potential) whose access is impaired by physical and intellectual factors – sometimes termed 'passengers with special needs' or 'passengers with reduced mobility'. A useful working definition is provided by European Union Directive 85/2001/EC (Article 2.21) on technical requirements of bus and coach vehicles:

> " 'Passenger with reduced mobility' means all people who have difficulty when using public transport, such as disabled people (including people with sensory and intellectual impairments, and wheelchair users), people with limb impairments, people of small stature, people with heavy luggage, elderly people, pregnant women, people with shopping trolleys, and people with children (including children seated in pushchairs) "

A similar definition is provided by European Union Regulation EC 1107/2006 (Article 2) on air passenger rights:

> "'Disabled person' or 'person with reduced mobility' means any person whose mobility when using transport is reduced due to any physical disability (sensory or locomotor, permanent or temporary), intellectual disability or impairment, or any other cause of disability, or age, and whose situation needs appropriate attention and the adaptation to his or her particular needs of the service made available to all passengers"

Both definitions relate to the notion of reduced mobility and to impairments that make specific access measures necessary.

At the same time as those officially defined as people with reduced mobility, a broader range of people benefit from improvements to accessibility, including people travelling with small children or with heavy or voluminous items of luggage and pregnant women and older people with reduced (rather than severely impaired) mobility. We define these people as encumbered passengers, for whom accessibility improvements also yield significant benefits.

The term 'improved accessibility' refers to interventions of two types: either an improvement that results in greater access to transport vehicles, or; an improvement that improves access to destinations, increases participation and generates new trips. Examples are given throughout the Report, and range from introducing low-floor accessible buses, building accessible rail stations, and improving road crossings for pedestrians.

During the course of the Roundtable, we incorporated within 'accessibility improvements' the concept of Universal Design for transport systems, as defined among other authorities by the Norwegian Road Authority (Odeck et al. 2010) among other authorities:

"'Universal Design' refers to the design of infrastructure, transportation systems or their surroundings to accommodate the widest range of potential users regardless of their impairments or special needs"

This calls for the main design or intervention of a vehicle, building, etc. to accommodate the widest range of potential users. From a UD perspective, a holistic approach to accessibility shall be prioritised rather than ad-hoc retrofitting of existing structures.

The definitions of 'economic benefits' adopted in our report follow those used in standard methodologies and frameworks for assessing transport infrastructure investment and changes in policy. In many ITF/OECD countries it is common practice to value the direct welfare benefits for transport

users resulting from marginal improvements such as time savings or additional journeys, together with wider socio-economic impacts, and include them within appraisal frameworks, through:

- Cost-Benefit Analysis (CBA), which assesses the extent to which, over the long-term, a given investment generates social and economic benefits that exceed its costs of construction and operation, and;
- Economic Impact Assessment (EIA), which analyses the macroeconomic impacts of a specific project or regulation and express benefits in terms of GDP, GVA and jobs based on the analysis of demand ramifications throughout the economy.

Assessing the benefits of improved accessibility can take place within existing frameworks, and evidence from different studies was shared at the Roundtable. Other, new methodologies can be viewed along a spectrum that ranges from traditional methods for standard CBA to capability approaches (which are removed from utilitarian welfare analysis). In between these extremes, we find techniques specifically developed to assess the impacts of investment in this area, and others that put forward modifications to the traditional CBA framework.

Lastly, while a wide definition of 'transport systems' can be adopted to identify transport investments which can promote accessibility, discussions in the Roundtable focused on walking, urban public transport, rail and air transport rather than on private vehicle transport by road (bicycles, cars and taxis), and this chapter reflects this.

Structure

This chapter is organised into four main sections in addition to this Introduction.

The first section entitled "The rationale for assessing the benefits of accessibility" spells out the importance of an evidence-based assessment of accessibility measures even where rights-based legislation exists, and despite the challenges surrounding any attempts to quantify the benefits of improved accessibility.

The second section on the "Identification of beneficiaries and benefits" discusses whose benefits should be taken into account, and provides an approach to classifying the categories of benefits of improved accessibility, starting from the existing benefit classification systems used.

The third section on "Measurement and valuation of benefits" brings together a description of the different techniques used so far to value benefits in this area. It also provides an overview of the limited empirical evidence existing to date. Starting from standard CBA and EIA, this section also presents a number of new methodological approaches to collect and process information around the impacts of accessibility measures.

The fourth section provides insights for policy makers and identifies areas where further research could be developed.

The rationale for assessing the benefits of accessibility

A universal right

Global dialogue on accessibility issues under the aegis of the United Nations has led to a major shift in the treatment of accessibility. The formulation of a structured policy framework now comprises the World Programme of Action concerning people with disabilities; the United Nations Standard Rules on the Equalization of Opportunities for Persons with Disabilities; and the Convention on the Rights of Persons with Disabilities (CRPD). These global instruments define accessibility both as a human rights issue and a development concern, and as such accessibility has been included in the post-2015

Sustainable Development Goals not "only a means and a goal of inclusive development but also an enabler of an improved, participative economic and social environment for all members of society" (UN DESA 2015).

The vast majority of the signatories to the Convention have transferred its provisions into national laws. Specifically, Article 20 of the CRPD stipulates that "States Parties shall take effective measures to ensure personal mobility with the greatest possible independence for persons with disabilities, including by:

- Facilitating the personal mobility of persons with disabilities in the manner and at the time of their choice, and at affordable cost;
- Facilitating access by persons with disabilities to quality mobility aids, devices, assistive technologies and forms of life assistance and intermediaries, including by making them available at affordable cost;
- Providing training in mobility skills to persons with disabilities and to specialist staff working with persons with disabilities;
- Encouraging entities that produce mobility aids, devices and assistive technologies to take into account all aspects of mobility for persons with disabilities".

A number of reforms in the European Union (EU) aim to make transport more accessible for people with disabilities, as documented by a recent EU-FRA Report. The German Passenger Transport Act, which entered into force on 1 January 2013, obliges city councils to ensure barrier-free local public transport by January 2022; amendments to the Spanish Act on the 'Regulation of ground transportation' require all vehicles used for passenger transport to meet basic accessibility requirements, with penalties for those who do not comply. The Dutch Regulation on the accessibility of public transport required at least 46% of buses to be accessible for people with disabilities by January 2016. The French Law n°2005-12 mentioned above already introduced the requirement for all public transport services (except metros) to be accessible for disabled and mobility-impaired passengers by 2015. The UK Disability Discrimination Act of 1995 set technical access standards for vehicle construction and end dates by which all vehicles in service must be accessible.

In light of the growing rights-based legal codification of accessibility both at the global and national level, is it at all necessary to concern ourselves with the identification and quantification of economic benefits from improved accessibility? We argue that defining the benefits of accessibility is still necessary, given the limitations of rights-based approaches, and the presence of trade-offs and budget constraints. We address this in the sections below. Persevering with current efforts to map the benefits of different accessibility measures more accurately will also be useful in making choices between alternative solutions to make transport more inclusive.

The limitations of rights-based approaches

In Chapter 2, we discuss some of the limitations of an approach that relies on rights-based guarantees only. The authors point out: "despite the fact that they establish accessibility as a human right, the mandates (i) universally acknowledge costs and (ii) often incorporate cost-benefit balancing as legitimate considerations in their implementation". Table 1.1 summarises the provisions that refer to cost considerations in seven of the legislative instruments analysed by the authors. Hence, there is a risk of over-reliance on rules, with a failure to account for benefits that are high enough to offset the costs.

Table 1.1. **Legislative limits on undue financial burden**

Country / Governing body	Laws/Rule regarding access and prohibiting discrimination on basis of disability	Limits on accommodation requirements
United Nations	Convention on The Rights of Persons with Disabilities (CRPD)	Accommodation required as long as it does "not impos[e] a disproportionate or undue burden, . . ." [*Convention on The Rights of Persons With Disabilities, Article 2, 2006*]
Australia	The Australian Disability Discrimination Act 1992	Accommodation required unless would impose an "unjustifiable hardship" [*Disability Discrimination Act 1992, Cth, section 31*].
Canada	Covered by the Canadian Charter of Rights, Freedoms and the Canada Transportation Act	Service providers must make provision for accessible transport up the point of 'undue hardship' [*Canada Transportation Act and Council of Canadians with Disabilities v. Via Rail Canada Inc., 2007*]
New Zealand	Human Rights Act 1993 (amended Human Rights Amendment Act 2001)	Accommodation required, including for access to "places, vehicles, and facilities," except "when it would not be reasonable to require the provision of such special services or facilities" (*section 43*)
European Union	European Accessibility Act (proposed 2015)	Accessibility requirements referred to in Article 3 apply to the extent that they do not impose a disproportionate burden on the economic operators concerned." [*Directive Of The European Parliament and of The Council , Article 12*]
United Kingdom	Disability Discrimination Act 1995; The Equality Act 2010	Prohibits discrimination against persons with disabilities, requiring "reasonable adjustments" which includes consideration of "financial and other costs which would be incurred" (1995)
United States	Americans with Disabilities Act, 1990	Entities must to make 'reasonable accommodation' "unless such covered entity can demonstrate that the accommodation would impose an undue hardship . . . "or "would result in an undue burden, i.e., significant difficulty or expense." [*Americans With Disabilities Act Of 1990, Sec. 12111 and section 36*.104]

A risk to the above is the potential lack of preparedness by public administrations and operators to stand the cost-benefit test, when challenged in court. Challenges can be made by those same entities that are required to make reasonable adjustments for accessible transport, for instance. The review of judicial proceedings in Chapter 2 highlights that the kind of benefits considered relevant and measurable in relation to accessibility ranges from very narrow to fairly broad. As such, the authors conclude that in the absence of a shared approach, the interpretation of legal requirements can lead both to inequality of opportunities across jurisdictions and to the failure of courts to impose accessibility requirements to the same extent as for other provisions (for which a more consistent approach to benefit valuation exists) are.

Finally, if investment in accessibility is viewed as a way to comply with disability-related legislation only, the notion that the impacts of improved accessibility and Universal Design (UD) can be positive for a wider section of the population than just the disabled passengers may be overlooked. Beyond legal protection and non-discrimination, a broader group of passengers such as encumbered people can benefit from improved accessibility and providing for non-negotiable accessibility requirements only will not be conducive to maximising all potential benefits.

The view that accessibility only provides small benefits for a minority may in fact prevail in some jurisdictions: "conventional thinking is that Universal Design is for the few (e.g. disabled passengers) and, given that they are few in numbers, UD projects will generally be unprofitable from a socioeconomic point of view" (Odeck et al. 2010). Only a thorough assessment of benefits can provide the evidence needed to debunk this conventional thinking.

Trade-offs and budget constraints

The overreliance on a rights-based approach may also lead to significant delays in implementing existing rules in the presence of budget constraints, especially when the benefits to key decision makers (notably the Treasury and its local equivalents in devolved jurisdictions) are not clearly articulated. An example of how this risk may materialise comes from France, where the implementation of the legislative requirements has been delayed beyond 2015 due to unplanned budget constraints. The new deadline for implementing accessibility measures in the Ile-de-France region is now before 2021 instead of 2015. Although there has been no analysis of the cost of the delay in implementation of accessibility, the benefits foregone are likely to be high.

Moreover, at times when decision-makers have to trade off potential investment options, those measures for which there are clear and more readily available economic benefits may be prioritised over accessibility measures. Investment in road safety, for which benefit valuation techniques are common practice in a number of national appraisal frameworks, is an example. In that case, decision makers would be familiar with the 'currency' in which safety benefits are expressed, such as the value of a statistical life. Such a currency for accessibility does not yet exist.

Evidence-based assessments to support decision-making

Better and more informed decisions in the field of accessibility require stronger evidence to support the assessment of potential benefits. Typically, authorities will need to decide whether to implement accessibility measures as a package, and if so which measures should be included in the package. This is the case, for instance, of measures aiming to improve accessibility for blind people and passengers using wheelchairs at the same time. In the absence of an established set of techniques to value those improvements, "decision-making about investment in accessibility (…) relies on 'local knowledge', using discretionary transport funds and [only implements] 'add-ons' to other projects" (Chapter 3). Thus in a rights-based framework, the key question may not be *whether* to invest in accessible transport, but rather *to what extent.* Faced with complex decisions, evidence around the economic impacts of specific measures can support more informed investment choices.

Identification of beneficiaries and benefits

This section provides a more descriptive account of the beneficiaries of improved accessibility, and the type of benefits that are likely to emerge. We propose an overall framework for classifying benefits and beneficiaries, without suggesting that all of the beneficiaries and benefits described should be included in every analysis of accessibility, but rather aiming to provide a complete list of potential impacts for different types of users (both mobility impaired, and other encumbered passengers) and for non-users (such as potential users).

In considering the nature of beneficiaries and their measurement, a balance must be struck between the most comprehensive accounting for 'need' in transport, and methods that are practically applicable in local decision-making contexts. If investment in accessibility improvements is currently discretionary and ad-hoc, there may be reluctance among practitioners to move to an appraisal framework that adds significant cost to the process.

Beneficiaries

Given that accessibility improvements arguably benefit all users of transport to varying degrees, there is necessarily a difference between who the identified beneficiaries are, and which particular beneficiaries are accounted for in economic appraisal. This difference is important if a practically applicable analysis framework is to be readily adopted by transport practitioners, who rely on measurement of the impacts of their investment decisions.

On the one hand, a narrow focus on mobility-impaired passengers at the time of analysis may be easier to implement and less prone to the uncertainties inherently linked to forecasting and behavioural responses. On the other hand, a wider definition captures the benefits that improved accessibility brings to all encumbered passengers, and potentially to all travellers – both current and future. The following paragraphs address this issue.

Mobility-impaired passengers only

A narrow focus on the benefits that accrue to mobility-impaired passengers requires the identification of passengers with disabilities through a standardised approach, and the estimation of benefits specifically accruing to those users.

Such an approach is adopted in a case study of upgrades to pedestrian infrastructure in Hamilton, New Zealand (Chapter 3). The upgrades included new raised zebra crossings to provide safe and accessible crossing points where previously the intersection was not universally accessible. The case study involves pedestrian counts before and after the upgrade. In order to identify the potential beneficiaries, the focus of the counts is on people using mobility aids such as walking sticks.

Some of the advantages of using mobility aids are:

- they are used by a significant of the encumbered passengers group;
- they provide a visibly identifiable proxy of need that corresponds directly with the way that investment decisions are already made in transport (e.g. based on traffic counts), and;
- their use is shown to be highly correlated with other disabilities in New Zealand's official population surveys.

The case study finds that improved accessibility results in more people using formal road crossings, and there is a statistically significant increase in the use of formal road crossings by people using mobility aids. To assess the net economic benefit of the intersection upgrade, the authors estimate the value of additional trips undertaken after the investment relative to the number prior to the investment. Following Hufschmidt et al. (1983) the benefits are estimated based on costs associated with alternative mechanisms for achieving similar outcomes. In this case, a minimum taxi fare is the alternative, given that mobility-impaired users would not be able to access local public transport easily.

A further advantage of focusing on tangible proxies such as mobility aids to identify the beneficiaries is the correspondence between survey observation and local/national surveys that use the same type of indicators, improving the potential for ex-ante benefits estimation. For example in New Zealand, the use of mobility aids is recorded as part of the National Disability Survey and it varies between 1% and 4% of any catchment population.

The authors highlight a downside of this approach though: "While the benefits of universal design are evident for all people, the proxy measure of people who use mobility aids is an indicator of accessibility and not a means of capturing all potential beneficiaries of best-practice transport infrastructure and processes" (Chapter 3). Therefore, any proxy measure (such as mobility aid use) ought to include an estimate of the additional benefit to those not specifically counted by the indicator population, such as those affected by intellectual disabilities.

Mobility-impaired and other encumbered passengers

The wider effects of accessibility and Universal Design become more evident with the inclusion of a greater range of passengers in the assessment of benefits. 'Needs' do not just arise from the presence of a specific disability and accessibility improvements can cater for the needs of a wider group of users. Some intermediate categories of users exist between the very narrow category of disabled passengers and the

largest category of population as a whole. Two main categories can be defined as encumbered passengers and older passengers, both part of a broader group than mobility impaired only.

A working definition of both encumbered and older passenger is used in Chapter 5 reporting on the findings of the Access for All research carried out for the Department for Transport (DfT) in the United Kingdom, in relation to step-free infrastructure investment at rail stations. For the purpose of interviews and counts, passengers are categorised into the following groups:

- Wheelchair users
- Hearing impaired
- Sight impaired
- Mobility impaired (users with walking aid, frail older users, etc.)
- Encumbered (users with small children, heavy luggage or shopping, pushchairs and any other hindrance), and
- Unencumbered (all other passengers).

Whereas the first four categories make up 1% of all station users, encumbered passengers make up another 5% – thus increasing the number of beneficiaries observed at railway stations considerably. The surveys undertaken on site show that a large majority of passengers notice and benefit from the improvements (e.g. using the new lifts), but the research only aims to calculate the benefits of those classified as mobility-impaired and encumbered. The two direct user benefits included in the analysis are a reduction in generalised travel costs and an increase in demand.

The Access for All research demonstrates that the inclusion of encumbered passengers' benefits in addition to those with mobility impairments is sufficient to generate benefits in excess of costs for most of the railway stations surveyed. This provides a useful benchmark against which future studies can be compared. However the limitation of such an approach lies in the need to carry out on-site surveys and interviews which can be both costly and include an element of subjectivity, for instance in the identification of what type of 'heavy luggage' counts towards encumbrance and what constitutes a "frail older user".

Linking encumbrance and age may be a way to simplify the above methodology. Growing ageing populations are a well-established trend in most high and middle-income countries. A parallel trend related to ageing populations is that "more and more older people … want to travel and have the means to do so", but at the same time "there is a strong correlation between age and disability, or loss of mobility" and "enabling older people to remain independent and self-sufficient for as long as possible is crucial" (Frye, 2015).

The link between age and (loss of) mobility is echoed by recent projections from the European Commission (2015), highlighting that "the number of citizens with disabilities and/or functional limitations will increase significantly with the ageing of the EU's population […and that…] it is expected that in 2020 approximately 120 million persons in the EU will have multiple and/or minor disabilities". In Germany, statistics show that three-quarters of those classified as severely disabled are 55+ years old.

Given the high degree of correlation between age and mobility impairments, older passengers' benefits could be accounted for separately, and partly as a proxy for encumbered travellers. When considering both current and future passengers, demographic considerations may be included as part of the assessment. Rising life expectancy would lead to an increase in the relative size of beneficiaries in most countries/regions without a clear corresponding growth in the demand for transport services, depending on the incidence of what is defined by the World Health Organisation (WHO) as 'healthy ageing'.[1] For instance, the percentage of potential public transport users is decreasing among older

people who are becoming more car reliant and want to continue driving (Haustein and Siren, 2015). This makes it even more important for public transport providers to offer attractive and accessible services for older people, when they want to keep them as passengers.

An advantage of focusing on age as a proxy for encumbered passengers is that data is often readily available at different geographical levels to estimate the size of those affected by accessibility improvements, since most local and regional surveys provide a segmentation of the resident population by age. However, a main disadvantage is the narrow focus of the assessment, and an unintended policy outcome of directing accessibility investment towards areas with higher densities of older people could be the creation of old people's enclaves, which would reinforce patterns of isolation and exclusion.

All passengers

Investment that enhances the accessibility of the transport system can be beneficial not just for mobility-impaired and encumbered passengers, but for all passengers, because comfort and system quality, safety, reliability and information provision will generally improve travel for all. In extending the scope of benefit valuations to all users of transport systems, we highlight the relevance of adopting the UD approach as defined above. Since UD refers to measures that make public transport accessible to as many passengers as possible, a direct consequence of this approach is the need to value the benefits of investment to all passengers who are affected.

The inclusion of all passengers' valuations can affect the magnitude and applicability of those estimates. Valuations that demonstrate benefits for a large section of society can provide greater policy support for accessibility measures, however the effect on the size of the benefits is not univocal, as discussed in the section on disbenefits below. Decisions about widening the net of beneficiaries included in the analysis need to take the policy goals of the measures assessed closely into account.

Current passengers, future passengers and non-passengers

Valuations of benefits in transport traditionally comprise benefits to both current and future users, and there is no apparent reason why this should not be the case for accessibility benefits – arguably, the case is even stronger in light of demographic changes. However some of the difficulties encountered in the valuation of other measures can be exacerbated in the context of accessibility and require special attention.

First, demand forecasting is traditionally uncertain, and forecasting the number of encumbered users can encounter these specific difficulties:

- Mobility-impaired people may develop habits of seclusion as a result of years of perceived low accessibility of the external environment, hence the share of latent demand may be higher than across the entire population;
- The need for several other features of the built environment to be accessible ("accessible mobility chain"), including access to and from buildings, shops, schools, etc. for a person to decide to make use of public transport systems, and;
- Unless information dissemination strategies are well defined and tailored to disabilities such as visual and cognitive impairment, the impact of the measures will be dependent on the extent to which their introduction is known.

In addition, the inclusion of new passengers in the analysis raises a number of questions about the value of those additional trips induced by the accessibility improvement. The next section addresses these questions.

Dedicated surveys to test for evidence of behavioural change can contribute to reducing uncertainty. When carrying out these surveys, a key issue is the sample size. If the surveys focus disproportionately on disabled and encumbered passengers, the results of the studies may not be reliable unless they are sample weighted to reflect the composition of passenger demand, which is turn is difficult to predict. For instance, should the weights be based on actual demand (which may be suppressed because of limited accessibility, loss of confidence, etc.) or based on potential demand (assuming access for all, and information about it, is provided)? In light of these issues, surveys are useful but need to be carefully designed to ensure that the sample is as representative as possible of people's current and future mobility needs.

Benefit types

User benefits

Improvements in accessibility result in similar user benefits to other transport interventions, for example, reductions in travel times, greater service quality and convenience, improved safety and greater trip-making. There may be other user benefit categories relevant to accessible transport improvements. These include the reduction in stigmatic harm associated with inaccessible transport.

Travel time savings benefit all passengers and can result from improvements such as:

- Faster access/egress time to/from buses, train stations, airports, etc. thanks to the removal of barriers and obstacles to mobility, as well as better signage and information provision.
- The introduction of accessible ticket machines which reduce the time spent by travellers with disabilities purchasing and using tickets as well as the cost penalty of many on-line transactions.

A recent ITF Report (ITF, 2014) summarises evidence around additional benefits to travel time savings. These relate to convenience, which is linked to 'absence of effort' in using transport services that are fit for purpose. Convenience is important to enhance the attractiveness of transport and to provide for mobility needs more generally; but some key elements (e.g. not being able to travel at the desired time, the absence of good information) may disproportionately affect encumbered passengers. As the practice of benefit evaluation is well established in relation to both travel time savings and convenience, these benefits can be easily incorporated in the evaluation of accessibility-related interventions.

In Chapter 2, authors discuss other categories of user benefits, which specifically pertain to mobility-impaired passengers, in the context of recent changes in the practice of CBA in the US. In particular, in 2011 the Federal Government issued Executive Order 13,563 on CBA authorising government agencies to consider human dignity (stigmatic harm, humiliation, embarrassment) as part of regulatory impact assessment (RIA). The inclusion of dignity considerations underlines the importance of accessible journeys as a way to improve social inclusion as well as reducing the stigma attached to disability or old age. These user benefits can be considered alongside those traditionally assessed in transport appraisal.

Non-user benefits

Non-user benefits encompass a larger set of indirect economic benefits from transport investment, such as decongestion and uplift in property values (Levin, 1960). In this context, non-user benefits refer to benefits accruing to "those who do not change their behaviour as a result of the scheme, but who are affected in some way as additional people using [accessible transport] have 'second-order impacts' on the transport network" (Chapter 5). These benefits will be particularly important to consider if the accessibility improvement leads to modal shift from private, motorised transport by road towards public transport modes.

Non-user benefits also include other impacts that will not manifest themselves in transport markets, such as the concepts of option value and existence value. Option value is associated with individuals' attitude to uncertainty, and captures the willingness of individuals to pay for the option of using accessible transport, even if they do not do so at present. People may project themselves in the future and realise that factors such as injury and old age can change their future transport needs. Existence value relates to individuals' willingness to pay for accessibility improvements; even if they do not plan to use accessible transport, they derive value from the guarantee of equal protection and non-discrimination through the provision of accessible facilities (Chapter 2). Altruism values may also be present, as long as people consider the wellbeing of others important.

Operators benefits

Transport providers are likely to benefit from improved accessibility through different mechanisms. First, increased passenger numbers because of better accessibility can lead to increased revenues for transport operators such as rail companies, bus companies and airlines. However, this will not necessarily be the case in the event that a large proportion of new passengers receive concessionary travel. In a number of countries such as Germany and the UK, older and disabled passengers benefit from discounts and free travel by public transport and rail. In this case, greater passenger numbers do not directly translate into higher revenues[2].

Secondly, transport operators experience cost reductions if encumbered passengers can access transport more independently instead of relying on assistance by dedicated personnel. For example, low-floor buses save time boarding and alighting of all passengers by shortening stop dwell times (Fearnley et al., 2011; Odeck et al., 2009). For these benefits to be fully realised, policy-makers need to ensure that the interface between a duty of assistance and accessibility improvements is addressed; examples of the lack of coordination include the requirement to always be assisted when using lifts at rail stations, even when these provide barrier-free access to trains. Without tackling these potential coordination issues, some benefits would not materialise (e.g. there would be no reduction in stigmatic harm for the assisted person) and operating costs would not decrease. If transport operators are in public ownership, then some operators' benefits would also be public sector benefits, discussed next.

Public sector benefits

In addition to user, non-user benefits and benefits to transport operators, the public sector may also benefit indirectly from improvements in accessibility. In some ITF/OECD member countries such as the Netherlands and the UK, it is customary to assess the extent to which transport links affect people's propensity to work. These impacts aim to capture the additional labour force participation resulting from lower transport costs, by estimating the extent to which a share of passengers take up employment opportunities following investment. As part of wider economic impacts (WEIs) methodology, the next change in public expenditures is then assessed as extra income tax minus social contributions (e.g. unemployment benefits).

Enabling mobility-impaired passengers to enter the labour market will result in similar benefits. In the case of accessible transport, it seems appropriate to disaggregate and add further dimensions to the traditional labour market benefits, in order to articulate the variety of impacts that accessible transport can have on people's lives. Examples include the following: greater participation in social and economic activities; the ability to access services (both for essential health and education purposes and for leisure) more easily and more frequently (Chapter 3), and; greater inclusion, countering the risk of isolation which can lead to adverse psychological problems (ECT Charity 2016; Green et al., 2014). Links can also be drawn between accessible transport and health, building on the growing evidence that active travel modes support healthier lifestyles (Choi et al., 2013; Flint et al., 2014).

The next section reviews some of the techniques for translating these benefits into monetised values, but acknowledging the potential for public sector savings is a useful starting point

Broader economic impacts

The practice of transport appraisal commonly recognises the presence of broader economic benefits (ITF, 2015). In the context of CBA, this includes wider economic impacts (WEIs) and the labour market effects described above, as well as productivity and competition effects. These impacts may be included in the appraisal of accessibility benefits, to the extent that the investment is large and affects economic geography (ITF, 2011). However, the same caveats to the inclusion of WEIs apply in the case of accessibility improvements (ITF, 2015).

In the context of EIA, 'socio-economic accounting' at the macroeconomic level provides estimates of the direct, indirect and induced effects of a given economic sector in terms of gross value added (GVA), gross domestic product (GDP) and jobs – the methodologies are described in more details in the next section. These develop specific frameworks to account for additional private spending and/or avoided costs (e.g. additional consumption because of more frequent travel to see friends and family).

Estimates of broader impacts show the size of the benefits in relation to other sectors of the economy. The main risk when considering broader impacts is double counting. Some of the benefits mentioned here may already be captured under other benefit categories, and therefore including them may lead to an overestimation of total benefits. As with WEIs, the inclusion of these benefits needs to rely on robust approaches to avoid common pitfalls.

Capability values

The 'capability approach' developed by Amartya Sen offers a different perspective on the benefits of improved accessibility. Moving away from the utilitarian approaches to measure of societal well-being typical of CBA, Sen elaborates the concept of capabilities. The concept suggests that policies are most beneficial when they provide the freedom to fulfil everyone's capabilities and that the provision of some primary goods is essential to this fulfilment. In Chapter 2 authors propose incorporating accessibility benefits in order to recognise "the range of freedoms that newly accessible facilities open up for people to pursue life chances, opportunities and ways of life". Different measures of capability values are discussed in the next section.

Disbenefits and trade-offs

Investment in accessibility improvements can also give rise to negative economic benefits. The inclusion of disbenefits is useful in order to highlight some of the unintended effects of making transport systems more accessible, as well as to improve the rigour of benefits estimates more generally.

For instance, the introduction of dedicated space for wheelchairs and pushchairs can somewhat reduce the available capacity on public transport and may lead to greater crowding at peak times, or less space for luggage and bicycles – unless additional capacity is added. An unintended effect is the potential nuisance of audio-information provision at public transport stops and street crossings. In some cases, measures that improve accessibility for some passengers will result in disbenefits for others, as may be the case with tactile pavements designed for blind travellers, which make it more difficult for wheelchair users to access e.g. rail platforms.

These types of trade-offs generated by accessibility measures are common and, although the disbenefits generated are not likely to be large and can often be motivated by good design, these should be considered as adverse effects for completeness.

Lastly, investment in accessibility improvements may not be as effective if it is badly implemented. Examples of bad implementation include providing new infrastructure while ignoring complementary

soft measures such as communication and information provision. These measures are critical to ensure awareness among potential users and beneficiaries of accessibility improvements.

Measurement and valuation of benefits

A clear identification of beneficiaries and benefit types is critical to any assessment of the benefits of improved accessibility, since it supports the development of a robust narrative and provides a solid basis for subsequent analysis. For instance, analysts would benefit from selecting upfront the categories of benefits that will be measured quantitatively as opposed to those which will be discussed qualitatively. It can also highlight the risks of potential overlaps and trade-offs.

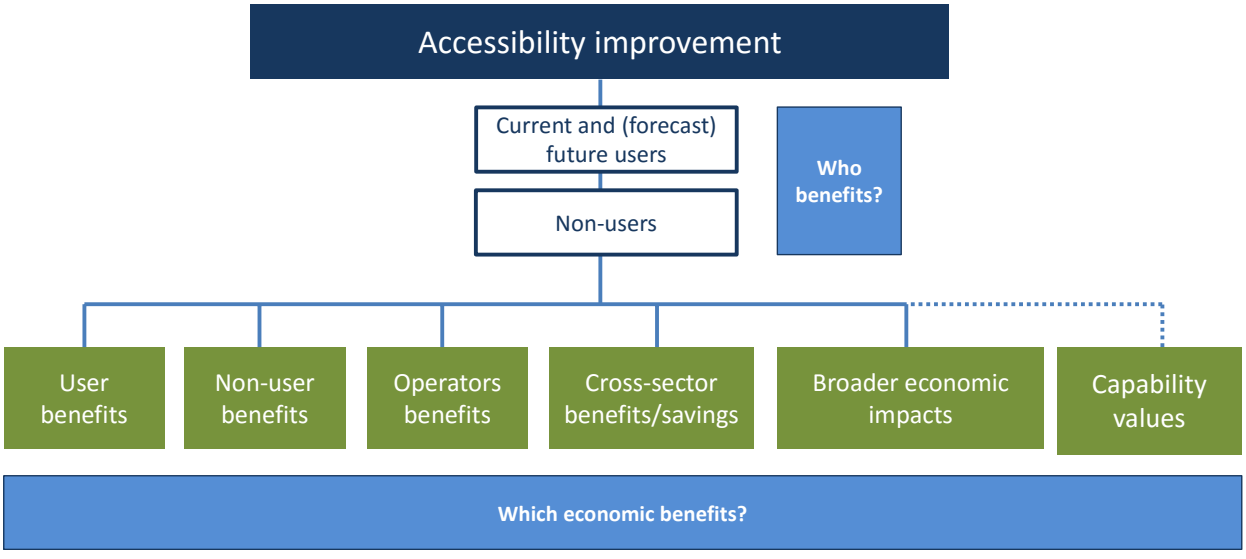
This section reviews some of the methodologies and parameters that are available to measure and assess the benefits of improved accessibility discussed above. These are presented along a spectrum that ranges from traditional methods for standards CBA, to new techniques that explore the capabilities approach. In between these extremes, there are techniques that specifically address the gaps in this area of transport appraisal, for instance by modifying existing CBA/EIA frameworks, as well as techniques that pertain to other sectors and from which transport practitioners can learn.

We also report on the (few) practical applications of these methodologies that are available. A key finding is that, even when standard CBA and a narrow set of benefits are used, the net present value (NPV) of estimated benefits from accessibility improvements can outweigh the costs of achieving them. Similarly, the EIA studies presented here show that the size of the potential impacts arising from accessible transport can be high, both in absolute terms and as a share of GDP.

Standard appraisal frameworks and valuation techniques (1) – CBA

As discussed in the Introduction, documenting and valuing the economic benefits resulting from marginal transport improvements through CBA is customary in many ITF/OECD countries. Valuation techniques are available to quantify user benefits, non-user benefits, and benefits accruing to operators, the public sector and the broader economy, as summarised in Figure 1.1 below. This standard framework can be adapted to provide a valuation of the economic benefits of accessibility, as discussed next; the inclusion of capability values (dotted line) deserves a special discussion at the end of this section.

Figure 1.1. **Framework for measuring the economic benefits of improved accessibility**



Standard welfare analysis involves measuring the willingness to pay (WTP) for transport improvements. At the simplest level, the Value of Time (VOT) translates time savings into monetary values. As discussed by Wardman (2014), the overall attractiveness of a transport mode is being represented in practice as being composed not just of time values, but also cost and other factors each expressed in common monetary units using different weights for each component. These components include crowding, the number of transfers, information provision and comfort – all factors that accessibility measures tend to target. Dedicated surveys as well as previous studies can provide the valuation of these attributes to complement VOT in benefit valuation analysis. The overall attractiveness of a means of travel can then be translated into time units, usually known as Generalised Time (GT).

The two studies discussed below apply standard welfare analysis to accessibility improvements. First, the work by Steer Davies Gleave discussed above (Chapter 5) in the context of the UK Access for All programme. In this study, the beneficiaries are all mobility-impaired or encumbered passengers, and the approach used is to select a single VOT for all encumbered passengers from national guidance in the UK (Web TAG). The VOT that more closely reflects the highest share of trip purpose (i.e. non-work VOT) is chosen. The demand to which benefits are applied is measured by the surveys undertaken before and after the intervention, so that new users' benefits are accounted for.

The appraisal gives a positive benefit cost ratio (BCR), but with substantial variation between the different stations. Overall, the benefits exceed costs by 2.4:1 with one station having a very high BCR of 11.3:1 and three stations having BCR below 1. Sensitivity tests were undertaken, mostly 'pessimistic' in nature. The overall programme BCR remained positive, the lowest value being 1.44 : 1. The benefits to unencumbered passengers were not included in the central case.

As discussed in the section on Operators benefits, some passengers receive heavily discounted, or even free, travel on public transport. In this case, the focus can be on using equivalent time savings as the measure of the benefit of accessibility improvements as in the UK study. Equivalent time savings can be then converted to monetary values using standard VOTs.

In the second example, researchers in Norway carry out a valuation study and develop a CBA framework for UD projects that features using Stated Preferences (SP) and Contingent Valuation (CV) techniques. Stated Preferences techniques are used to elicit monetary values for transport attributes. In an SP study, a respondent is presented with two or more alternatives, described by the attributes of a trip, including cost. A respondent's task is to choose the alternative that they most prefer, trading for example the ease of accessing information and cost. In CV questions, respondents assign a monetary value to the improvement of a single attribute or a package of attributes.

The studies by Fearnley are based on focus groups, on-board interviews with passengers and on-line valuation surveys in three different Norwegian cities where the levels of transport accessibility are high. Special care is taken to present attributes and their levels in a way that enables respondents to make trade-offs as realistically as possible in the choice experiment, i.e. by extensive use of graphic illustrations. SP questionnaires are prepared to elicit preferences on specific attributes such as low-floor buses, and subsequently CV is used to elicit a maximum willingness-to-pay for UD improvement, both individually and bundled. The main results of the studies carried out in Norway are summarised in Table 1.2.

A significant finding of this work is the fact that UD projects provide benefits to all passengers, and not only to those encumbered. All passengers regard UD measures as general quality improvement. Therefore, all passengers value these improvements, i.e., they have a willingness to pay for them.

Research in the field of valuation can shed light on the values of other parameters than VOT even when user preferences cannot be readily observed (e.g. in the case of accessibility attributes that are not sold on the market separately from a bundle of services bought through tickets).

The results provide insights on the valuation of specific accessibility measures, showing for instance that the highest valuation is for information sources at stops. This is consistent with focus groups and an on board surveys. However, the results also raise important methodological issues. Taken at face value, these results indicate which measures are preferred by most users, using techniques that may be viewed as a form of democracy in an economic context. Nevertheless, the package effect is problematic – should we compare preferences for a bundle against the valuation of each single attribute?

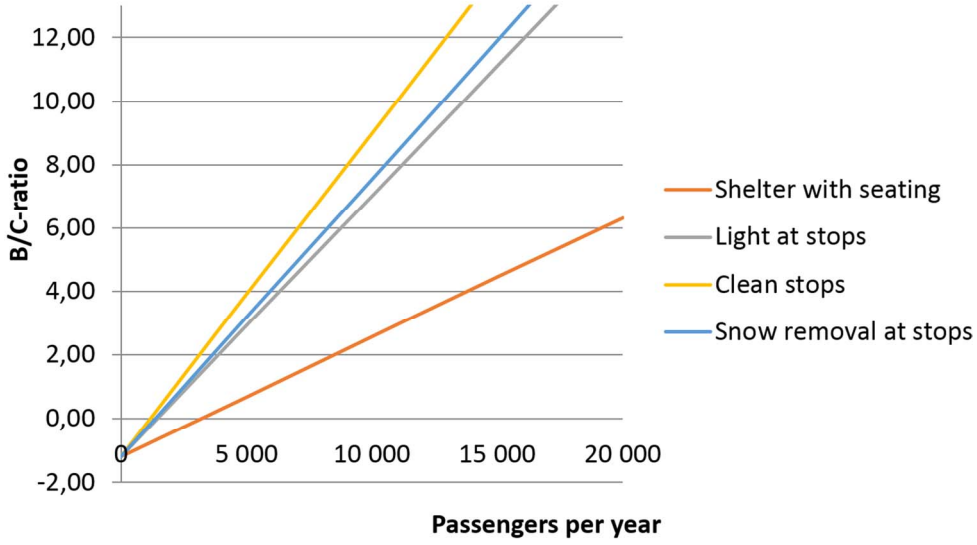
Table 1.2. **Valuation of improved information provision at public transport stops**

WTP per ride	NOK	USD
Map over local area	0.43	0.08
Speaker about changes in departure	0.69	0.12
Screen with real-time information	4.05	0.72
All three information devices	4.62	0.81

Source: Adapted from Fearnley et al. (2009, 2011), exchange rates as at March 2016

The authors apply the estimated values to assess the benefits to existing users only. Despite the exclusion of induced users, the BCR for each of the UD features appraised is positive, as shown in Figure 1.2 below. Taking into account standardised cost measures, the benefits exceed the costs for each feature as long as more than 2 000 passengers per year use the stop (4 000 to have a positive BCR for shelters).

Figure 1.2. **Benefit-cost ratio of UD measures over 40 years by passengers per year**



Source: Adapted from Fearnley (2016)

It is worth emphasising that both studies from the UK and Norway demonstrate that the accessibility features examined have a positive Benefit-Cost Ratio (BCR). Even in the presence of conservative techniques and lower-end estimates of the potential benefits, investment in accessibility delivers value for money in these two cases, except for some smaller UK stations. We consider next possible

modifications to the standard framework, introducing measures that could be seen as relaxing the assumptions used more conservative appraisal methods.

Potential modifications/additions to the CBA framework

Even within standard CBA frameworks, segmentation is sometimes applied to reflect VOT differences depending on whether resource costs (e.g. for business trips) or pure WTP (e.g. for leisure travellers) are considered. In the context of accessibility valuations, further segmentation takes place by estimating specific WTP values for encumbered users and assigns these to the portion of demand represented by encumbered passengers. Valuation studies using SP and CV techniques can provide evidence to formulate specific WTP values, which can be assigned to encumbered users.

Fearnley et al. (2011) provide a practical application by reporting WTP for all passengers and for encumbered passengers separately – the values are presented in Table 1.3 below. The results obtained show that encumbered passengers' WTP is considerably higher in relation to low-floor vehicles than the average values for all passengers. However, the main message is the fact that low floor buses benefit all.

Table 1.3. **Valuation of improved accessibility of public transport vehicles**

WTP per ride	NOK (all passengers)	USD (all passengers)	NOK (special needs passengers[1])	USD (special needs passengers)
Low-floor vehicle	1.67	0.30	2.88	0.51
Low-floor vehicle and adjusted ground at stop	2.07	0.37	4.01	0.72

Note: 1. Defined as those with limited mobility, using a walking aid, pregnant, carrying heavy luggage, and small children

Source: Adapted from Fearnley et al. (2011), exchange rates as at March 2016

Whether the segmentation of demand to assign higher WTP (or VOT) to encumbered passengers is possible, or indeed desirable, remains an open question. It is clear that encumbered passengers will value some measures more highly. For instance, reducing the number of interchanges in a given journey is particularly beneficial to those who find it difficult to board and exit transport vehicles; likewise, the provision of information is especially important for passengers with hearing, visual and cognitive impairments in order to facilitate their travel experience. However, any additional segmentation of demand makes benefit valuations more prone to complexity, and ultimately controversy.

In Chapter 5 the author carries out sensitivity tests on the central case by including the benefits to all passengers (as opposed to a central case where only encumbered passengers' benefits are accounted for) through a corresponding uplift in demand at the stations that receive accessibility investment. This way, the BCR increases from 2.4:1 in the central case to 19:1 in the alternative scenario.

Lastly, even in the presence of a clearer articulation of, and quantification techniques for, accessibility benefits, it remains critical to select the beneficiaries consistently. The classic appraisal framework tends to include the benefits of those whose travel is induced by the improvements and to value their benefits as half of the value of existing users (commonly known as the "rule of a half" – see e.g. Jones 1977). In the case of encumbered and particularly disabled passengers, the rule of a half can be questioned on the basis that the trips induced by the improvement and made by new users are not marginal. Rather, they are transformative to the extent that they provide access to a host of services and opportunities (including employment) that would have otherwise been unavailable in the absence of accessible transport.

Against this background, a possible adjustment is not to apply the rule of a half in a blanket approach to accessibility projects, similarly to the case of non-standard land-use change (see discussion by ITS Leeds, 2003[3]). Analysts could consider using values of 0.75 instead of 0.5, if justified by a strong narrative. A separate issue from the valuation of induced demand is the estimation of new users by forecasting behavioural changes, which is discussed below.

Standard appraisal frameworks and valuation techniques (2) – EIA

Moving away from CBA, other standard frameworks which measure economic impacts involve some form of 'socio-economic accounting' at the macroeconomic level. Economic Impact Assessments (EIA) provide estimates of the direct, indirect and induced effects of a given economic sector in terms of gross value added (GVA), gross domestic product (GDP) and jobs. The relative size of the economic benefits calculated is not comparable to the welfare benefits estimated in CBA, but it informs policy-makers about the amount of economic activity dependent upon a particular intervention.

In recent years, the European Commission has supported a number of studies in the field of Tourism for All. As discussed in Chapter 4, the most recent 2012 review at the European level concluded that accessible tourism (i.e. tourism activity by both disabled and p;der travellers) generated a gross annual turnover of about EUR 352 billion, GVA of approximately EUR 150 billion and GDP impacts quantified in the realm of EUR 164 billion. This translates into more than 4.2 million jobs. These direct impacts almost double when indirect and induced effects are included. The study finds that if European destinations were made fully accessible, demand for tourism services by mobility-impaired passengers could increase by over 40%, although some displacement from other regions of the world will be involved.

This study provides a good basis to perform similar analysis in the field of Transport for All. Since accessible transport services "enable persons with special access needs, either permanent or temporary, to enjoy a holiday with no particular barrier or problem" (GfK SE et al., 2013), a portion of these economic impacts assumed to be associate with accessible transport.

Looking at the impact of concessionary travel for older people in the UK, Mackett (2014) analyses the effects of concessionary travel on the contribution of older people to the economy, by assessing which share of older people's economic contributions is dependent on travel. The main results for the UK are shown in the Table 1.4 below. These figures show that a large proportion of the economic contribution to society by older people is dependent on travel and that improvement in accessibility could enable them to contribute 10% to the national economy. An important caveat is that the percentage of the contribution dependent on travel is calculated based on limited evidence from a variety of sources.

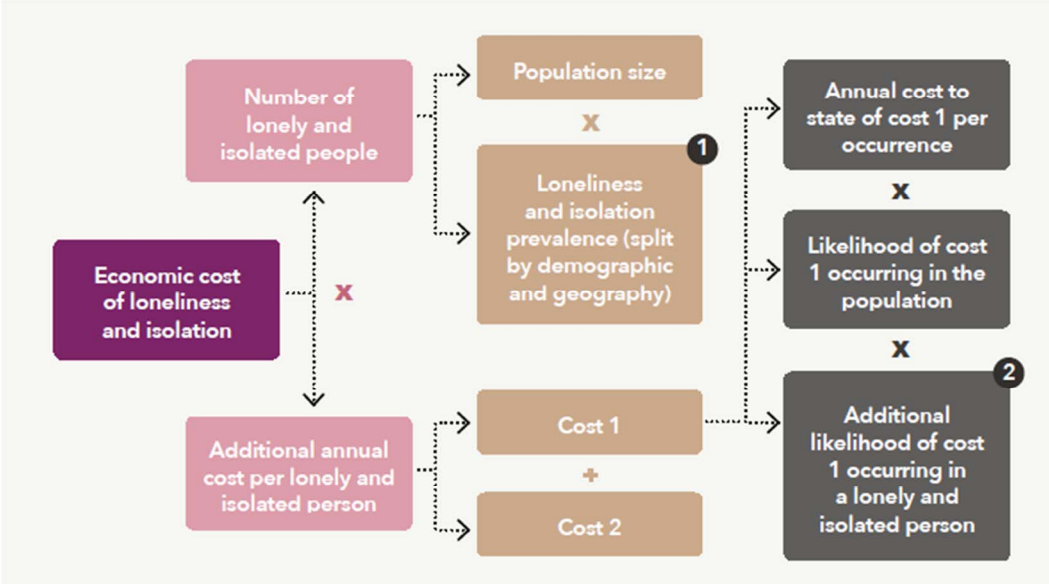
Table 1.4. **Contributions to the economy dependent on travel by older people in 2030**

Contributions	GBP m	% requiring travel	Travel-dependent contributions (GBP m)
Direct and indirect expenditures (e.g. shopping)	127 279	90	114 551
Volunteering	14 535	100	14 535
Childcare	4 473	50	2 237
Other non-tax contributions	62 762	0	0
Employment taxes	33 113	96	31 788
Taxes on expenditures	29 111	92	26 782
Other taxes	19 795	0	0
Total	291 070		189 893

Source: Adapted from Mackett (2014).

The flipside of the impact analysis using spending data is to look at avoided costs instead. A specific approach to estimate avoided social costs was elaborated in the UK by Deloitte for the ECT Charity (2016). This examines the extent to which loneliness and isolation leads to health and social problems for older people (e.g. earlier use of homecare, increase in doctor's visits) and estimates the related costs. Next, based on a review of the literature and focus groups, assumptions are made as to how can community transport[4] can reduce loneliness and isolation, and therefore savings in the order of GBP 0.4 bn-1.1bn can be made annually. The logic map underlying these savings is presented in Figure1. 3.

Figure 1.3. **Framework for quantifying the benefits of community transport**



Source: Deloitte Analysis for ECT Charity, Why Community Transport Matters (2016).

In this type of analysis the net macroeconomic contribution by encumbered passengers to the local / national economy would not be unidirectional; nonetheless, it could be argued that money spent on preventative / reactive expenditures to make up for the lack of community transport could be directed towards activities which generated greater wellbeing for mobility-impaired travellers and society at large.

Potential modifications/additions to the EIA framework

The evaluation methods used in the studies presented above could be replicated and expanded to estimate the benefits of accessibility. Analyses can assess the extent to which the economic contributions by encumbered passengers are dependent on the presence of an accessible transport system, or the extent to which accessible transport reduces loneliness and isolation and thus social care costs. Within this type of framework, analysts can also look at the cost of alternative forms of travel as well as the increased costs of assistance by transport operators (e.g. providing staff to accompany disabled passengers) to compensate for inaccessible facilities. Chapter 3 gives an example that introduces the avoided cost of taxi rides as part of the appraisal of pedestrian accessibility improvements.

When dealing with economic impacts that are dependent on accessible transport, it is important to note that improvements in transport systems may not be sufficient to trigger the increase in economic and social activity. A more holistic perspective is necessary, taking into account the extent to which other features of the built environment (e.g. homes, public offices) are also conducive to greater activity. A

journey is only as accessible as its weakest link. The interdependence between transport and other accessibility measures needs to be highlighted in economic assessments.

Additional approaches and valuation techniques

Existing tools in transport planning and economics, discussed above, may not be sufficient to account for the benefits of accessible transport fully. We put forward two sets of approaches that can provide additional techniques for benefit estimations: first, approaches that borrow from existing techniques as applied to other areas of transport appraisal as well as other sectors; second, new methodological approaches that either widen the scope of standard analysis or shift the focus to benefit types otherwise unaccounted for.

Working with what we know – safety and distributional impacts

The estimation of transport benefits typically includes monetised safety benefits from reduced accidents and incidents. Based on the projected reductions in accident rates, benefits are calculated by multiplying the 'value of a statistical life' as indicated in national guidance times the estimated number of deaths avoided following a transport intervention. The value of avoided injuries is another common metric.

Similarly, in the field of accessibility, analysts can incorporate the value of passengers' lives in the assessment of benefits. Measures used in healthcare impact assessments (e.g. in Russia, the UK and US), such as Quality Adjusted Life Years (QALY), can be applied to transport analysis. A QALY is calculated by looking at the extent to which an intervention improves the quality and length of life of an individual and his/her ability to function in five dimensions, including mobility as such. QALY provides a common currency for measuring the extent of health gains and supports decision makers with additional information (Phillips, 2009). This is especially valuable given the far-reaching impacts that accessible transport can have on the quality and possibly the length of mobility-impaired passengers' lives.

The appraisal of distributional impacts is common practice in some ITF/OECD countries. Analysis in this field aims to assess the variance of transport intervention impacts across different social groups. In the UK, this is a mandatory component of transport appraisal and guidance is provided by WebTAG Unit A4.2 (UK DfT, 2015). The analysis is mainly qualitative, but follows a consistent assessment framework. With respect to accessibility, the framework introduces:

- 'accessibility audits', which involve both desk-based research and site visits to examine specific features such as ease of access and information provision, and;
- 'strategic accessibility assessments', which involve geo-spatial analysis to assess the prevalence of disabled users in the corridor affected by the intervention

Altogether, the analysis feeds into an overall accessibility assessment, with scores ranging from 'detrimental' to 'highly beneficial'. Distributional analysis with a focus on accessibility can provide valuable insights into the extent to which specific policies and investment provide benefits to the groups that they aim to target, such as encumbered passengers.

New approaches – health, well-being and capability values

Emerging methodologies that assess the impact of transport interventions on health and well-being more widely can also be adopted when looking at accessibility benefits. The rationale for introducing health considerations is particularly strong given that a) improved accessibility often results in non-marginal changes to transport demand, catering for those who did not use transport systems prior to the intervention, and b) the provision of better design and access can significantly reduce stress, anxiety and fear for mobility-impaired users. Two streams of research are relevant here.

First, researchers in the UK find evidence of the correlation between active transport modes (walking, cycling and public transport) and health aspects: people who commuted to work by active and public modes of transport have significantly lower body mass index (BMI) and percentage body fat than their counterparts who use private transport (Flint et al., 2014). These findings echo the outcomes of a longitudinal study of over 11 000 people aged 50 and over (Webb et al., 2012), whereby the BMI of those who switch to using buses when concessionary travel is are compared to those who continue to use private cars. The study finds that older people who use public transport are less likely to be obese and less likely to become obese than those who do not.

Secondly, new empirical evidence from Korea (KOTI World-Brief 2015, Vol. 7 No. 70) considers Universal Design features for transport services, with a focus on accessibility at airport terminals and surface access. Mean energy consumption and RRI[5] are collected for users without impairments, with visual impairments and wheelchair users. The analysis reveals the differences in efforts and stress experienced by each type of users, showing for example that visually impaired users experience the highest levels of stress (see Table 1.5 below). The authors advocate accessibility policies that move away from just qualitative surveys to incorporating this emerging quantitative evidence.

Table 1.5. **Mean RRI of different users going through airport terminals (unit milliseconds)**

Categories	Wait	Move	Check-in	Shopping	Security check	Restroom	Wait	Average
Not encumbered, using stairs	716.8	541.7	654	623.6	645.3	654.4	651.1	641
Not encumbered, using elevator	695.6	641	648.9	651.7	647	668.3	627.5	654.3
Not encumbered, using escalator	734.4	655.4	682.6	646.8	670.6	680.7	669.1	677.1
Wheelchair, using elevator	650.6	664.4	673.2	679.3	661.1	695.3	732.5	679.5
Visually impaired, using elevator	690.7	605.5	609.8	530.1	578.7	573.3	571.8	590.5
Visually impaired, using escalator	662.3	605.5	609.8	530.1	578.7	575.3	571.8	590.5
Average	691.7	626.4	656.5	619.9	637.9	652.3	647.8	X

Source: Kim, J.C. et al., (2015).

Going forward, it will be important for those objective measures to be combined with subjective measures to ensure that data is interpreted correctly. Neither of the methodological approaches described here leads to monetary estimates that can be directly used to quantify economic benefits – at least up to the time of the Roundtable in March 2016. However, this work can certainly be developed to convert health impacts such as obesity and stress into monetary values for obtaining overall benefits figures.

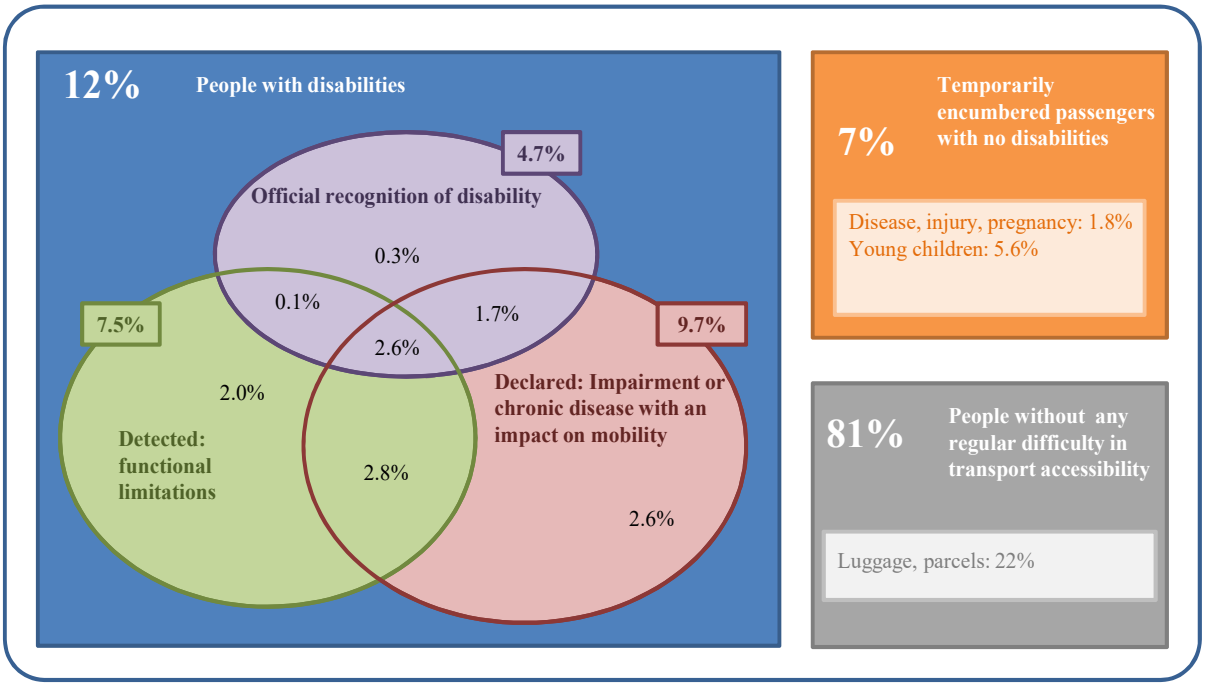
Even without monetary estimates, these studies shift the public discourse towards new types of benefits which should not be overlooked. Accessibility improvements and their related benefits can also be analysed within the framework of capability values. Valuing and measuring better opportunities that fulfil everyone's capabilities involves developing indices of well-being and participation. The most popular to date is the United Nations' Human Development Index (HDI), which tracks progress in the fields of social participation and subjective well-being. Similar indices with a focus on mobility-impaired, older and encumbered passengers can become powerful monitoring tools that support policy-makers in the implementation of legal requirements, and in the provision of data for economic assessments.

Critically, such indices need to rely on consistent data collection and repeated surveys over time. Recent efforts by STIF in the Paris region (Ile-de-France) to map transport accessibility provide an example of the type of data that could be used to this end. STIF conducted a regional survey on impaired mobility in 2013 and 2014, with three main objectives:

- Identifying the part of the general population with impaired mobility: disabled persons (including their type of impairment) and persons with temporary impairment (pregnant women, injured people, and those travelling with young children or with luggage...) – see Figure 1.4
- Comparing the daily mobility behaviour of disabled people with that of the general population (number of trips, purpose, modes of transport according to the type of disability, etc.)
- Assessing the perception by the population of accessibility of the different transport modes and of the measures that have been recently implemented by the population in general and by disabled people in particular.

STIF plan to repeat the survey again around 2020, in order to monitor changes in use, behaviour and perceptions around accessibility. As of 2014, the Ile-de-France resident population over 5 years of age is classified as per the diagram below.

Figure 1.4. **Characterization of the population of Ile-de-France regarding accessibility**



Source: STIF (2014).

Similar efforts are under way in Ireland as part of the Transport Access for All strategy. A set of questions for users, first distributed in 2008 and repeated in 2011 covers issues of access, comfort and the quality of travel for encumbered passengers. The first questionnaires will form a baseline to provide, in the future, an on-going indication of progress in terms of actual improvements to the experiences of people with disabilities in using public transport.

Although approaches based on well-being and the fulfilment of everyone's capabilities are not easily married with the benefit estimates typical of CBA and EIA, they provide a tangible complement to more standard analysis in this field, and they highlight the far-reaching impacts of accessible transport systems on their beneficiaries. In addition, existing measures of well-being such as the HDI can be enhanced with the inclusion of transport accessibility indicators.

A way forward: Research and policy implications

Research agenda

Participants in the Roundtable strongly highlighted the need for further research, in order to develop and strengthen the benefit estimation techniques presented in this report. More specifically, we recommend three types of studies:

1. Ex-post case studies of accessibility improvements
2. A large, ex-ante assessment of proposed measures to improve accessibility
3. Cross-sectoral studies to map out the benefits of accessibility beyond transport practice.

With respect to ex-post case studies, this report cites research that provides primers for the development of further work. Some of the key elements necessary for ex-post assessments include:

- Data availability, to a minimum on actual and unmet travel demand, and journey times, before and after the implementation of the accessibility measure;
- The ability to identify the discrete effects of accessible transport and/or Universal Design as opposed to other interventions which may be confounding factors, and;
- A clear identification of beneficiaries, and transparent decisions as to whose benefits are being measured consistently before and after the intervention.

By resorting to travel surveys, household surveys and/or census information, transport operators' data and on-site interviews, analysts can gather sufficient data to carry out the case studies. However even in the presence of good data, ex-post analysis needs to be very clear in relation to the types of benefits and beneficiaries been considered.

A large, ex-ante assessment at the international level in this area would be extremely useful. In a similar fashion to the work carried out on the benefits of tourism for all by the European Commission in 2012, a team of experts across countries could be gathered with the goal of exploring different benefit estimation techniques and provide reference values for future work. Furthermore, this work could feed into the compilation of a 'manual case study' for benefits estimation.

The accessibility measure assessed could be either a specific planned improvement resulting from international standards / legislation (e.g. information provision at public transport stops) or a broader set of Universal Design measures bundled together. The techniques employed to value the benefits should reflect the diversity of approaches outlined in this report, starting with a narrower focus (standard CBA/EIA) and progressively widening this scope to include disaggregated impacts, wider impacts and new methodological approaches.

The third recommendation is a specific call for accessibility to be more explicitly integrated in research and policy dealing with health and social wellbeing. Accessible transport contributes to broader objectives to do with health and wellbeing, however these benefits sit largely outside of those traditionally accounted for in transport project appraisal. Likewise, research in the field of accessible transport ought to bring in specialists and policy advisors from health and other sectors.

The cross-sector links are broad, ranging from emerging evidence that links health benefits to active transport modes generally, and the importance of having access to healthcare and social support facilities. Examples of potential integration include the assessment of QALY impacts from improved accessibility to public transport. Greater collaborative research efforts across sectors can strengthen the case for investment in accessibility.

Policy considerations

In many ITF/OECD countries, legislators and governments have explicitly enshrined accessibility as a legal requirement and have thus made it a key objective of transport policy; but progress in this field is slow and the implementation of accessibility-enhancing measures is constrained by a number of barriers. These include competing demands for investment due to budget constraints, and an unclear understanding of the economic benefits of improved accessibility including how these benefits fit in a transport investment context. While costs are usually known, benefits are not clearly defined, quantified, documented, or attributed to transport.

This report stresses the need to remove the barriers that limit understanding of these benefits in order to make better investment decisions in this area of transport policy. The inclusion of accessibility considerations in a consistent appraisal framework will help policy-makers as well as transport providers, by highlighting both the positive effects of making improvements and the costs of inaction. Once these effects are taken into account, different accessibility improvements can be compared with one another, as well as with other investment types, in a more objective way to address trade-offs. In addition, budgetary pressures based on cost considerations can be better balanced with a narrative on benefits.

The approaches to identifying and measuring the benefits of improved accessibility described in this report are not easy to implement and will require inputs from experts, together with specialised analysts and direct contributions by the beneficiaries of those improvements. Progress in this field relies on policy makers appropriately supporting research efforts to consolidate knowledge and provide case studies for different accessibility measures. This will involve not just providing the funding needed for additional research, but also being open to incorporating findings in national appraisal frameworks and to recognising the cross-sector nature of this type of transport interventions.

Notes

1 More information at: http://www.euro.who.int/en/health-topics/Life-stages/healthy-ageing/healthy-ageing

2 In CBA specifically, analysts may treat revenue increases as a transfer of benefits rather than additional benefits, depending on the consumer surplus measure applied to the CBA function. It should be noted that in the UK bus companies receive compensation for the revenue that they would have received from older and disabled passengers had they made the journey previously but not for the extra journeys generated.

3 "Toolkit for the economic evaluation of World Bank transport projects", Final report (Chapter 6) by the Institute for Transport Studies (ITS), University of Leeds for the World Bank, September 2003.

4 Here the specific definition used is Community Transport, referring to transport that is provided to meet the specific needs of groups of people. This includes accessible transport, defined as transport services for people with disabilities who find it difficult or impossible to use conventional passenger transport, e.g. dial-a-rides, dial-abuses and social car schemes

5 The biggest wave generated by the heart is known as the R wave and the interval between the R waves is referred to as RRI. RRI gets longer during rest and shorter during exercise or when experiencing stress

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Chapter 2
Towards a framework for identifying and measuring the benefits of accessibility

Daphne Federing
HDR, Washington, DC, United States of America

David Lewis[1]
HDR, Ottawa, Canada

This chapter (i) explains the motivation for articulating the benefits of accessibility; (ii) provides a narrative basis for articulating how accessibility affects economic and social life; and (iii) moves towards a framework for quantifying the benefits of accessibility.
In examining laws, regulations and judicial proceedings in different nations, the chapter finds that most view cost as a limiting factor on what public and private entities can be compelled to provide in relation to the accessibility of transportation, the built environment, employment, and services. This is so even in the context of constitutionally and legislatively enshrined human rights. The chapter also finds that cost-benefit balancing is emerging as a necessary part of the accessibility governance framework. When addressing the specific application of accessibility rights, governments, regulatory bodies and courts around the world deal comprehensively with costs but fail to value important categories of benefit, such as the reduction of stigmatic harms, "option" benefits and "existence" value, and capability value. The chapter describes progress towards a comprehensive narrative and analytical framework for describing and measuring such benefits.

[1] Retired

Introduction

This chapter has three objectives, (i) to explain the motivation for articulating the benefits of accessibility; (ii) to provide a narrative basis for articulating how accessibility affects economic and social life; and (iii) to move towards a framework for quantifying the benefits of accessibility. To serve as the basis for a policy narrative, the framework needs to be easy to communicate and free of jargon, or at least free of jargon that is not intuitively obvious in its meaning. To succeed as the basis for quantifying the benefits of accessibility, the framework needs to reflect proven methodological applications or give clear indications of where additional methodological research is required.

Barriers to the realization of a fully accessibility transportation system and built environment lie in the very nature of the constitutional and legislative mandates that establish accessibility as a societal goal and a human right. The United States, Canada, the European Union, Australia and many nations of Asia and Africa have either established or are considering constitutional and legislative protections for people with disabilities against barriers to participating in the activities of daily life. Virtually all such mandates are formulated as human rights legislation. The Americans with Disabilities Act, for example, is crafted as an anti-discrimination law, not unlike the civil rights laws of the 1960s that prohibit discrimination on the basis of race; and not dissimilar from the U.S. Constitution's First Amendment protections against discrimination on the basis of religion. The Preamble to the United Nations Convention on The Rights of Persons with Disabilities (CRPD), now signed by more than a 150 countries, *"Reaffirm[s] the universality, indivisibility, interdependence and interrelatedness of all human rights and fundamental freedoms and the need for persons with disabilities to be guaranteed their full enjoyment without discrimination."* Similarly, the Supreme Court of Canada has confirmed that accessible transportation provisions of the Canadian Transportation Act are, in essence, human rights protections that invoke the antidiscrimination principles of the Canadian Charter of Human Rights [Council of Canadians with Disabilities v. Via Rail Canada Inc., 2007]. In Australia, accessibility mandates fall under the "Australians with Disability Discrimination Act [Disability Discrimination Act 1992]; the European Union has enacted "The European Directive on Equal Treatment" [Council Directive 2000/78/EC] that obliges all member states to prohibit discrimination against people with disabilities.

Despite the fact that they establish accessibility as a human right, the mandates (i) universally acknowledge costs and (ii) often incorporate cost-benefit balancing as legitimate considerations in their implementation. The acknowledgement of costs represents a barrier to accessibility simply because making and keeping facilities accessible entails expenses which not all are willing to incur. The acknowledgement of benefits and cost-benefit balancing can cut both ways. On the one hand, recognizing that high costs can be balanced by proportionately high benefits helps counter the economic threat posed by the acknowledgement of costs alone. This advantage is offset however where the language or interpretation (the narrative) of legal mandates would indicate that costs overshadow benefits, or where the definition of benefits is too narrowly conceived.

How societies treat the costs and benefits of accessibility

The similarity regarding the treatment of costs among the accessibility mandates of various nations is evident in Table 2.1. Perhaps the most far-reaching statement of disability rights is the United Nations Convention on The Rights of Persons with Disabilities (CRPD), signed by more than a 150 countries since its adoption by the U.N. General Assembly in December 2006. The CRPD explicitly incorporates the consideration of costs to individual entities when determining what actions must be undertaken to ensure accessibility, so as to be sure "not [to] impos[e] a disproportionate or undue burden."

Other laws and directives predating the CRPD, such as the United States' Americans with Disabilities Act (1990), the Australian Disability Discrimination Act (1992), and The United Kingdom's Disability Discrimination Act 1995 also included provisions limiting accessibility requirements on

specific entities if meeting those requirements would result in an "undue hardship" (Americans with Disabilities Act, Section 36.104), "unjustifiable hardship" (Australian Disability Discrimination Act 1992, Cth, section 31) or would not be "reasonable." (Disability Discrimination Act 1995). The Canadian Human Rights Act stipulates that providers of service to the public (such as public transportation) must show that "reasonable accommodation has been provided *up to the point of undue hardship.*"

Table 2.1. **Legislative limits on undue financial burden**

Country / Governing body	Laws/Rule regarding access and prohibiting discrimination on basis of disability	Limits on accommodation requirements
United Nations	Convention on The Rights of Persons with Disabilities (CRPD)	Accommodation required as long as it does "not impos[e] a disproportionate or undue burden, . . ." [*Convention on The Rights of Persons With Disabilities, Article 2, 2006*]
Australia	The Australian Disability Discrimination Act 1992	Accommodation required unless would impose an "unjustifiable hardship" [*Disability Discrimination Act 1992, Cth, section 31*].
Canada	Covered by the Canadian Charter of Rights, Freedoms and the Canada Transportation Act	Service providers must make provision for accessible transport up the point of 'undue hardship' [*Canada Transportation Act and Council of Canadians with Disabilities v. Via Rail Canada Inc., 2007*]
New Zealand	Human Rights Act 1993 (amended Human Rights Amendment Act 2001)	Accommodation required, including for access to "places, vehicles, and facilities," except "when it would not be reasonable to require the provision of such special services or facilities" (*section 43*)
European Union	European Accessibility Act (proposed 2015)	Accessibility requirements referred to in Article 3 apply to the extent that they do not impose a disproportionate burden on the economic operators concerned." [*Directive Of The European Parliament and of The Council , Article 12*]
United Kingdom	Disability Discrimination Act 1995; The Equality Act 2010	Prohibits discrimination against persons with disabilities, requiring "reasonable adjustments" which includes consideration of "financial and other costs which would be incurred" (1995)
United States	Americans with Disabilities Act, 1990	Entities must to make 'reasonable accommodation' "unless such covered entity can demonstrate that the accommodation would impose an undue hardship . . . "or "would result in an undue burden, i.e., significant difficulty or expense." [*Americans With Disabilities Act Of 1990, Sec. 12111 and section 36*.104]

More recent initiatives, such as the European Union's proposed European Accessibility Act, continue to explicitly incorporate limits on accessibility requirements so as not to "impose a disproportionate burden on the economic operators concerned" (Directive of The European Parliament And of The Council on the Approximation of the Laws, Regulations and Administrative Provisions of the Member States as Regards the Accessibility Requirements for Products and Services, Article 12).

The concept of undue, disproportionate or unjust burden or hardship in these laws is focused on those costs which would be incurred by a public or private entity to ensure accessibility, as well as the point at which these costs become so high as to no longer require making the accommodations. The Australian Disability Discrimination Act stipulates that accessible accommodation is required unless doing so would impose an unjustifiable hardship in relation to the *financial circumstances* and estimated *amount of expenditure* required of the entity making the adjustments. The Americans with Disabilities Act in the United States also invokes the term "undue hardship" and defines it as an "action requiring significant difficulty or expense" [Emens 2008, p. 871]. The CRPD specifies that 'economic operators' look at "the size, resources and nature of the economic operators" and "the estimated costs and benefits

for the economic operators" when assessing whether or not an accessibility accommodation "imposes as disproportionate burden" (Convention on The Rights of Persons with Disabilities, Article 12, 2006).

Yet, what makes an accessibility accommodation "reasonable" and not an "undue burden" is, in the words of legal scholar Elizabeth Emens, "a murky business" [2008, p. 877, fn 118]. With notable exceptions, such as Australia's Disability Discrimination Act in which the benefits of accessibility are acknowledged as a factor to be balanced against cost, an economic barrier to accessibility arises from the tendency of costs to overshadow benefits in both legal and non-legal conversations about the accessibility mandates of most nations. Emens speculates on possible reasons for this including legal and cultural factors. From a legal perspective, she notes that the Americans with Disabilities Act is different from other human rights legislation because it defines discrimination in terms of design change and accommodation: Under the ADA, the term 'discriminate' includes … not making reasonable accommodations to the known physical or mental limitations of an otherwise qualified individual with a disability …" [Emens 2008, p. 877, fn 118]. Because of the explicit accommodation requirement, the ADA is likely to be understood as imposing costs.

From a cultural perspective, Emens [2008, p882] speculates that society's ideas about disability make costs more visible than benefits:

> "A prevailing assumption about disability is that it means loss or lack. Indeed, the etymology of 'disability' suggests that something is missing that needs to be made up for, filled in, supplied. Disability is thus often understood as something lesser that requires the distribution of resources toward it to compensate. For this reason, disability may be generally associated with imposing costs on some for the benefits of others."

Emens [2008, p882] also says that despite efforts by advocates and scholars to promote a "social" model of disability, the "medical" model prevails in the broader culture, as does the sense that a disability is a lack that requires costly filling. Whereas the medical model of disability views disability as a medical problem requiring a medical solution, the social model says that someone is disabled by the interaction between her body or mind and the disabling environment that is built for one kind of body or mind rather than another.

> "It seems plausible that this understanding of disability primes courts, commentators and others to see the accommodations made for disability as beneficial to those for whom they are designed and costly for all others, particularly for those others who are not disabled." [Emens, p884]

Although society tends to give more weight to the costs of accessibility than to the benefits, there are two channels through which attempts are being made to take benefits into account. One is through judicial proceedings; the other is regulatory analysis. In general, benefits tend to be defined more narrowly than costs.

Judicial proceedings

A number of influential court cases provide foundations for the way societies tend to think about the benefits of accessibility. In the United States, the case *Zande v. Wisconsin Department of Administration* [1995, 44 F.3d 538 (7th Circuit)] is pivotal. Two matters of accessibility and accommodation were at issue, (i) an employer's refusal to allow Ms. Vande Zande to telecommute and to provide computer equipment to enable her to do so; and (ii) the employer's refusal to alter the design of a kitchenette on her floor at work to install the counter two inches lower than planned so that she could use it rather than using the bathroom sink for activities such as washing out her coffee cup.

The Court's decision in the Vande Zande case set two key precedents, one positive one negative. On the plus side, the Court ruled that benefits matter as well as costs in making a determination of what constitutes undue financial burden. On the down side, the Court employed a very narrow definition of what constitutes benefit. Noting that the ADA defines "an action requiring significant difficulty or expense" but offers incomplete guidance on its application, the Court ruled that the "financial condition of the employer is only one consideration" and concluded that "undue" must be interpreted to mean that the expense is undue in relation to the resulting benefit, as well as the employer's resources. On the other hand, the Vande Zande court case established a very narrow definition of benefit: it ruled that the telecommuting accommodation was not reasonable because it would interfere with teamwork and direct supervision, yet without acknowledging that telecommuting would also benefit many workers, whether or not they have disabilities, and could lead to potentially lower corporate overhead expenses: and it ruled that the harm involved in using the different sink was "merely stigmatic" and therefore too insignificant to warrant mandatory accommodation.

The Vande Zande case was decided in 1995. A 2007 Canadian Supreme Court decision recognizes a broader perspective on benefits. In Council of Canadians with Disabilities v. VIA Rail (a ruling against the use of passenger rail cars that do not meet a stated standard of accessibility) the Court states as follows:

> "A factor relied on to justify the continuity of a discriminatory barrier in almost every case is the cost of reducing or eliminating it to accommodate the needs of the person seeking access. This is a legitimate factor to consider: Central Alberta Dairy Pool v. Alberta (Human Rights Commission), 1990 2.S.C.R. 489, at pp. 520-21. But, as this Court admonished in Grismer, at para. 41, tribunals must be wary of putting too low a value on accommodating the disabled (emphasis added)."

A subsequent Canadian case goes further still in broadening the scope of benefits deemed legitimate in balancing judgments about of undue hardship. In a 2007 decision, upheld by the Supreme Court in 2008 [*Council of Canadians with Disabilities v. Air Canada]*, the Canadian Transportation Agency (a quasi-judicial tribunal of the Canadian federal government) ruled against the legality of charging personal assistants of passengers with disabilities for a second seat (the "one-person-one-fare" ruling, or 1P1F). In its decision [Norman and Neubauer v Air Canada, 2008] the Agency explicitly "*recognized the evidence presented by the applicants' expert of the following positive social impact*" of 'cross-sector benefits' from reduced pressure on social welfare systems, and lower fiscal burdens related to the 'insurance value' of a potential future need of persons currently without disabilities for accessible facilities, and an 'existence value' of ensuring a protection deemed an aspect of civil society. On this basis the Agency found that the benefits were sufficient to justify the estimated increase in overall ticket prices likely to result from a 1P1F policy and that the costs of such a policy were reasonable in light of the improved access to the transportation network for persons with disabilities.

Regulatory Analysis

In nations with broad constitutional and legal mandates for accessibility, the mandates are given operational meaning through the process of government regulation. In so doing, governments employ in one form or another, a process called Regulatory Impact Analysis ("RIA"), or regulatory assessment or regulatory evaluation. The role of an RIA is to provide a detailed and systematic appraisal of the potential impacts of a new regulation in order to assess whether the regulation is likely to achieve the desired objectives. The philosophy underlying RIA underlines the need to ensure value for money and to guard against the risk that regulatory costs will exceed benefits for society as a whole. From this perspective, the central purpose of an RIA is to ensure that regulation will be "welfare-enhancing" from the societal viewpoint – that is, that total benefits will exceed total costs.

Since regulatory impact analysis is generally conducted in a comparative context, with differently scoped alternatives for achieving stated objectives, the breadth of benefits considered will go far in determining the degree of accessibility to be mandated by regulation. A notable example is Australia's 1999 regulatory analysis designed "to assist decisions regarding the provision of transportation services to people with disabilities under the Australian Disability Discrimination Act" [Attorney General's Department, Government of Australia, 1999]. The Australian RIA cites as its objective, "To promote recognition and acceptance within the community of the principle that persons with disabilities have the same fundamental rights as the rest of the community."

The RIA also states, however, that, "The Disability Discrimination Act also recognizes that these rights do not mean access at any cost; there must be a balance between benefit and cost."

Since the RIA compares the costs and benefits of mandating alternative degrees of accessibility, the scope and definition of benefits counted in the Cost-Benefit Analysis matters greatly. Typical of many such analyses, the Australian study quantifies two categories of benefit, (i) those associated with projected additional transportation trip-making; and (ii) "cross-sector" benefits. Cross-sector benefits (resource savings that accessible transportation facilitates through the substitution of distributed services for more fiscally costly home-based services) arise across a broad spectrum, including services like chiropody, meals, and home care.

Notwithstanding the seemingly wide range of benefits it considered, the Australian study found that the costs of the selected option would exceed the benefits by fully AUD 1.1 billion. Indeed, higher accessibility standards than those in the selected option were rejected as, "not being consistent with the concept of unjustifiable hardship as set out in the DDA."

A more recent Regulatory Impact Analysis, this one in the United States concerning the establishment of architectural accessibility requirements for commercial and state and local government buildings, recognizes a wider range of benefits. The RIA [US Department of Justice, 2004, 2010] picks up on Canadian themes outlined above in stating that:

> "Benefits are primarily represented by the creation of social value, and can be divided into three categories. "Use value" is the value that people both with and without disabilities derive from the use of accessible facilities. "Option value" is the value that people both with and without disabilities derive from the opportunity to obtain the benefit of accessible facilities. Finally, "existence value" is the value that people both with and without disabilities derive from the guarantees of equal protection and non-discrimination that are accorded through the provision of accessible facilities."

In a significant development, In 2011, the U.S. federal government issued Executive Order 13,563 on cost-benefit analysis (CBA) authorizing agencies to consider "human dignity" (stigmatic harms, humiliation, embarrassment) in identifying the costs and benefits of proposed regulations (see Box 2.1 and discussion later).

Box 2.1. Human dignity and evaluating reductions in stigmatic harm

In 2011, the U.S. federal government issued Executive Order 13,563 on cost-benefit analysis (CBA) authorizing agencies to consider "human dignity" (stigmatic harms, humiliation, embarrassment) in identifying the costs and benefits of proposed regulations. Bayefsky writes that just prior to that step in 2010,

"The Department of Justice (DOJ) issued a Rule regarding non-discrimination on the basis of disability in state and local government services [sic] [and many commercial entities]. This Rule requires increased access for disabled people in a variety of settings. The [Regulatory Impact Assessment] RIA first considers dignity-related benefits in a cost-benefit analysis of a specific part of the rule, which sets standards requiring sufficient space in single-user toilet rooms for a wheelchair user to transfer to the toilet from the side rather than from the front. This means that wheelchair users will not have to go to an establishment with someone who can help them in the bathroom, or go alone to the bathroom and risk needing help once they get there. The RIA explains that "[a]lthough the monetized costs of these requirements substantially exceed the monetized benefits, the benefits that have not been monetized (avoiding stigma and humiliation, protecting safety, and enhancing independence) are expected to be quite high."

If the "avoidance of stigma and humiliation" is understood as a dignity interest, then dignity as an un-monetized benefit is being set against monetized costs and used to help make up a shortfall in monetized benefits. DOJ, in other words, is practicing Cost Monetization.

Yet the RIA then moves closer to fuller monetization. First, the RIA conducts a break-even analysis. The RIA calculates that the monetized costs of the new standards exceed their monetized benefits by USD 36.2 million per year for one type of toilet room, and USD 19.14 million per year for another type of toilet room. Therefore, "for the costs and benefits to break even in this context, people with the relevant disabilities will have to value safety, independence, and the avoidance of stigma and humiliation at just under 5 cents per use" for one type of toilet room, and USD 2.20 per use for another type of toilet room.

The attempt to put a price on safety, independence, and the avoidance of stigma and humiliation suggests that the RIA is approaching Full Monetization which involves the monetization of dignity. The RIA confirms this impression with a section elsewhere in the Rule titled "Value of Stigmatic Harm." In this section, the RIA measures "the proportion of persons with disabilities who elect to use adapted transit when dial-a-ride is available at equal or lesser fare and better time costs," on the basis that these people's preference for "integrated transportation service as opposed to segregated service suggests an interest in avoiding the stigma of being disabled." The RIA uses this proportion to calculate a "weight on the value of time" of 0.25, which it then applies to the time savings measure used to calculate monetized benefits. The result is to narrow the gap between monetized costs and monetized benefits. This exercise, in essence, monetizes the "avoidance of stigmatic harm" through the medium of people's valuations of time on the basis of a revealed-preference study."

Source: Bayefsky, Yale Law Journal (The RIA in question was conducted by HDR as consultants to the Department of Justice).

Accounting comprehensively for the benefits of accessibility: Towards an international standard

When examining the judicial and regulatory record, we see that the kind of benefits considered relevant and measurable in relation to accessibility ranges from very narrow to fairly broad. What is lacking is a consistent and comprehensive approach, within countries and, needless to say, across nations. The authors' preliminary framework for such an approach is presented in Figure 2.1. An outline

of possible means of quantification, monetization, and indexing for different dimensions of the framework is given in Table 2.2.

Drawing on the judicial and regulatory record as well as progress in welfare economics, the framework recognizes both use and non-use related benefits; benefits to people both with and without disabilities; benefits as actual outcomes as well as the freedoms available to people to realize an improved quality of life; and, incorporates reduced stigmatic harms and humiliation as distinct benefits of accessibility.

The framework combines elements of utility theory, as manifest in Cost-Benefit Analysis (CBA), and it also draws on aspects of Capability Theory. Cost-Benefit Analysis is an established means of organizing and facilitating a public discourse on the use of resources and the likelihood of welfare gains in relation to prospective alternatives for change. Capability Theory as advanced by Amartya Sen and others, holds that governments should consider not only the kind of lives we manage to lead (the outcomes, or "benefits" in CBA), but also, as explained by Sen, the freedom that we have to choose between different styles and ways of living. Capability thus refers to 'the real opportunity that we have to accomplish what we value'. It is 'the various combinations of functionings (beings and doings) that the person can achieve. Capability reflects a person's freedom to lead one type of life or another... to choose from possible livings' (Sen 2009). The operational application of the Capability approach is by no means as advanced as Cost-Benefit Analysis but has been influential in the formulation of various indices of well-being (see later).

The framework recognizes the benefits of accessibility in four broad categories, (i) agency benefits (ii) user benefits; (iii) non-user benefits; and (iv) capability. (Note that capability elements to the right of the dashed line in Figure 1 and below the dashed line in Table 2.2 and not additive to elements to the left and above the dashed line).

Agency benefits

Accessible vehicles and facilities can lead to fewer accidents among agency employees and reductions in some maintenance and operating costs.

Worker Safety. Improvements such as level platforms, improved wayfinding, and accessible ticket kiosks can improve worker safety in addition to that of transit patrons.

O&M Savings. Some improvements can reduce the wear on facilities, such as level platforms (as wheelchairs travel more smoothly across gaps) and others can lead to greater independence of passengers as they navigate facilities, and which in turn leads to less worker time to assist passengers.

New passenger demand can also lead to increased revenue to service providers. Ordinarily however increased revenue from fares is not treated as an economic benefit in Cost-Benefit Analysis since it often represents a transfer from taxpayers (through subsidy) to passengers.

Figure 2.1. **Framework for measuring the benefits of accessibility**

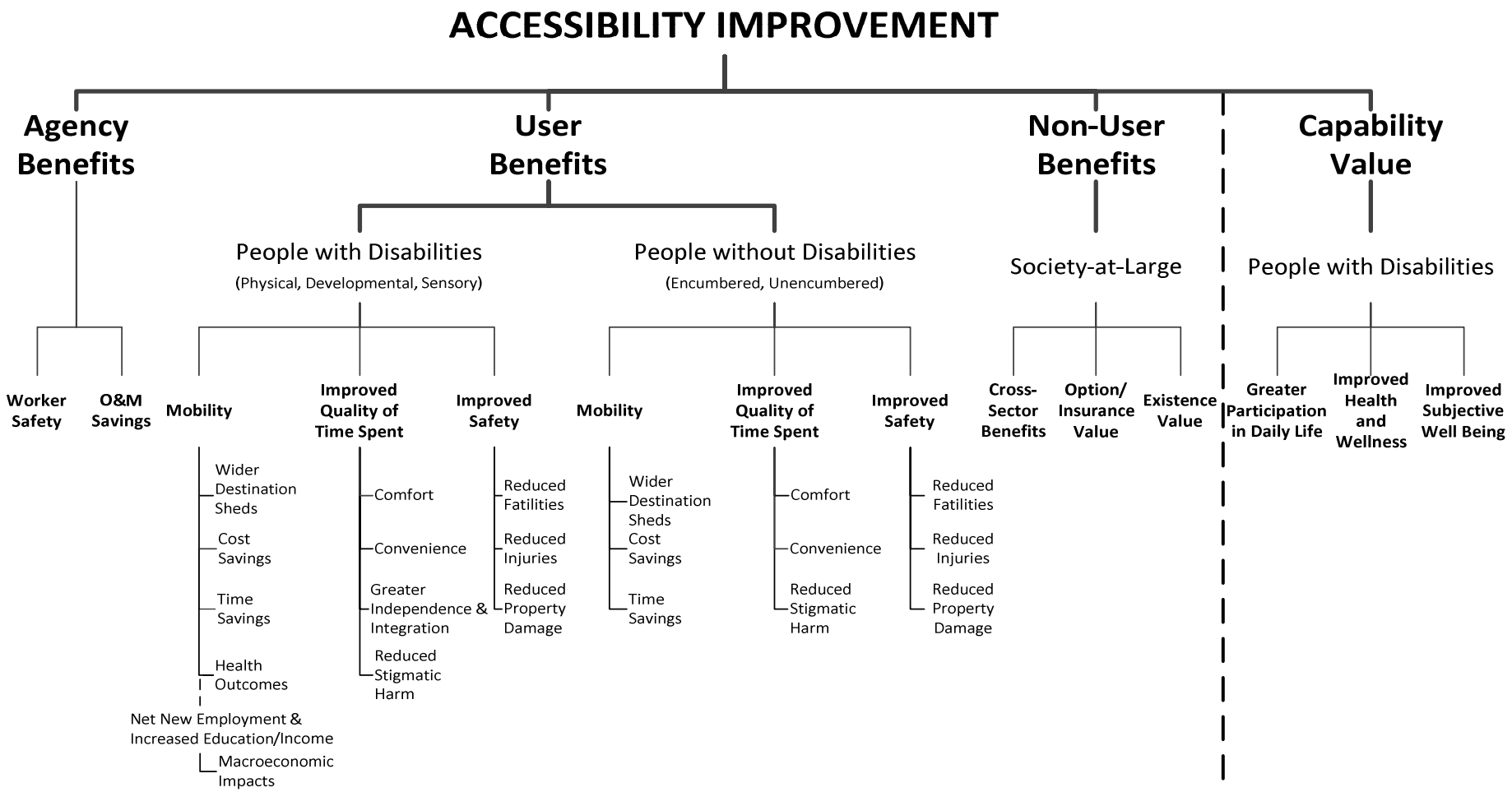


Table 2.2. **Framework for measuring the benefits of accessibility: Quantification, monetization, and indexation**

Class of benefit	Type of benefit	Beneficiary	Description	Quantification	Monetization - indexing
Use	Mobility	People with disabilities	Wider access to desired destinations, generated trips.	Demand analysis; Geographic information systems; Gravity and Isochronic indices	Willingness to pay/accept;
Use	Mobility	People with disabilities	Time savings	Demand analysis	Value of time
Use	Mobility	People with disabilities	Improved health outcomes	Quality-adjusted life years	Value of quality-adjusted life years.
Use	Mobility	People with disabilities	Net new employment	Labour market analysis and multiplier effects	Personal income (productivity); tax revenue
Use	Quality of Time Spent	People with disabilities	Increased comfort	Demand analysis	Willingness to pay premiums
Use	Quality of Time Spend	People with disabilities	Increased convenience	Demand analysis	Willingness to pay premiums
Use	Quality of Time Spent	People with disabilities	Reduced stigmatic harms	Cost monetization or demand analysis	Willingness to pay/accept premiums
Use	Safety	People with disabilities	Reduced fatalities, injuries, property damage	Demand and incidence analysis	Willingness-to-pay based statistical value of life, limb, suffering, property
Use	Mobility	People without disabilities	Wider access to desired destinations, generated trips.	Demand analysis; Geographic information systems; Gravity and Isochronic indices	Willingness to pay/accept; value of quality-adjusted life years.
Use	Mobility	People without disabilities	Time savings	Demand analysis	Value of time
Use	Mobility	People without disabilities	Increased comfort	Demand analysis	Willingness to pay premiums
Use	Mobility	People without disabilities	Increased convenience	Demand analysis	Willingness to pay premiums
Use	Safety	People without disabilities	Reduced fatalities, injuries, property damage	Demand and incidence analysis	Statistical value of life, limb, suffering, property
Use	Macro-economic Impacts	Society-at-large	Income gains through higher labour market participation and educational attainment	Input-output analysis	Direct, indirect and induced GDP
Non-Use	Cross-Sector	Society at-large	Social service agency resources	Demand and budget analysis	Budgetary resource savings
Non-Use	Option Value	Society at large	Insurance	Demographic analysis; stated preference analysis	Willingness to pay/contingent valuation analysis
Non-Use	Existence Value	Society at-large	Civic society	Stated preference	Contingent valuation
Capability		People with disabilities	Access to freedoms through due process; political process; judicial process	Periodic randomized sample survey	Index of participation in daily life
Capability		People with disabilities	Increased life-opportunities through access to health, employment, education, social outlets …	Periodic randomized sample survey	Index of health, education, and wellness
Capability		People with disabilities	Increased subjective well-being	Periodic randomized survey	Index of subjective well-being

User benefits

User-related benefits stem from the consumption of accessible facilities and arise for two categories of people, those with and those without disabilities.

For people with disabilities, user-related benefits take three forms; mobility benefits, improvements in the quality of time spent travelling; and safety.

- Mobility: Mobility benefits of improved accessibility to transportation systems and the built environment can arise in the form of increased geographic reach ("larger destination sheds") for people with disabilities to job opportunities, healthcare, educational facilities, and social networks. Improved health and wellness can arise from greater access to healthcare services and facilities.[1] Such increased reach can also yield net new (or higher wage) employment and greater long-run education and related income opportunities. Mobility benefits can also arise in the form of time and cost savings for currently-made trips. As shown in Figure 2.1, the increased range of destinations can yield greater employment, education and income for people with disabilities, resulting in macro-economic gains (gains to GDP) and government tax revenues.
- Quality: Enhanced accessibility can improve the quality of trip-making in various respects. People with disabilities can travel more independently, free of dependence on friends, family, or volunteer assistance and free of stigmatic harms, humiliation and embarrassment (see Box 2.1).
- Safety: Access improvements such as the reduction or elimination of gaps between platforms and rail carriages can measurably reduce the number of passenger fatalities and injuries. Reductions in the frequency of property damage (to things such as wheelchairs) also arise.

All three categories of mobility benefit can result in net new employment and education and related income opportunities with associated incremental (as distinct from economic transfers) macro-economic effects (direct, indirect, induced economic impacts). Their incremental nature makes them additive in the context of Cost-Benefit Analysis.

For people without disabilities, user benefits also take three forms; mobility benefits; improvements in the quality of spent travelling; and safety. Although employment and educational effects may arise for people without disabilities, these are far less likely to represent net new or "incremental" effects from an economic perspective.

Box 2.2. Wider benefits of accessibility: Accessible ticketing machines

Using an accessible ticketing machine or kiosk is faster than using one which is non-accessible or only partly accessible. Cost Benefit Analysis recognizes the value travelers place on their time. For example, current guidance in the United States (from the U.S. Department of Transportation [USDOT]) recommends USD 44.30 per hour as the value of travel time savings for air and high-speed rail travelers (all purposes) (USDOT, 2015). Thus, the benefit to a traveler of the time saved from using an accessible ticketing machine or kiosk would be estimated by multiplying the number of minutes saved by the value of that person's time (e.g. 5 minutes saved multiplied by USD 44.30/hour, for a total of USD 3.69 per use).

But in addition to making the check-in process go faster, an accessible kiosk could also make the process more comfortable (or less uncomfortable) – for example, by not requiring an awkward reach for buttons. Multiple studies have shown that people are willing to pay for a more comfortable travel experience – say, being able to sit down during a subway ride instead of standing. Drawing from such studies, analysts can estimate the value of greater comfort by applying a premium (or "mark-up") on the base value of the time. One estimate of this premium is 50% (Goodwin, 1976 cited in HDR Decision Economics, 2008; additional research summarized in USDOT, 2014). In other words, five minutes saved of uncomfortable travel time – or time using a non-accessible ticketing machine – is worth 50% more than five minutes of time saved that is not uncomfortable.

Additionally, evidence indicates (see Box 2.1) that people attach greater value to time that is spent without experiencing humiliation or embarrassment, such as time spent struggling with facilities and equipment or having to ask someone for assistance. The value of avoiding time spent enduring 'stigmatic harm' can be estimated in a similar manner to the value of improved comfort. According to one estimate, the added premium to the base value of time per hour for avoiding such stigmatic harm is about 25% [Lewis, 1985].

The premium for greater comfort and the premium for avoided stigmatic harm can both be applied to our accessible ticketing machine example from above, in which 5 minutes of time is saved by using the accessible equipment. Those saved 5 minutes were minutes that would have previously been spent in uncomfortable conditions and with additional risk of stigmatic harm; the value of that time saved has a premiums of 50% and 25% added, increasing the value of the time saved by an additional 88%.

Non-user benefits

Non-user benefits of accessibility arise in the form of cross-sector resource savings, option value, and existence value.

- *Cross-sector benefits*: Cross-sector benefits are economies achievable in another sector of the economy as a result of expenditure in the transport sector. Such economies are manifest principally in the form benefits to non-transportation social service programs. Some studies have shown that more accessible transit can relieve demand and financial pressure on non-transportation social safety net programs. The reverse is also true; reductions in accessibility lead either to increased expenditures on non-transportation social service expenditures (health, nutrition and unemployment support programs) or, alternatively, to reduced benefits for those in need of such programs.

- *Option value*: Option value can be viewed as the willingness of individuals who do not use a particular resource (such as an accessible rail service) to pay for the option of using it should they deem it desirable to do so. Option value also extends to the willingness of users of the resource to use it more extensively. The U.K. Department for Transport states that:

  *"*Option values are associated with unexpected use of the transport facility which is not built into demand forecasts and would otherwise not appear in Cost-Benefit Analysis as a benefit;

Option values are related to individuals' attitude to uncertainty - in practice a range of option values is likely to be found within the population."

- *Existence value*: Existence value is defined as a person's willingness to pay for a resource for which he or she has no current or future plans for use. The existence value of accessibility is the value that people both with and without disabilities derive from the guarantees of equal protection and non- discrimination that are accorded through the provision of accessible facilities.

Capability value

The Capability perspective on benefits recognizes increases in the range of freedoms that newly accessible facilities open up for people to pursue life chances, opportunities and ways of life. It also recognizes the wider range of access to rights, and diverse facets of social justice facilitated by a more accessible environment.

As indicated above, the Capability approach has been influential in human development theories and valuation methods (see Box 2.3). It has led to the creation the Human Development Index (HDI); the Inequality-Adjusted Human Development Index (IHDI); and the Gender Inequality Index (GII). As shown in Figure 2.1 and Table 2.2, we propose that nations and large urbanized areas develop, track and employ in policy making three Capability indices specifically pertaining to people with disabilities, as follows:

1. Index of Participation in Daily Life among People with Disabilities;
2. Index of Health and Wellness among People with Disabilities; and
3. Index of Subjective Well-Being among People with Disabilities.

Each index would be based on appropriate component factors and weighted according to a scheme developed by consensus among policy experts, lay people with disabilities and other stakeholders. An on-going program of empirical research would measure the impact of improvements in accessibility on desired progress in each index and inform policy directions accordingly (see Box 2.3).

Box 2.3. Do capability indicators influence policy?

The Human Development Index is an easy-to-understand numerical measure made up of what most people believe are the basic ingredients of human well-being: health, education, and income. The first Human Development Index was presented in 1990. It has been an annual feature of every Human Development Report since, ranking virtually every country in the world from number one (currently Iceland) to number 177 (currently Sierra Leone).

This composite index has become one of the most widely used indices of well-being around the world and has succeeded in broadening the measurement and discussion of well-being beyond just income. In a number of countries, the Human Development Index is now an official government statistic; its annual publication has been found to inspire serious political discussion and renewed efforts, nationally and regionally, to improve lives.

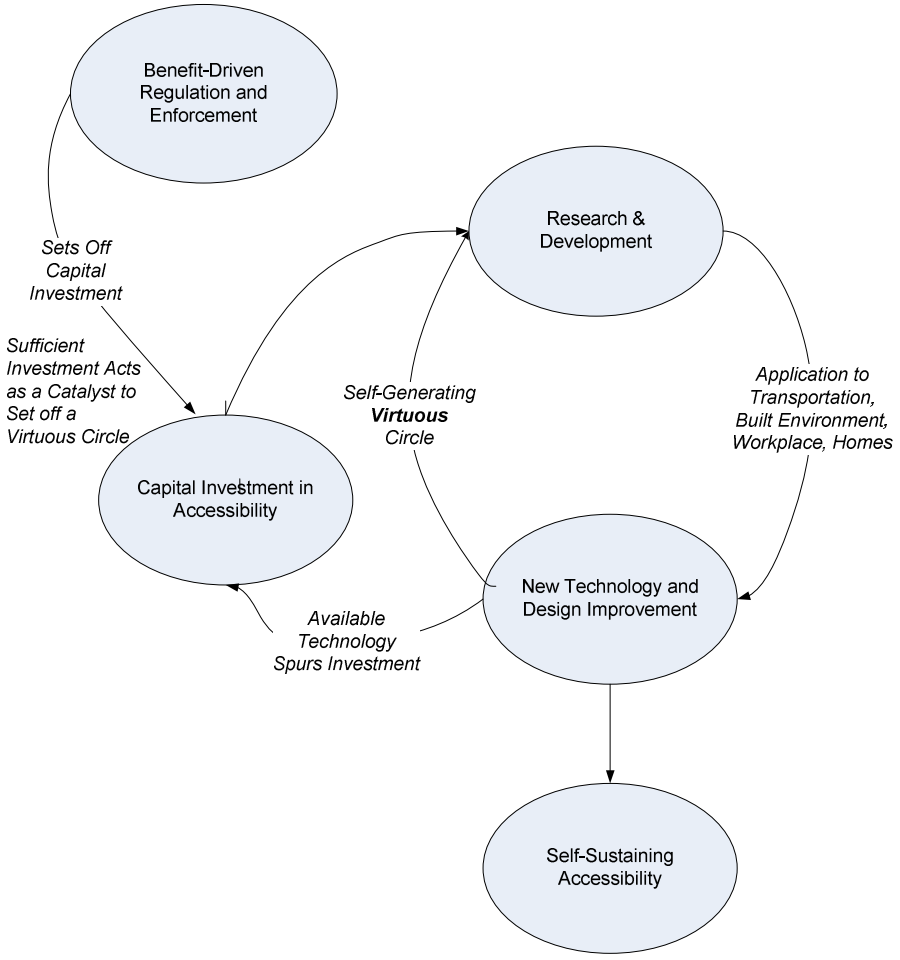
The United States uses a modified version of HDI methodology to evaluate the development levels of different states, regions and population groups within the country. This version is called the American Human Development Index (AHDI), and it uses data drawn from the Bureau of Census and other official government sources. Using the AHDI, differences between populations and regions can be identified, and the well-being of the general U.S. population can be studied. While statistics about high-income and low-income populations were available prior to AHDI use, not as much was known about the general population.

In some cases, the HDI approach has focused on excluded groups, to understand the root causes and persistent patterns of deprivation beyond national averages usually reported in international documents. The Central and Eastern Europe Human Development Report of 2003 presented the first large scale household survey of the Roma, with over 5 000 interviews and data comparable across five countries in Central Europe. The data allowed the calculation of the HDI for Roma, the disaggregation of Millennium Development Goal (MDG) indicators and the comparison with similar indicators for non-Roma populations. The report was used as a reference by the World Bank and Open Society Institute initiative called "A Decade of Roma Inclusion", with the objective to meet the MDGs for Roma people. This case is not unique; in Chile, beyond the publication of HDIs, a team of human development experts measured human development trends at the communal level, and calculated the HDI for the Mapuche populations to determine interethnic and intra-ethnic inequalities. According to a United Nations report, the analysis revealed insights on sub-national circumstances, with a focus on indigenous populations, informing diagnostics and planning at the regional level.

Triggering self-sustaining accessibility

Broadening and standardizing the way in which society thinks about and measures benefits will help facilitate the adoption of higher standards of accessibility. But this is only the beginning of the story: for a deeper economic dynamic now comes into play. Economic theory and supporting evidence shows that achieving a threshold rate of capital investment can set off a market dynamic called a "virtuous circle." Because new capital embodies the latest technology and design innovations, the more rapidly new capital is added to, or integrated into a sector, the faster average productivity in that sector will grow and the faster costs will decline. Moreover, the rate of technological progress is itself dependent on the rate of capital investment. The more quickly new capital is added to or integrated into the capital stock, the better the quality of that capital stock will be in terms of embedded technology and design. The virtuous circle is illustrated in Figure 2.2.

Figure 2.2. **Triggering a virtuous circle of self-sustaining accessibility**



An example of the virtuous circle specifically in relation to accessibility is the evolution of accessible urban buses in the United States. Prior to passage of the Americans with Disabilities Act in 1991, level-change technology for wheelchair boarding was expensive and unreliable, adding some 15 percent to the price and running costs of a bus. Following the mandate for 100 percent accessible buses within a specified period of time, the demand for better technology led to an on-going virtuous circle of investment, research and development, more investment and so-on until today the addition of bus accessibility represents less than a fraction of one-percent. Costs for curb cuts in urban pavements have followed a similar path in North America and Europe.

Importantly, due to the work of investment experts such as Richard Donovan and others, the financial sector is awakening to the reality of sizeable "returns to disability" that stem in part from public sector nudges to create markets and inspire corporate steps to satisfy related market demands.

The strategic message in the above is fourfold:

1. The key to achieving sustainable accessibility is to trigger a virtuous circle of self-sustaining investment in accessible technology and design;

2. The key to triggering the virtuous circle is sufficient capital investment;

3. The key to sufficient capital investment is strong regulatory and court enforced mandates; and

4. The key to developing strong mandates is the recognition of benefits in the widest sense, namely the framework presented in Figure 2.1.

Strong benefits and capability-driven mandates are needed to unlock a virtuous circle of investment and research and development which in turn drives down the costs of accessibility to levels that permit self-sustaining investment in accessible facilities and equipment. While there is evidence of this dynamic beginning to take hold in some nations, it has not done so in many others.

Conclusion

This chapter (i) explains the motivation for articulating the benefits of accessibility; (ii) provides a narrative basis for articulating how accessibility affects economic and social life; and (iii) moves towards a framework for quantifying the benefits of accessibility. While there remains technical research and development to be conducted in order to operationalize the framework depicted in Figure 2.1, each component of the framework has precedence in the application of Cost-Benefit Analysis and Capability Theory, precedence that speaks to its feasibility.

Adoption of the framework as a narrative tool can take the form of reference to it in policy debates and reports in order to provide perspective on questions of cost-benefit balancing.

Adoption of the framework as an analytical tool can include both the quantification and monetization of those aspects for which there is enough existing data to make robust estimates of benefits, as well as qualitative assessments of those benefits which cannot yet be adequately measured and assigned monetary-equivalent value. While different nations and organizations will need to move toward quantification at their own pace, such adoption, with differing degrees of quantification, can help keep the focus on the full spectrum of benefits of greater accessibility.

Note

[1] Mobility may be viewed as a healthcare intervention that improves generates increased quality-adjusted life-years, as indicated in Table 2.2.

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Chapter 3
The economics of enhancing accessibility: Estimating the benefits and costs of participation

Bridget R.D. Burdett
TDG Ltd, Hamilton, New Zealand

Stuart M. Locke
Department of Finance, University of Waikato Management School, Hamilton, New Zealand

Frank Scrimgeour
Institute for Business Research, University of Waikato, Hamilton, New Zealand

Inclusiveness affects the underlying thinking and consequential analysis of accessibility issues in transport. If the fundamental premise is that all people are equal and should be viewed as stakeholders in matters of public policy then it not only reflects international treaties, such as the Rights of the Child and the Rights of Persons with Disability, it encapsulates these and others in a broader perspective of equality. To claim that inclusiveness in transport policy is a paradigm shift may be an over statement, however, what seems self-evident in our discussion is not reflected in best practice at this time. It is important that some measure of the particular beneficiaries of investment in barrier-free transport is defined. We propose that the use of observable mobility aids, by persons making all manner of trips as pedestrians and public transport users, can be incorporated into cost-benefit appraisal and to inform broader transport planning. The proportion of people using a mobility aid in catchment populations can be estimated so that gaps can be defined between current and desired levels of demonstrated inclusion in transport and especially accessible infrastructure. This indicator is readily operational to estimate benefits and comparative costs of trips not made. These methods ought to be refined to objectively assess accessibility in parallel with other objectives for transport.

Introduction

In this chapter, we discuss how inclusiveness influences the underlying thinking and consequential analysis of accessibility issues from a total community perspective. This is a significant advance in approach to transportation issues and potentially a whole range of other public policy concerns. For the purpose of this discussion, the focus is on transport. If the fundamental premise is that all people are equal and should be viewed as stakeholders in matters of public policy then it not only reflects international treaties, such as the Rights of the Child and the Rights of Persons with Disability, it encapsulates these and others in a broader perspective of equality. To claim that inclusiveness in transport policy is a paradigm shift may be an over statement, however, what seems self-evident in the discussion that follows is not reflected in best practice at this time. Through our discussion, we propose a more inclusive and readily operational approach. Making the goal of inclusion explicit is important so that we can start to measure the gap between an inclusive streetscape, and the status quo, in which many people are absent and unaccounted.

What do members of the public assume about new pedestrian and public transport infrastructure? Implicitly they may assume the design conforms to principles of best practice. Constraints in the physical environment, competing demands from road traffic, and compromises to meet constrained budgets require making concessions, which reduce any prospect of universal best design. Potentially, some planners may lack knowledge and understanding as to the nature of what is "best practice".

Additionally, towns and cities across the world have a legacy of less than universally accessible infrastructure, particularly in terms of their extensive networks of footpaths and road crossings. To improve access so that more people can participate in our towns and cities, we need better ways to promote accessibility as an objective, so that new construction is more likely to be usable by as many people as possible. It is of fundamental importance to fairly prioritise upgrades to legacy infrastructure.

Notwithstanding recommended paths forward towards inclusion, there are two dangers to bear mind. First, policies to fix past failings are not the primary focus of inclusiveness and there is a danger that retrofitting becomes the way forward. There is no issue that improving accessibility may be good but it is not the beginning and the end of inclusiveness policy. Second, the unintended consequences are often much bigger than anticipated. In the mini case study below the examples are teased out further but suffice it to say that improving mobility for older people in an area may create an aged persons enclave, with declining maintenance of property, falling school rolls, and a great opportunity for either gangs or gentrification as a result of older people concentrating in this location.

Current context

In New Zealand, most nationally funded transport projects are prioritised according to three criteria: strategic fit (whether or not the project supports government objectives for land transport); effectiveness (whether the project will address the problem it sets out to address); and an economic benefit/cost appraisal. For better or worse, this assessment framework provides an objective approach for comparing projects from different regions so that investment is prioritised toward continuous improvement for all road users. These criteria support the ranking of dozens of projects.

Usually, travel timesaving and road safety (with estimates of 'value of a statistical life' and assumed reductions in crash rate) form the majority of the monetised benefits. As a policy objective, accessibility ('barrier-freedom') is not typically valued as a standalone starting point for investment. Improvements to accessibility are usually funded through discretionary budgets or as part of safety or efficiency works. The benefits and costs of investment in barrier-free infrastructure, that is universally accessible, are not quantified. This may be because there is currently no accepted method to monetise the benefits of accessibility improvements. Budget fragmentation in respect of transport matters, interagency overlaps and lack of carry forward of funds does create uniquely poor outcomes.

An example of the struggle within transport economics to fairly compare access improvements relates to New Zealand's Economic Evaluation Manual (NZTA 2016). Transport policy analysts and practitioners use this reference in appraising transport project benefits and costs for a consistent, objectively comparable methodology. This example discusses the issue of community severance, which happens when the traffic function of a road (typically a major arterial road) is elevated above any 'place' function inherent in the neighbouring land use. Severance makes crossing the road difficult; the community is 'severed' because it is not safe or convenient to participate in activities in segmented sections of the area:

> "Any areas affected by severance shall be identified, described and, if appropriate, mapped. The location of community facilities and the effects of the project on the accessibility of these facilities, particularly for pedestrians and cyclists shall be reported. Travel time changes for cyclists and pedestrians should be included with other road user costs in the economic evaluation.
>
> Main crossing points shall be marked and the numbers of crossing movements indicated. In the case of projects, such as motorways, which create major barriers, their effects on overall community structures shall be reported.. Where projects have incorporated features to reduce community severance, the incremental costs and benefits of these measures shall be reported. The benefits of reduced travel times, particularly for pedestrians and cyclists, and crash savings, shall be quantified to determine incremental BCRs of these factors." (NZTA 2016, p364)

This excerpt highlights two important points:

1. Issues such as accessibility and community severance are known to be related to transport; professionals try to incorporate them into decision-making; and

2. Measures to evaluate fairly the impacts of community severance and accessibility are not currently available; they can only be 'reported' in a qualitative manner, in conjunction with concrete analysis of more familiar indicators: in this case, monetised travel time and crash costs.

Because of a lack of economic methodology and no ready indicators to make trade-offs explicit, investment in accessibility and in particular pedestrian networks is prioritised based on 'local knowledge' using discretionary transport funds or as part of larger projects justified using economic appraisal for outcomes associated with safety or efficiency. For example, when a new school opens a discussion concerning road crossings within its catchment may occur at a meeting with improvements suggested. Consideration of benefits for pedestrians within larger infrastructure projects (for example redesign of a signal-controlled intersection) progress with the scheme, according to the technical understanding of individual planners and designers involved.

At other times, the allocation of discretionary budgets for maintenance and minor works incorporates unsolicited or prompted feedback from local communities. While these processes usually result in incremental improvements to the overall network for all road users, there is no way of monitoring the investment's true effectiveness for all people, let alone the particular benefit to people who have a particular need for universally accessible environments, for example older persons, those identifying with disability, young children, and people encumbered with luggage.

Comparably little data about the number and nature of people and their mobility are used in transport project appraisal and investment decision-making, particularly when compared to the copious quantities of data collected about motor-vehicle traffic itself. Many cities and countries hold large databases of

traffic volume data for each road link in their networks. They build and maintain complex models that use this data to predict traffic volume change for decades to come. Road traffic efficiency and safety objectives can readily trump 'accessibility' objectives in the absence of data about beneficiaries of this investment.

Despite best practice guidelines, the absence of data about people means that their needs cannot be transparently prioritised when trade-offs are made in new design. Furthermore, maintenance improvements that could result in accessibility improvements become ad-hoc, based on nebulous criteria. For example, footpath reseals may be scheduled to link with timelines for water infrastructure upgrades; the purpose of the footpath as a means for people to participate as pedestrians is not factored into any prioritisation calculation, so this investment is not necessarily targeted where needs of people are greatest. Consequently, outcomes of the process are that the social and health benefits to individuals and communities of accessible infrastructure are not explicitly considered. Invisible access problems, where infrastructure is not used because it is not accessible, remain unaddressed.

To summarise we contend that accessibility is an important objective in transport but it is difficult to measure, so it is typically not measured. This may be one reason why investment in accessible infrastructure for its own sake is relatively ad-hoc (Burdett, 2013) or justified using safety, for pedestrians and cyclists, etc., as the primary objective. The lack of effective, convenient and attributable ways to measure transport investment in accessibility also leads to reliance on best-practice standards. These act as a means to meet obligations under international conventions, such as the United Nations Convention on the Rights of Persons with Disability (United Nations, 2006). Application of these standards usually results in access improvements for new infrastructure and systems, but they do not help policy makers and other transport professionals prioritise areas of greatest need.

Approach

Measures of accessibility are essential to effectively prioritise universally accessible infrastructure. Beneficiaries of universal design ought to be included through measurement of their presence or absence. The purpose of this initial exploratory study is to suggest that people who use a visibly identifiable mobility aid can be counted as a proxy indicator of the potential and actual beneficiaries of investment in accessible transport infrastructure. Coupling observation with more refined census data in communities of interest will provide for more robust analyses.

There is no established and agreed way to even define beneficiaries of universal design, let alone measure their presence or absence. Considering beneficiaries as synonymous with a person identifying as having disability is common, which is a loose application of a widely used social model, defining disability as 'arising from the interaction of a person's functional status with the physical, cultural, and policy environments.'

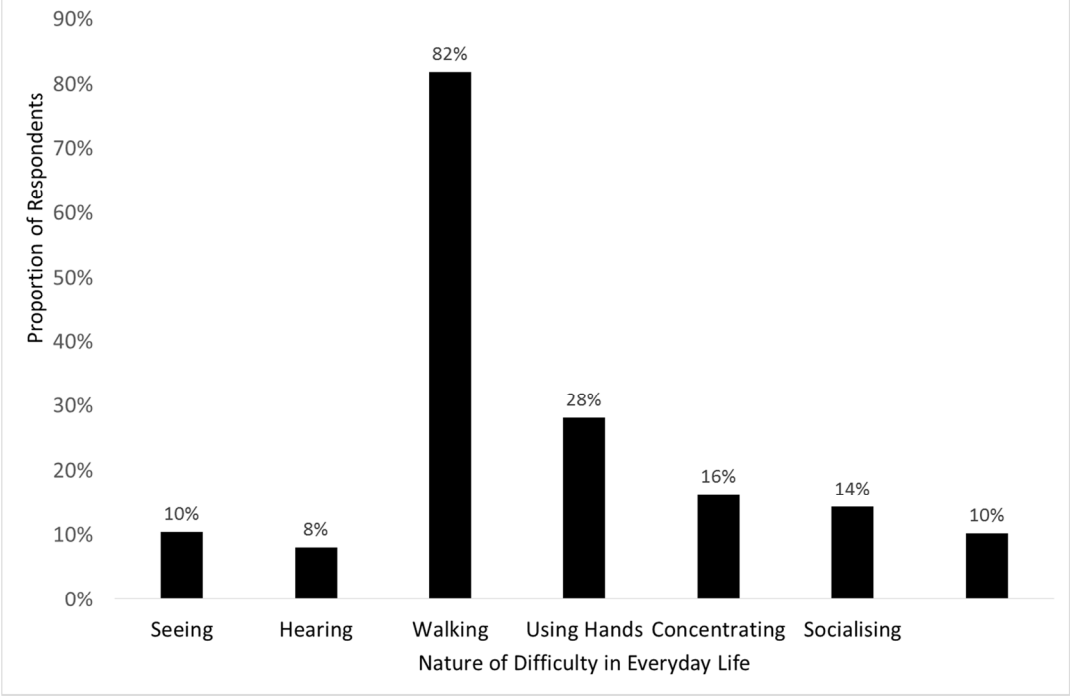
Many countries now use the 'Washington Group Short Set' questions to produce internationally comparable data about disability and its variation within a population. These questions include for example 'Do you have difficulty seeing, even if wearing glasses?' and 'Do you have difficulty walking or climbing steps?' (Madans, Loeb & Altman, 2011; Washington Group on Disability Statistics, 2009). Frye (2012) states that Census data such as the Washington Group Short Set responses are often too broad to be useful as a driver of policy change, and in any case there is too much lag between data collection and its publication for it to be a political lever. In some countries (including New Zealand), these data about disability are not disaggregated to anything less than national or regional level. Importantly, for this chapter, lacking low-level spatial data about people and their diverse abilities means that local authorities who make transport investment decisions have no data at all about differences within their population; they cannot invest in accessibility improvements that would benefit particular groups with any confidence that the investment in that particular location is justified according to relative need.

Despite difficulties defining and measuring disability, given that arguably everyone is a beneficiary of universal design some of the time; that many factors influencing participation are invisible, such as mental illness or hearing difficulty, for example; if an observational measurement method is going to be used, then it must necessarily involve a proxy measure for 'beneficiary of universal design'.

Almost by definition, people who use a mobility aid have more difficulty using transport as a means for participation than those who do not use any aid. Our previous research shows that there are differences for travel and in levels of participation by people who do and do not use mobility aids (Burdett, 2014).

More recently, we surveyed 2 952 New Zealanders about mobility aid use; their perceptions and use of different transport modes, and their participation in everyday activities. Our sample was intentionally biased towards people aged over 65 years (n = 1 562) and people identifying as having some disability (n = 2 256) so that we could instigate differences within these groups, and importantly, between them and younger people / those without disabilities. As well as asking about disability identity we included the Washington Group Short Set of Questions to understand any correlation between mobility aid use and general difficulty in everyday life. Figure 3.1 indicates responses to the types of disabilities respondents face.

Figure 3.1. **Types of difficulties mentioned by survey respondents**



As expected due to intentionally biased sampling, the data in Figure 3.1 show typically much higher proportions of people with stated difficulties than present in the New Zealand population. For example, approximately 4% of New Zealanders have difficulty seeing, and 13% have some mobility difficulty (Statistics New Zealand, 2013). The statistical analysis of these data, not reported at length in this chapter, commences with conventional diagnostic checking, consideration of the distributional nature of the data and use of various parametric and nonparametric analyses involving univariate and multivariate methods. The data are available from the lead author on request.

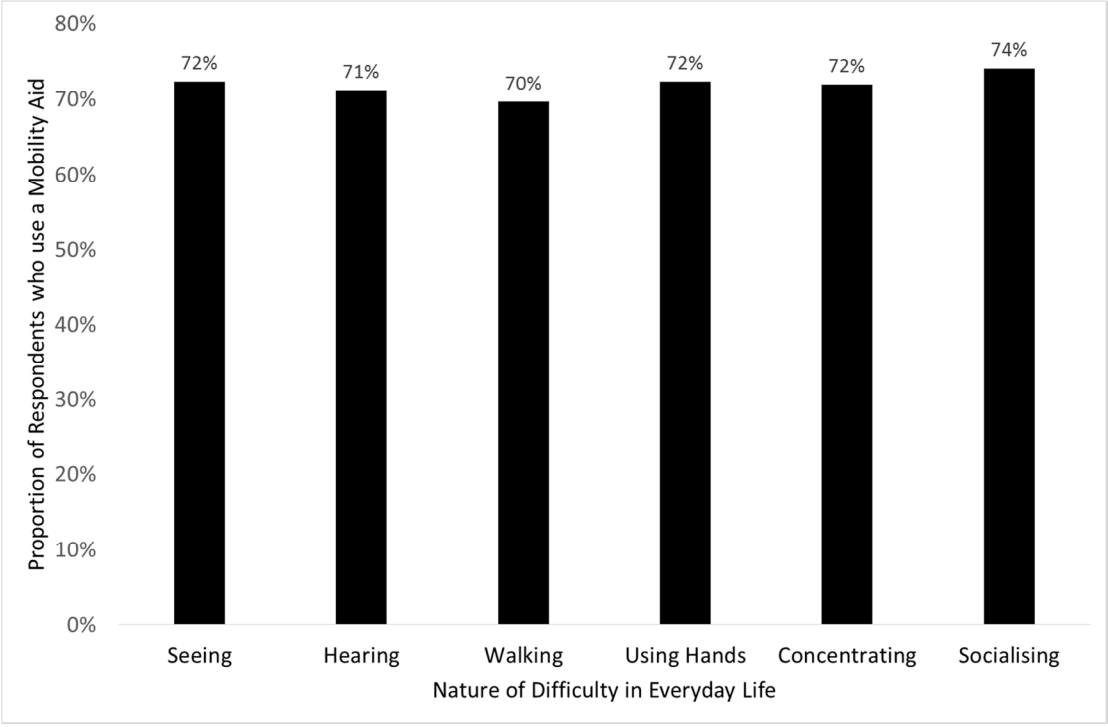
Some salient points coming from the survey are that the types of disabilities faced by men and women differ very little, there is not a large difference between regions and not surprisingly, they do differ with age. The type of activities, for which mobility is desired, varies in a statistically significant way between, gender, region and age as does the type of transport used. In non-suburban areas in New Zealand, such as rural communities, there is no public transport and recreational facilities are less abundant.

The lack of universal inclusiveness is obvious, demonstrated by differences in participation between people with and without disability. This is a major contribution of the survey: robust statistical analyses confirmed what common sense might have conjected. Additionally, it leads to clarity of some of the economic issues involved, which have not surfaced previously in the public policy debate. As an example, multivariate regression for the various forms of mobility assistance using the gender, disability form, age, region etc. provides clear indications of what is statistically significant[1].

Perhaps most usefully for the current discussion are links found between mobility aid use, and all manner of difficulty in everyday life. Our data reveal that more than two thirds of people identifying with particular need across all of the 'Washington Group Short Set' questions also report using a mobility aid when travelling outside their home. That is, mobility aid use is not an indicator of mobility impairment alone, but may also be a useful indicator of general difficulty. Our data is biased by a high proportion of older age groups, and therefore a higher than typical proportion of people who have difficulty walking (in particular), and this may be reflected in respondents reporting multiple difficulties - however, as a visible indicator of human diversity, mobility aid presence or absence among participating populations could nonetheless be genuinely useful for professionals to understand whether or not environments (including transport systems) are inclusive in their design and operation. Figure 3.2 indicates responses to the question 'Do you use a mobility aid [of any kind]' according to peoples' stated difficulty in everyday life.

There is a significant positive correlation found between mobility aid use, and some stated difficulty with everyday activity according to New Zealand's adaptation of the Washington Group questions; $r(2\ 952) = .32$, $p < .001$. Interestingly however, a person who uses a mobility aid is no less likely to travel at all on at least five days per week ($\chi\ 2\ (1, N = 2\ 752) < .01$, $p = .999$); therefore their presence or absence at a particular location may be attributable to the relative accessibility of the transport infrastructure and the place, than to any inherent lack of motivation for travel.

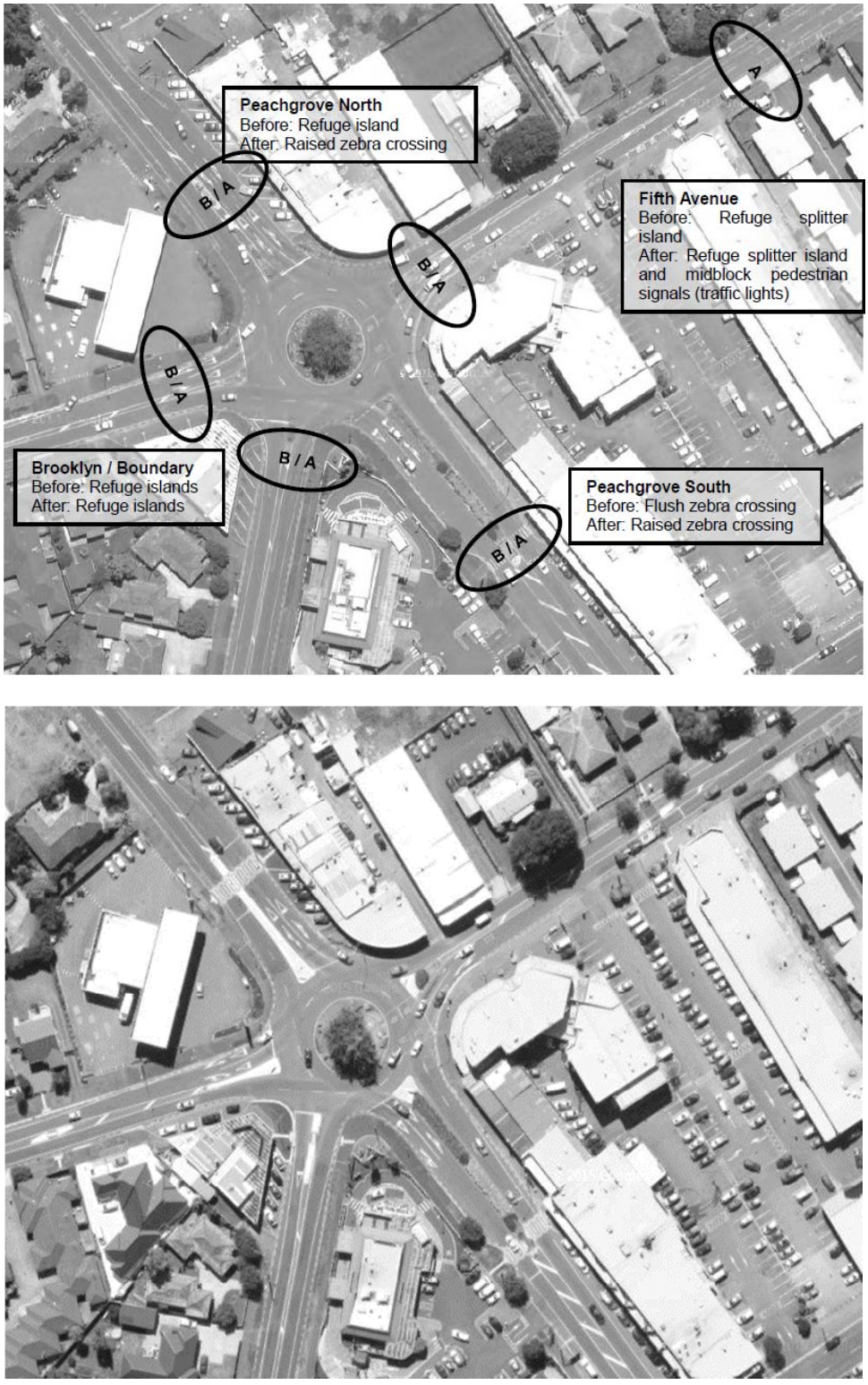
Figure 3.2. **Proportion of respondents with different difficulties who use a mobility aid**



Case study

A recent package of accessibility improvements to pedestrian infrastructure in an area of Hamilton (NZ), a city of approximately 140 000 people, in an area known as Five Cross Roads provides a useful context as a case study. The site is a suburban intersection within a low to medium-density residential area. Within 100 m of the intersection of five approaches are dozens of shops, a medical centre, social service offices, cafes and restaurants. Figure 3.3 depicts the location, including changes made to road crossings.

Figure 3.3. **Intersection (junction) detailing road crossing locations before (B; above) and after (A) improvement works**



Our study, which is for demonstration purposes only of the counting approach, examines what happens in terms of accessibility resulting from the new pedestrian infrastructure. Surveys of pedestrians using this suburban intersection before and after improvements to road crossings at the site assist in testing its usefulness. In particular, this involved counting people who use a mobility aid at the intersection, as a proxy indicator of the beneficiaries of investment in accessibility. The sample is small and accordingly no real statistically significant conclusions can be drawn. However, the indicators are in the anticipated direction.

Three primary research questions require answers:

1. Do more people use the formal road crossings after upgrading of the crossing to be more universally accessible?

2. Are people who use a mobility aid more likely to use a formal road crossing?

3. Do more people using mobility aids use the intersection post improvements?

Before the improvement works, the roundabout essentially provided one zebra crossing flush with the surrounding road surface (on the southeastern approach only), and one refuge crossing point per approach, within the splitter island that serves to provide deflection for on-road traffic entering and leaving the roundabout circle. Roundabouts are notoriously difficult for any pedestrians to cross, particularly without any more than splitter island refuge points (Schroeder, Rouphail & Hughes, 2008).

Table 3.1. **Pedestrian traffic before and after infrastructure upgrade**

Approach (Clockwise from Peachgrove Road North)	**Before**			**After**		
	Crossing type	Number using crossing	Number crossing in-formally	Crossing type	Number using crossing	Number crossing in-formally
Approach road						
Peachgrove Road North	Refuge island	60 (1)	53 (1)	Raised zebra crossing	116 (4)	23 (0)
Fifth Avenue	Refuge island	84 (0)	325 (5)	Refuge island + signalised crossing	91 (4)	314 (7)
Pachgrove Road South	Flush zebra crossing	113 (5)	45 (0)	Raised zebra crossing	142 (8)	13 (0)
Brooklyn Road	Refuge island	39 (4)	5 (0)	Refuge island	49 (4)	21 (1)
Boundary Road	Refuge island	24 (1)	27 (0)	Refuge island	48 (1)	59 (1)
Total per approach		320 (11)	455 (6)		446 (21)	430 (9)
Total overall	775 (17)			876 (30)		

Note: Numbers in brackets represent number of people using a mobility aid

The improvements include two raised tables with zebra crossings, to provide safe and accessible crossing points on Peachgrove Road north and south, as well as a signalised crossing northeast of the intersection on Fifth Avenue. Provision of tactile ground surface indicators for people with visual impairment is in place on most crossings. No major changes were made to crossing points on Boundary or Brooklyn Roads. These design decisions were made using discretionary budget in the absence of any explicit analysis of the likely benefits for people of this investment.

Pedestrians crossing the road on each approach to the intersection were counted for four hours in April 2014 before improvements were made, and for four hours in February 2015 after changes were constructed. Counts were conducted on a Wednesday in each case, from 8am – 10am, and 2pm-4pm. Count data are summarised in Table 3.1, including the number of people crossing each road; whether or not they used a formal crossing or crossed the road informally i.e. jaywalked and the number of people using a mobility aid in each case.

Results were analysed to answer each of the research questions as follows. All statistical tests were analysed using Chi-squared tests of independence with 2x2 contingency tables and a 5% significance level.

1. Did more people use the formal road crossings after crossings were made more universally accessible?

   Yes: before improvements were made, 320 out of 775 people (41%) used formal crossings. After the improvements, 446 out of 876 (51%) used formal crossings. This change in proportion from 41% to 51% was statistically significant (X^2 (1, N = 1 651) = 15.31, p <0.001).

2. Were people who use a mobility aid more likely to use a formal road crossing?

   Yes: of 47 people using mobility aids overall across both count sessions, 32 (68%) crossed at a formal crossing, with 15 crossing informally. Of 1 604 people without a mobility aid, 734 (46%) crossed at a formal crossing. This difference was significant (X^2 (1, N = 1 604) = 9.15, p = .002).

3. Did more people using mobility aids use the intersection after improvements were made?

   Yes: 17 people using mobility aids were counted before improvements were made compared with 30 after, an increase of 76%. However, compared to the overall growth in people counted at the intersection after improvements were made (an increase of 12%, from 758 to 846), this increase in the counted numbers of mobility aid users was not statistically significant (X^2 (1, N = 1604) = 2.25, p = .133)

The main advantage of using an indicator population such as mobility aid users is that planners can estimate the opportunity cost of trips not made. This is because a desirable or target proportion of mobility aid use, based on analysis of catchment demographics, can be used to estimate the number of people not counted. These differences in proportions of people using a mobility aid between different locations are useful to infer gaps in accessibility, so long as mobility aid use in the catchment populations are similar.

Data about mobility aid use in different geographic areas are not collected in New Zealand, but rates can be estimated based on known rates of use according to age and gender profiles. Using this method (available from the authors on request), it is estimated that mobility aid use by people living in New Zealand typically varies between 1% and 4% of any catchment population, with older populations showing the highest rates. These data can then be compared to proportions of transport users observed ‘on the street’ in different situations.

The key learning that comes from this observation is that without data questions cannot be answered and typically they do not get asked. Counting mobility aid users is only one method available to transport planners to improve equity in prioritising new investment. It is useful because it is a more direct indicator of participation than more technical measures of accessibility, or walkability, that combine various details such as pavement quality (width, crossfall, smoothness etc.), aesthetic components (such as the presence of greenery) and security measures (such as lighting). These measures, while useful to monitor asset performance or maintenance requirements, provide no direct indication of the value of the infrastructure for the intended beneficiaries.

Discussion

The results of this study show that counting people using the transport system, and including the proportion who use mobility aids as a subset, can provide information about inequity of access, particularly when compared to underlying proportions of people living in a community of interest. Where the proportion of people using a mobility aid is significantly different on different crossing points at an intersection such information can inform future investment for accessible infrastructure.

There are at least two further important aspects worthy of consideration:

1. Why did the person using a mobility aid cross the road, and
2. If they crossed the road, then so what?

In the context of our mini case study we know more people using mobility aids did cross the road once an impediment of unsafe crossing opportunities were removed and they were placed on a more equitable plane with other citizens. However, there is no apparent increase in their opportunities to jaywalk. Were the users of the crossing going shopping, attending medical appointments, socialising for coffee with others, attending a card afternoon at the social club, or purchasing a flagon of wine to drink in the park? In some instances, there are clear shadow prices, which are available as proxies in the estimation of value. If carers no longer need to go for shopping then their time-saving is of value in a market where there are not enough carers. Social engagements keep the spirits up and may improve the quality of life and reduce the need for medication. Playing scrabble or cards may assist with reducing loneliness and depression salon keep the mind a little sharper to postpone or ward off dementia. These have value. Drinking to excess with buddies or by oneself has negative benefits.

Having crossed the road, access to shops and other venues may still be a challenge. Once in the shop, is it feasible for everyone to navigate freely along the aisle, between displays and select items from a shelf? Having crossed one road to visit the pharmacy is it possible to get across the next street should it be necessary? There is little advantage in improving accessibility at one juncture if it not adequate to serve the needs of those in search of particular products or services.

If we ease access in one area, do we attract people who need accessibility to the area? When new schools are built or have excellent reputations people move into the zone, or rent a mailbox in zone, in order to be able to enrol their children at this top school. So we might expect if we build one accessible area in a city then we create a park for people with disabilities. Over time does this become a ghetto, or are the benefits to all people of more inclusive design enough to attract a broad spectrum of residents? One of the consequences of selective interventions is that people move to take advantage of short-term opportunities but the longer-term produces quite adverse outcomes.

What of those who did not cross the road?

A crossing suitable for all is desirable but there are many who cannot get to the crossing. Most obviously, they may not know of its existence and so the lack of signals has an economic cost. Physical barriers are likely to imprison people with disabilities and reduce their social engagement. If footpaths

are not suitable and constructed appropriately then some people cannot get to the crossing. If ground floor dwellings have steps for access and egress then these are as good as iron bars around the dwelling for many.

As most dwellings in city regions now have access to ultrafast broadband, and 97% of the country is covered by 3G or 4G mobile it is possible that shopping online, chatting online, medical prescriptions online, kindle for books, and interactive exercise games on UHD television monitors means the prisoners/ persons with disability no longer need to leave the property. It may result in recluses who live and die alone.

The majority of dwellings and businesses carry numbers on the front, e.g. 22 so we know the bungalow is 22 Arthur St. Of course, this assumes we know it is Arthur St and can read the 22. In New Zealand, domestic pets are chipped and livestock similarly have an identifying signal under a scheme called NAIT. Traceability is important for agriculture produce and government takes this seriously. School education is compulsory through to age 17 and at the end of this most people can read and count. For those with disabilities do we consider the use of numbering properties with identifying chips? Compulsory identification of property addresses in an appropriate form may well be another component of future inclusive communities.

As noted above there are sources of data such as access to internet. However, breakdown of demographic information to small units is not general available. In the case of Five Cross Roads, the number of people identifying as having disability is not readily available to those who see their responsibilities as encompassing promoting accessibility.

The economic model

The conceptual analysis of "inclusive" development requires translating into empirical analysis if it is to be useful in informing public investment decisions. This analysis starts using traditional approaches to benefit cost analysis adjusted to incorporate adequately non-market values as presented in standard text such as Freeman (1993).

To estimate the economic net benefit of the intersection upgrade considered above we estimate the value of additional trips undertaken post the investment relative to the number prior to the investment. Here we refer to trips by people with disabilities, as estimated using our proxy measure of mobility aid use.

The Net Present value of the investment is $\sum$ (Net Benefits)/ $(1+r)n$ where r is the discount rate and n = the number of time periods considered.

The gross benefits are estimated as the sum of [(additional trips by people using mobility aids * the value per trip) + (additional trips by people not using mobility aids * the value per trip)]

The net benefits are the gross benefits less both the initial capital investment costs and additional annual costs.

Estimation of the gross benefits requires careful attention to the number of trips and who takes them. For this chapter, estimating the number of annual trips is for two categories of people – those who do and do not use a mobility aid. More sophisticated analyses for larger projects would estimate trip numbers for multiple categories of people, including for example those encumbered with luggage or caring for small children; those with difficulties that are not visible, such as deafness or mental illness; and those people who always travel with a carer or assistant.

Given that trip numbers are estimated by surveys of people movements for a limited number of hours in a day or week it is important to be careful in the translation of trips in a 4 hour window to annual data which incorporates weekend and week days in all seasons of the year. The specific value for the

trips depends on who is taking the trip and for what purpose. Trips will have different values pertaining to their purpose such as work or education; meeting basic needs as in shopping or visiting medical facilities or for other purposes such as travel for leisure and recreational purposes. Estimates of these values are achievable through undertaking choice experiments such as those made popular by Hensher et al (2012). Given no choice modelling this chapter drew on earlier approaches to estimating benefits as described and utilised by Hufschmidt et al. (1983) that provided mechanisms for benefit estimation based on costs associated with alternative mechanisms for achieving the benefits.

For the Five Cross Roads case benefits are estimated conservatively as being NZD 10 per trip (a minimal taxi fare) for people who use a mobility aid. For people without a mobility aid the benefit was assumed to be only 20% of that given they are more likely to have other opportunities for travel. The benefits for people with mobility aids are expected to grow at 1% per annum given projected demographic change while benefits for people without were held constant.

For the Five Cross Roads case, the investment is assumed to have resulted in extra trips. An estimate of the initial investment is NZD 400 000 and this analysis assumes an additional NZD 20 000 per annum of maintenance costs beyond what would have occurred in its absence.

These assumptions form the basis of reporting the estimated benefits in Table 3.2.

Table 3.2. **Preliminary estimates of benefits from Five Cross Roads investment**

Increase in person with mobility aids trips per year	147%
Increase in person without mobility aids trips per year	12%
Increase in trips by people with mobility aids	8 475
Increase in trips by people without mobility aids	62 856
NPV of investment	NZD 1.27 M
IRR of investment	48%

Sensitivity analysis

Clearly, the results are very sensitive to assumptions. It is feasible to utilise a range of estimates for key variables such as estimated number of trips, estimated value of trips, interest rates, and costs.

The purpose of this example is to assert it is feasible to produce economic estimates that are plausible and that can be refined as further data are collected and analysis undertaken.

Conclusions

As accessibility (barrier-freedom) is adopted as an important policy objective in transport, we need a means to estimate the gap between what is currently provided, and what we want the transport system to look like. To demonstrate inclusion, we need to start with an understanding of who we are not including and to what extent this is attributable to investment in more or different transport infrastructures.

Central to this chapter is the issue of awareness of accessibility among professionals who plan for and design our built environments. This includes new infrastructure, but importantly it also includes the extensive upgrades required to bring our towns and cities up to universally accessible standards. As well as site-specific implications, data about people who use mobility aids generally can help to improve understanding of accessibility among transport industry practitioners. The accessibility of different types of crossings is measurable according to actual use, and differences in footpath use and are then compared based on factors such as path width, grade, crossfall and quality.

Counting users of mobility aids as a subset of all users of transport provides a means to make links between transport outcomes, social wellbeing and public health. Central to its uptake and effectiveness is

a high-level directive, so that the transport industry begins to measure accessibility as part of its decision making process. Without indicators of accessibility in transport, social and health objectives relating to active and independent participation have no means of being realised. As noted by Rickert (2005), "The recent emphasis on inclusive transport occupies an intersection between the interests of urban infrastructure workers and social development workers. These two groups understandably look at indicators and performance measures from different perspectives." (p.13). Currently in New Zealand, government priorities for transport are dominated by traffic efficiency and general road safety, which is itself biased towards car crashes because of inherent under-reporting rates of incidents involving pedestrians. The importance of accessibility for non-transport outcomes (aside from economic development) is largely ignored.

The proxy measure of people who use mobility aids is an indicator of relative accessibility, and not a means of capturing all potential beneficiaries of best-practice transport systems and infrastructure. Counting mobility aid users to infer costs of trips not made provides a method to link transport and social objectives at a high level. It also enables universal design decisions to be prioritised with an objective assessment of relative costs and benefits. The benefits of universal design are relevant for all people. These outcomes are becoming increasingly evident with population ageing. The number of New Zealanders aged over 65 years was 12% in 2006 and is projected to increase to 21% by 2031. This means that users of mobility aids will increase as a proportion of all New Zealanders.

As well as providing information for road controlling authorities and private interests at particular locations, walking data as a whole can build to provide a detailed picture about variation in access to the transport system. Given that transport exists to support peoples' active participation in life, this data has potential to provide a strong link between transport objectives, and social and economic outcomes.

It is important that planners, policy makers, investment managers and disability advocates invest more effort in refining economic valuation models that can enhance the evidence gained from survey data concerning individual travel choices.

Implications for transport planning and practice in New Zealand

Our findings show that counting mobility aid users is an authentic and practical way to build economic models to prioritise accessible transport. It is recommended that while the industry continues to advance 'best practice' in terms of accessible built environments, issues of inclusive access for all people should be tackled through cross-sector initiatives at local, regional and national levels. Involvement by health, social service, transport and non-government sectors (including community groups and advocates) is encouraged, to deliver real change so that every New Zealander can live a meaningful life.

The model detail could be easily and readily incorporated into process manuals and software New Zealand transportation professionals use to appraise transport project benefits and costs. However, the central issue is not whether the model could be used, but how to foster a cultural shift within the transportation and other sectors so that the information is sought and the right questions asked. Specific recommendations to build this economic model and its premises into local, regional and national professional transportation practice are as follows.

Transport funding in New Zealand is prioritised based on 'strategic fit' which links funding activity classes with government priorities for transport. The current government priorities for 'high strategic fit' are based on reducing congestion to support economic development directly, and reducing the incidence and severity of crashes. This research demonstrates that at a national level, there are economic benefits linked to healthy participation, supported by accessible transportation networks. An ability to demonstrate high 'strategic fit' supporting investment across different ministerial portfolios is a high-level recommendation. In this way, a transport activity class supporting investment in accessible

transport could be justified with high health strategic fit. Therefore, this work can be used to bridge different sectors, particularly where the outcome benefit (for example, health and social development) is in a different sector from that investing (for example, transport).

At a regional level, evidence about inequity of participation could be used to inform Regional Land Transport Plans, and as a tool in development of Regional Public Transport Plans to identify areas of relative disadvantage. The model could be adapted to provide regional indicators of participation and absence of people from society. With refining, the model could be used in a predictive way so that changes to population structures over time (most urgently with issues of ageing populations) can be incorporated and accessible transport funding prioritised.

Locally, City and District authorities can use these findings to investigate inequity within their own communities according to community demographics. It is recommended that City and District Councils work with local disability sector representatives (and their own Community Development teams) in the short-term to provide their own local data about areas of greatest need. It is also recommended that street accessibility audits be used to prioritise maintenance spending to remove built environment barriers. Trained auditors can identify details such as kerb cut locations and suitability, and footpath conditions compared to best practice, and then provide councils with a prioritised list for routine improvements.

Over time, the importance of accessibility as a policy objective in transport may grow such that specific training is warranted. In road safety, for example, we have extensive training courses and separate groups within our national agencies developing road safety-specific policy. This "Safe System" approach could be readily adapted to address accessibility, where transport professionals could work with health, community and social sectors to improve participation outcomes. Clearly this level of investment would require changing political approaches. However, the ageing population and diversity of access to a traditional independent motor vehicle-based transportation may necessitate such changes to thinking in coming years.

Limitations and unintended consequences

The survey data reveal taxis are a preferred form of transport for those with disabilities. The provision of taxis promotes accessibility to shopping, employment, accessing community and health services and many more components of life. While this may appear desirable, it may lower the degree of exercise obtained. If taxis are not available to travel to a community centre for recreational activities (ranging from wheelchair basketball to book clubs), those conditioned to taxi use may just choose not to participate.

The unintended consequences of public policy are plentiful when it comes to accessibility. Economists often refer to Adverse Selection and Moral Hazard as two forms of market failure typically resulting from public policy. Two examples of unintended outcomes provide illustrations. For several years there has been support for a programme of expanding the use of internet facilities by the aged, known in New Zealand as Senior Net. This encourages emailing, online banking, online shopping, social media, and even self-diagnosis of medical conditions. The unintended consequence is promotion of house boundedness and less exercise, contributing towards increased prevalence of obesity and conditions such as diabetes.

A second example is the greater availability and use of mobility scooters. As kerbs are improved, more mobility scooters use the footpaths, especially around shopping centres. Scooters and pedestrians are not necessarily highly compatible and definitely, the synergy effect with teenagers on skateboards is not apparent.

The main limitations of this approach are data collection costs, and meaningful interpretation of findings. Manual pedestrian counts are relatively expensive compared to not collecting any data. However, the data presented in this chapter shows that there is benefit from even a one-off count of four

hours at a site of interest. Compared to the investment in data about motorised traffic, the cost is relatively low. Interpretation of this data relies on understanding of community demographics. This information is not always collected as part of transportation assessments, so it requires a new approach.

The big limitation is mindset and associated capacity building among professionals as well as advocates for individual groups of need. The physical environment and social environment are not separate spaces. To move forward professionals need to embrace the social outcomes of inclusiveness, diversity and sustainability. Engineers' participation is pivotal to building an inclusive society. Can they step up to the challenge, or do they necessarily need more enforcement of specific pieces of legislation or a new level of social planner to supervise them?

Advocates for individuals with particular needs have long approached issues of inclusiveness as a basic human right. While this is understandable, the problem is perhaps best addressed by working in genuine collaboration with the professionals who do their utmost to build a better world. Mutual understanding between advocates and professionals is essential, so that engineers and planners have a mandate to ask different questions and seek different data; and so that advocates can build effective relationships with those whose assistance they seek.

Note

[1] The initial study showed that regional differences between bus and train use were statistically significant and taxis while uniformly popular were less used where buses were available.

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Chapter 4

Economic benefits of improved accessibility to transport systems and the role of transport in fostering tourism for all

Markus Rebstock
University of Applied Sciences, Transport and Spatial Planning Institute, Erfurt, Germany

Accessibility is one of the key aspects of current transport planning, especially in reliance to public transport and pedestrian traffic facilities. This chapter deals with this subject by outlining which are or could be the benefits of improved accessibility to the transport system with a special focus on economic benefits and the tourism sector. Therefore selected existing studies will be analysed. Besides the legal background and social aspects of accessibility related to the transport sector will be covered.

The first part of the chapter deals with the legal background and social aspects of accessibility in the transport sector. It shows that nowadays in many countries accessibility of transport systems is not a voluntary task but a task bound by law and that an accessible environment is not only essential for people with disabilities and necessary for up to 40 % of the population but also a matter of comfort for all users.

The second part outlines which are or could be the economic benefits of improved accessibility to the transport system. Two studies from Norway used the stated preference method to monetise and prioritise different universal design measures. In general this method seems to work also as a tool for analysing economic benefits of accessibility measures. Nevertheless the results of these studies have to be interpreted with extremely caution in order to avoid discrimination.

The third part deals with the economic impact of accessible tourism using the example of Europe. The inducible impact of accessible tourism on the transport sector as well as the relevance of passenger transportation for accessible tourism is elaborated. All in all accessible tourism produces a huge economic impact on the tourism sector and beyond, and by improving accessibility in the future a significant raise of economic benefits is possible. In general traffic is precondition for tourism. Besides tourists spend a significant part of their travel expenses for the journey to the destination and back and for local transportation. This makes it clear that accessible transport systems will directly benefit from an increasing accessible tourism market.

Introduction

Accessibility is one of the key aspects of current transport planning, especially in reliance to public transport and pedestrian traffic facilities. This chapter deals with this subject by outlining which are or could be the benefits of improved accessibility to the transport system with a special focus on economic benefits and the tourism sector. Therefore selected existing studies have been analysed. Besides, the legal background and social aspects of accessibility related to the transport sector have been covered.

Legal background of accessibility related to the transport sector

First of all it has to be noticed that in general "it is difficult to separate out the proportion of costs associated with the "accessible" features and to do this would be suspect, if only because defining exactly what is an accessible feature needed by disabled users is often difficult. Much that is done to meet the requirements of disabled people is of benefit to all passengers. (For example low-floor buses are necessary for wheelchair-users and at the same time reduce the boarding time and the alighting accidents, which is a clear benefit of this accessibility measure for all passengers as well as for the transport company and for the society as a whole.) It can be argued that since the ability of disabled people to use public transport is now (…) accepted as a right, attempting to apportion costs to them would be as irrelevant as attempting to apportion costs between, say, male and female transport users." (European Conference of Ministers of Transport, 2004)

Based on this it has to be stated that a full and effective participation and inclusion in society by all persons with disabilities is a human right, not only but especially for the nations having signed and ratified the "Convention on the Rights of Persons with Disabilities" (CRPD). To enable persons with disabilities to live independently and participate fully in all aspects of life accessible transportation plays an important role. Hence accessibility is one of the general principles of the CRPD. Therefore the CRPD declares that "States Parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas. [In detail the CRPD demands the] (…) identification and elimination of obstacles and barriers to accessibility especially to buildings, roads, transportation and other indoor and outdoor facilities, including schools, housing, medical facilities and workplaces. (…) [Besides the States Parties have] to ensure personal mobility with the greatest possible independence for persons with disabilities." (United Nations, 2006)

In addition to the CRPD the national states usually have a complementary legislation for people with disabilities regulating also the general provisions for accessibility. For example in Germany a Disability Equalisation Act regulates that public paths, open spaces and streets as well as transport facilities and means of transportation open to the public have to be designed in an accessible way (BGG, 2002). Also the European Union has proposed at present an "European Accessibility Act, which will set common accessibility requirements for certain key products and services that will help people with disabilities at EU level to participate fully in society." (European Commission - DG Employment, Social Affairs & Inclusion, 2015) Amongst others the Act includes air, bus, rail and waterborne passenger transport services including the built environment used by clients of passenger transport services as well as the environment that is managed by service providers and by infrastructure operators.

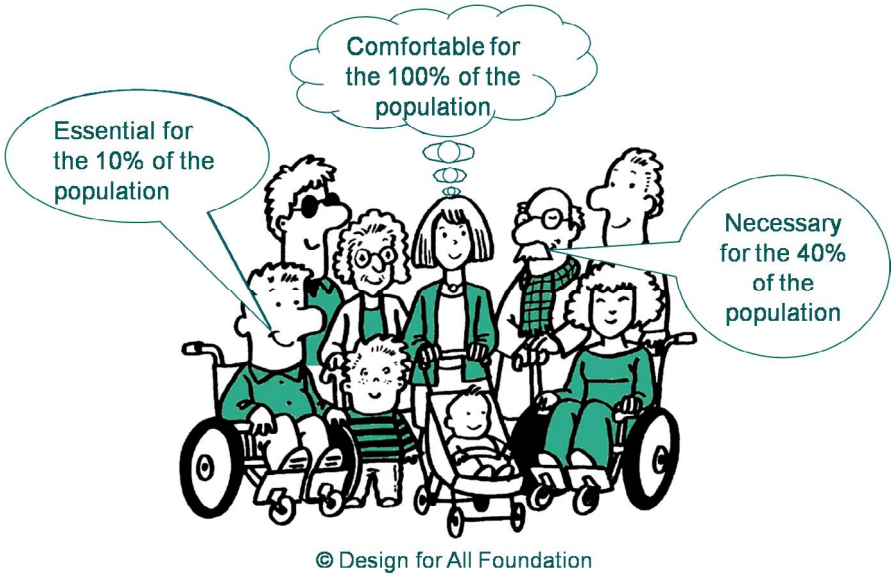
Notwithstanding that all these laws to some extent include reservations of decision regarding costs (for details see Federing and Lewis, 2016), it has to be kept in mind that in most nations the discussion about economic effects of improved accessibility to transport systems cannot be a question of designing a system accessible or non-accessible, because they have to be designed accessible by law anyway. The pending question is in fact how to design the several transport elements with their locally specific characteristics in detail. In this context economic conditions of course play an important role for example

in the context of Cost-Benefits-Analyses (CBA) for investment decisions in reliance to time and financial limits.

Social aspects of accessibility

As mentioned above on the one hand it is not easy to appoint whether a measure is of benefit only to a specific group of passengers or to all passengers. On the other hand nowadays it is well-recognised that an accessible environment is essential for about 10% of the population and necessary for about 20 to 40%. And last but not least accessible environments are comfortable for all (Rebstock, 2011), see Figure 4.4.

Figure 4.4. **Accessible environments are comfortable for all**



Source: Design for All Foundation (2016), Design for All is design tailored to human diversity, http://designforall.org/design.php, accessed 09 January 2016

The 10% of the society with indispensability of an accessible environment are the so called people with disabilities. But of course this group is not homogeny and the individual abilities and limitations of people with disabilities vary in reliance to the built environment. Nevertheless this group can be specified as follows (Bundesministerium für Verkehr, Bau und Stadtentwicklung, 2000):

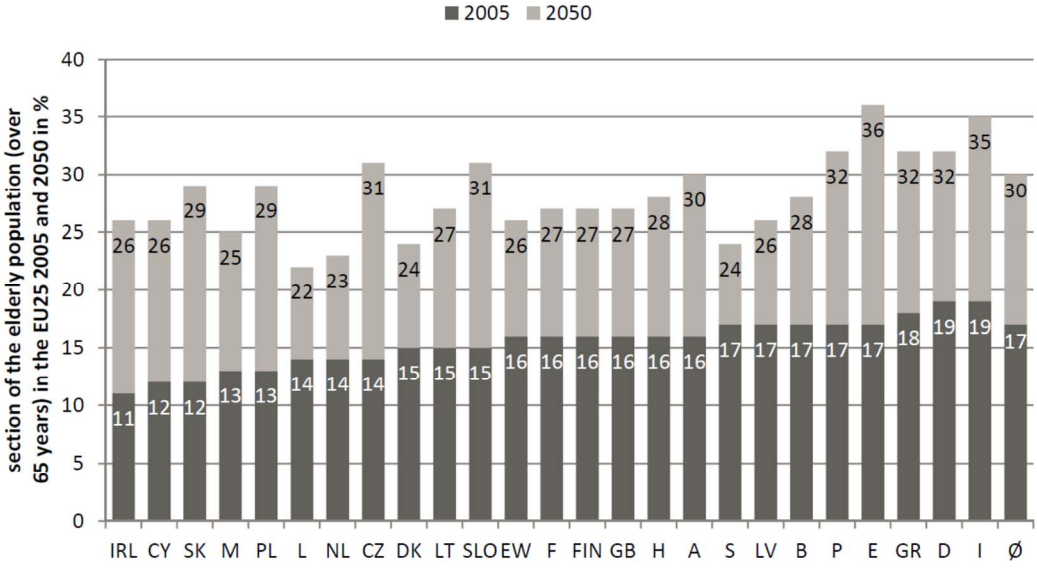
- People with locomotion limitations (e. g. limp, stand or grasp limits)
- People with sensory limitations (e.g. blindness, deafness, visual impairment)
- People with speech limitations
- People with cognitive limitations
- People with mental limitations

The size of the group with necessity of an accessible environment varies from 20 up to 40% of the society (Becker et al., 2007). This includes amongst others people with temporary or age-related mobility-restrictions, pregnant women and people with buggies or dogs. Temporary restrictions occur

e.g. because of heavy respectively lots of luggage or accident-related limits (Rebstock, 2011). From age-related restrictions especially small children and elderly people are affected.

In the context of age-related restrictions of elderly people the so-called demographic change has to be taken into account, because it will have a high influence on the future development of societies in many countries. In reliance to the world's population it is expected that the proportion of people over 60 years will double between 2000 and 2050 from about 11% to 22% and the absolute number will increase from 605 million to 2 billion (Frye, 2015). In Europe for example an absolute shrinkage of the general population is anticipated, while the proportion of older people will increase (Leibniz-Gemeinschaft e.V., 2007). Rates of negative growth will vary considerably across the European Union (EU). Not all of the countries in Europe expect an absolute shrinkage of the population. For example, in the United Kingdom, Ireland, Iceland, France and Portugal as well as in the Scandinavian states population numbers are predicted to remain stable or increase until 2050. By contrast, the transition countries in Central Europe will experience population shrinkage without exception (Gans and Leibert, 2007). But all nation states' populations will 'age', and this means that across the EU the median age will increase notably in the first half of this century. By 2050, about half of the European Union's citizens will be older than 50 (Aschemeier, 2007). Of particular note is that the proportion of those aged 80 and over is predicted to increase some 180% between 2005 and 2050, and growth of the 65-79 age group is expected to be 44% in the same period (Commission of the European Communities, 2005). Figure 4.5 shows the proportion of the population that is elderly (65+) in the EU25 member states for the years 2005 and 2050. While the proportion of elderly people will rise in all countries, it will vary and is predicted to range between 36% in Spain and 22% in Luxembourg.

Figure 4.5. **Section of the elderly population in the EU25 2005 and 2050 in %**



Source: Data: Dangschat, J.S. et al. (eds.) (2007), Mobilität und Verkehr im demografischen Wandel, Mobilität mit Zukunft, 1/2007, VCÖ, Wien, p.18

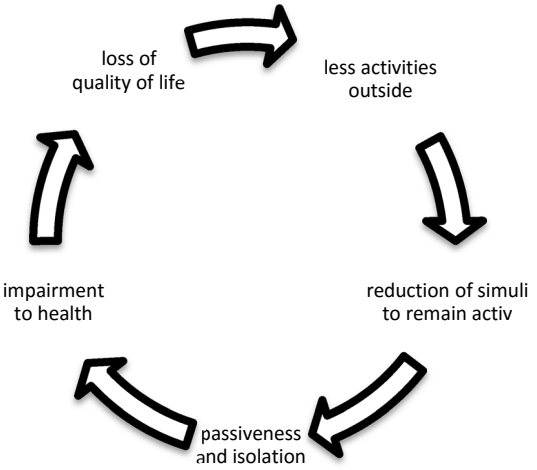
In measuring benefits of future accessibility developments in the field of passenger transport and mobility, a detailed understanding of the demographic trends is crucial; changes in the age structure are of particular importance in relation to the nature, means and timing of transport activities (Forschungsgesellschaft für Straßen- und Verkehrswesen e. V. - Arbeitsgruppe Verkehrsplanung, 2006). Several studies have shown that elderly persons "are more often immobile in the sense of not leaving the house on a given day, make fewer trips on days they go out, use non-car transport modes more

frequently, and travel over shorter distances than do younger cohorts (…). They also tend to travel less outside peak hours or at night." (Schwanen and Páez, 2010) Besides for the elderly accessibility of specific sources and objectives like medical institutions, public authorities, retail stores, municipal centers, churches and senior citizens' residential estates get more important (Hamann, 2006). Nevertheless it has also to be noted that elderly persons are not a homogenous population group. For example "lifestyle (e.g. working, semi-retired, housing, hobbies, etc.) and the socio-demographic characteristics (e.g. gender, marital status, ethnicity, driver license possession, etc.) of the old are varied." (Mercado, Páez and Newbold, 2010) In relation to this, mobility can be viewed in general as possessing five significant elements (Metz, 2000):

1. Travel to achieve access to desired people and places. (…)
2. Psychological benefits of movement – of "getting out and about". (…)
3. Exercise benefits. (…)
4. Involvement in the local community yielding benefits from informal local support networks. (…)
5. Potential travel – knowing that a trip could be made even if not actually undertaken.

In order to realise many opportunities for older people to participate fully in society, strategies need to be cognisant of the need to preserve individual mobility. If the ability to live autonomously and independently and to participate in outside activities is lost, a vicious circle of immobility can ensue: an important stimulus for elderly to stay active is lost, and this in turn leads to passiveness and loss of abilities, which can result in further isolation and passiveness, see Figure 4.6. As Shoval et al. make clear, "out-of-home mobility is critical to numerous aspects of elderly people's quality of life." (Shoval et al., 2010)

Figure 4.6. **Vicious circle of immobility**



Source: Haindl, G. and R. Risser (2007), "Mobilität und Lebensqualität älterer Menschen", Verkehrszeichen, Vol. 23, No. 3, p.14

Despite the common trend of longer-lasting health among older people, the increase (in absolute and percentage terms) in the elderly population will likely result in higher rates of personal mobility impairment (Kasper, 2005). The successful repression of so-called diseases of civilization will lead to higher incidences of chronically-degenerative illnesses (Münz, 2005), and even with comparative good health ageing can result in physical and mental insecurities (Kasper, 2005). There is "a strong correlation between age and disability, or loss of mobility." (Frye, 2015) For example "the number of citizens with disabilities and/or functional limitations will increase significantly with the ageing of the European Union's population. Taking into account demographic ageing, it is expected that in 2020 approximately 120 million persons in the European Union will have multiple and/or minor disabilities." (European Commission, 2015) In principal age-related physical restrictions are partially comparable with those of people with disabilities. The only difference is that for physically and mentally healthy older people these restrictions generally come into effect over time (Appel, 2007). For example in Germany 7.5 million people were registered as "severely disabled" (2013), which amounts to a proportion of 9.4% of the German population. Three-fourth of them were 55 years or older and one-third were 75 years or older (Statistisches Bundesamt, 2014). As such, transport systems have in principle to be accessible to a wide range of potential passengers in varying states of health and personal mobility, if a high amount of elderly people are not to be excluded from public life (Hettrich and Herzog, 2007). So it can be pointed out that accessibility is not only a question of inclusion and equal treatment of people with disabilities but also a matter of social and health policies for the elderly. Even the demographic change will increase the need of accessible transport systems in order to avoid immobility and a raise of medical and care costs of the future elderly. Moreover the growing proportion of elderly people is also an important economic issue especially related to the tourism sector (see corresponding section).

Nevertheless it has to be kept in mind that with respect to the heterogenic group of the elderly as mentioned above accessibility in terms of barrier-freedom is only one of the quality features of an age-friendly transport system (see Table 4.3).

Table 4.3. **Quality features of an age-friendly transport system**

System quality	Explanation
Affordable	Use of the transport and mobility system should be possible within older people's financial means.
Available	The transport and mobility system should exist in a way that older people can use it.
Barrier free	The system's facilities should be usable by disabled persons without any specific difficulty and without assistance from third persons. They should as such be designed to take into account the physical, sensory and cognitive impairments more likely to be experienced by older people.
Comfortable	The transport and mobility system should be designed or adapted to ensure that older people can use it without experiencing undue discomfort, pain, stress or anxiety.
Comprehensible	Information about the transport and mobility system should be communicated in ways that make it easy for older people to understand.
Efficient	It should be possible to travel to the required destination within a reasonable amount of time.
Friendly	The transport and mobility system should be approachable for older people. Where applicable staff should be available in a number of ways (phone, face to face) and should be aware of older people's particular needs.
Reliable	The transport and mobility system should perform as advertised, allowing for an element of unpredictability caused by unforeseen events, e.g. by extreme weather.
Safe	The transport and mobility system should not be dangerous for older people, with specific needs, to use. They should not feel unsafe while using it.

Secure	The transport and mobility system should be dependable and should not present unnecessary risks to older people. They should feel confident that they are not at risk when using it.
Transparent	Older people should be aware of the existence of the transport and mobility options available to them, and understand how to use them.
Complementary	The transport and mobility system should be supported by policies capable of promoting accessibility for older people by means other than personal transport, e.g. internet access, mobile services.

Source: Berding, J. et al. (2015), "Policies for transport and mobility in an ageing society: An evaluation of current practice in Europe and beyond", in Bundesanstalt für Straßenwesen (ed.), Ageing and Safe Mobilitiy: Papers, Bergisch Gladbach, p.4

Last but not least it has to be highlighted that in most cases accessibility measures have a useful effect on all users, because the comfort of the system increases, respectively the system quality will increase as well. As mentioned above a low-floor bus is necessary for wheelchair-users and reduces the boarding time and the alighting accidents, but in addition these types of busses are also more comfortable for all users, because it is easier and saver to board without steps at the entrance. This is only one example; there are many other measures for people with disabilities which also provide high overall socioeconomic benefits. Nowadays many accessibility projects have already internalised this and therefore are based on a more broadly approach (see Table 4.3), like design for all, inclusive design or universal design concepts (Rebstock, 2011).

Notwithstanding the above, of course also some more specific measures without (or at worst with negative) effects on other users exist. Nevertheless this type of measures also has to get off the ground for equalisation purposes, but maybe compromises have to be made. In this context and related to measures for a specific disability it has in general to be ensured not to build up a new barrier for other users (Leidner, Neumann and Rebstock, 2006).

Studies analysing the economic benefit of accessibility measures in the transport sector

First of all it has to be noted that not many studies exist, which investigate the economic benefit of accessibility measures in the transport sector. In general there is a lack of evaluation of accessibility interventions, "which makes it difficult to draw conclusions regarding their impact and success, to establish whether resources used in this field are effective and to implement changes to improve project delivery in the future." (Berding et al., 2015) Nevertheless during the last years a few efforts have been undertaken to identify economic benefits of improving accessibility of the transport systems. The following analysis raises no claim to completeness.

One example from UK analysing several railway stations after improving their accessibility shows that 1% of all station users are customers with disabilities and another 5% are passengers who are temporarily encumbered, for example because of taking a buggy or heavy luggage with them. These values are surprising low in reliance to the remarks made in the previous chapter, but this could also be an indicator for low rates of use of public transport in the UK by people with mobility restrictions in general. Nevertheless about 10% of the passengers with disabilities have increased the number of trips after improving the accessibility, whereby one third of the wheelchair users, approximately a fifth of passengers with hearing impairment, and 15% with mobility impairment increased their use of the improved stations. All in all the study states an economic benefit, with benefits overall exceeding costs by 2.4:1 over a 60-year appraisal period, although the values differ from station to station (Steer Davies Gleave, 2015; for comprehensive analysis see Chapter 5).

As another example a Norwegian study analysed the passengers' valuation of universal design measures in public transport. At first the study stated that benefits arising from measures to improve accessibility for passengers with disabilities are not limited to these groups but provide benefits and ease

of use for all passengers as mentioned in the previous chapter. So the study focused upon the impact of accessibility measures in public transport on all passengers as well as on passengers with disabilities. Based on these measures passenger benefits were quantified and monetised. Therefore a full scale stated preference survey among passengers has been undertaken (Fearnley et al., 2009). This "stated preference method" refers "to a family of techniques which use individual respondents' statements about their preferences in a set of transport options to estimate utility functions. The options are typically descriptions of transport situations or contexts constructed by the researcher." (Kroes and Shelton, 1988) The method is particularly useful in reliance to CBA, in order to compare the social costs and benefits of measures by aggregating them on a common monetary scale. Especially the external effects often involve impacts on public goods, which are not traded in the market and therefore, no market prices exist. One technic for valuing public goods is the stated preference method, at what experimentees were asked directly for their willingness-to-pay in order "to get an improvement or avoid a decrement in the quality or quantity of the public good." (Hensher, 1994) The Norwegian study is based on focus groups and on-board interviews with passengers in three different Norwegian cities where considerable accessibility measures in public transport were implemented. "Special care is made to present attributes and their levels in a way that enable respondents to make trade-offs as realistically as possible in the choice experiment, i. a. by extensive use of graphic illustrations. As a final exercise (…) [the researchers] obtain respondents' willingness to pay for the "package" of full accessibility for all, from door to door, using contingent valuation, and compare this with the sum of values for individual measures." (Fearnley et al., 2009) According to the authors´ opinion within the stated preferences method the accessibility measures can be prioritised, ranked and compared with other investments in the transport sector as part of CBA. So as a result values for different accessibility measures were defined. Each measure is associated with a recommended value per ride in Norwegian krones (NOK). For example a low-floor bus gets NOK 1.67, a light at stops NOK 2.82 or satisfactory snow and ice removal NOK 4.97 (Table 4.4). The results are representative for all passengers, and not only for those with disabilities. All in all the authors conclude that the study has provided for the first time in Norway and probably also internationally a robust set of valuation of accessibility measures in public transport useable for CBA (Fearnley et al., 2009).

Table 4.4. **Summary of recommended valuations, NOKs per ride.**

Values based on choice experiments	Value
Information at stops	
Local map	0.43
Speaker with info of changes, disruptions	0.69
Screen with real-time information	4.05
All three information devices: map, speaker and RTI	4.62
Information on board	
Next stop via speaker	3.62
Next stop via screen	3.67
Both: next stop via speaker and screen	4.20
Improved boarding and alighting	
Low-floor vehicle	1.67
Low-floor vehicle and adjusted (elevated) curb at the stop	2.07
Shelter at stops	
Shelter without seating	3.12
Shelter with seating	5.10
Cleaning and ice/snow removal at stops	
Satisfactory cleaning	3.62
Satisfactory snow and ice removal	4.97
Values based on contingent valuation	
Light at stops	2.82
End to end trip universally designed	3.83
Stops and vehicle universally designed	4.35

Source: Fearnley, N., S. Flügel, M. Killi, M. Dotterud Leiren, Å. Nossum, K. Skollerud and J. Aarhaug (2009), Kollektivtrafikanters verdsetting av tiltak for universell utforming, TØI rapport, Oslo, www.vegvesen.no/_attachment/121428/binary/227195 , accessed 15 December 2015, p.i-ii

Another study from Norway has used the stated preferences method in order to quantify benefits of universal design measures related to public buildings and outdoor areas. Based on an internet survey with about 800 answers benefit rates for 18 accessibility measures were defined. Their selection was based on a study of measures in different databases, for example of a Norwegian public sector administration company and from some other similar projects for counties and municipalities in Norway. Each measure was allocated to an average benefit and to benefits for different groups of people with functional limitations who are dependent on these measures. The values were used within CBA in order to compare benefits and costs of different measures and to prioritise them. As a result a spreadsheet software file and a manual which describes the calculations in general and for each measure were published for public use (Analyse & Strategi AS, WSP Norge and Vista Utredning AS, 2011). Table 4.5 shows the average valuations of the measures included in this study.

Table 4.5. **Average valuations, NOKs per visitor**

Effort	NOK
Good pedestrian walking surfaces outdoor	3
Visual marking of walkways	9
Visual and tactile marking indoors	9
Stair handrails	7
Automatically opening entrance doors	1
Visual contrast on entrance doors	0,5
Access ramps for entrances	1
Access ramps in swimming pools	1
Access ramps at beaches	1
Visual marking of doors and glass walls	2
Low counters	4
Universal designed toilet facilities	1
Installing elevators	5
Modernisation of existing elevators	2
Indoor lighting	17
Outdoor lighting	17
Assistive listening system / hearing loop	0,9
Floor space for wheelchair access	0,3

Source: Data: Analyse & Strategi AS, WSP Norge and Vista Utredning AS (2011), Tiltak for universell utforming i bygg og uteområder Veileder i samfunnsøkonomisk analyse, Oslo, https://www.regjeringen.no/globalassets/upload/bld/uurapportveileder.pdf , accessed 15 January 2016, p.14

Notwithstanding the conclusions of the Norwegian studies mentioned above focusing on universal design the values have to be interpreted with extremely caution. For example lists as shown in Table 4.4 and Table 4.5 cannot be ranked without a deeper look into each single measure, because the importance of a single accessibility measure differs in reliance to the abilities of the current user. Some measures benefit many different groups of users, but the benefit per user is rather low. Other measures maybe affect only some user groups, but for them the measure could be an indispensable condition for using the whole system. For example the measure "Low-floor vehicle and adjusted (elevated) curb at the stop" in Table 4.4 is valued with NOK 2.07, the "Shelter with seating" with NOK 5.10. But for wheelchair-users a stepless entrance in the bus is essential for using the system and therefore this is also a matter of avoiding discrimination (see previous section). By contrast a seating at the shelter is mostly irrelevant for wheelchair-users, but has high overall socioeconomic benefits. Besides a sharply higher willingness to pay was recognised on non-accessible transport lines than on the accessible ones (Fearnley, 2016). Table 4.5 shows high benefit rates per user for indoor and outdoor lighting, for visual and tactile markings and for stair handrails and elevators. Especially good lightning conditions seem to be highly profitable and might not be considered enough so far. On the contrary measures like hearing loops have a comparatively low average valuation of NOK 0.9 per person, but of course, for people using a hearing aid, the value is much higher. As a consequence the interpretation of average benefit rates cannot be separated from non-discrimination purposes. Merging both benefit dimensions in a kind of a matrix could be a way to prioritise, with the absolutely indispensable accessibility measures for specific target groups on the one hand, and with the averagely high rated measures on the other hand. Maybe this could

lead to priorities regarding high overall socioeconomic benefits as well as high individual benefits and avoidance of discrimination and exclusion. On top of this it has always to be kept in mind the country with his specific cultural and geographical background within which the study was made. For example in the northern European countries like Norway measures like "satisfactory snow and ice removal" and "good lightning" could be much more important as for example in southern European countries, because of the quite long snowy and darkness periods during winter times.

The economic impact of accessible tourism in Europe and his reliance to the transport sector

Economic impact of accessible tourism in Europe

During 2012 and 2013 the European Commission tasked a few studies to get a better understanding of accessible tourism in the European Union. One of these studies has also analysed the economic impact of accessible tourism on the tourism sector in Europe. Besides the current and future demand for accessible tourism in Europe and beyond as well the travel patterns and behaviours of tourists with accessibility needs were investigated. In fact there is no direct link to economic benefits for the transport sector in this study, but transportation is part of the services and facilities "which enable persons with special access needs, either permanent or temporary, to enjoy a holiday and leisure time with no particular barrier or problem." (GfK SE et al., 2013) Amongst others it became apparent that tourists with disabilities spent less money and less nights during their journey than high-aged tourists. Thus the economic benefit of "Tourism for All" in the EU produced by people with disabilities is less than the benefit produced by elderly people, but both need accessibility features during their holidays. Within the EU27 in 2012 both groups together spent approximately EUR 80 per one-day trip, about EUR 700 per domestic overnight trip and about EUR 1 100 per foreign overnight trip. The direct overall benefits of Tourism for All to the economy of the European Union is quoted to a gross turnover of tourism-related service providers of about EUR 352 billion and to a gross value added (GVA) of approximately EUR 150 billion. In reliance to the gross domestic product (GDP) the economic benefit was EUR 164 billion. This complies with more than 4.2 million employees who are located directly in the EU tourism businesses.

In addition to the effects coming directly from the tourism businesses the tourism-induced indirect economic effects have to be regarded. In general the tourism sector affects a wider-scale of economy through the so-called "multiplicator effects". These are the indirect and induced effects on income and employment of up- and downstream economic sectors coming from expenses and investments, for example industries producing goods and services for the tourism sector like wholesalers or the manufacturing industry (Spektrum der Wissenschaft Verlagsgesellschaft mbH, 2001). With simultaneous consideration of all direct, indirect and induced effects the accessible tourism sector produced an economic output of EUR 786 billion, a GVA of EUR 356 billion, a GDP of EUR 394 billion and about 8.7 million employees within the EU. Excluded in this study are the effects induced by tourists not travelling alone. But "of course, like other tourists, older people and people with disabilities will generally travel with friends or family." (Frye, 2015)

Besides the domestic EU-market also eleven international key inbound markets (IM11) have been analysed in this study. Tourists from outside the EU with accessibility demands travelling to the EU spent on average about EUR 1 000 per trip. The direct overall benefits to the economy of the European Union is quoted to a gross turnover of tourism-related service providers of about EUR 16 billion and to a GVA of approximately EUR 7 billion. In reliance to the GDP the economic benefit was about EUR 8 billion. This complies with approximately 286 000 employees working directly in the EU tourism businesses. Considering the multiplier effect the accessible tourism key inbound markets produced an economic output of EUR 34 billion, a GVA of EUR 15 billion, a GDP of EUR 17 billion and about 538 000 employees within the EU.

Furthermore the potential increase of demand for accessible tourism offers in the EU by 2020 was investigated on the basis of three scenarios of improved accessibility measures. Within the framework of these scenarios, a certain amount of people who did not travel in the past would be willing to travel in the future in case of improved accessibility offers of tourism facilities. For scenario A representing minimum improvements of accessibility the economic benefit of demand for accessible tourism offers in the EU would increase by 18.3 - 19.7% in comparison with the indicators used for the status quo analyses (economic output / gross turnover, GVA, employment) as mentioned above. For scenario B representing medium improvements of accessibility the economic benefit would increase by 24.8 - 26.6% and for scenario C representing extensive improvements of accessibility the economic benefit would increase up to 39.4% against the baseline. Based on this scenario including all direct, indirect and induced effects the economic output would be EUR 1 073 billion, the GDA EUR 484 billion and the GDP EUR 537 billion within the EU. In addition the international inbound markets would also increase significantly. For Scenario A up to 33% of people with special access needs who haven`t visited the EU yet would do so in the future, under scenario B it will be up to 40% and under scenario C up to 46%. So the overall economic benefit would increase by 28.9% under scenario A, by 53.3% under scenario B and by 74.9% under Scenario C. In the best case and under consideration of the multiplier effect the accessible tourism key inbound markets will produce an economic output up to EUR 60 billion, a GVA up to EUR 26 billion, a GDP up to EUR 30 billion and up to 940 000 employees within the EU (GfK SE et al., 2013).

Table 4.6 summarises the economic benefits of accessible tourism in Europe.

Table 4.6. **Economic benefits of accessible tourism in Europe**

			EU27	IM11
Average expenditures for day trips			EUR 80	-
Average expenditures for domestic overnight trips			EUR 700	-
Average expenditures for foreign EU overnight trips			EUR 1 100	EUR 1 000
Gross turnover	**Tourism**		EUR 352 billion	EUR 16 billion
	All		EUR 786 billion	EUR 34 billion
	Scenario C		EUR 1 073 billion	EUR 60 billion
Gross Value Added GVA	**Tourism**		EUR 150 billion	EUR 7 billion
	All		EUR 356 billion	EUR 15 billion
	Scenario C		EUR 484 billion	EUR 26 billion
Gross Domestic Product GDP	**Tourism**		EUR 164 billion	EUR 8 billion
	All		EUR 394 billion	EUR 17 billion
	Scenario C		EUR 537 billion	EUR 30 billion
Employees	**Tourism**		EUR 4.2 million	EUR 268 000
	All		EUR 8.7 million	EUR 538 000
	Scenario C		EUR 12.1 million	EUR 940 000
Increase of tourism demand	**Scenario**	**A**	24%	33%
		B	37%	40%
		C	44%	46%
Increase of economic contribution	**Scenario**	**A**	18.3 % – 19.7%	28.9%
		B	24.8 % – 26.6%	53.3%
		C	up to 39.4%	74.9%

Source: Data: GfK SE, University of Surrey, Neumannconsult and ProA Solutions (2013), economic impact and travel patterns of accessible tourism in Europe. final report, Nürnberg, Surrey, Münster, Barcelona, www.media.designforall.org/publico/index.php?opc=documento&document='3106 ', p.26-32, p.165, p.174

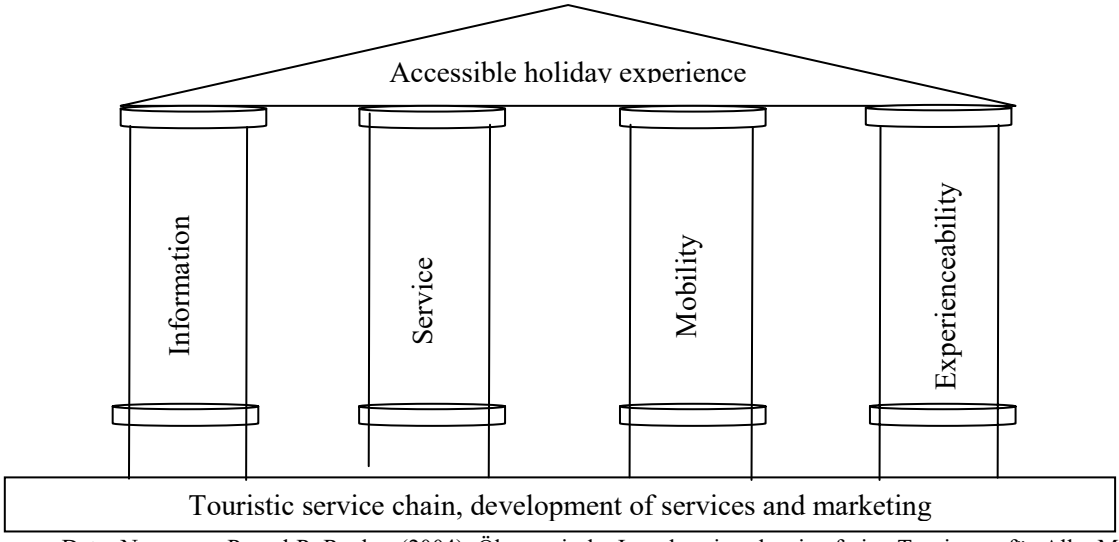
As mentioned above no direct link to economic benefits for the transport sector was found in the European study. But some points of reference can be elaborated from other publications. For example in a German study about the economic benefits of Tourism for All commissioned by the Federal Ministry for Economics and Labour the structure of the daily expenses was analysed. So tourists with disabilities in Germany spent about 39% of their one-site tourism expenses for accommodation, 24% for gastronomy, 14% for other services, 13% for goods from the local retail sector, 7% for leisure offers and 3% for local transportation (Neumann and Reuber, 2004). Unfortunately the journey to a destination and back has not been considered. Nevertheless by all journeys a large part of the travel expenses account for changing of location. Estimations assume that between 25% and 60% are allotted to the journey to and from one's destination. Of course the single parts of the travel expenses and the total travel prices are different in reliance to the kind of a journey and to the means of transportation used (Freyer, 2009). But

all in all it can be assumed that a significant part of the economic benefits named in Table 4.6 accounts directly for the transportation sector. Only as an indication hereof the expenditure rates for travelling mentioned above can be set in reliance to the today`s economic benefits of tourism-related service providers and to scenario C representing extensive future improvements of accessibility, nonetheless the results won't be resilient. This would imply that the gross turnover coming from the transport to and from one's destination would increase from at least EUR 92 billion at present up to almost EUR 130 billion, the GVA from EUR 39.25 billion up to EUR 55.3 billion and the GDP from EUR 43 billion up to EUR 60.7 billion. And for local transportation the gross turnover would increase from EUR 8.3 billion up to EUR 11.9 billion, the GVA from EUR 3.5 billion up to EUR 5.1 billion and the GDP from EUR 3.9 billion up to EUR 5.6 billion.

Relevance of passenger transportation for the accessible tourism sector

As mentioned above, no direct link to economic benefits for the transport sector was found in the European study about the economic impact of accessible tourism on the tourism sector. But nevertheless tourism is not possible without transportation and its elements like transport routes and means of transportation (Gross, 2005). And, as shown in Figure 4.7, especially for an accessible holiday experience mobility is one of the four key pillars.

Figure 4.7**. Key pillars of an accessible holiday experience**



Source: Data: Neumann, P. and P. Reuber (2004), Ökonomische Impulse eines barrierefreien Tourismus für Alle. Münstersche geographische Arbeiten, Münster, p.54

Following this, accessible transportation is one of the most important elements of the so-called "accessible touristic service chain". This service chain takes into account several parts of a journey subdivided in the following elements (Rebstock, 2010 / Rebstock, 2011):

- Travel preparation (preparation, provision of information, booking)
- Travel action (journey to a destination, arrival and orientation, accommodation, catering, leisure time and sports, service and assistance, entertainment and culture, tours and shopping, return journey)
- Travel post-processing: memories and confirmation

In general people with disabilities have the same needs as people without disabilities (Hrubesch, 1998). However related to accessibility implementation processes a considerable difference occurs. So it is not possible only to look after access for some parts of the touristic service chain, because otherwise people with disabilities will meet several barriers during their holiday activities (Treinen et al., 1999). Thus people with disabilities make different demands to the touristic service chain and their single elements (ADAC, 2003). So it´s very important not to forget one of these chain links, because "a journey is like a chain - it is only as good as its weakest link." (European Commission - Directorate General Transport, 1999)

Accessible Tourism "needs products and cooperation all along the touristic service chain, (…) [if a destination wants to be successful in this sector]. Unrestricted accessibility to the transport sector is one of the key requirements for success, because at least half of the terms of the touristic service chain (journey and departure, arrival and orientation, locomotion on location, leisure time and sports, entertainment and culture, tours and shopping) are directly hooked on barrier-free mobility." (Rebstock, 2010) Therefore accessible transport systems are an essential condition to reach the other accessible elements of the touristic service chain like hotels, restaurants or points of interest. According to this it`s indispensable to develop the transport sector of a destination in a way that it`s accessible for all, whenever a region wants to be successful in the accessible tourism sector (Rebstock, 2011).

This statement is underlined by a German study commissioned by the Federal Ministry for Economics and Labour, which detected that locomotion on location for 76% of the tourists with mobility restrictions was an important criteria for the choice of their travel destinations. 74% mentioned the journey to and from one's destination, 71% named tours (see Table 4.7).

Table 4.7. **Importance of the elements of the touristic service chain for people with disabilities**

1	accommodation	82%
2	locomotion on location	76%
3	journey to and from one's destination	74%
4	tours	71%
5	travel preparation	71%
6	cultural activities	62%
7	arrival and orientation	61%
8	service on location	58%
9	health care on location	52%
10	catering	51%
11	shopping	37%
12	sports	19%

Source: Data: Neumann, P. and P. Reuber (2004), Ökonomische Impulse eines barrierefreien Tourismus für Alle. Münstersche geographische Arbeiten, Münster, p.33

This is in line with the European study mentioned above, which has analysed the importance of different aspects related to the choice of travel destinations by people with disabilities. 63% of them named "accessible transport types to and from destination" as important or very important for their choice and about 60% "transport once at destination" (GfK SE et al., 2013). Also "the majority of older people rate comfort and ease of travel highly and (…) their choice of destination will be determined both

by the ease with which they can arrive and leave and the convenience with which they can move around the resort or city at their destination." (Frye, 2015)

The German study also analysed which elements of the touristic service chain have been negatively affected people with disabilities during their journey (see Table 4.8). Thus the greatest barriers exist in reliance to cultural activities, locomotion on location plus tours and sports. Furthermore half of the people with disabilities are confronted with barriers during their journey to and from one's destination. This situation is accentuated by the fact that especially for the journey to the destination and back, for the locomotion on location and for tours the most clearly disproportions between the demands of the traveller and the real observed conditions exist (Neumann and Reuber, 2004). These results are in line with a previous German study, which amongst others identified that people with disabilities meet several barriers during their holidays especially by using the public transport system and the local walkway networks (Treinen et al., 1999).

Table 4.8. **Ranking of impairments during travelling**

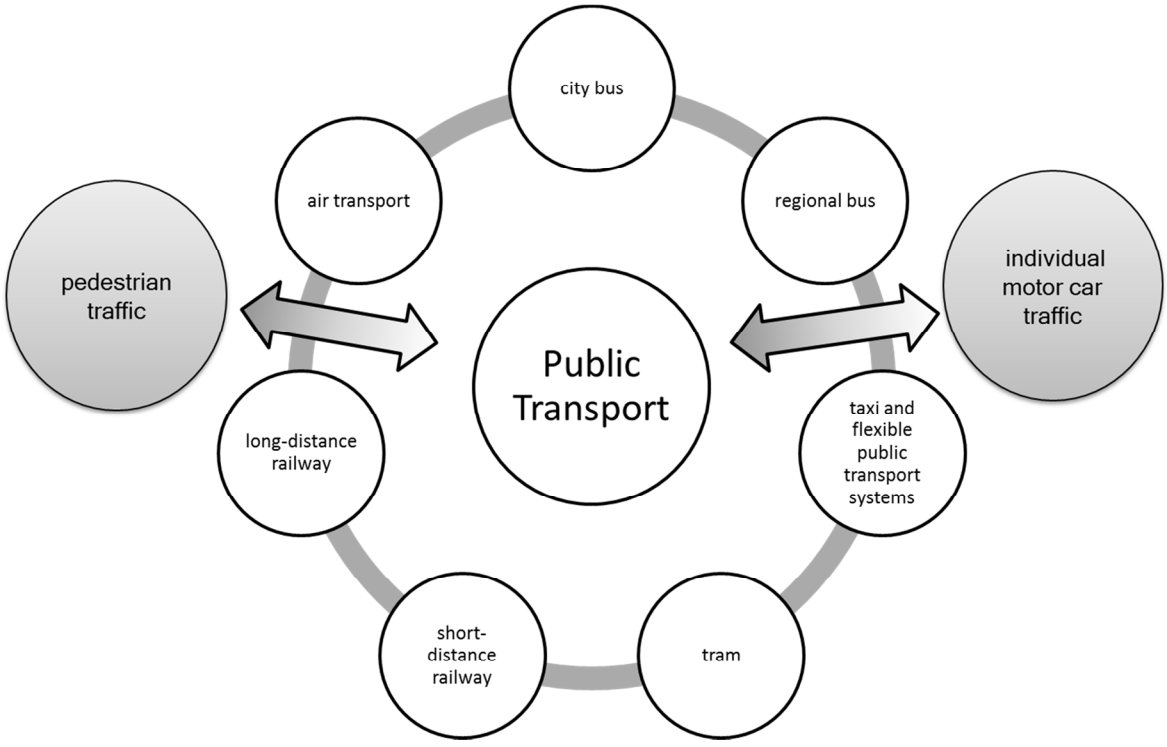
1	cultural activities	67%
2	locomotion on location	65%
3	tours	63%
4	sports	55%
5	journey to and from one's destination	52%
6	accommodation	47%
7	arrival and orientation	44%
8	shopping	42%
9	service on location	42%
10	travel preparation	40%
11	health care on location	35%
12	catering	24%

Source: Data: Neumann, P. and P. Reuber (2004), Ökonomische Impulse eines barrierefreien Tourismus für Alle. Münstersche geographische Arbeiten, Münster, p.33.

For the accessible tourism sector this implies that besides an accessible journey to the destination and back with private cars or public transport systems also an accessible locomotion on location has to be obligatory ensured. This includes the individual motorised transport as well as local public transport systems and local walkway networks (Rebstock, 2011). About 80% of the people with special access needs used the private car for the transport to and from one's destination or at destination during the last 12 months, as investigated in the European study about the economic impact of accessible tourism on the tourism sector. Half of them used the airplane, around 40% took the train, 40 % used the local public transport, one-third used a taxi and one-third took a long-distance bus (GfK SE et al., 2013). Indeed the private car is foregrounded also for tourists with access needs, but in comparison to travel analyses of all tourists, people with disabilities using public transport systems more often as tourists without special access needs (Treinen et al., 1999). Therefore the provision of an accessible public transport is not only necessary because of enabling people with disabilities to use public transport at the destination but also for building up an plausibly image of an accessible destination. Accessibility is getting more and more a

matter of course, at least in bigger cities, because by now many cities have made their public transport systems accessible or are just doing it step by step. Thus many tourists "expect and demand the same level of accessibility when they travel abroad." (Frye, 2015) Without local accessible public transport offers it cannot be expected that tourists perceive a destination as accessible. Besides it`s difficult or maybe not possible at all to convincingly impart an image of an accessible destination. Hence accessible public transport offers are also necessary because of touristic marketing reasons (Rebstock, 2005). However to design the public transport useable to the greatest extent possible it`s essential that the four thematic sectors infrastructure, rolling stock, operations and services as well as information are taken into consideration. Aside this complexity within one single public transport system the public transport sector as a whole also is very complex and all sectors have to link to each other in an accessible way of using (see Figure 4.8).

Figure 4.8. **Complexity of public transport**



Source: Rebstock, M. (2010), "Success factors for the development of a Tourism for All approach in low mountain ranges - possible solutions and implementation difficulties on the basis of the Thuringian pilot project "model region for a barrier-free Tourism for All"", in Andeas Kagermeier und Joachim Willms (ed.), Tourism Development in Low Mountain Ranges, Studien zur Freizeit- und Tourismusforschung, Mannheim, pp. 70.

One example for the implementation of Tourism for All in a touristic marketing strategy is the city of Erfurt, capital of the federal state of Thuringia, Germany. Since 1999, the tourist marketing board is working on accessible tourism issues and Tourism for All is part of marketing plans and strategic planning. Tours by minibus with wheelchair-access or guided in German Sign Language as well as the brochure "Erfurt erlebbar für Alle" (Erfurt Tourismus und Marketing GmbH, 2014) listing accessible offers are examples of these activities. Moreover in 2008 the city of Erfurt was one of the founding members of the more national and internationally oriented touristic marketing association "Barrier-free destinations in Germany" (Arbeitsgemeinschaft„ Barrierefreie Reiseziele in Deutschland", 2008). Nowadays "Erfurt is considered to be one of the most famous accessible destinations in Germany." (GfK SE et al., 2013) One of the key factors of this success are the widely accessible local public transport

system (tram and bus) and walkway networks. This progress was critical driven by the presence of the local working group "Barrier-free city of Erfurt", a network headed by the city representative for people with disabilities and with members coming from the city administration, from associations of people with disabilities, from the University of Applies Sciences, from the tourism sector, from the local public transport company and from the Chamber of Architects (Landeshauptstadt Erfurt - Stadtverwaltung, 2015).

Usually Tourism for All should be integrated in more holistic approaches to capitalise on tourism. From there and in terms of inclusion Tourism for All purposes should always be kept in mind by all activities and developments made for the tourism sector. In this context transportation is one of the key sectors.

Conclusion

This chapter has shown that nowadays in many countries accessibility of transport systems is not a voluntary task but a task bound by law. Besides it was elaborated that an accessible environment is not only essential for people with disabilities and necessary for up to 40% of the population but also a matter of comfort for all users. Thus measures for travellers with special access needs in most cases provide benefits and ease of use for all passengers.

Moreover a few studies dealing with economic benefits of accessibility measures were analysed. Two studies from Norway used the stated preference method to monetise and prioritise different universal design measures. In general this method seems to work also as a tool for analysing economic benefits of accessibility measures. Nevertheless the results of these studies have to be interpreted with extremely caution in order to avoid discrimination, especially in reliance to measures, which are on the one hand valued rather low on average and on the other hand are an indispensable condition for specific user groups to use the system.

Finally the economic impact of accessible tourism and his inducible benefits on the transport sector as well as the relevance of passenger transportation for accessible tourism was elaborated. All in all it can be stated that accessible tourism produces a huge economic impact on the tourism sector and beyond, and by improving accessibility in the future a significant raise of economic benefits is possible. In general traffic is precondition for tourism. Besides tourists spend a significant part of their travel expenses for the journey to the destination and back and for local transportation. So it can be assumed that accessible transport systems will directly benefit from an increasing accessible tourism market.

However tourism is more dependent on transportation than the other way around, because transportation has more fields of action in reliance to passenger and freight traffic. Nevertheless for example in Germany about 40% of all ways and 50% of all passenger kilometres are leisure or holiday traffic (Gross, 2005). Anyhow accessible transportation is essential for accessible tourism respectively for Tourism for All. According to this it`s indispensable to develop the journey to the destination and back as well as the transport on the location in a way that it`s accessible for all, whenever a region wants to participate in the economic benefits induced by accessible tourism.

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Chapter 5
The benefits of improving access to the United Kingdom rail network via the Access For All Programme

Tony Duckenfield

Steer Davies Gleave

"Access for All" is a UK government funded programme to make stations more accessible for people with disabilities by providing step free access along with complementary measures such as improved wayfinding information. Steer Davies Gleave was commissioned to evaluate the programme in a manner consistent with official guidance ("WebTAG"), and to quantify the benefits to rail passengers and train operators.

This chapter describes what data was collected, how it was collected, how it was analysed and what the results were. It also identifies some important lessons for improving the implementation of the programme, which may have wider applicability.

In summary, the programme was shown to have a positive economic case even when only considering the narrow benefits included within WebTAG. Additional social and community benefits were also identified, and it was highlighted that better promotion of the programme would improve its value for money even further.

While this particular case study focusses on UK rail stations, the lessons and methodological approach are applicable more widely.

Introduction and scope

The Access for All (A4A) programme is a Department for Transport (DfT) funded initiative to improve accessibility at key stations on the rail network. It provides for the creation of obstacle free routes through the station to the trains, plus complementary improvements funded via a "small schemes" fund, all aimed at making stations more accessible for disabled passengers.

The fund initially committed spending of GBP 370 million over the period 2004 – 2015. In addition, the small schemes fund has delivered smaller scale accessibility improvements at more than 1 100 stations. The Main Programme is now seeing GBP 160m extension of the fund and programme from 2015-2019.

The UK's Department for Transport (DfT) commissioned a research study to quantify the benefits of the current Access for All Programme in order to support additional funding for the programme for 2015-2019. The 2015 study followed a previous study completed in 2010, also undertaken by Steer Davies Gleave. The full 2015 report is available to download from the Steer Davies Gleave website[1]. Further information about the programme can be accessed via the Network Rail website[2].

Research was required to specifically look at:

- What are the benefits to passengers of the programme?
- What are the benefits to train operators?
- How could the programme be further improved?
- What are the wider social benefits and what BCR metric should be used to assess the benefits of investment in accessible pedestrian routes on railway stations?

The research comprised the following elements:

- Selecting a representative sample of stations which had benefitted from Access for All investment;
- Accessibility audits of the selected stations;
- Station user interview surveys at the selected stations;
- Classified count surveys using video cameras, which enabled the volume of passengers with walking aids and luggage to be counted, along with overall usage and usage of the lifts;
- Analysis of station usage and Railcard sales at selected stations and control stations in order to support the quantification of impacts;
- Business Case assessment to determine the benefit to cost ratio (BCR) of the Access for All programme.

Study stations

Following analysis of those stations included in the Access for All programme to date, the following stations were selected as a representative sub-sample:

- Bridgend;
- Huddersfield;
- Kidderminster;
- Purley;

- Rutherglen; and
- Vauxhall (London).

This sample of stations provides a good spread of locations, station sizes and types, as shown in Table 5.1.

Table 5.1. **Study stations**

Station	Location	Station type	Type of works (main elements)	Completed	Spend/user
Bridgend	Wales	Medium mixed use station	2 lifts installed and a new footbridge	March 2012	GBP 0.94
Huddersfield	Yorkshire & the Humber	Large mixed use station	2 glass lifts installed from subway to platform level, new stairways	September 2011	GBP 0.48
Kidderminster	West Midlands	Medium mixed use station	2 lifts installed and a new footbridge	July 2008	GBP 1.37
Purley	London	Medium commuter station	4 lifts (platform to subway) and substation, significant station refurbishment	July 2008	GBP 1.22
Rutherglen	Scotland	Medium mixed use station	1 lift installed, new ticket office and foyer renewal	March 2009	GBP 1.62
Vauxhall London	London	Large commuter station	4 lifts (platform to subway) and substation, significant station refurbishment	July 2012	GBP 0.15

Station Accessibility Audits

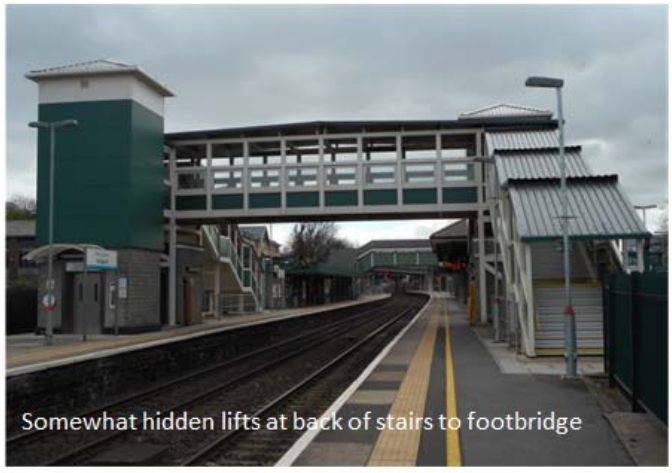
The Accessibility Audits were used to assess the presence and quality of station provisions from an accessibility perspective. Their overall aim was to assess the effectiveness of the Access for All investment in making it easy for people with a disability or encumbrance to move around the station and through it to access the rail network.

In general, the provision and quality of accessibility infrastructure varied. While most stations have the infrastructure in place, on several stations we identified issues relating to the location of the infrastructure, the signage to it and maintenance. Some specific issues included:

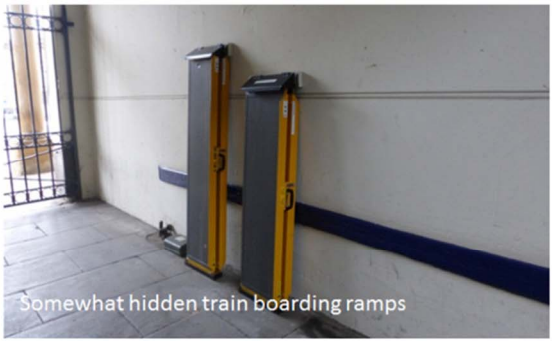
- Inaccessible ticket machines and ticket counters;
- Difficulty in locating the help points and induction loops;
- Lack of presence of station attendants on platforms;
- Lack of lift visibility; and
- Fading warning tactile/coloured strips on platform edge.

The images below illustrate the variations in quality of implementation at each of the study stations.

Bridgend station



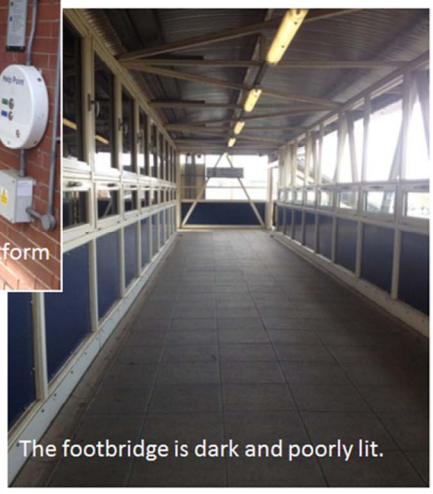
Huddersfield



Kidderminster


Stairs obscuring view of the lifts

Clear signage and help-point on platform


The footbridge is dark and poorly lit.

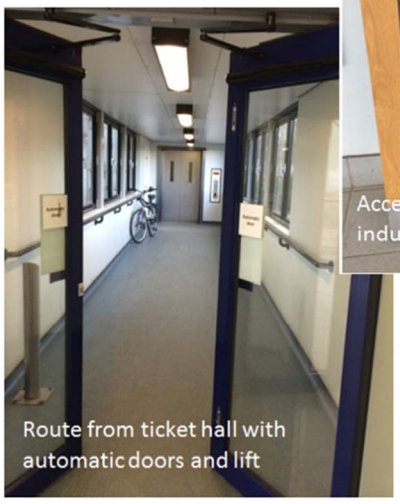
Purley

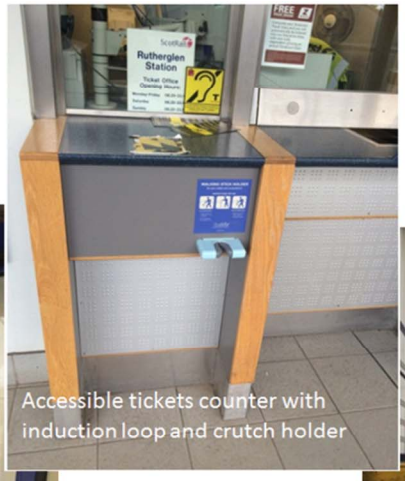

Tactile strip, clear signage and staffed information office on platform

Meeting Point, clear signage and ramp available on platform

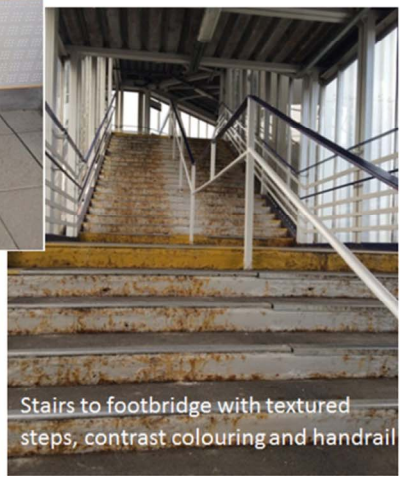
Accessible ticket machine

Rutherglen

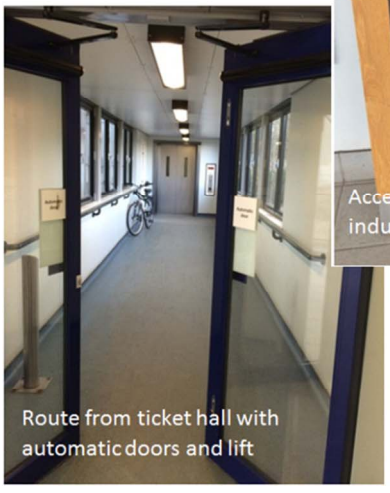

Route from ticket hall with automatic doors and lift

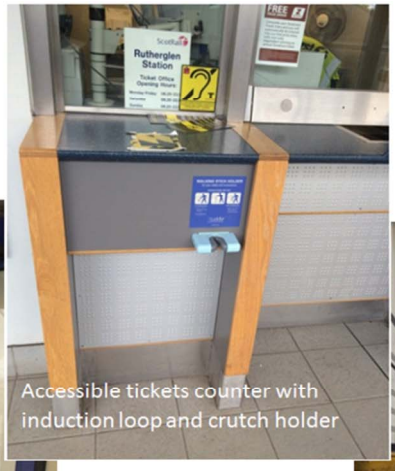


Accessible tickets counter with induction loop and crutch holder

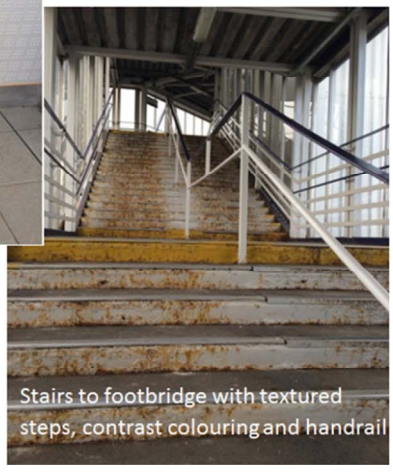

Stairs to footbridge with textured steps, contrast colouring and handrail

Vauxhall


Route from ticket hall with automatic doors and lift



Accessible tickets counter with induction loop and crutch holder


Stairs to footbridge with textured steps, contrast colouring and handrail

Station user interviews

The station user interviews involved relatively short face-to-face interviews conducted with passengers waiting for a train. To ensure the capture of views of disabled station users, the interview survey was based on a quota sample in order to over-sample disabled passengers.

In total, 1 849 passengers were interviewed, with the sample by passenger category being:

- Mobility Impairment - 220
- Wheelchair User - 14
- Hearing Impairment - 96
- Visual Impairment - 137
- Encumbered – 832
- Unencumbered – 834.

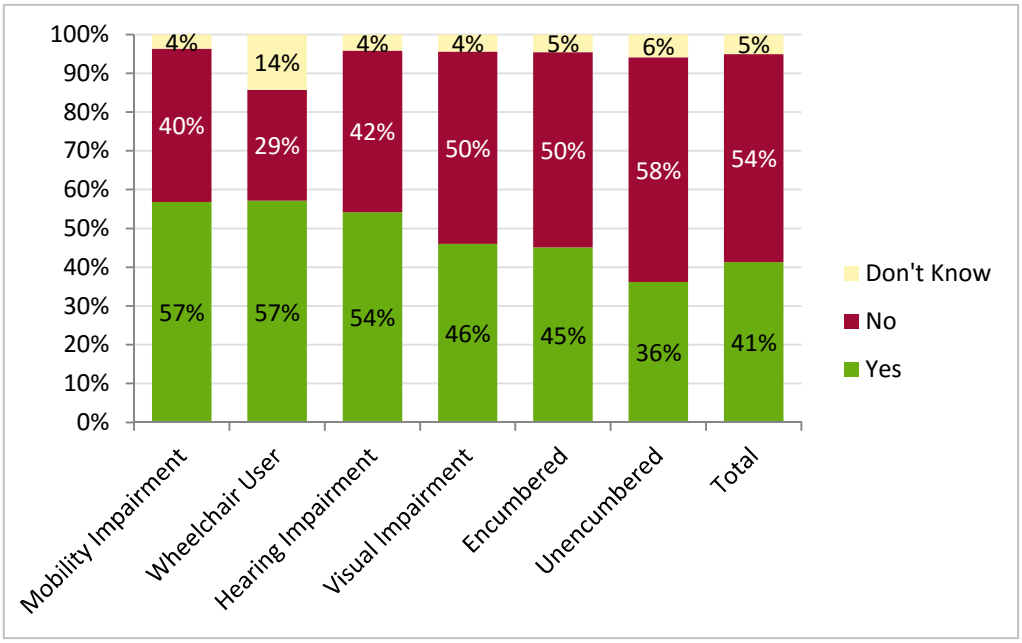
The questionnaire included questions concerning:

- General travel behaviour and use of rail;
- Basic details about current trip (purpose, use of Railcard, etc.);
- Ratings for relevant station attributes, and overall ease of use of station;
- Reasons for any low ratings;
- Awareness of any improvements to the station;
- Effect of any improvements on use of the station and general perceptions of accessibility of the rail network;
- Whether the current trip would have been made without the improvements (to identify generated trips); and
- Passenger details (Postcode, demographic, mobility / disability details).

Awareness of improvements

Overall, 41% of station users had noticed the improvements made at the stations "in the last few years". Amongst passengers with a disability the recognition was higher, with 57% of mobility impaired passengers and wheelchair users noticing the improvements at these stations.

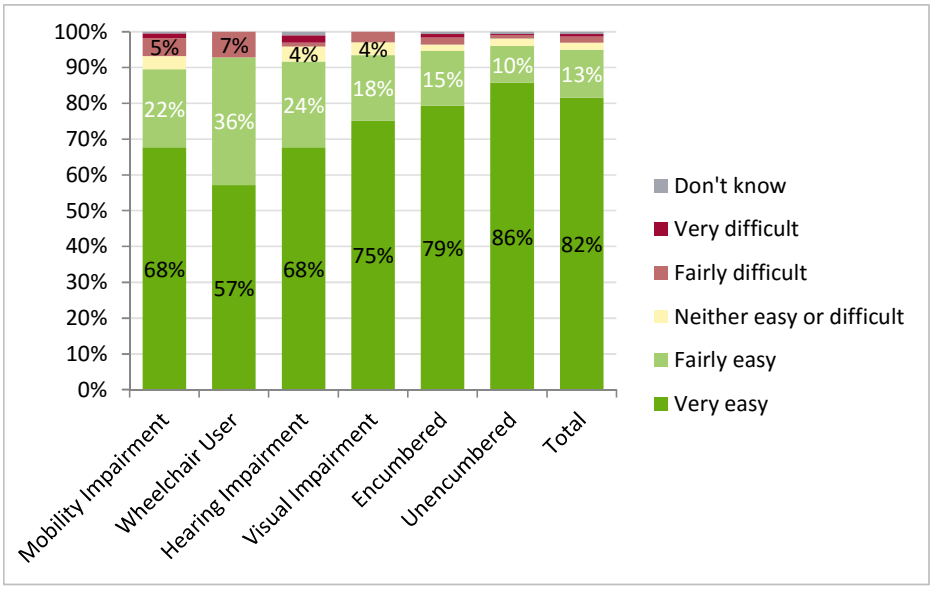
Figure 5.1. **Are you aware of any changes made to this station in the last few years to make it easier to use the station?**



Satisfaction

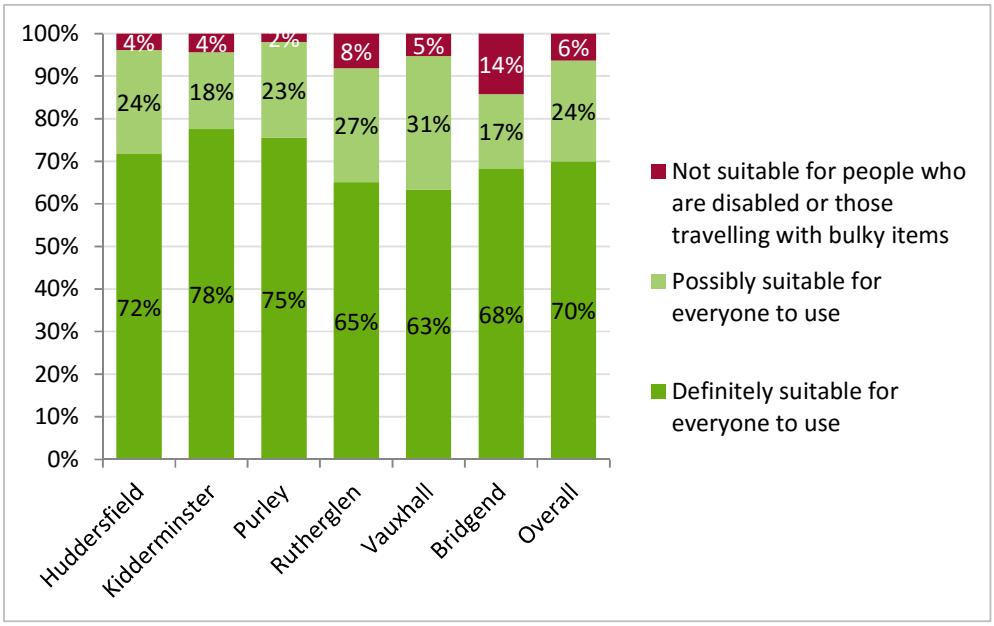
Most (82%) users of the six study stations said that they found getting from the entrance to the platforms 'very easy'. This was also true of the disability groups, with the vast majority describing access from the entrance to the platforms either 'fairly easy' or 'very easy'.

Figure 5.2. **How easy did you find it to get from or to the station entrance to the platforms?**



Respondents were also asked to categorise the overall accessibility of the station they were using, and the majority (70%) said they felt that the station was definitely suitable for everyone to use, with a further 24% saying that they felt it was possibly suitable for everyone to use. This did leave 6% overall and 14% of wheelchair users saying the station is not suitable for people who are disabled or travelling with bulky items.

Figure 5.3. **Overall rating of station accessibility**

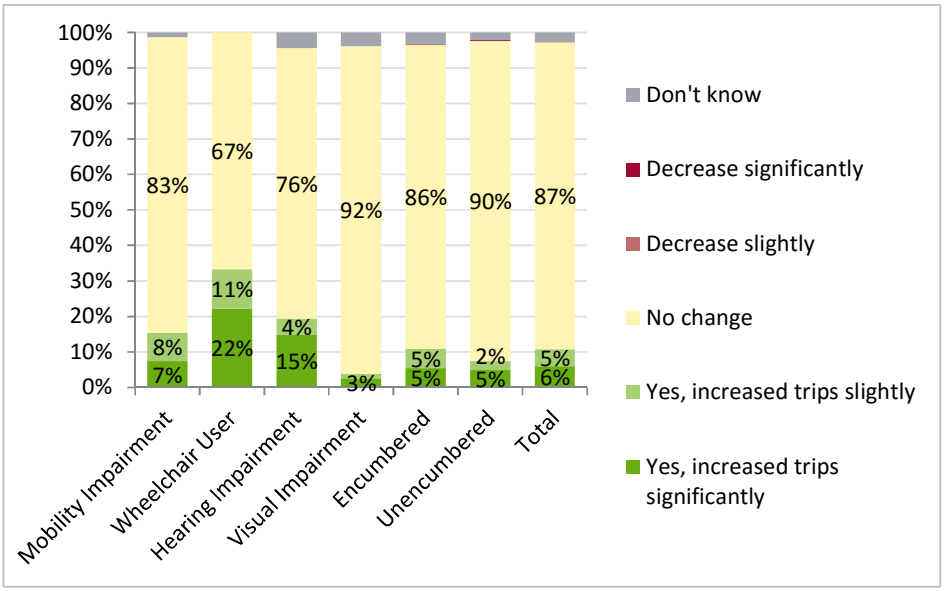


Impact of improvements

Respondents who said they were aware of improvements were asked if the improvements had affected their use of the station and 11% of all station users said that they had increased the number of trips they made from that station, with 6% having increased the number of trips significantly.

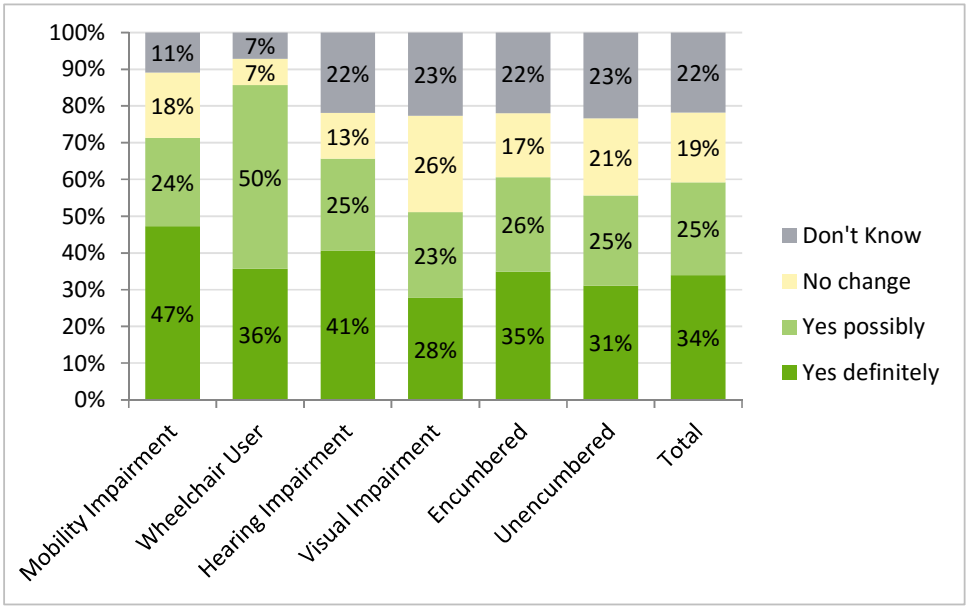
This figure was higher amongst some disabled groups, with a third of wheelchair users, 19% of hearing impaired passengers, and 15% mobility impaired passengers having increased their use of the station.

Figure 5.4. **Have any of these improvements affected your use of this station?**



In general, station users felt that the improvements at the study stations would encourage people with limited mobility or a disability to use the station more, with 59% saying that the improvements would definitely or possibly encourage others with a disability to use the station more. This figure was higher amongst the mobility impaired (71%) and the hearing impaired (66%).

Figure 5.5. **Do you think these improvements, if any have encouraged other people with limited mobility or a disability to use this station more?**

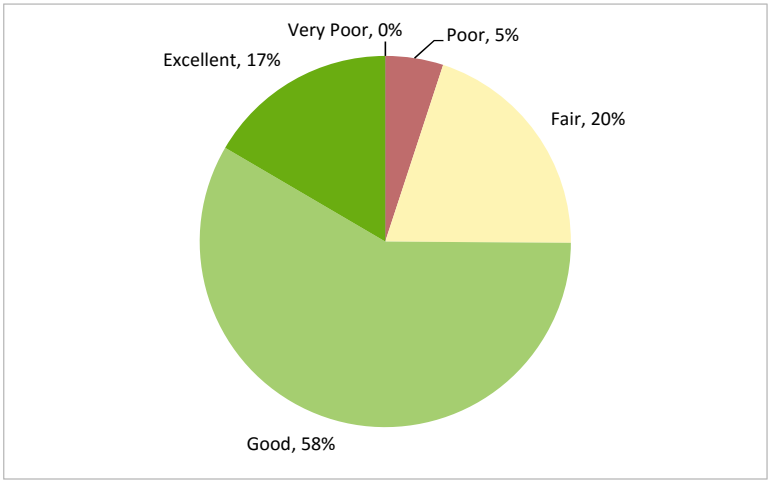


Provision for passengers with different disabilities

This section considers the overall provision at the study stations for passengers with different disabilities, assessing the quality of provision for those with difficulties walking, seeing, and hearing, and those encumbered by luggage.

Those with a mobility difficulty were generally satisfied with the facilities provided for passengers that have difficulty walking – three quarters described them as either 'good' or 'excellent', with only 5% describing them as 'poor'. Figure 5.6 provides the details.

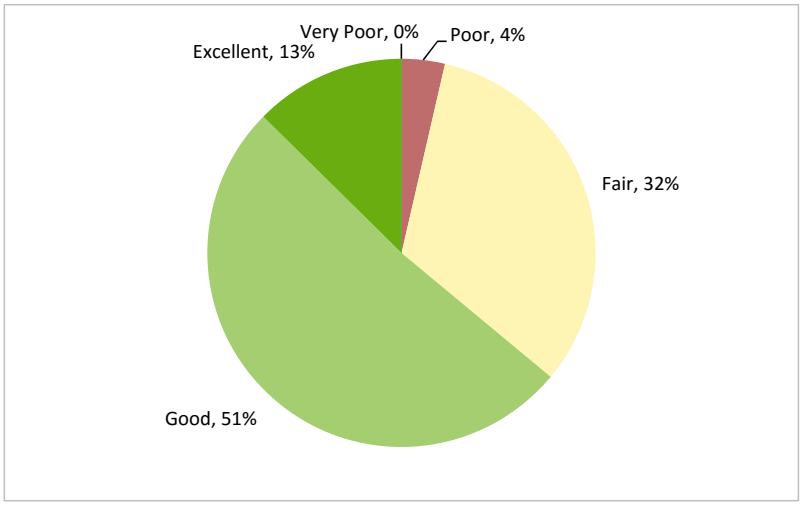
Figure 5.6. **Facilities to help people with difficulties walking**



Base=respondents with a mobility difficulty

Two-thirds (64%) described the facilities for people with difficulties seeing as 'good' or 'excellent' with only 4% describing them as 'poor'. Some room for improvement was identified with 32% saying the facilities are 'fair'.

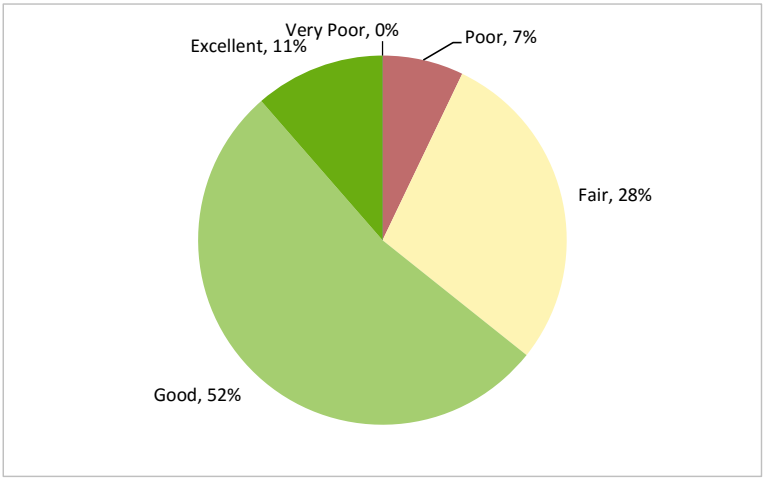
Figure 5.7. **Facilities to help people with difficulties seeing**



Base=respondents with a visual impairment

Similarly, while the majority (63%) rated the facilities for people with hearing difficulties as either 'good' or 'excellent', nearly a third (28%) rated them as 'fair' and 7% as 'poor'. However, on a more positive note, none said they are 'very poor' (see Figure 5.8).

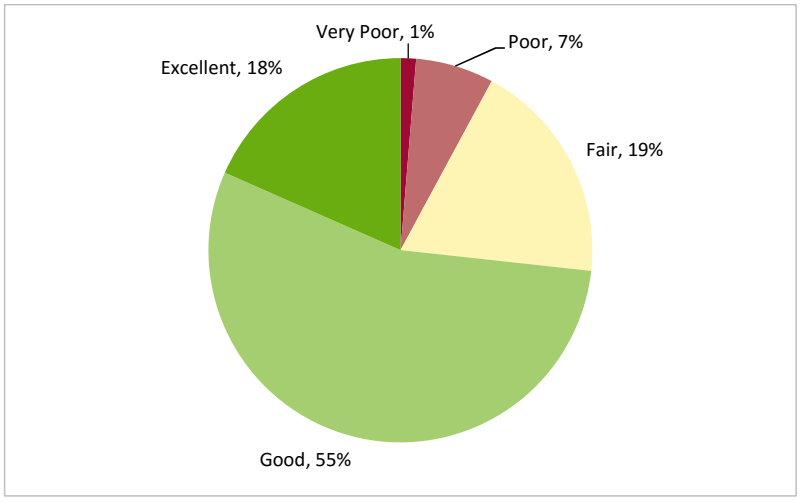
Figure 5.8. **Facilities to help people with hearing impairments**



Base=respondents with a hearing impairment

Overall, those carrying bulky luggage or equipment were happy with the facilities provided for them, as shown in the following figure (Figure 5.9). However, 8% did rate the facilities as 'poor' or 'very poor'.

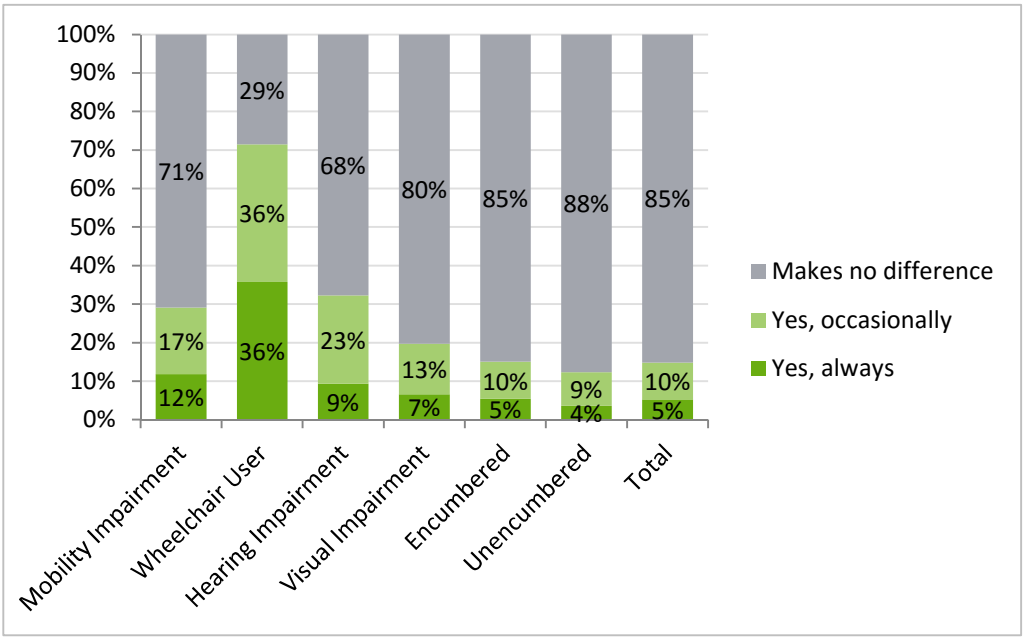
Figure 5.9. **Facilities to help people with difficulties carrying bulky luggage or equipment**



Base=respondents encumbered by luggage

The impact of provision of facilities for disabled people on station choice is notable amongst some disability groups, particularly for wheelchair users, with the majority saying that they would either always or occasionally travel further to a station which is easier for disabled people to use. Just under a third of mobility impaired and hearing impaired passengers felt the same.

Figure 5.10. **When considering which station to use, would you travel further in order to start or end your journey at a station that is easy to use for people with disabilities?**



Lift usage

The numbers of passengers using the lifts for an average weekday and average Saturday are shown in Table 5.2, by type of disability. This highlights the point that the majority of lift users are actually passengers without any disability or encumbrance (73% on a weekday and 61% on a Saturday). Passengers encumbered by luggage are the second largest category, with people with a mobility difficulty only representing 2-3% of lift users.

Comparing the lift usage to the overall station usage indicates that overall, 5% of the station users use the lifts. Lift usage did vary substantially from station to station, with both the volume of passengers and the proportion of passengers using the lifts varying. In fact, the proportion of passengers using the lifts ranged from 1% to 8%, with a key factor believed to be the visibility and consequent awareness of the lifts.

Table 5.2. **Lift usage counts**

Day of week	Mobility	Wheelchair	Hearing	Sight	Encumbered	Unencumbered	Total
Weekday	67	7	0	69	915	2925	3982
Saturday	39	2	0	16	546	938	1541
Weekday	2%	0.2%	0%	2%	23%	73%	100%
Saturday	3%	0.1%	0%	1%	35%	61%	100%

Economic appraisal

The economic appraisal is based on a spreadsheet model developed based on Department for Transport WebTAG guidance[3]. The model therefore has 'standard' elements (e.g. economic appraisal parameters and economic performance metrics) that are common to all economic appraisals and fully

consistent with current WebTAG guidance, as well as 'scheme specific' elements that vary on a case by case basis (e.g. scheme cost, demand, benefits, opening date etc.). As far as we are aware, this is the only example of where WebTAG has been used to assess accessibility benefits, but there is no specific reason why other schemes or programmes cannot be evaluated in this way.

There are a number of potential economic benefits from improved accessibility at stations. In broad terms these accrue to three sets of people; existing station users who gain from an improvement in the accessibility and general quality of provision; new users who are attracted to use the station due to these improvements and who gain a benefit from doing so; and non-users who are indirectly affected as a result of 'externality' impacts stemming from a change in transport demand and network costs. These potential benefits are set out in Table 5.3.

Table 5.3. **Potential economic benefits from station accessibility improvements**

User group	Description	Example impacts of accessibility schemes
Existing Trips / Users	People who already use the stations.	Benefits from improved accessibility – due to obstacle free access, better signage and information, trained staff etc.
New Trips / Users	New station and rail users.	Benefits from improved accessibility – due to obstacle free access, better signage and information, trained staff etc.
Non-Users	Those who do not change their behaviour as a result of the scheme, but who are affected in some way as additional people using rail have 'second order' impacts on the wider transport network.	Benefits from a reduction in car trips, leading to reduced accident and emissions costs, as well as decongestion benefits for other road users. Crowding impacts will occur if accessibility improvements lead to enough increase in rail passengers to create crowding disbenefits for existing rail users.

User benefits

The user benefits are based on the growth in station usage due to the station improvements, as ***identified*** in the post-implementation ***station users*** surveys. This is then used to calculate the percentage change in generalised costs per station and user group using a generalised cost elasticity of -1. The 'Do Minimum' generalised costs (in minutes) are calculated based on the weighted journey times for the different parts of a rail journey, and the 'Do Something' generalised costs (in minutes) are the 'Do Minimum' generalised cost multiplied by the percentage change.

The user benefits for the existing users are based on the difference between the 'Do Something' and the 'Do Minimum' generalised costs, the value of time (VoT) and the number of existing users, as shown in the formula below:

$$User\ Benefits_{\ existing\ users} = (\text{'Do Something' GC} - \text{'Do Minimum' GC}) * VoT * No_{\ existing\ users}$$

New users get half of the benefits experienced by existing users. The 'rule of half' is based on the assumption that new users' willingness to pay is equal to that of the average existing user.

Non-user benefits

Non-user benefits are benefits that accrue to people and businesses who are not direct users of the improved stations. The externality benefits are derived from the reduction in car vehicle kilometres resulting from modal transfer to rail due to the accessibility improvements at the stations.

The reduction in vehicle kilometres drives the following externality benefits:

- Decongestion - Decongestion benefits result from the removal of cars from the road and accrue to remaining cars on the road network. The benefit per kilometre removed depends on the existing level of congestion;
- Infrastructure - Reduced infrastructure costs resulting from a reduction in car kilometres;
- Accident reduction - Accident reduction results from the removal of car kilometres;
- Reduction in carbon emissions - Carbon emissions are also reduced as a consequence of the reduction in car kilometre;
- Reduction in local air and noise pollution - Locally, air and noise pollution is reduced as a consequence of the reduction in car kilometre.; and
- Indirect taxes – indirect loss in government tax revenue following reduced car kilometres principally due to reduced petrol usage.

Rail operator benefits

The growth in station use will result in an increase in rail fare revenue to the train operating companies. The additional rail revenue is calculated based on the increase in demand per user group and station and the average cost of an off-peak return ticket at each station, adjusted to account for Railcard usage (as identified in the station user survey).

Additional revenue from retail spending on stations and trains and Railcard purchase have not been included, although these would be expected to increase with increased station use.

Appraisal assumptions

The economic appraisal is based on the following assumptions:

- Assumed overall scheme construction start year of 2009 –for purpose of appraisal a single representative start point has been selected, and scheme opening year of 2010. This reflects the average construction start and opening years for the selected stations (however, exact construction start years have been used for the cost rebasing for each individual station);
- An appraisal period of 60 years, as standard in DfT appraisal guidance. In addition a sensitivity test at 30 years has been undertaken;
- All scheme costs and benefits are presented in 2010 prices and values in line with DfT guidance;
- The discount rate used is 3.5% for the first 30 years, then 3.0% thereafter, in line with guidance;
- Costs are assumed to grow in real terms, e.g. a real increase above general inflation. The assumption employed is that all costs (operating costs and fares / revenues) increase at a real growth rate of 1% per annum;
- Values of Time and Value of Time Growth in line with DfT guidance:

- All benefits have been valued at an average non-work value of time of GBP 6.04 per hour based on the 'other' market price (in 2010 prices). This is a prudent assumption as the value of 'other' travel time is lower than that of 'commuting' and 'business';
- The non-work real growth in the VoT has been applied to all benefits over the appraisal period (from WebTAG);
- Average rail demand growth of 2.5% per annum has been assumed up to 2035, beyond which no further growth is assumed. This is somewhat lower than the observed rail growth between 1987 and 2014, so provides a conservative estimate. The growth rates and 'cap year' are consistent with those employed for 'standard' DfT rail appraisals;
- Externality benefits based on DfT's Marginal Externality Costs (WebTAG). This varies by station depending on location and dominant road type assumptions;
- The demand uplift due to the improvements has been calculated based on the station user surveys where passengers were asked if the accessibility improvements had led to an increase in their usage of the station. The percentage that stated that they had increased their usage were multiplied with the assumed increase, 1/3 more trips for those saying they had increased their number of trips "significantly" and 1/10 more trips for those saying they had increased their number of trips "slightly";
- Of the new demand 50% is assumed to be modal transfer from car;
- To take into account general growth unrelated to the accessibility improvements at the selected A4A stations, the growth numbers have been reduced by subtracting the average control station growth;
- Unencumbered users are assumed to have no growth related to the station accessibility improvements. This is a conservative assumption as 3% of this group indicated that they had increased their use following the station accessibility improvements. This approach was adopted because of the relative uncertainty over the valuation for these users (for example how much benefit did they actually get from using the lifts?). However, a sensitivity test was used to quantify this potential benefit.

Appraisal results

The appraisal gave an overall positive benefit cost ratio, but with substantial variation between the different stations. Overall, the benefits exceed costs by 2.4:1 with one station (Vauxhall) having a very high BCR of 11.3:1.

The key economic benefits of the scheme are user benefits, especially benefits to existing users, which provide over half of the total benefits. These existing users include, for example, passengers with luggage or travelling with small children.

It is important to recognize that the BCR calculation does not include the following benefits:

- Benefits to 'unencumbered' users - there will also be benefits the unencumbered due to general renewal of station facilities and improved quality of signage, information, lighting and removal of clutter;
- The value of improvements of this nature (i.e. inclusiveness) that the general population (i.e. those who do not use the scheme) place on such interventions, based on their principles and ethics about the role of Government (and by extension Government expenditure) in supporting an inclusive society;

- 'Option values' for potential users of the scheme. The value that potential users would gain would derive from the possible future benefits associated with:
- Anticipation of future need – i.e. people who will have children / get old;
- Ability to travel if temporarily incapacitated e.g. injured ; and
- The ageing of the population means that in the future more people will likely come into the various disabled categories.

Sensitivity testing

Sensitivity testing was used to verify the robustness of the results and highlight the key parameters affecting them. The following tests were used:

1. Operating & maintenance costs (central case 1.5% pa, test case 3% pa);
2. Capital cost (test case +50% on actual costs);
3. Demand elasticity (central case -1, test case -0.5);
4. Generalised cost (central case 130, test case 100);
5. Uplift in demand (central case based on survey results from each station applied to that station, test case based on the average survey response across all stations applied to each station);
6. Base demand (50% of central case);
7. Benefits from new trips (central case 50% benefit, test case 25%);
8. Including unencumbered users (central case 0% benefit, test case 1% increase in trips);
9. Modal shift from car (central case 50% modal shift, test case 25%);
10. Fare levels (test case 50% of estimated fare levels);
11. Appraisal period (central case 60 years, test case 30 years); and
12. Rail trip growth (central case 2.5%, test case 5.0% - closer to the observed growth in national rail trips over the last 30 years).

The overall outcome of the sensitivity testing was that even in the worst case the business case was still positive (a BCR of 1.08). At the other extreme, including benefits to unencumbered users raises the BCR to 19.45.

Conclusions

The overall conclusion is that the Access for All programme benefits users and society more generally, and has a positive business case. In other words, the benefits of improving the accessibility of rail stations by creating step-free access outweigh the costs even using a fairly narrow business case assessment methodology.

At the same time, the business case is dependent on the particular circumstances of the station, with the crucial factor being the number of disabled and encumbered passengers using the station.

It is important to recognize that the business case is only part of the story. Improved access to stations has important social benefits in terms of giving everyone the opportunity to travel by rail. Its benefits also extend well beyond people with a disability, most obviously to passengers with luggage, but also to what we've termed "unencumbered" passengers: in effect, all passengers benefit to some extent. The passenger survey data provides some good supporting evidence for this.

This study does highlight some general lessons outside of just the Access for All programme. In particular, to maximize the impact of investment in infrastructure ("hard measures") a co-ordinated programme of complementary "soft" measures should be implemented. These should include (but not be limited to):

- Communications to raise awareness of the improvements targeted not just at people already travelling, but also at those put off from travelling by perceived difficulties in accessing services. Typically this may include a launch event and coverage in local media (newspapers, magazines, radio);
- Clear passenger information and signage on-site;
- Good information available at the journey planning stage (typically on websites) which clearly identifies the accessibility features available;
- Staff training and awareness so they can help and support disabled passengers without taking away their independence.

Another general conclusion is that accessibility to a transport service is only as good as the weakest link. In the rail example, the benefit of improving access to stations is severely compromised if passengers cannot then get on their train. This should be borne in mind when considering funding priorities.

Finally, in terms of who benefits, a good scheme to improve accessibility can actually benefit everyone, not only people with a disability. All passengers benefit to some extent, as does the transport operator (which benefits from increased patronage), and society more widely. Society can benefit both in an economic sense where improved access to public transport encourages switching from less efficient private transport, and in a social sense in terms of helping to create a more level playing field and a more caring society which everyone can proud of.

Notes

1 http://www.steerdaviesgleave.com/sites/default/files/elfinder/Reports/Access4AllBenefitResearch2015.pdf

2 http://www.networkrail.co.uk/improvements/access-for-all/

3 https://www.gov.uk/guidance/transport-analysis-guidance-webtag

Participants list

Ann Frye Ltd

Mrs. Ann FRYE
Director
Ann Frye Ltd
75Alderney Street
SW1P 4DR London
United Kingdom

Tel: +44-207 944 4461
Fax: +44-207 944 6102
Email: ann.frye@dft.gsi.gov.uk

EU/UE - European Commission

Mr. Jean-Louis COLSON
Head of Unit
Directorate General for Mobility and Transport
EU/UE - European Commission
Rue de la Loi 200
1049 Brussels
Belgium

Tel: +3222960995
Email: jean-louis.colson@ec.europa.eu

Finnish Transport Safety Agency, TraFi

Ms. Kirsi TERVOLA
Special Adviser
Organisation Services; Flight operations training
Finnish Transport Safety Agency, TraFi
Kumpulantie 9, 00520 Helsinki
FI-00101 Helsinki
Finland

Tel: +358400383541
Email: kirsi.tervola@trafi.fi

HDR

Ms. Daphne FEDERING

Principal Economist
HDR
8403 Colesville Rd 910
MD 20910 Silver Spring
United States

Tel: +12404852623
Email: Daphne.Federing@hdrinc.com

Mr. David LEWIS

Former Senior Vice President
HDR
903 – 160 George Street Ottawa
K1N 9M2 Ottawa
Canada

Tel: +613 241 1690
Email: dlewis1@bell.net

Institute of Transport Economics

Mr. Nils FEARNLEY

Senior Researcher
Institute of Transport Economics
Gaustadalleen 21
0349 Oslo
Norway

Tel: +4790923924
Email: naf@toi.no

New York City Department of Transportation

Mr. Quemuel ARROYO

Policy Advisor on Accessibility
Policy
New York City Department of Transportation
55 Water Street
9th Floor
10041 New York
United States

Tel: +12128396426
Email: qarroyo@dot.nyc.gov

Steer Davies Gleave

Mr. Tony DUCKENFIELD

Head of Behavioural Insight
Steer Davies Gleave
28-32 Upper Ground
SE1 9PD London
United Kingdom

Tel: +44 20 7910 5000
Email: Tony.Duckenfield@sdgworld.net

Syndicat des Transports de la Région Ile-de-France

Mme Laurence DEBRINCAT

Head of Studies department
DDAET Division Etudes Générales
Syndicat des Transports de la Région Ile-de-France
39 bis 41 rue de Châteaudun
75009 Paris

Tel: + 33 (0)1 53 59 21 06
Fax: +33 (0)1 53 59 21 33
Email: laurence.debrincat@stif.info

SYSTRA

Mr. Mark WARDMAN

Technical Director
Mnchester Office
SYSTRA
25th Floor, City Tower, Piccadilly Plaza
MI 4BT Manchester
United Kingdom

Tel: + 447718359372
Fax: +01612360095
Email: mwardman@systra.com

Technical University of Denmark

Ms. Sonja HAUSTEIN

Senior Researcher
Department of Transport
Technical University of Denmark
Bygningstorvet 116B,
Kgs. Lyngby
2800 Denmark

Tel: +4545256519
Fax: +4545936533
Email: sonh@transport.dtu.dk

The Korea Transport Institute (KOTI)

Ms. Kyounga PARK

Associate Research Fellow
The Korea Transport Institute (KOTI)
Postal address, 370 Sicheong-Daero,
339-007 Sejong-Si
Korea

Tel: +82(44)2113061
Email: kapark@koti.re.kr

The University of Waikato

Mr. Stuart LOCKE

Professor of Finance
Hamilton
The University of Waikato
273 Peake Road, RD 1
4393 Cambridge
New Zealand

Tel: +64275004260
Email: smlocke@waikato.ac.nz

Traffic Design Group Ltd (TDG)

Ms. Bridget BURDETT

Senior Transportation Researcher
Traffic Design Group Ltd (TDG)
Level 6, 11 Garden Place
3240 Hamilton
New Zealand

Tel: +64 7 839 5500
Email: bridget.burdett@tdg.co.nz

University of Applied Sciences Erfurt

Mr. Markus REBSTOCK

Senior Researcher
Transport and Spatial Planning Institute
University of Applied Sciences Erfurt
Bürgermeister-Schiller-Str. 18,
D-99098 Erfurt
Germany

Tel: +493616700655
Email: rebstock@fh-erfurt.de

University College London (UCL)

Mr. Roger MACKETT

Emeritus Professor of Transport Studies
Department of Civil, Environmental and Geomatic Engineering
University College London (UCL)
Gower Street
London
United Kingdom

Tel: +44020 7679 1554
Email: roger.mackett@ucl.ac.uk

Mrs. Jenny MINDELL (COHEN)

Reader in Public Health
Research Department of epidemiology & Public Health
University College London (UCL)
1-19 Torrington Place
London
United Kingdom

Tel: +44-2076791269
Email: j.mindell@ucl.ac.uk

OECD/OCDE

Ms. Aimee AGUILAR JABER

Economist
ITF/RPA
OECD
Marshall Building 2143
2 rue André-Pascal
75016 Paris
France

Tel: +(33-1) 45 24 92 20
Email: Aimee.AGUILARJABER@itf-oecd.org

Mr. Lorenzo CASULLO

Economist
ITF/RPA
OECD
Marshall Building 2215
2 rue André-Pascal
75016 Paris
France

Tel: +(33-1) 45 24 13 30
Email: Lorenzo.CASULLO@itf-oecd.org

Ms. Mary CRASS

Head of Institutional Relations & Summit
ITF/IRS
OECD
Marshall Building 2114
2 rue André-Pascal
75016 Paris
France

Tel: +(33-1) 45 24 13 24
Email: Mary.CRASS@itf-oecd.org

Mme Monserrat FONBONNAT

Assistant
ITF/RPA
OECD
Marshall Building 2135
2 rue André-Pascal
75016 Paris
France

Tel: + (33-1) 85 55 60 34
Email: Monserrat.FONBONNAT@itf-oecd.org

Mr. Stephen PERKINS

Head of Research & Policy Analysis
ITF/RPA
OECD
Marshall Building 2133
2 rue André-Pascal
75016 Paris
France

Tel: +(33-1) 45 24 94 96
Fax: (33) 1.45.24.13.22
Email: Stephen.PERKINS@itf-oecd.org

Mr. Daniel VERYARD

Transport Analyst
ITF/RPA
OECD
Marshall Building 2191
2 rue André-Pascal
75016 Paris
France

Tel: +(33-1) 45 24 82 68
Email: Daniel.VERYARD@itf-oecd.org

Mr. Seung Kook WU

Secondee (KOTI)
ITF/RPA
OECD
Marshall Building 2191
2 rue André-Pascal
75016 Paris
France

Tel: +(33-1) 45 24 90 84
Email: SeungKook.WU@itf-oecd.org

International Transport Forum

Economic Benefits of Improving Transport Accessibility

The economic benefits of improving transport accessibility for all are rarely taken into account when making decisions about investment and regulations. While costs are often known, benefits such as greater access to services, jobs and tourism are unknown or even undefined.

This report reviews economic theory and practical case studies to set out the basis for the development of a common framework empowering decision-makers to value the impacts of greater accessibility for mobility-impaired, encumbered and ultimately all passengers.

International Transport Forum
2 rue André Pascal
75775 Paris Cedex 16
France
T +33 (0)1 45 24 97 10
F +33 (0)1 45 24 13 22
Email : contact@itf-oecd.org
Web: www.itf-oecd.org

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