International Transport Forum

Accessibility and Transport Appraisal

Summary and Conclusions

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The International Transport Forum

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The Roundtable on Accessibility and Transport Appraisal was held in Paris from 21-22 October 2019 and chaired by Professor Phil Goodwin. The ITF Secretariat wishes to thank the 37 participants, who come from 15 ITF member countries. A list of Roundtable participants is provided in the Annex.

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Executive summary

What we did

The Roundtable explored the differences between the analysis of transport issues based on mobility perspectives and those based on accessibility. In the former view, additional travel is generally seen as necessarily yielding additional welfare. In the latter perspective, travel is considered a derived demand, and its underlying purpose of increasing effective access to goods, services and activities may be met in ways other than travel. The Roundtable focused in particular on the reasons accessibility perspectives are little used in transport appraisal, the practical implications of this and the changes in investment outcomes that would be likely to arise from a shift towards the use of accessibility-based approaches.

What we found

Transport planning and evaluation in terms of mobility yield flawed outcomes, yet this paradigm has been dominant in many countries for half a century. The mobility perspective posits that less obstructed, faster and lower-cost movement is inherently desirable. As a result, it does not adequately take into account the underlying purpose of transportation: the ability to reach destinations. Neither does it acknowledge the role proximity plays in this.

The analytical tools used in the mobility paradigm emphasize the monetary value of the travel-time savings that would accrue from faster road travel enabled by expanded capacity. Thus, the main elements of modelled benefits come from a greater volume of faster travel by a greater number of cars. These benefits are seen as inherently contributing to economic welfare and implying the need for sufficient increases in road capacity to enable relatively congestion-free travel. However, mobility does not in itself ensure accessibility, and can even detract from it. Greater mobility for some can reduce mobility and accessibility for others. This can, in turn, lead to significant deterioration of certain aspects of the quality of life and an inefficient use of economic and natural resources.

Sustainable transport policies that address the shortcomings of the mobility perspective share most or all of the following characteristics: they use accessibility-based methods and metrics; they reallocate road space in favour of modes other than cars for travel over short distances; and they reduce traffic in residential neighbourhoods. Furthermore, they result in fewer large-scale infrastructure developments that encourage growth in car traffic and employ land-use planning and development control to encourage higher residential densities. They explicitly recognise the need to deliver benefits to all social groups, implying an allocation of resources favouring those who have the fewest opportunities. They also include consideration of the role of digital communications to optimise social and economic activity.

In certain conditions, the formal models underpinning the two approaches are closely related. Many studies have used an entirely conventional economic analysis of mobility to reach similar policy conclusions on questions such as the merits of active travel and the disadvantages of car-based transport. This is an important caveat, and the implications for transport modelling are a potentially fruitful topic for further analysis.

The core concepts in accessibility analysis are measures of the ease or difficulty different individuals face in obtaining access to personal, social and economic activities. These typically use graphical representations and mathematical quantities based on the location of homes, workplaces and other

activities and their connectivity. The fundamental inputs to accessibility are proximity and mobility. Unlike mobility approaches, which often favour the provision of transport for longer and longer journeys, accessibility approaches include the search for ways of reducing the amount of travel necessary to fulfil social and individual needs.

The Covid-19 pandemic has resulted in travel restrictions of one form or another in many countries. The encouragement of active travel modes such as walking and cycling, plus an expansion of home delivery services for essential goods, is in line with the sustainable transport policies enumerated above. It is too early to say whether these initiatives will be developed and sustained in the future, but this experience has shown the practical feasibility and benefits of accessibility planning.

What we recommend

Use metrics in transport project appraisal that closely reflect the objectives sought

Numerous well-developed accessibility indicators exist, but there is no one pre-eminent approach that is accepted as the preferred option for use in transport appraisal. Thus, the choice of accessibility metrics should reflect contextual factors, notably the specific objectives, the options being analysed and the available data.

Continue to use cost-benefit analysis (CBA) for appraisal but broaden its perspective

The scope of standard social CBA can be expanded significantly to take many or most accessibility-based perspectives into account. CBA guidance and practice should favour the adoption of a broad analysis which addresses relevant accessibility issues as far as is feasible. This will favour consistent and integrated analysis.

Use accessibility metrics to improve understanding of distributional issues

A key benefit of adopting accessibility metrics is they enable a clearer focus on distributional issues than is feasible using traditional CBA. This includes the level of accessibility of particular groups, especially the disadvantaged. Presenting accessibility analysis in conjunction with the results of a broadened CBA will therefore significantly improve the information base available to decision makers.

Take account of virtual accessibility and other substitutes for mobility

Accessibility indicators must themselves be sufficiently broadly specified and flexibly implemented to ensure they take account of non-traditional forms of accessibility (e.g. virtual accessibility) and their significance for policy.

Communicate results with clear illustrations from accessibility mapping

Accessibility indicators are more likely to be influential if they are readily understood by decision makers and stakeholders. Recent innovations such as accessibility mapping provide opportunities to communicate the insights of accessibility indicators more effectively and should be adopted widely.

Use retrospective assessments to test new methods and ensure consistency

As accessibility perspectives are increasingly adopted in policy making, systematically conducting assessments of the results will be crucial in testing key hypotheses and weighing outcomes.

Introduction

The starting point for the Roundtable was the recognition of widespread discontent with a predominant paradigm for transport appraisal that focuses on the volume of physical movement (e.g. vehicle or passenger kilometres travelled, or numbers of trips) or its speed as the key means of assessing the performance of transport systems. This is known as the mobility perspective. Academic researchers in the field increasingly argue it should be replaced by an accessibility perspective, which measures populations' ability to reach potential and actual destinations, pursue activities and obtain goods and services. The accessibility perspective focuses on the underlying purpose of travel rather than the act of travelling itself.

A range of accessibility indicators have been developed over several decades and are widely used as research tools. The accessibility perspective is increasingly adopted in policy discussion about the strategic objectives of projects and programmes. However, it plays little part in guiding transport infrastructure planning and project appraisal decisions, with the mobility perspective continuing to dominate formal project appraisal and selection processes. A key question is whether the greater use of accessibility measures would lead to project selection outcomes that address a wider range of policy objectives and provide greater clarity regarding objectives, costs and benefits. Moreover, by doing so, would it better support the achievement of social and economic goals?

Integrating the accessibility perspective

The Roundtable participants were in broad agreement as to the nature of the policy problem to be addressed and the objectives to be sought by better integrating the accessibility perspective in policy choices. Fundamentally, the mobility perspective can be seen as focused on transport systems and on the quantity or speed of movement rather than the underlying needs and desires that motivate travel. It is a much-repeated axiom that travel is a derived demand, i.e. it is the means to reach desired destinations and pursue activities that are the primary demands. Using the volume of movement as the benefit indicator arguably obscures this basic insight. By contrast, adopting the accessibility perspective explicitly recognises this and refocuses analysis on people's ability to obtain access to the services they need and want.

When formal assessments using CBAs are made for transport projects, they are often dominated by the estimated value of the travel time saved as a result of the investment. This tends to reflect the exclusion from the analysis of significant externalities relating to environmental and health impacts. Where this is the case, the effects tend to be as follows:

- transport budgets that allocate the bulk of resources to road infrastructure at the expense of public transport, walking and cycling
- a focus on long-distance travel at the expense of addressing problems in local travel
- a higher priority effectively given to improving the conditions of travel for the most well-off travellers rather than for the poorest
- too much focus on initiatives that increase the total volume of traffic.

There is increasing criticism of this imbalance, especially because it does not give due weight to the effects of transport infrastructure choices on health (whether negative, through increasing noxious emissions, or positive, by encouraging active lifestyles), local and global environmental impacts, and quality of life factors such as the aesthetic quality of locations in the public domain and social well-being. In principle, there is no reason why such factors could not be given greater weight within mobility-based CBAs, and indeed some economists advocate doing so. However, in practice it is argued that the use of the accessibility perspective, in putting the policy focus on people's need to get access to activities, destinations and interactions with other people, lends itself more easily to inclusion of these wider economic and social objectives. Adopting accessibility, rather than mobility, as the primary indicator in transport planning is intended to ensure that the focus is on the underlying needs of travellers, rather than short-term mobility demand. By the same logic, it should also more effectively take account of the indirect effects of transport infrastructure choices on the whole of society rather than simply on users of the transport system. It could also provide scope for considering a wider range of policy instruments, such as those that increase access while reducing the need for mobility. These can include various changes to land use regulation (e.g. facilitating mixed-use developments and increasing density), as well as measures that enhance virtual, rather than physical, accessibility.

As noted, mobility-based planning tends to result in a focus on car-oriented transport investments and often implies the least affluent profit less from government expenditures on transport, since they have the least degree of access to private cars. Such outcomes can also be questioned on the basis that gains are likely to be subject to the law of diminishing returns: an accessibility framework would suggest there might

be limited benefits associated with continuing to focus investments on facilitating the movement of cars in many circumstances.

An additional dimension of the problem arising from the use of the mobility perspective concerns the relationship between transport and land-use planning. A frequent critique asserts the adoption of the mobility perspective has resulted in unfavourable land-use patterns (in particular the rise of urban sprawl), which themselves exacerbate accessibility problems. Proponents argue that adopting the accessibility perspective enables these negative interactions to be addressed by linking transport and land-use planning effectively. This may be done by including land use in formal accessibility models, or by other means.

The Roundtable participants discussed the value of accessibility indicators in complementing or potentially replacing the user-benefit approach to appraisal followed in standard CBA and transport policy assessment. They also discussed the potential for accessibility to be used as an input to CBA by estimating the monetary value of transport investments in terms of accessibility rather than mobility. Lastly, participants considered examples of the practical application of accessibility tools and lessons learned from this experience.

The state of the art in accessibility analysis

In academic terms, accessibility is a mature and advanced field of study, developed over a period of at least 50 years, and in some respects much longer. A substantial research effort has produced clearly defined mathematical modelling structures, with well-explored data requirements and methods that have delivered quantified as well as conceptual results. These results are reflected in a substantial academic literature (see Miller, 2020). Some large-scale exercises have also been undertaken by national and local government bodies. The Roundtable heard in particular about the details of such studies in the United Kingdom, where the Public Transport Accessibility Level (PTAL) model is widely used by public bodies, France and the United States (Meunier and Quinet, 2020). Thus, the accessibility paradigm is far from being unexplored territory that would require years of research before it could be used in practice.

However, academic research and government work in this field have often been carried out in mutual isolation. This has meant that its use in formal project appraisal remains very limited. One asserted reason for this is that the dominance of the mobility perspective is underpinned by its prescription of a single, pre-eminent analytical tool: CBA.

CBA centres on the calculation of expected time savings and the determination of their monetised value, both of which are easily understood concepts in that they relate readily to that part of people's daily lives spent trying to save time and money. They provide a simple narrative, which is readily understood by policy makers, stakeholders and the public: it is good to save time, and this has a value, so it is worth spending money to secure this benefit. Geurs (2019) argues this comparative simplicity is a key reason the rule-of-half measure, which is based on outputs from stand-alone transport demand models (Box 1), seems to dominate economic appraisal practice. The tendency for this approach to be prescribed in national CBA guidance documents is also a significant factor. As more comprehensive and theoretically attractive alternatives require the use of more complex transport models to measure accessibility benefits, their use in economic appraisal and transport planning has been limited.

By contrast, there is no pre-eminent accessibility indicator that is widely accepted as the appropriate starting point for project appraisal practice. Rather, there is a wide range of indicators, each of which is more or less well suited to different uses. However, many provide metrics whose meaning is not readily or intuitively understood. Geurs (2019) identifies four distinct types of accessibility metrics: infrastructure based, location based, utility based and person based.

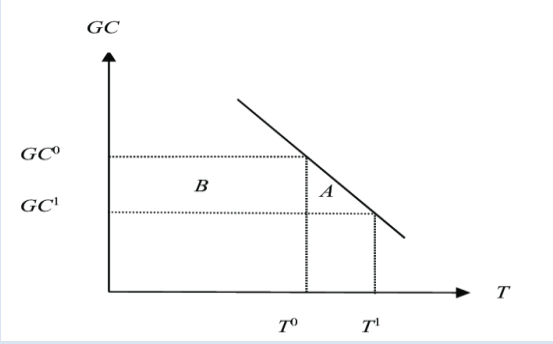
Widely used in engineering, infrastructure-based metrics include travel speed and congestion indices and typically measure the "sum of all impedances" (i.e. time and cost) of moving from a particular point to all other relevant points, thus giving an accessibility measure for that point. They can be varied by applying actual or modelled measures of what trips take place – i.e. substituting a choice set for actual demand. However, it is important to distinguish between actual accessibility and the potential for it. That potential is only converted into reality when the characteristics and geographical location of destinations are considered in relation to the means of travel (this is usually done separately for people with different travel possibilities).

Location-based metrics can be used from an origin or destination perspective. Cumulative opportunity measures the raw number of opportunities available within a given travel time. This is somewhat inconsistent with micro-economic theory and actual travel behaviour in that it uses an arbitrary cut-off point (i.e. opportunities just beyond the given time threshold are ignored) and implicitly treats all opportunities as being equally important. Gravity-based opportunity measures, by contrast, do not include

an arbitrary cut-off point but discount accessibility benefits by time taken to reach the opportunity. There are strong links in the literature between these models and both spatial-interaction models and discrete-choice models. Location-based measures can be broadly distinguished from infrastructure-based measures in that they incorporate both transport and land-use components rather than focusing specifically on the transport components.

Box 1. Rule of half

Traditionally, the rule-of-half method, which is based on the consumer surplus concept, is applied in CBA for transport project appraisal. In welfare economics, the level of welfare is measured by summing the amounts of money people are willing to pay for goods and services. As shown by the demand function in the accompanying figure, if the generalised cost (GC) decreases from GC0 to GC1 due to a transport infrastructure improvement, travel demand will increase from T0 to T1. Consumers who have already agreed to pay GC0 now pay GC1, generating a welfare change represented by the area B. Since new consumers pay less for the trip, the welfare change can be approximated by the rule of half: 1/2(T1−T0) (GC1−GC0), which is shown by the area A. The total change in consumer surplus is A+B.



Source: Hunt, J., Wang, W. and M. Zhong (2019).

Following economic utility theory, utility-based metrics focus on analysing the welfare benefits that people derive from access to spatially-distributed activities. The best-known is the "logsum" measure of consumer surplus, which measures the difference between the cost of travel and the value of the access provided. Because it directly measures the expected utility derived from access, it can be readily integrated in a CBA framework.

Lastly, person-based metrics take into account the fact that activity has both spatial and temporal dimensions – i.e. activities occur at specific locations for finite temporal durations. They measure accessibility in terms of the space-time feasibility of opportunities available to an individual, using the volume of the three-dimensional space-time prism or the number of opportunities in its projection on planar space (i.e. potential path space [PPS]) as indicators. These indicators are person-specific and provide a framework for incorporating the spatial configuration of the transport system and the spatial distribution of urban opportunities, plus individual spatial and temporal constraints, into a single measure of accessibility. However, these have not found their way into planning practice most likely because they are not easily understood without graphic illustrations (Figure 1).

Figure 1. The space-time cube used in person-based accessibility metrics

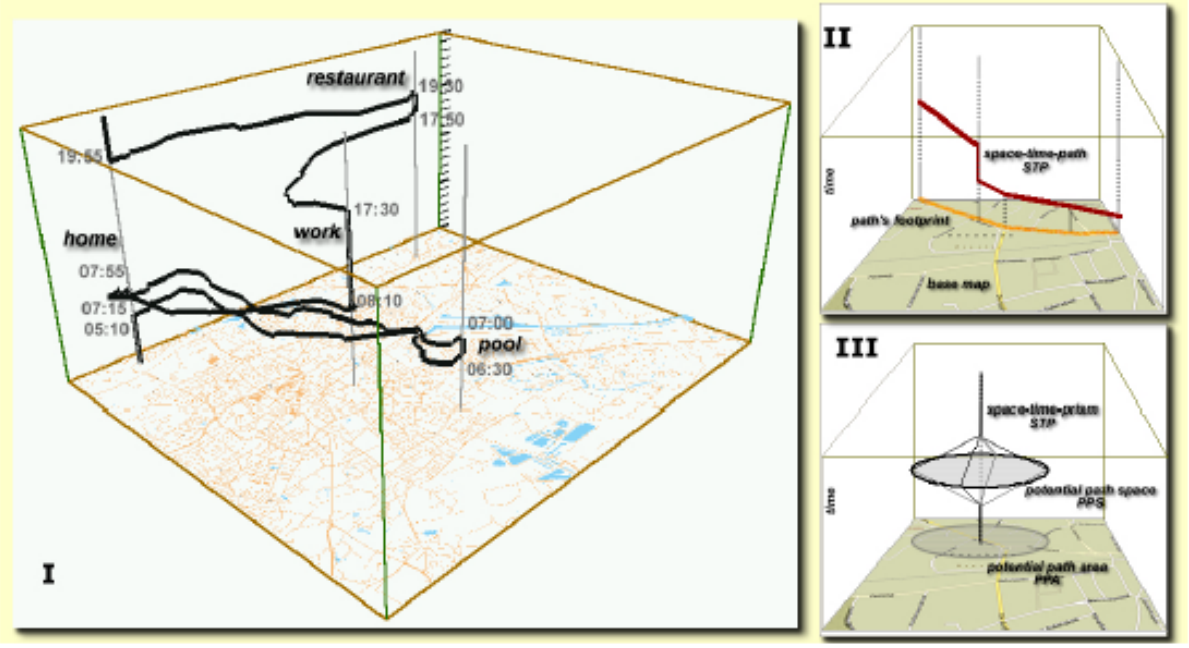
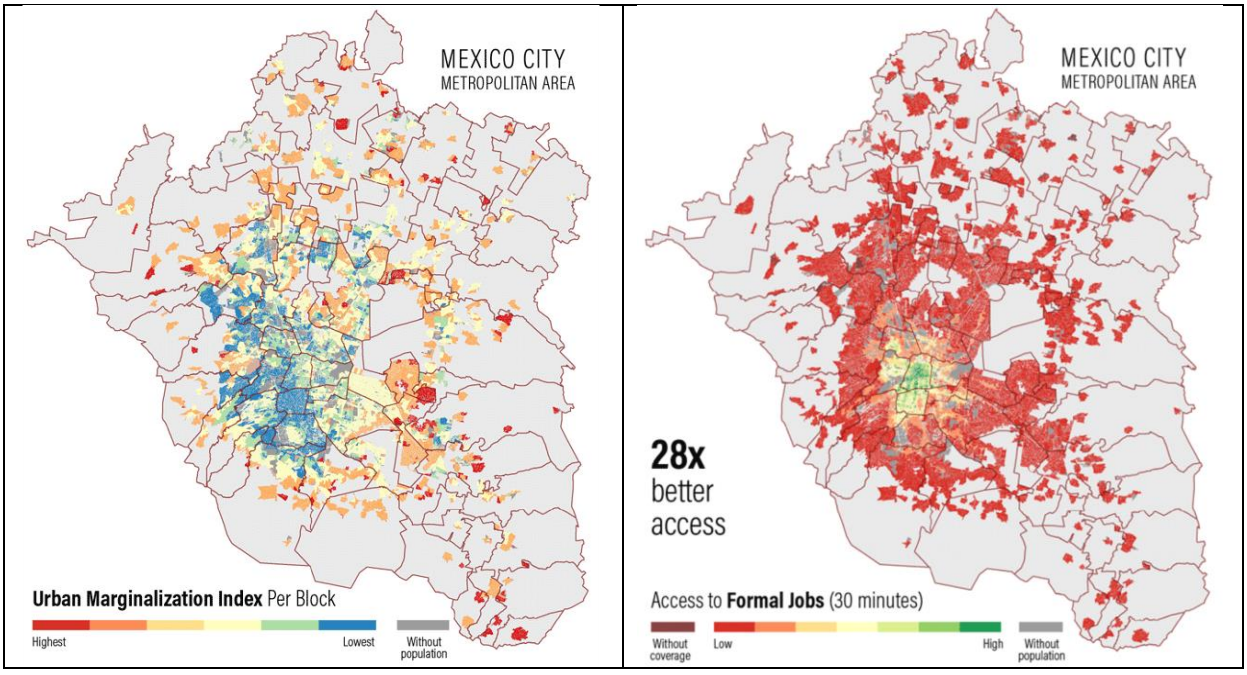


Figure 1. The space-time cube: I. An example of the author's travels on an average Thursday in Enschede, the Netherlands. II. The space-time cube's basics: a Space-Time Path and its footprint. The vertical line in the path represents the time a person remains at the same location, called station. III. A Space-Time-Prism (STP) indicates the locations that can be reached in a particular time interval (the Potential Path Space (PPS)). The projection of the PPS on the map results in the Potential Path Area (PPA).

Source: Kraak (2003).

Each of these approaches has strengths and weaknesses, both theoretically and practically, and suggestions that one or the other should be adopted as the core indicator have generally received little support in analytical discussions. However, an important development is the advent of digitised geographic information systems and the striking maps that can be produced from the data collected (Figure 2). The information conveyed by maps can be highly intuitive if well specified and accompanied by a clear legend. Nevertheless, care must be taken to ensure the indicators developed closely reflect the specific policy problems to be addressed and that data limitations do not result in poor approximations. As in all appraisal and modelling to support planning decisions, the policy issues to be addressed must be clearly identified and specified first and the assessment indicators determined accordingly. Any tendency for the modelling tool to drive the issues examined must be avoided.

Figure 2. The least marginalised in Mexico City have 28 times better access to jobs via public transport



Note: Accessibility indicator based on digitised geographical information systems (GIS) mapping.

Source: The City Fix Map of the Month, World Resources Institute (WRI), https://thecityfix.com/blog/map-month-mobility-health-education-inequality-mexico-city-spatial-problem-mauricio-brito-lorelei-ramirez-reyes-jorge-macias-eric-mackres/.

The left side of Figure 2 maps the degree of marginalisation of different neighbourhoods, based on a combination of social, economic, demographic and access-to-service indicators, while the right side maps their level of access to formal jobs by public transport. There is a clear inverse relationship between degree of marginalisation and access to jobs: the WRI calculates that someone living in the wealthiest neighbourhoods has 28 times better access to formal jobs in a 30-minute trip by public transport and walking than someone living in the poorest areas.

Issues related to greater use of accessibility analysis for appraisal

A number of issues must be addressed to facilitate a move towards the use of accessibility for project appraisal purposes. These are as follows:

- the institutional and cultural factors that underpin continued use of mobility perspectives
- the means by which accessibility measures are deployed
- a need to identify clear linkages between accessibility-based planning and the sustainable transport agenda.

As suggested in the Introduction above, this agenda is not uniquely associated with accessibility analyses. Indeed, there have been many attempts to address these issues by broadening the definition and scope of classical social CBA. Thus, while the adoption of accessibility perspectives is often identified with a policy agenda favouring a move to sustainable transport over the provision of road space for car travel, there is no unambiguous link between the accessibility shift and the shift in the urban transport policy perspective.

Institutional and cultural factors

Some authors have identified the institutional dynamics of transport planning as one of the factors that tends to cement continued use of mobility-based approaches and constrain the adoption of accessibility-based alternatives. Levine (2019) argues that mobility models and metrics retain their central role in transport and land-use policy in part because they represent professional norms in the transportation field: "Practitioners bound to uphold their professional norms by legal or ethical constraints, or by simple convention, would find themselves hard pressed to deviate from established standards such as these." Similarly, Martens (2019) describes transport planning in terms of an institution, with set rules and professional norms and limited opportunities for departing from them.

Martens argues that the rules are political in nature, as they address the attention of planners to some issues over others, embodying particular perspectives on what counts as a transport problem and what possible solutions exist, or what benefits are worth pursuing. This perspective implies the need for political action to drive step changes in approach. An example is the United Kingdom government's adoption of its Social Inclusion Agenda in 2004, which triggered the move to using accessibility-based planning in the United Kingdom through its explicit requirement to focus on the people's needs for access to services and opportunities via public transport. However, while accessibility-based planning was entrusted to local authorities, few if any resources were transferred to them to enable them to address these new responsibilities. Moreover, to the extent that traditional mobility-based transport planning, including its focus on large infrastructure projects, remains the dominant approach at the national level, the scope for the adoption of accessibility perspectives at local level to yield substantially improved outcomes for those with the lowest levels of accessibility will remain limited. A key factor, therefore, is to ensure that changes in approach to land use and transport planning are co-ordinated and mutually supportive.

Accessibility-based transport planning and sustainable transport

Mobility-based project appraisal is frequently criticised as having led to allocations of transport investment that unduly favour private vehicles. It is frequently assumed, and sometimes explicitly argued, that formal appraisal based on accessibility would of itself lead to a reallocation of resources toward more sustainable and equitable transport modes. However, several Roundtable participants argued that this outcome does not necessarily follow and that the specific means by which accessibility measures are adopted, including the philosophical perspective(s) adopted in analysing differences in accessibility across social groups, are crucial, as discussed below.

A key factor suggesting that adopting accessibility perspectives will not necessarily drive major shifts in the modal distribution of transport investments is the great majority of people in most developed countries have access to private cars. As a result, road-based projects will yield greater accessibility gains than other modes. This reflects the fact that most destinations are more accessible by private car than other modes. Second, a given proportionate increase in the speed of a fast mode will result in a much greater increase in the area that can be accessed than an identical increase in the speed of a slower mode. This means total accessibility will also be increased by a greater amount (Martens, 2019). This implies that simply substituting appraisal methods will not automatically solve the problems discussed above. Rather, the means by which accessibility insights are integrated into planning will be crucial to the results achieved.

Care should be taken in advocating accessibility primarily as a path to more sustainable transport. Levine (2019) notes that if an accessibility improvement is measured in terms of an accompanying gain in another realm (e.g. reduced vehicle kilometres travelled [VKT]), the implication is that in the absence of that accompanying gain the value of the accessibility improvement per se is zero. This is inconsistent with the view that, as the underlying purpose of transportation accessibility, is valuable in its own right. The environmental sustainability implications of different investment choices require separate analysis, regardless of whether a mobility- or accessibility-focused approach to planning and appraisal is taken.

How accessibility measures should be deployed

Concern that the current mobility-based approaches to transport planning do not adequately weigh the need to ensure an acceptable minimum standard of accessibility underlies much of the advocacy of a shift toward an accessibility perspective. Project appraisal and selection based on CBA and related methods will frequently result in investment choices that confer accessibility gains predominantly on those who are already well served in this regard, while doing little or nothing to assist those with the lowest levels of accessibility. This will occur wherever projects demonstrating the highest level of access gain per unit of cost have this characteristic and reflects the fact that CBA is not inherently concerned with distributional questions. Accessibility-based evaluation is not immune from this weakness, but it has the advantage of readily supporting distributional analysis across individuals, groups, and locations.

The relatively low level of use of such distributional analysis is arguably the result of a lack of agreement among academics, professionals, policy makers, politicians and the wider public about what might constitute fairness in the domain of transport. The academic literature proposes a range of possible philosophical perspectives that could be employed in the transport policy context. For example, Van Wee and Geurs (2011) point out that the social justice implications of inequalities can be evaluated from the differing philosophical perspectives of Utilitarianism, Egalitarianism and Sufficientarianism (broadly, Sufficientarianism as a theory of distributive justice aims to make sure each of us has enough). The nature and extent of any shift in the outcomes of transport planning processes following the adoption of the

accessibility perspective would necessarily differ according to which of these underlying perspectives is adopted. This points to the need for a more fundamental reflection on the duties of government with respect to transport.

Conversely, Geurs (2019) argues these different perspectives can each be relevant for different policy purposes. Utilitarian framing, for example, can be useful for many areas of policy delivery, particularly where the focus is on maximising the total benefits of an investment for all members of society. Conversely, when a proposed investment has a specific focus on achieving greater equity, whether for specific groups or in relation to deprived areas, egalitarian and sufficientarian approaches are more relevant (Lucas et al., 2016). If either of the latter two approaches is adopted, the distribution of changes in accessibility that arise from a particular investment become at least as important an analytical consideration as the total size of the changes.

Martens (2019) also argues that it is essential to consider the distribution of accessibility changes if a shift towards using accessibility metrics is to yield a significant change in the outcomes of transport planning. Effectively incorporating analysis of the distribution of accessibility into transport planning has a number of corollaries. One is that there is a need to establish minimum acceptable standards for accessibility that cover a range of key activities or destination types and are widely regarded as legitimate and appropriate. This in turn implicitly requires that governments commit themselves to adopting initiatives to guarantee accessibility improvements over time for people who fall below those thresholds (Martens, 2017; Geurs 2019).

Such an approach entails challenges, since – as Geurs notes – the identification of such minimum thresholds remains an unresolved challenge in both the academic literature and policy practice. One aspect of the challenge lies in the sensitivity of the results of accessibility analysis to the specific measures adopted (see Box 2). However, notwithstanding these challenges, experiences in other policy domains (e.g. income or housing) suggest there are ways to overcome this challenge and reach a broadly supported agreement. Reaching such an agreement is of course predicated on broad political support for the very idea of a minimum threshold for accessibility.

Box 2. Accessibility and equity measures

While a number of measures of income inequality exist and have sound underpinnings (e.g. the Gini Coefficient and the Palma Ratio), their use in measuring differences in accessibility is problematic. For example, Pritchard et al. (2019) used both Gini- and Palma-based measures to analyse the impact of adopting different accessibility measures on the results of the associated equity analysis. The authors found the resulting Palma ratio was sensitive to the accessibility measure used, with person-based accessibility measures tending to show greater inequality. The Gini results were also found to be heavily influenced by the choice of accessibility indicator and by how the area-based values were assigned to the population.

Actual versus potential accessibility

Across its various manifestations, accessibility measurement focuses on people's ability to reach destinations rather than their revealed travel behaviour. Martens (2019) notes that several authors have taken the view that the accessibility gains reaped by a person should be estimated independently of the actual level of trips they make. He endorses this approach to the use of accessibility measures on both theoretical and methodological grounds. This potential-accessibility approach defines the change in

accessibility as being equal to the increase in the number of potential destinations that can be reached, regardless of changes in individuals' actual transport behaviour. That is, different individuals are assessed as benefiting from the same accessibility improvement, regardless of their actual travel patterns, provided they have access to the specific transport mode under consideration.

Geurs (2019) points to literature explaining that people tend to value options available to them (in this case the option to reach certain destinations) per se, even though they may not choose to exercise all available options. This concept has long been associated with the accessibility perspective, being reflected in the first definitions of accessibility, given by Hansen in 1959. A related point, raised by Lopez and Monzon (2019) is that accessibility has both objective and subjective well-being dimensions, with the latter particularly a product of its ability to give rise to feelings of social inclusion or at least minimise or avoid feelings of exclusion. The authors note that the role of transport projects in minimising accessibility-related social exclusion and inequality is becoming a central issue within accessibility research. A specific measure of subjective accessibility known as the Perceived Accessibility Scale (PAC) has recently been developed and has already been applied to the assessment of accessibility in Denmark, Finland, Norway, Singapore and Sweden. The results of modelling in Sweden demonstrate differing degrees of difference between objective and subjective accessibility levels across different residential area (Box 3).

Box 3. Perceived accessibility

Developed by Friman, Lättman and Olsson (2016), the PAC is based on an aggregated psychological approach to capturing accessibility, focusing on the individual dimension of accessibility (i.e. opportunities) by targeting perceptions of accessibility as a complement to objective measures of accessibility. The perceived accessibility approach addresses the interaction between individuals and their environment. It is predicated on the assumption that different individuals are expected to perceive their accessibility differently depending on their expectations, preferences and abilities, even if their objective accessibility conditions are the same (Lättman, 2018). In line with recent policies which emphasize the importance of accessibility for all, the authors argue assessments of perceived accessibility are needed to help in identifying segments of individuals that experience lower accessibility than others and thus are at risk of being socially excluded.

Source: Lättman (2018).

Geurs (2019) broadens this point further, arguing there is a need to bring perspectives from other academic disciplines (e.g. economics, psychology, sociology and geography) into the appraisal process to ensure these additional dimensions of accessibility are appropriately analysed and included. He argues the use of Multi-Criteria Analyses (MCA) constitutes a practical way of broadening appraisal frameworks to incorporate these additional perspectives. However, adding requirements for MCA to be conducted to supplement CBA tends to undermine, or render inconclusive, the CBA result. Appraisal structures in which the CBA constitutes merely one among several different assessments required to be undertaken will tend to severely play down the relevance of its key insights into comparative efficiency and effectiveness. The lesser degree of rigour attached to most MCA models, which leaves them prone to gaming in many situations, further underlines this concern. Thus, it may be preferable to have alternative approaches that both try to ensure that the CBA takes account of as broad a range of impacts as possible and presents other equity-based insights separately. However, this should be done in a way that helps clarify the nature of the trade-offs that exist between efficiency, effectiveness, equity and other policy objectives.

A key issue is the relationship between accessibility indicators and current appraisal practices, based on the welfare economics paradigm and in particular the use of CBA. Some accessibility advocates argue for their tools to replace the use of CBA. This view is in some cases underpinned by the suggestion that the CBA paradigm may be inherently biased, systematically favouring motorised road transport over other modes. However, there is evidence to the contrary: CBA is systematically applied in many transport contexts, and benefit-cost ratios higher than those typical of road infrastructure investment projects are often found for specific investments in cycling infrastructure, for example, or for congestion charging schemes, which necessarily discourage the use of private vehicles. At the same time, carrying out accessibility analysis using estimates based on Willingness to Pay (WTP) will necessarily produce results favouring those that can pay for better accessibility, as is the case with standard CBA. The use of indicators of accessibility will not in itself resolve the problem of addressing the distribution of the gains from potential projects.

A second view is that there is an underlying compatibility between the formal tools of accessibility and those of economic assessment, and that it can be proved that the two sets of indicators exactly correspond in their theoretical underpinning in welfare economics. In this view, using accessibility measures can allow adoption of a more complete and better specified version of the economic paradigm, provided double counting is avoided. Concern that CBA, as practised, does not take sufficient account of environmental quality and climate change can be addressed by including quantified and monetised estimates of these externalities in project appraisals, whether mobility or accessibility approaches are used. Similarly, estimates of the positive health benefits of shifts toward active transport modes are increasingly being monetised and included in project analysis. Key information on the efficiency with which such outcomes are achieved must be included in both mobility and accessibility assessment. From this point of view, choice is not accessibility versus CBA; rather, CBA based on accessibility will be more complete and better capture the benefits of transportation investments than if it is based on mobility.

In this context, it was argued that accessibility benefits and user benefits are equivalent for many practical purposes, provided that the parameters of the accessibility measure are based on the implicit preferences of the travellers themselves rather than on the preferences of politicians or other policy makers. The reason for this is the net benefit of a travel option will depend on the quality of opportunities at the destination, as well as the characteristics of the mobility options available, including travel time, travel cost, reliability and convenience. While accessibility assessment focuses on the quality of opportunities at the destination and mobility assessment focuses on travel time, time budget and income constraints, the value to the individual of the activity or service at the destination are implicit in both types of assessment. If the same approach for aggregating benefits across users is used, the overall results will be the same (Eliasson, 2019). The principal concern with the use of a user-benefits measure based on willingness to pay for time savings is that it obscures distributional effects.

CBA remains Ill-equipped to deal with distributional questions, however, whereas these are intended to be at the centre of the accessibility paradigm. Consequently, there was a clear view that CBA must at a minimum be supplemented by other relevant analysis in order to represent an accessibility perspective fully.

In sum, while there was no consensus among Roundtable participants on this key issue of the relationship between CBA and the accessibility perspective, the differences on this question did not reflect differing views of the underlying policy problem of ensuring that decision makers are well informed regarding the accessibility impacts of key investment options. Rather, they largely relate to differences in how to present results to policy makers and what constitutes the most relevant data.

Conclusions and recommendations

Adopting the accessibility perspective implies a broader scope of analysis in project appraisal, including consideration of environmental, health, safety and distributional perspectives. The accessibility paradigm provides a robust approach to identifying which communities and individuals suffer most from poor accessibility, whereas standard economic analysis does not usually address these factors. By implication it also enables a focus on the size of the benefits that can be delivered to the least well served – i.e. the equity gains to be made – through adopting policies based on these metrics.

The Roundtable identified many metrics used by accessibility practitioners, ranging from pragmatic measures of specific elements (e.g. level of service and catchment areas) to overall system-wide indexes of the total accessibility of a system. Each of these can be useful in specific circumstances. However, there is no single pre-eminent metric that summarises these results in an intuitive way, and this may have been a key impediment to the acceptance by transport planners, policy makers and stakeholders of an accessibility paradigm for project and policy assessment purposes. In the absence of such a metric, transport planners frequently struggle to understand accessibility in a way that can be translated into their practice, unless they are provided with specialised training. This necessarily implies they have a limited ability to communicate accessibility-based perspectives to policy makers and stakeholders.

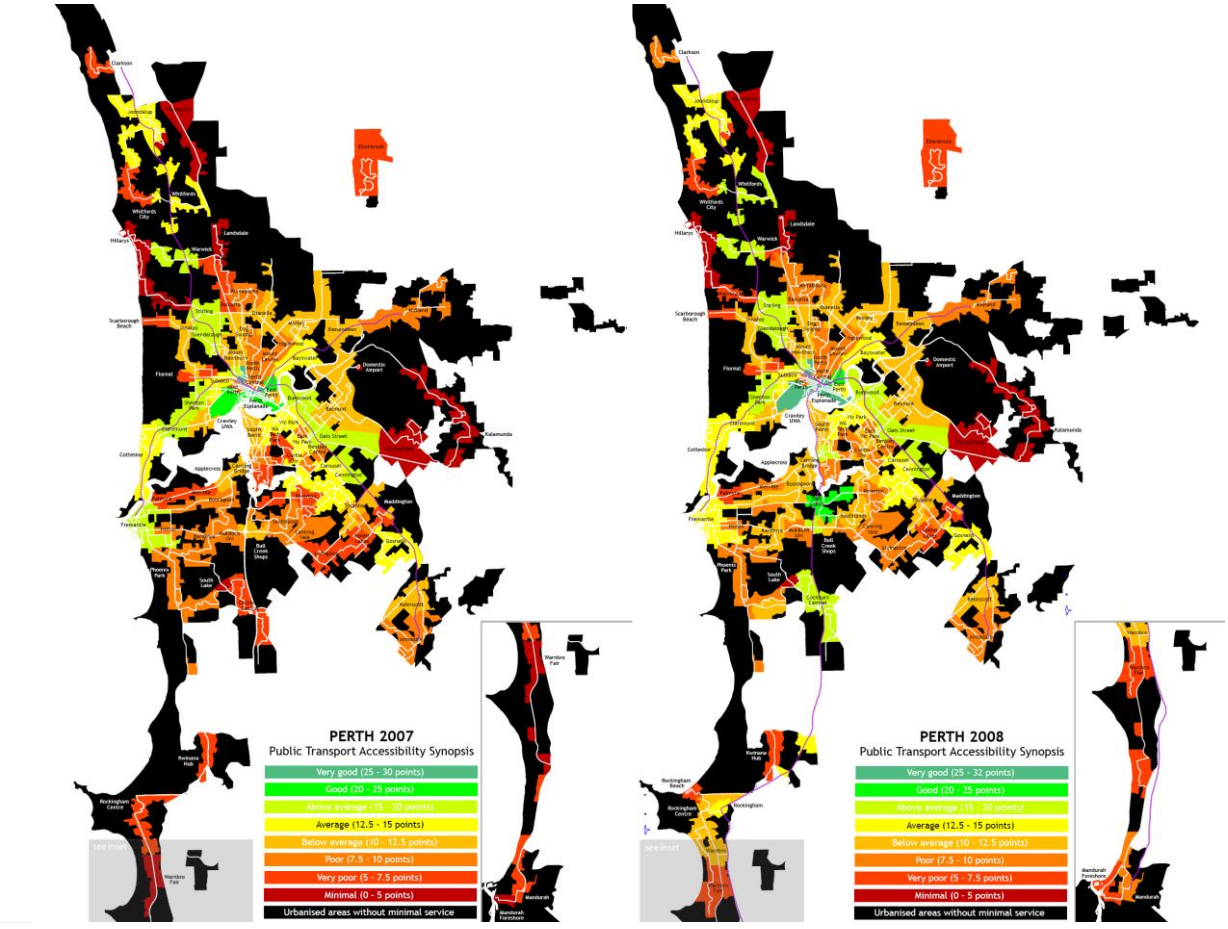
In this context, the recent advances in the development and practical implementation of digital mapping tools constitute a highly promising means of supporting better understanding of the insight provided by accessibility analyses on the part of decision makers. Figure 3 provides an example of such a mapping tool. It shows the output from the Spatial Network Analysis for Multi-Modal Transport Systems (SNAMUTS) accessibility tool. In this case a composite measure of accessibility is applied to compare the changes in public transport accessibility before (left figure) and after (right figure) the opening of a new railway line running from the Perth central business district (centre of the map) southwards to Mandurah. A traffic-light colour code is employed: green shows the population/employment catchments with the best potential accessibility, while red shows those that are the least accessible. Black is used to denote those areas where the public transport service was below the minimum standard (two buses/trains per hour in the inter-peak period) applied. The transformation of accessibility for a significant share of the most poorly serviced communities in the region around Perth is clearly visible.

Well-designed and carefully explained maps that clearly highlight locations in which people have low levels of transport access have the ability to change the mind-set of policy makers, even without recourse to measures of economic utility. This is a substantial advantage and likely to be the pathway to wider application of the accessibility paradigm.

While accessibility mapping provides one important means of communicating accessibility perspectives to decision makers, experience also shows the scope of standard social CBA can be expanded to take many or most accessibility-based perspectives into account. Given CBA will and must remain at the heart of the transport appraisal practice, this is an important consideration. Decision-makers are more familiar and comfortable with CBA than many other appraisal tools, though it is notable that such acceptance is weaker when it appears to lead to implausible policy suggestions or gives the impression that results have been manipulated to give a favoured result. CBA, for example, has not been very influential in such important policy initiatives as the pedestrianisation of city centres or the non-marginal issue of climate change. CBA guidance and practice should favour the adoption of a broad analysis which addresses relevant accessibility issues as far as is feasible. This will favour consistent and integrated analysis. Presenting accessibility

analysis in conjunction with the results of broadened CBA will therefore significantly improve the information base available to decision makers.

Figure 3. Mapping accessibility in Perth, Australia



Source: Curtis (2011).

Accessibility must also be understood broadly, including giving adequate consideration to virtual accessibility and its implications for mobility. For example, e-commerce reduces mobility by substituting for shopping trips, albeit that it generates deliveries, which partially offset this effect. Teleworking may substitute increasingly for commuting trips, particularly following its wide-scale adoption as part of the Covid-19 pandemic confinement measures. When adopted outside confinement conditions, teleworking is likely to reduce trip numbers at peak hours but also generate new trips during working hours, as more flexible working patterns emerge. Understanding such changes in trip patterns will be particularly important in a context in which mobility reduction may become a key part of the policy agenda. Increasing familiarity with the accessibility analysis needed to describe such effects should make policy makers and stakeholders more amenable to a shift towards the use of accessibility metrics for project appraisal.

Similarly, there is an increasing focus in many OECD countries on increasing economic and social inequality and the costs rising inequality imposes on the whole of society (as discussed in the OECD's Better Life Index documentation, for example). This trend can also be expected to increase the attractiveness of moving towards accessibility-based indicators, as these indicators are much more clearly focused on identifying

the distributional dimensions of the changes in transport opportunities that proposed projects would generate.

Finally, as accessibility perspectives are increasingly adopted in policy making, systematically conducting assessments of the results will be crucial to testing key hypotheses and weighing outcomes. In particular, this could include assessing the actual impact of accessibility gains on broader policy issues related to changing land use, including the impact on levels of economic development, land values and the size of agglomeration externalities. By opening the way to wider research, such retrospective analyses should also ultimately contribute to better information on the impact transport investments have on the achievement of many broader public policy objectives.

References

Curtis, C. (2011), "Integrating land use with public transport: The use of a discursive accessibility tool to inform metropolitan spatial planning in Perth", *Transport Reviews*, Vol. 31, No.2, pp. 179-197.

Eliasson, J. (2019), "Reconciling accessibility benefits with user benefits", *International Transport Forum Discussion Papers*, No. 2020/21, OECD Publishing, Paris.

Geurs, K. (2019), "Accessibility and transport appraisal: approaches and limitations", *International Transport Forum Discussion Papers*, No. 2020/22, OECD Publishing, Paris.

Kraak, M. (2003), "The space-time cube revisited from a geovisualization perspective", Proceedings of the 21st International Cartographic Conference (ICC), Durban, South Africa, ISBN: 0-958-46093-0.

Lättman, K. (2018), Perceived accessibility – Living a satisfactory life with help of the transport system, Doctoral Dissertation, Karlstad University Press, Sweden.

Lättman, K., Olsson, L. E. and M. Friman (2016), "Development and test of the perceived accessibility scale (PAC) in public transport", *Journal of Transport Geography*, Vol. 54, pp. 257-263.

Lättman, K., Olsson, L.E. and M. Friman (2020), "Restricted car-use and perceived accessibility", *Transportation Research part D: Transport and Environment*, Vol. 78, https://doi.org/10.1016/j.trd.2019.102213.

Lättman, K., Olsson, L. E. and M. Friman (2018), "A new approach to accessibility- Examining perceived accessibility in contrast to objectively measured accessibility in daily travel", *Research in Transportation Economics,* Vol. 69, pp. 501-511.

Levine, J. (2019), "The accessibility shift: conceptual obstacles and how to overcome (one of) them", *International Transport Forum Discussion Papers*, No. 2020/23, OECD Publishing, Paris.

Lopez, E. and A. Monzon (2020), "Dimensions of accessibility benefits", Discussion Paper, International Transport Forum, Paris.

Martens, K. (2017), Transport justice: designing fair transportation systems, New York/London, Routledge.

Martens, K. (2019), "A people-centred approach to accessibility", *International Transport Forum Discussion Papers*, No. 2020/24, OECD Publishing, Paris.

Miller, E.J. (2019), "Measuring Accessibility: Methods & Issues", *International Transport Forum Discussion Papers*, No. 2020/25, OECD Publishing, Paris.

Monzon, A. and E. Lopez (2019), "Dimensions of accessibility benefits", *International Transport Forum Discussion Papers*, No. 2020/26, OECD Publishing, Paris.

Meunier, D, and Quinet, E. (2020), "Accessibility: a universal tool?", presentation to the Roundtable on accessibility and transport appraisal. ITF, Paris, 22 October, 2019. (Unpublished).

van Wee, B. and K. Geurs (2011), "Discussing equity and social exclusion in accessibility evaluations", *European Journal of Transport and Infrastructure Research*, Vol. 11(4), pp. 350-367.

Wang, W., Zhong, M. and J. Hunt (2019), "Analysis of the wider economic impact of a transport infrastructure project using an integrated land use transport model", *Sustainability*, Vol. 11, p. 364, https://doi.org/10.3390/su11020364.

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Accessibility and Transport Appraisal

This report identifies the success factors for accessibility-based approaches to transport project appraisal. It explores the role of cost-benefit analysis as an appraisal tool and how it could better address distributional issues. Finally, it reviews the case for aligning accessibility metrics more closely with policy objectives and how they can be communicated via accessibility mapping. The report summarises discussions of an ITF Roundtable held in Paris, France, in October 2019.

All resources from the Roundtable on Accessibility and Transport Appraisal Roundtable are available at: https://www.itf-oecd.org/accessibility-and-transport-appraisal-roundtable

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