

# The Economic Benefits of Improved Accessibility to Transport Systems

Roundtable Summary and Conclusions

20

Discussion Paper 2016 • 20

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#### **Discussion Paper No.2016-20**

Prepared for the Roundtable on  
The Economic Benefits of Improved Accessibility to Transport Systems  
03-04 March 2016, Paris

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**December 2016**

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## **Abstract**

This paper 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.

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## 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 and the associated Discussion Papers 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 paper reflects this.

## Structure

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

Section 1 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.

Section 2 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.

Section 3 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.

Section 4 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

Federing and Lewis (2016) 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 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. **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, . . .” [ <i>Convention on The Rights of Persons With Disabilities, Article 2, 2006</i> ]
Australia	The Australian Disability Discrimination Act 1992	Accommodation required unless would impose an “unjustifiable hardship” [ <i>Disability Discrimination Act 1992, Cth, section 31</i> ].
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’ [ <i>Canada Transportation Act and Council of Canadians with Disabilities v. Via Rail Canada Inc., 2007</i> ]
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” ( <i>section 43</i> )
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.” [ <i>Directive Of The European Parliament and of The Council , Article 12</i> ]
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.” [ <i>Americans With Disabilities Act Of 1990, Sec. 12111 and section 36.104</i> ]

Source: Federing and Lewis (2016).

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 Federing and Lewis (2016) 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” (Burdett et al. 2016). 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 (Burdett et al. 2016). 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” (Burdett et al., 2016). 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 by Duckenfield (2016) reporting on the findings of the Access for All research carried out for the Department for Transport (DfT) in the UK, 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'.<sup>1</sup> 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 in 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/OECD Report<sup>2</sup> 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.

Federling and Lewis (2016) 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” (Duckenfield, 2016). 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 (Federling and Lewis, 2016). 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<sup>3</sup>.



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 (Burdett et al., 2016), 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 (see ITF Roundtable Report 149). 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. Federling and Lewis (2016) 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.

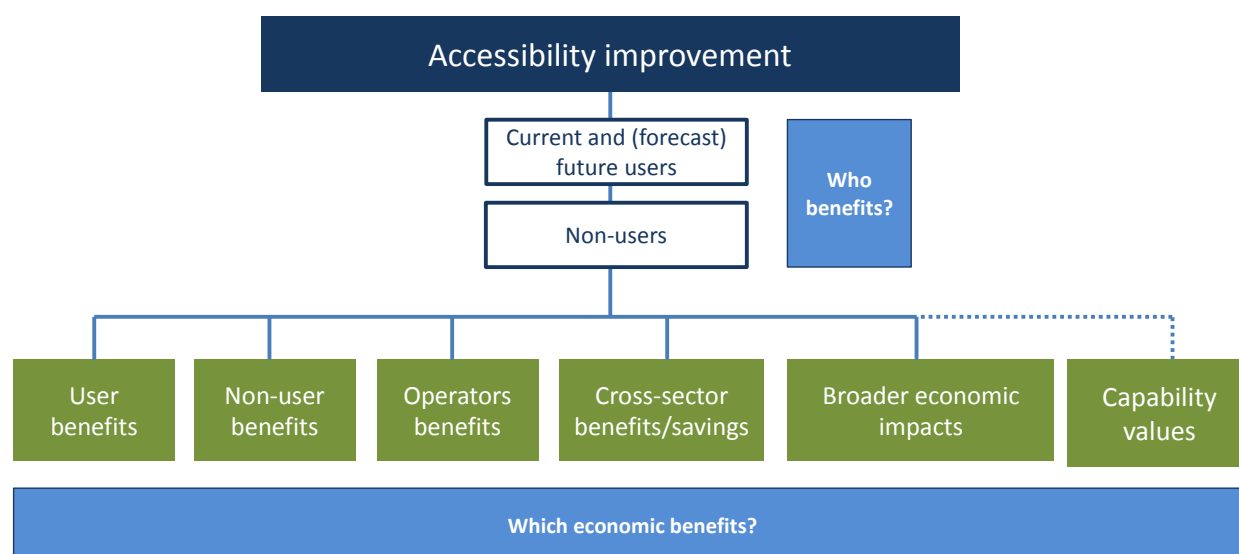
This section reviews some of the methodologies and parameters that are available to measure and assess the benefits of improved accessibility discussed above. These are presented along a spectrum that ranges from traditional methods for standards CBA, to new techniques that explore the capabilities approach. 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 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. **Framework for measuring the economic benefits of improved accessibility**



Source: Adapted from Federing and Lewis (2016).

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 (Duckenfield, 2016) 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 3.

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?

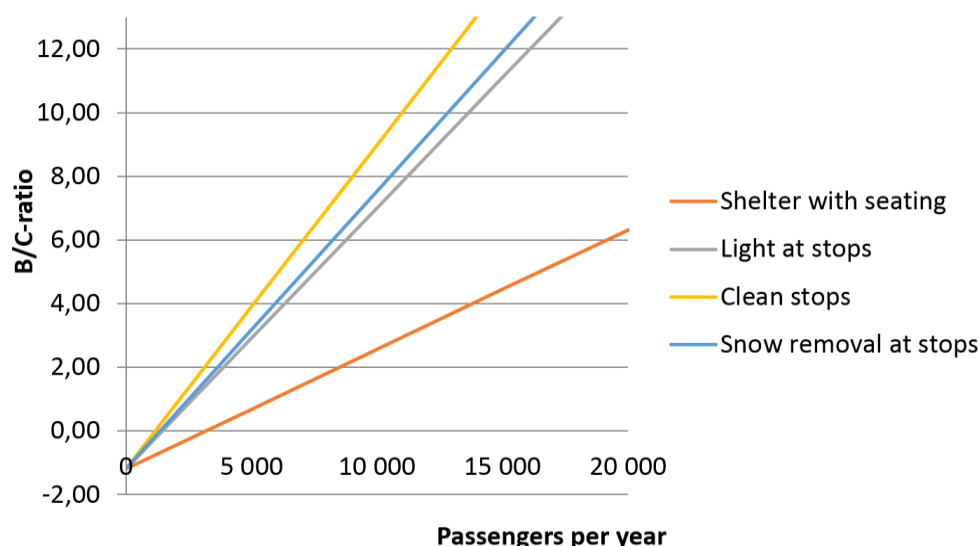
Table 2. **Valuation of improved information provision at public transport stops**

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 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 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 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 3. **Valuation of improved accessibility of public transport vehicles**

WTP per ride	NOK (all passengers)	USD (all passengers)	NOK (special needs passengers <sup>1</sup> )	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.

Duckenfield (2016) 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<sup>4</sup>). 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 by Rebstock (2016), the most recent 2012 review at the European level concluded that accessible tourism (i.e. tourism activity by both disabled and older 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 associated 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 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 4. Contributions to the economy dependent on travel by older people in 2030

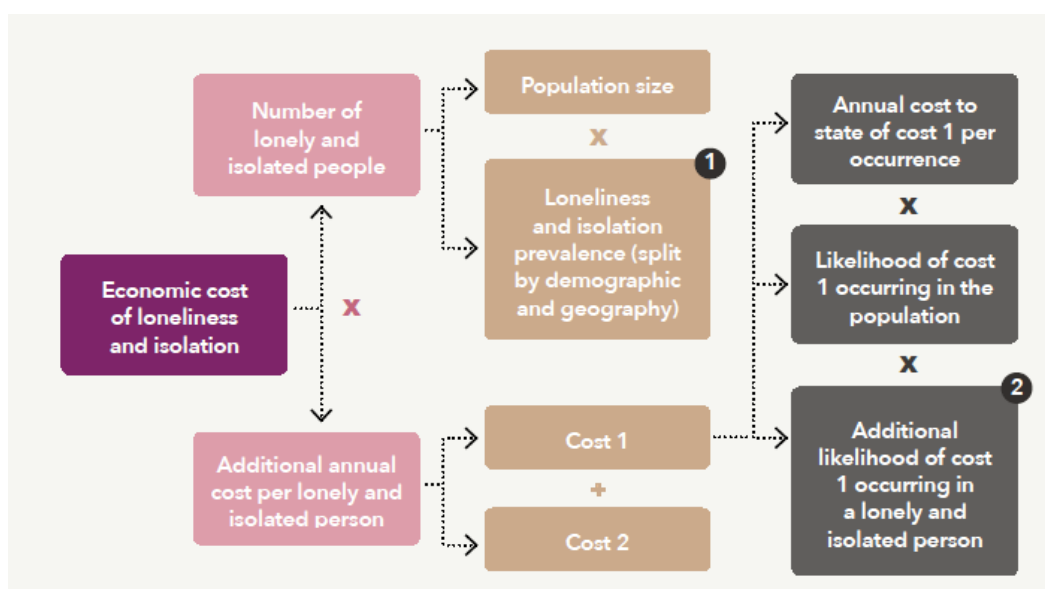
Contributions	GBP m	% requiring travel	Travel-dependent contributions (GBP m)
Direct and indirect expenditures (e.g. shopping)	127,279	90	114,551
Volunteering	14,535	100	14,535
Childcare	4,473	50	2,237
Other non-tax contributions	62,762	0	0
Employment taxes	33,113	96	31,788
Taxes on expenditures	29,111	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<sup>5</sup> can reduce loneliness and isolation, and therefore savings in the order of GBP 0.4bn - 1.1bn can be made annually. The logic map underlying these savings is presented in Figure 3.

Figure 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. Burdett et al. (2016) give 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<sup>6</sup>. 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<sup>7</sup> 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 5 below). The authors advocate accessibility policies that move away from just qualitative surveys to incorporating this emerging quantitative evidence.

Table 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.

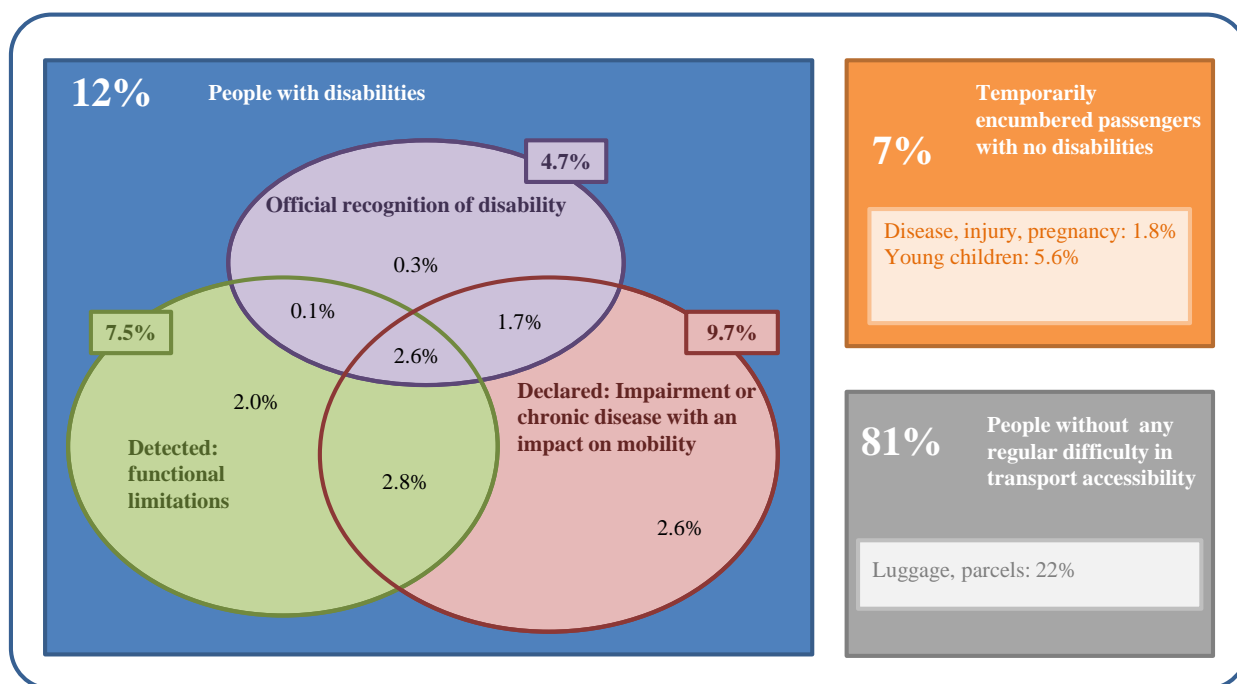
Critically, such indices need to rely on consistent data collection and repeated surveys over time. Recent efforts by STIF in the Paris region (Ile-de-France) to map transport accessibility provide an

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 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 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.

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## Notes

- 1 More information at: <http://www.euro.who.int/en/health-topics/Life-stages/healthy-ageing/healthy-ageing>
- 2 Refer to ‘Valuing Convenience in Public Transport’, ITF/OECD Roundtable Report 156
- 3 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.
- 4 ‘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
- 5 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
- 6 See UK Department for Transport, TAG UNIT A4.2 Distributional Impact Appraisal, December 2015
- 7 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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