



Accessibility Tool Engagement Research

Waka Kotahi NZ Transport Agency



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Quality Assurance Information

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Executive Summary

The purpose of this research project is to define the required and desirable elements of an accessibility modelling tool. The research is commissioned by Waka Kotahi NZ Transport Agency (Waka Kotahi) research programme. Waka Kotahi wish to assess accessibility with an improved computational tool, that is fit for purpose to support better decision making for both the public and private sector.

Inclusive access, a priority in the draft Government Policy Statement on Land Transport 2021/22 – 2030/31, means enabling all people to participate in society through access to social and economic opportunities, such as work, education and healthcare. Many organisations, including local authorities, central government, consultants, research institutions, and those planning the location of services and activities, use various measures of accessibility to support decision making.

For the purposes of this research, *accessibility* is defined as the ability or ease with which people can reach desired opportunities (i.e. jobs, goods, services and other travel destinations) by various modes of transport through the efficient arrangement of land use.

The objectives of this research are to address the following three questions:

- 1) What users want from an accessibility tool,
- 2) How well existing tools meet these needs, and
- 3) What additional development is required to address the gap (if any) between existing tools and the identified user requirements.

This public report addresses the user requirements for an accessibility modelling tool. This has been considered through engagement with public and private sector professionals and advocacy groups. The engagement has been undertaken through an online survey and a series of interviews. Six user types have been established and the requirements of each user group analysed with respect to modes, metrics and specification. The user types are:

- Property developers,
- Central and Local Government investment,
- Central and Local Government policy,
- Consenting Authorities,
- Advocacy groups for transport disadvantaged and mobility impaired, and
- Research sector.

Collectively, the public sector roles of supporting investment and policy (and corresponding roles of the consulting sector in delivering on public sector requirements, and researchers in expanding knowledge and capability), provide a strong base for the development of a sophisticated accessibility modelling tool (or tools). The needs of other user types are generally lesser and simpler, but provide a supportive narrative for future investment in accessibility tools and can be used to guide investment by highlighting those areas which deliver most value across the spectrum of public and private sector uses for accessibility outputs. The consistent themes from engagement show there is strong interest in the availability of a tool (or tools) which:

- is publicly available and easy-to-use;
- supports a broad range of public sector investment and policy functions, private sector due diligence and resource management requirements, and assist the needs of transport disadvantaged and mobility impaired sectors of the community;
- includes for a broad range of metrics from threshold based through to more complex measures such as utility-based metrics and the ability to monetise accessibility;
- can be used at a nationwide scale but could also inform regional and neighbourhood level assessments;
- addresses all key transport modes, but most importantly walking, cycling and public transport;
- has visibility of future infrastructure and transport system performance (potentially through linkages to transport models);
- has the flexibility to integrate with external data sets where required including demographic data; and
- includes friendly and meaningful graphical displays and maps.

The user requirements are a key input into an internal report which completes the requirements of this research project. The internal report addresses the following two research questions “How well existing tools meet these needs?” and “What additional development is required to address the gap (if any) between existing tools and the identified user requirements?”.

Waka Kotahi have expressed an interest in being the lead agency to provide a tool for accessibility analysis for all of government application and to be widely accessible for use by local government and industry. This report and the accompanying internal report are intended to be used to inform future investment in the development of accessibility modelling tools.

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1. Introduction

1.1 Purpose of Research

The purpose of this research project is to define the required and desirable elements of an accessibility modelling tool. The research is commissioned by Waka Kotahi NZ Transport Agency (Waka Kotahi) research programme. Waka Kotahi wish to assess accessibility with an improved computational tool, that is fit for purpose to support better decision making for both the public and private sector. This engagement-based research was undertaken by Abley Ltd (Abley), is focused on engagement with industry and is not a desktop study.

1.2 Definitions

Inclusive access, a priority in the draft Government Policy Statement on Land Transport 2021/22 – 2030/31, means enabling all people to participate in society through access to social and economic opportunities, such as work, education and healthcare. Many organisations, including local authorities, central government, consultants, research institutions, and those planning the location of services and activities, use various measures of accessibility to support decision making.

For the purposes of this research, *accessibility* is defined as the ability or ease with which people can reach desired opportunities (i.e. jobs, goods, services and other travel destinations) by various modes of transport through the efficient arrangement of land use.

1.3 Objectives

The objectives of this research are to address the following three questions:

- 1) What users want from an accessibility tool,
- 2) How well existing tools meet these needs, and
- 3) What additional development is required to address the gap (if any) between existing tools and the identified user requirements.

1.4 Summary of Report Contents

This report addresses the first research objective outlined in Section 1.3. The report is structured as follows:

- Chapter 2 outlines the engagement methodology
- Chapter 3 summarises engagement with accessibility tool users
- Chapter 4 discusses the engagement results
- Chapter 5 summarises the user types
- Chapter 6 presents conclusions and next steps

In addition to this report, the research team have developed a report for internal use within Waka Kotahi. The internal report addresses the second and third objectives of this study, summarising engagement with accessibility tool suppliers, discusses the state of the industry and provides recommendations for Waka Kotahi. Some of this information is commercially sensitive, therefore it is not published in this public report.

2. Engagement Methodology

2.1 Participants

This research project was informed by engagement with *users* and *suppliers* of accessibility tools, with the purpose of understand existing models and tools, and identifying user requirements for an accessibility modelling tool.

User participants were defined as people who (would) use an accessibility tool, specify accessibility tools to be used, and/or use the outputs of accessibility tools. These participants include consultant practitioners, property developers, public sector organisations including Central and Local Government, and research institutions.

Supplier participants were defined as people who supply an accessibility tool and/or use transport models to assess accessibility. These participants included suppliers of 'off-the-shelf' tools, transport models and bespoke GIS-based accessibility tools.

A range of users and suppliers were identified to participate in the engagement stage of this research, noting that some participants were both suppliers and users, particularly in consultancy firms.

2.2 Method of Engagement

A combination of online surveys (using SurveyMonkey) and interviews were used to engage with participants. An online survey was circulated directly to identified contacts and to a wider audience via the Engineering New Zealand Modelling User Group (MUGS).

The online survey included an introduction to explain the intent of the research project and gave participants the opportunity to respond to and/or think about their responses prior to an interview. Logic was integrated into the survey to ensure that participants were only asked questions relevant to their role in accessibility, that is as a supplier and/or as a user.

The Abley team then interviewed selected private sector participants, including property developers and accessibility tool suppliers. Tim Hughes (Project Manager, Waka Kotahi) conducted interviews with public sector participants.

2.3 Engagement Resources

The overarching research questions from section 1,3 were share with participants.

The engagement was designed to focus on existing practice and knowledge, and also on information requirements and limitations. For users, that meant determining what problems an accessibility tool could help them solve. For suppliers, the focus was on tool capabilities and data and technical constraints. Appendix A provides further detail on the engagement methodology, including a list of the questions included in the online survey.

The interviews with suppliers involved follow up questions based on survey responses.

Engagement with property developers was based on an open conversation, pre-empted by sharing a definition of and examples of accessibility. The conversations included the following avenues of inquiry:

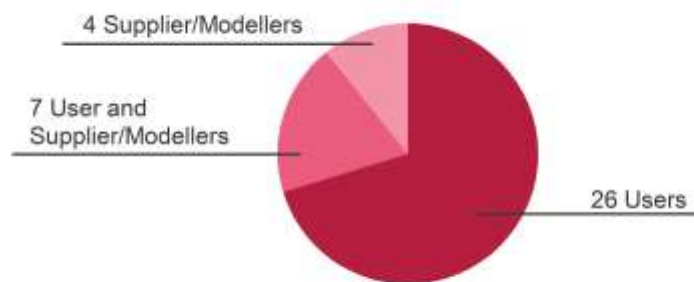
- Current practice for site selection and accessibility appraisal
- What accessibility factors are important for property development
- What limitations/challenges could a Waka Kotahi accessibility tool help to address
- Preferences for accessing a tool, e.g. free access or subscription-based pricing.

3. User Engagement Summary

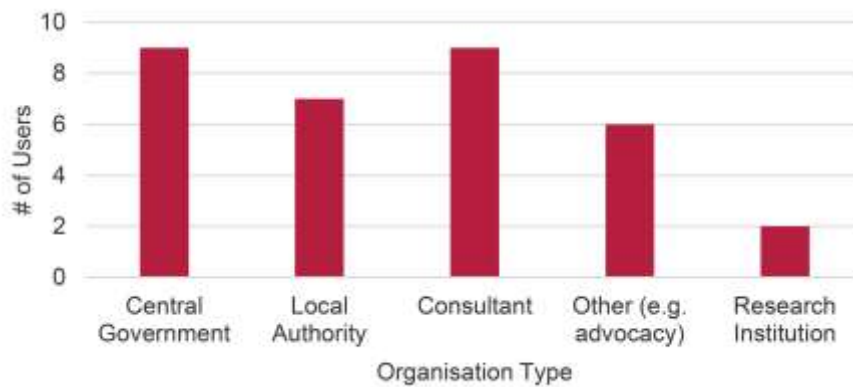
This section summarises the results from each of the online survey questions and is structured by repeating the survey questions in the order in which they were presented to respondents.

3.1 Number of Survey Participants by User/Supplier Type

This research report presents the results from the ‘User’ and user questions responses from ‘User and Supplier/Modeller’ participants. A separate internal only report includes the supplier questions responses. A total of 33 responses were received to the user questions and are summarised in this section of the report.



3.2 Number of Participants by Organisation Type



Responses were relatively evenly spread among public and private sector practitioners including both central and local government representation and the participation of research and advocacy groups.

3.3 What work do you or your organisation do that is relevant to accessibility?

Overall, the results from this question can be effectively summarised by the organisation type.

Central government participants primarily use accessibility to inform broad policy decisions or to monitor and assess the impacts of investment. There is also an underlying effort to improve access to education, employment, amenities, and services.

Local government participants indicate that accessibility plays, or should play, a part in many of their workstreams. The participants listed the following relevant applications:

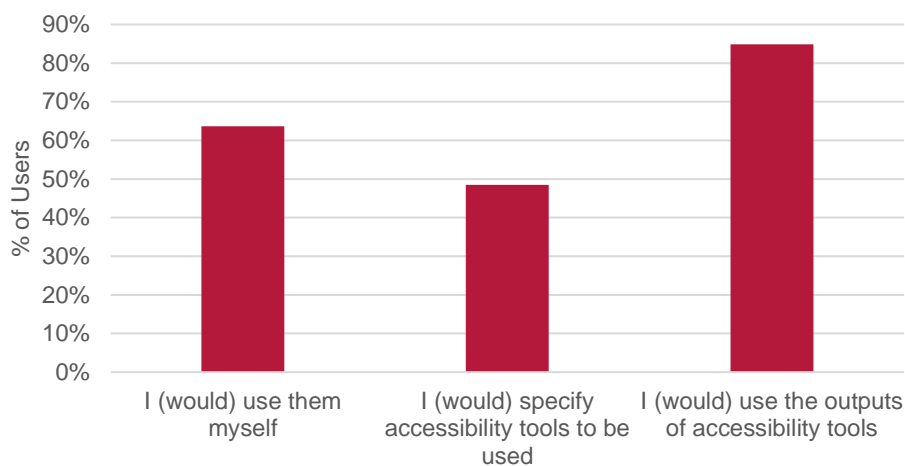
- 1) Transport planning
- 2) Business cases, including those for cycling and public transport
- 3) Urban design
- 4) Infrastructure strategy
- 5) Climate change strategy
- 6) Reviewing integrated transportation assessments

The consultant participants primarily use accessibility to inform the advice they provide, most frequently to support central and local government functions. The consultants have wide-ranging applications include demand estimation for walking and cycling facilities, review of walking and cycling networks, transportation modelling, and the design and provision of private and public infrastructure.

The advocacy groups interviewed are working to improve accessibility for pedestrians, cyclists, and people with disabilities. Research organisations that use accessibility tools are generally assessing inequalities in access, and other housing and urban issues.

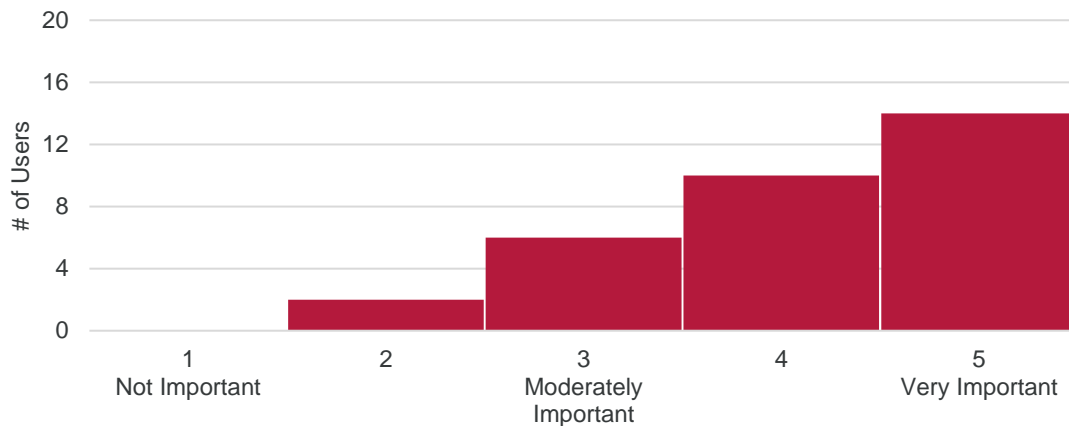
Across the whole range of user types, many participants use accessibility to test the impacts of different interventions to inform planning and investment decisions.

3.4 In what ways do/would you use accessibility tools?



The majority of respondents (85%) use the outputs of tools, however a large number of respondents also use them and/or specify the use of accessibility tools. 85% of users indicated they did/would. Note that users had the option to select more than one answer for this question.

3.5 How important is accessibility for the work you do?



Many users (24 or 75%) indicated that accessibility is more than moderately important (scoring 4 or 5) for the work that they do.

3.6 What problems would measurement of accessibility assist you to understand and solve?

The participants indicated the following problems which could benefit from the measurement of accessibility:

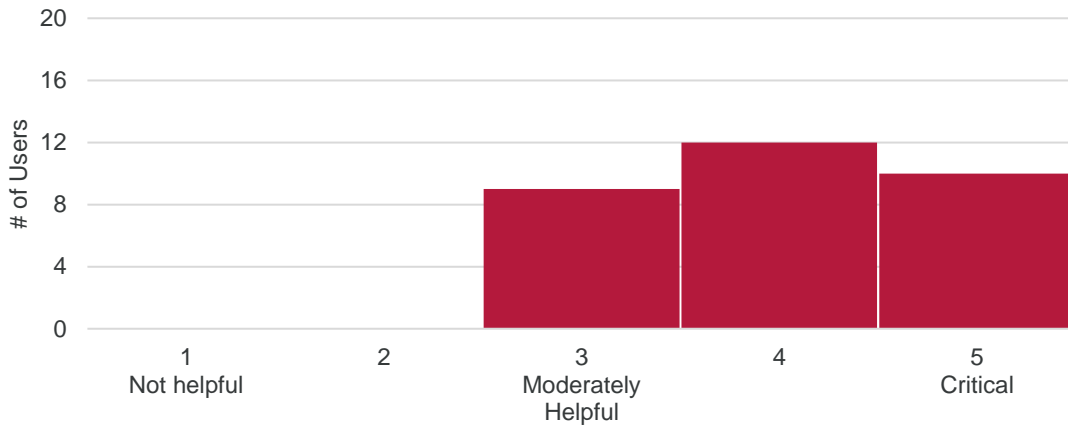
- 1) Investment prioritisation
- 2) Identifying barriers to people using amenities and public space
- 3) Limited data availability for transport needs of people with disabilities
- 4) Assessing latent demand for all modes
- 5) Transport deprivation, including assessing the relationship between access and health outcomes
- 6) Assessment of the best or most equitable locations to build property or public infrastructure
- 7) Assisting in workplace travel planning

The following word cloud diagram visualises the key words used to answer this question. The larger words indicate higher frequency of use by survey participants.



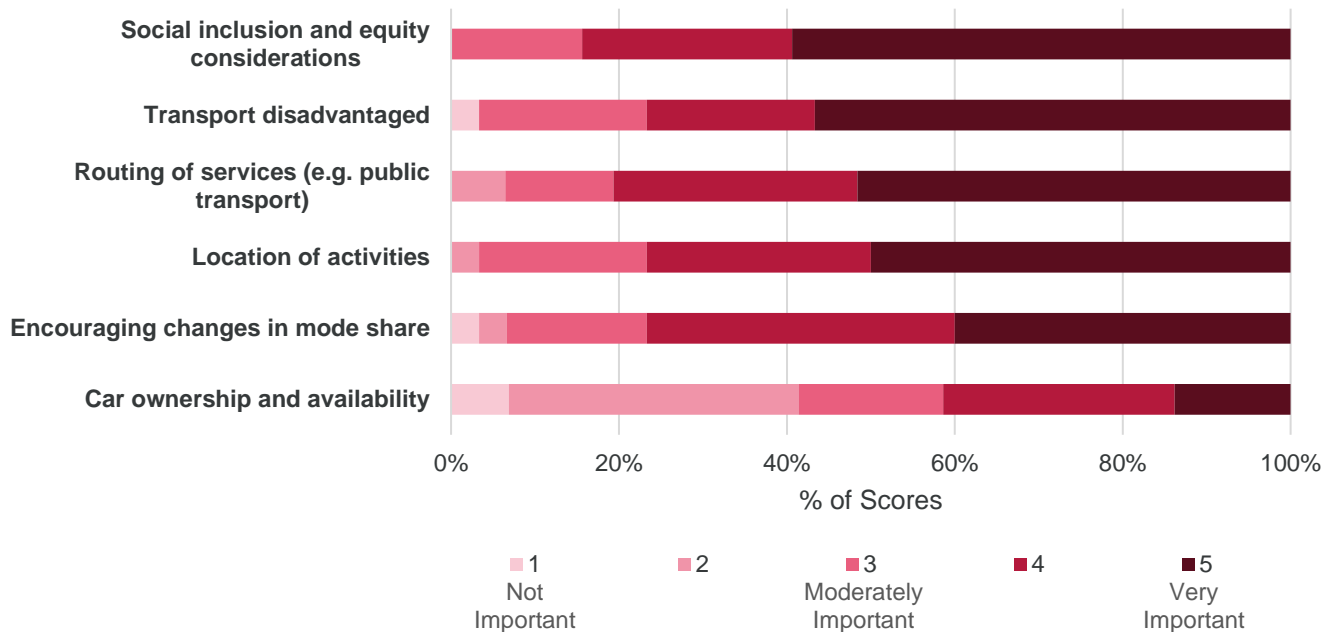
The most common word is “access”. Other key words include “investment”, “transport”, “impacts”, “better” and “people”.

3.7 How helpful would measurement of accessibility be to understand and solve these issues?



All of the survey participants state that measurement of accessibility is at least moderately helpful to solve the previously mentioned issues, with one third of respondents categorising accessibility as critical.

3.8 How important are the following topics to understand accessibility?

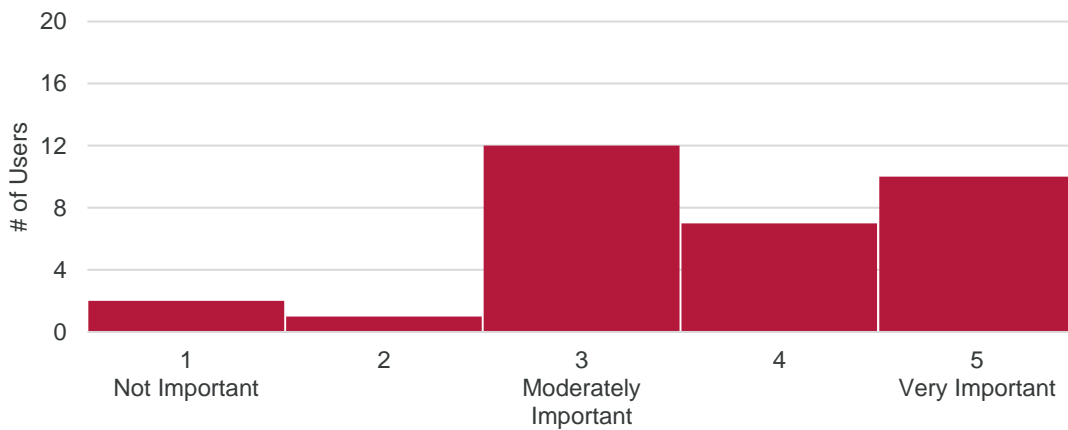


The results show relatively high importance scores for all options with 40-60% of respondents stating each topic was very important, except car ownership and availability. Many (41%) users score car ownership as *less than moderately important* (scoring 1 or 2). While this is the lowest scoring option, it is important to note that this answer is still evenly distributed with 41% of users also scoring it as *more than moderately important* (scoring 4 or 5).

The survey participants were also asked to specify any other topics they believed it important to understand. The participants listed the following concepts:

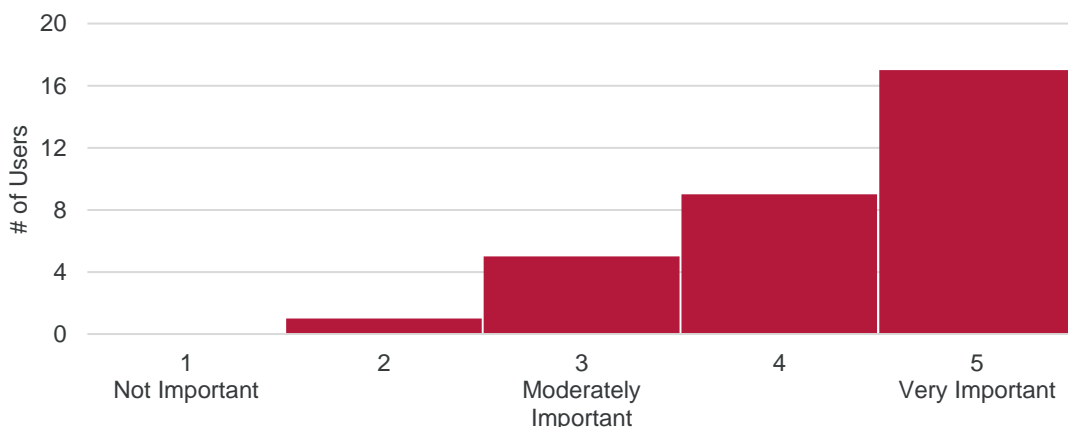
- urban development,
- bicycle ownership and availability,
- availability of micro-mobility and rideshare,
- topography,
- travel behaviour,
- health,
- door to door journey time,
- quality of built environment, and
- physical constraints and provisions such as no right turns or pedestrian crossing facilities.

3.9 How important is understanding how accessibility changes by time of day?



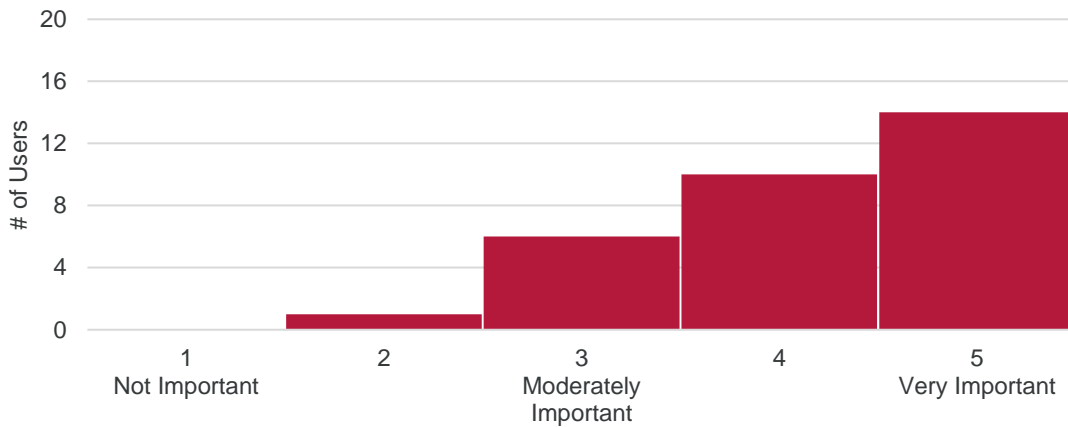
The majority (91%) of participants indicated that time of day changes are at least moderately important (scoring 3 to 5).

3.10 How important is understanding how accessibility changes between now and into the future?



Nearly all (97%) of participants rated understanding future accessibility changes as at least moderately important (scoring 3 to 5) and approximately half (53%) indicated that future accessibility changes are very important (scoring 5).

3.11 How important is it to consider accessibility and its relationship with demographic data and other data that may influence modal choice?



Nearly all (97%) participants rated the consideration of accessibility in relation to demographics as important (scoring 3 to 5), and 45% indicated that it is very important (scoring 5).

3.12 What accessibility outputs and indicators are helpful to you?

This question did not present respondents with a list of options so was essentially unprompted with respect to the types of indicators that may be helpful. A variety of specific output and indicator types were mentioned, and the general output types are summarised in the following list:

- 1) Travel time
- 2) Access to social and economic opportunities
- 3) The percent of certain types of facilities within a time threshold by different modes
- 4) Indicators in the form of isochrones, or areas that show similar levels of access to a singular point.

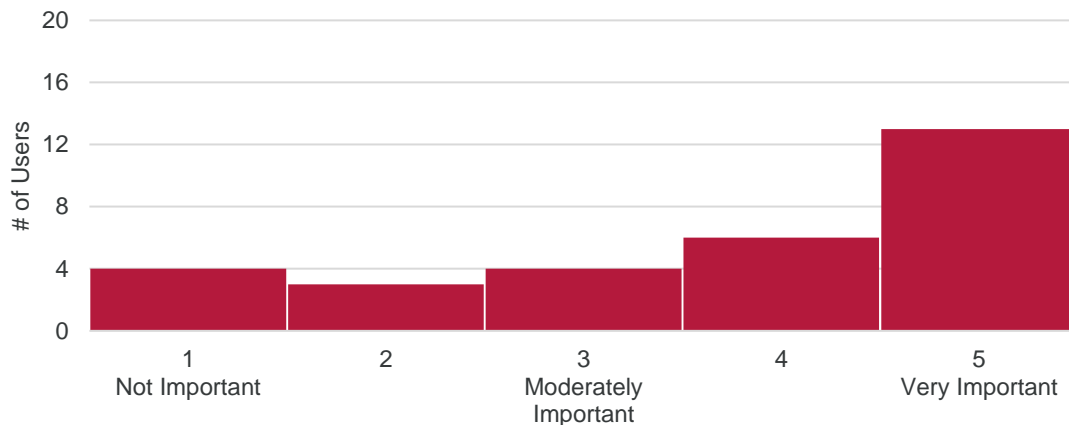
Many of the desired outputs/indicators are related, but they do represent unique ways to display and measure accessibility. One common theme across the participants was the desire for spatial results in the form of maps. A few users highlighted the benefit of easy-to-read maps with colour-coded accessibility scores.

Other users noted that safety and/or comfort indicators could benefit active mode planning. Some mentioned that it is important to be able to compare before/after scenarios. Additionally, it is important to be able to quickly run scenarios for various infrastructure or parameter changes. Some users noted outputs that would support the investigation into the relative representation of the disabled population that uses the transport system. It was mentioned that, in addition to the scores, it is important to be able to investigate or perform deep dives into why a certain area may exhibit good or poor accessibility outcomes.

A common theme was that accessibility outputs can be easily understood by both decision makers and the public. For example, the number of jobs accessible by a population might be more easily understood than an index.

The following word cloud diagram visualises the key words used in answering this question. The larger words indicate higher frequency of use by survey participants.

3.14 How important is it that an accessibility tool can interface with transportation models?



The majority (76%) of respondents consider interfacing with transport models to be at least moderately important and 43% rated this to be very important.

3.15 Are there any other tools or datasets that accessibility tools should interface with?

The participants listed the following tools and software:

- 1) Paramics microsimulation software
- 2) Emme strategic models
- 3) GIS software
- 4) Mega Maps (Safer Journeys Risk Assessment Tool)
- 5) Austroads Pedestrian Crossing Facility Selection Tool
- 6) Statistics NZ Integrated Data Infrastructure

The participants listed the following datasets:

- 1) Land use data
- 2) Total mobility data
- 3) Deprivation index
- 4) Local council transportation data
- 5) Population data
- 6) Safety statistics
- 7) Health data
- 8) RAMM data

3.16 Have you used accessibility indicators in your work? If so, what accessibility packages are you familiar with?

Only a few of the users provided insight into the accessibility tools or indicators that they have used in the past. Those that were specifically listed include: Accession (now TRACC), bespoke GIS models and the application of strategic

transportation modelling software, specifically Cube and EMME. The bespoke GIS models were described as fit for a specific purpose, but they could lack transferability. One user noted a key issue with most indicators was that they exaggerate the difference between the score of a job that is 44 minutes away and 46 minutes away for example. Further, a weakness of existing models is they tend to focus on just travel time, not the full cost of travel including parking or PT fares.

3.17 Property Development Sector Engagement

Five interviews were undertaken with property developers, four focusing exclusively on residential development and one on retail development. There was considerably less interest from the commercial sector perhaps demonstrating a lack of interest in or awareness of the value of accessibility.

Engagement with residential developers highlighted that accessibility is a fundamental important consideration for the property development sector. Understanding the surrounding transportation context informs site selection, shapes developments and is used to produce marketing material. Developers emphasised that they focus on specific accessibility considerations depending on the type of development and the target demographic group. For example, school proximity is unlikely to be important for a single-bedroom apartment development. Similarly, traffic congestion is critical for some developments but not for others, and it is sometimes a consideration for construction management planning.

The retail developer interviewed focuses almost exclusively on vehicle accessibility when considering site selection due to the nature of the bulky, heavy and frozen products being sold which are not readily transported by customers walking, cycling or (in many cases) using public transport. They also acknowledged that accessibility for all modes was important from a resource management approvals perspective.

There was general agreement that information about existing accessibility is relatively easy to source through a combination of desktop studies, primarily using Google Maps, and site visits to identify nearby services and attractions. In addition to identifying existing infrastructure such as bus stops, cycle ways, arterials, and proximity to attractions such as schools and shops, developers are also interested in future infrastructure projects, congestion levels and walking and cycling routes. However, it was highlighted that information relating to future projects is generally not readily available.

While accessibility is a key consideration for the property development sector, there are several reasons why only limited assessments are currently carried out at site selection stage. These include:

- the scale of development in New Zealand means that most developers are not selecting hundreds of sites per year and therefore have not invested in a more detailed process,
- accessibility is just one of many considerations such as land quality and titles, and
- the need to make decisions quickly in some cases.

Interviews with developers highlighted several common challenges that they face with their current accessibility assessment methods, including:

- different priorities for different developments, and the complexity of these priorities - e.g. a bus stop close to a site may be a positive, but directly outside the site may be a negative,
- limited visibility about future developments and infrastructure/network changes,
- potential customers need to be able to trust developers' messaging,
- it is difficult to source information about future traffic projections (noting that site selection generally occurs years before developments open), specific times of day, e.g. morning and evening peak, and variability at different times of the year,
- understanding travel times across a network and to/from a particular location, via a range of modes,
- importance of understanding network gaps and quality of provision, especially for cycling routes,
- urgency of decisions and information is not currently available in one place,
- communicating and marketing accessibility,
- reliability of information,
- ability to test cause and effect, and
- time required to complete Integrated Transport Assessments (ITAs) – developers generally outsource this to consultants.

Developers were asked whether they would be interested in a free online tool that is accessible to everyone, or a more customised tool that you pay to use and get a competitive advantage. While it was difficult to assess this without a pricing structure, participants indicated that a freely accessible tool would be best and were not concerned that this would provide a 'level playing field' of information available to the sector. They highlighted that the value of a tool is dependent on what information it provides. The key benefit would be information about future changes such as new developments, infrastructure upgrades and travel projections.

There was little or no acknowledgement from the residential development sector of the important role or accessibility in the resource management approvals process. This would generally be addressed by consultants and is recommended under some ITA guidance and often required especially at Plan Change stage.

The interviews demonstrate that accessibility is an important consideration for the property development sector, particularly for housing development. However, their assessment of accessibility is relatively constrained and is generally based on a qualitative assessment of a site's existing context through site visits and use of existing resources such as Google Maps. There are several opportunities for a Waka Kotahi tool to assist the sector. A key opportunity is to show anticipated changes to land use and the transport network in one place, and the ability to understand how these would impact accessibility.

3.18 Public Sector Engagement

The online survey participants included several public sector staff, and their responses against each question are aggregated into the preceding sections. Tim Hughes (Project Manager, Waka Kotahi) facilitated further engagement through individual interviews with public sector professionals. This included liaison with practitioners from the Ministry of Education (MoE), Auckland Transport (AT), Waka Kotahi and the Ministry of Housing and Urban Development (MHUD). This section summarises their current practice for assessing accessibility and identifies desired elements for an accessibility tool.

Central government respondents generally indicated that they have little expertise and understanding of accessibility measurement. Waka Kotahi and Auckland Transport are more actively involved in measuring accessibility, however they identified several challenges and limitations.

Ministry of Education

Several of the Ministry of Education's (MoE) workstreams involve accessibility, including school site acquisitions, designations, closures and travel planning. Key considerations for existing schools include school frontage, local access issues, pick up and drop off parking and 5-minute walking contours (from parking spots). New school location planning primarily involves selecting and purchasing sites in newly developing areas several years in advance in anticipation of development. This involves working with councils and developers to select appropriate sites, and MoE noted that road hierarchy is an increasingly important consideration with respect to receiving approvals from planning authorities. Accessibility is not a key consideration for school closures in urban areas but is more important for rural areas. School travel planning aims to improve active travel access and considers safe routes and options such as walking school buses. MoE highlighted a need to consider the nature of roads that people need to cross and what crossing facilities are available. Existing data sources relating to schools include the Ministry's list of schools, which includes location and roll information. It is understood that school travel surveys are a potential source of useful data but are generally undertaken by individual schools with the information not collated by MoE.

Auckland Transport

Accessibility metrics feature in Auckland Transport's (AT) public transport (PT) performance and management framework. The PT team uses accessibility indicators to establish and communicate the effects of proposed schedule and route changes. To date, their main method involves using 'Remix', a transportation planning software platform, to determine and show individual submitters how their location is affected using a surrogate isochrone tool. The tool allows users to visualise how many more opportunities can be reached from a chosen point and time, including both the existing scenario and with a planned PT change. AT has recently trialled using Conveyal Analysis, a software product that enables multimodal accessibility analysis. This provided a wider analysis of changes and different destination types compared to the individual-level Remix analysis. AT's key use to date is communicating with the public and as such they have been focused on accessibility indicators such as time to the nearest or number of opportunities, e.g. the number of jobs within 400m of stops.

Most of AT's modelling is focussed on public transport and private vehicle travel, however the Auckland Forecasting Centre has a coarse regional walking and cycling model. AT uses several tools that relate to cycling accessibility, including a Cycling Level of Quality tool for scoring the quality of cycling infrastructure proposals, a network of cycling counters and a cycling model. The cycling model was updated for the Central Isthmus area and used to identify high, medium and low priority corridors for the connected communities programme. AT does not have a walking model.

Ministry of Housing and Urban Development

The Ministry of Housing and Urban Development's (MHUD) purpose is *thriving communities where everyone has a place to call home* – he kāinga ora, he hapori ora. Accessibility is an important aspect of their key outcomes of *vibrant flourishing communities* and *space for businesses to grow*. Considerations include access to workers, suitability of sites, emergency housing, social/affordable housing, working with Iwi and access to amenities. Accessibility is also involved in MHUD's outcomes work for the Urban Growth agenda, National Policy Statement on Urban Development and Government Policy Statement on Housing and Urban Development. Policy 1 in the National Policy Statement on Urban Development¹ includes *planning decisions contribute to well-functioning urban environments, which are urban environments that, as a minimum have good accessibility for all people between housing, jobs, community services, natural spaces, and open spaces, including by way of public or active transport*. Policies 3 and 5 also specify that regional policy statements and district plans for urban environments should enable building heights and density of urban form commensurate to, amongst other factors, *the level of accessibility by existing or planned active or public transport to a range of commercial and community services*.

MHUD currently collects data and statistics for annual reporting of performance indicators, including accessibility, for understanding needs and for local planning for housing development. For annual reporting they use the accessibility indicators in the draft Government Policy Statement on Land Transport, such as the number of jobs that can be reached within a time travel threshold, and access to destinations such as schools, healthcare and supermarkets by each mode.

Waka Kotahi

Waka Kotahi provided an extensive list of accessibility modelling tool requirements, aggregated across the functions of their organisation. Waka Kotahi wish for an accessibility tool to:

- be able to identify the issues and be used to help develop strategies, assess investment programmes and test options within specific projects. This would include incorporation into multicriteria analysis (MCA) and economic evaluation for business cases,
- produce a set of standard indicators but also be flexible to analyse the individual components of accessibility.
- be used to better understand the existing and future state of the transport system including communities that are transport disadvantaged and where poor access to opportunities affects social and economic wellbeing.
- include the ability to test options and understand the likely effect of any interventions such as changes to information systems, transport infrastructure or services, land use changes, user preferences (behaviour change), technology (micro-mobility and MAAS) or other such changes.
- be used to assess land use proposals, especially location of key social services such as schools, health facilities etc. If successful in a wider regulatory context it might be the tool could form part of the assessment criteria when undertaking Integrated Transport Assessments.
- enable behaviour-based analysis of latent demand, mode shift potential, behaviour change, and emerging new modes.
- be able to work at a 'people in house' perspective, and also from a destination perspective of customer and workforce catchment. Future enhancements may include the prospect of business to business / freight capability.
- enable catchment analysis for public transport and other transport services
- takes into account quality-of-experience for each mode and suitability for different demographics, including risk averse for cycling, disability.
- interfaces with demographic, social exclusion and transport disadvantage data for calculating indexes that have strong link to accessibility, such as a transport poverty index.

¹ <https://www.mfe.govt.nz/sites/default/files/media/Towns%20and%20cities/AA%20Gazetted%20-%20NPSUD%2017.07.2020%20pdf.pdf>

- be managed by Waka Kotahi as the lead agency providing a tool for accessibility analysis for all of government application, and be widely accessible for use by local government and industry

Waka Kotahi anticipates that the accessibility tool should be able to meet the above anticipated outcomes, and the scope of works also provides an initial specification that the tool should be flexible enough to achieve the following inputs and outputs:

- Measures: Accessibility can be considered in relation to origins and destinations e.g. how easy can opportunities be reached for people at this location, and how easy is it for how many people to access this location. Potentially also business-to-business access for freight and other business interactions. The exact measures are unknown but are likely to include time to nearest opportunity, number of opportunities, a utility index combining both of these, and economic value of access. This should be supplemented by guidance on the appropriate uses, benefits and limitations of each indicator
 - Modes: For people, the main modes are car, public transport, walking (which required fine grained networks) and cycling. The tool could also preferably be able to consider other transport service such as taxis, MAAS, micro-mobility, deliveries, mobile services or non -transport solutions. Consideration could also be given to business accessibility and especially freight.
 - Scale: The tool should be able to be used at national and regional strategic planning level but also at a detailed neighbourhood planning level for example the trip to school and local services, and the effect of subdivisions and other development applications.
 - Connectivity: Consideration of connection to other tools such as traditional transportation models. Potential as part of fuller forecasting models of both access and movement – especially mode share.
- Outputs: Include outputs available in user friendly and meaningful graphical displays and maps.

4. Discussion of user requirements

Users that would benefit from an accessibility tool

The engagement showed that while many practitioners appreciate the importance of accessibility, they are limited in their ability to assess accessibility and would benefit from a standardised, widely available tool. All research participants, from consultants to public sector practitioners, indicated that accessibility measurement would assist them to understand and solve problems in their profession. The property development participants also indicated that an accessibility tool would improve their site appraisal processes and are frequently required for resource management processes. The public sector engagement highlighted that central government has a focus on accessibility and a tool would address their currently limited ability to measure accessibility.

Importance of accessibility

The research highlighted that accessibility is widely considered important. Nearly all (91%) of survey respondents said accessibility is at least moderately important, and 30% rated accessibility as very important. Property developers also highlighted that accessibility is a fundamental part of site selection and informs the design of developments. Accessibility features in policies and metrics across central and local government, making it highly important for the public sector.

Policy needs and issues

Based on the survey results and interviews, it is important that a Waka Kotahi accessibility tool can inform the following topics:

- Investment prioritisation
- Social inclusion and equity
- Transport disadvantage and deprivation
- Provision of public transport services
- Location of activities and social services, such as health and education
- Encouraging changes in mode share
- Site selection and appraisal
- Identification of barriers
- Access for people with disabilities
- Treaty obligations

Car ownership and availability was considered of relatively low importance compared to other topics, however 59% still rated it at least moderately important. Participants also identified several other policy needs and issues that the tool should inform, as listed in Section 3.8.

Destination activities

The interviews highlighted that different destination activities have heightened importance for different applications, however services, jobs and specific land uses, such as health, financial and education, were most commonly identified as important. There was support for the tool to allow users to select different destination types that are relevant to their assessment.

Demographics

No specific demographics were identified as more important than others by the survey participants. However, there was overwhelming feedback that it is important that the tool considers the relationship between accessibility and demographic data, as shown in Section 3.11. Property developers also emphasised the importance of understanding how accessibility priorities vary depending on demographics and the target demographic for a given development.

As identified in the list of policy needs and issues above, there is a need to consider social inclusion and equity, transport poverty and treaty obligations. These issues were particularly important for public sector participants and would require

the integration of demographic information. Waka Kotahi also identified a need to account for suitability for different demographics, including risk averse for cycling and disability.

Modes

Walking, cycling and public transport are all highly and equally important modes for consideration in the accessibility tool. The survey results in Section 3.13 showed that private vehicles, micro-mobility and freight are still somewhat important, but of lesser priority compared to active and public transport. There were several mentions of ridesharing and micro-mobility, such as scooters. The public sector interviews echoed these priorities, with an emphasis on walking, public transport and cycling. Waka Kotahi also indicated a desire to be able to report all existing and emerging modes and mode shift, including for example, taxis, Uber and school bus services. Freight was identified as a potential capability that could be incorporated in future.

The property developer engagement highlighted how modal priorities vary significantly depending on the type of development with private vehicle access being of most importance to retail developers where bulky, heavy or frozen goods are available.

Waka Kotahi also highlighted a desire to consider quality of experience for each mode.

Temporal variation

There was a consensus that forecasting accessibility based on changes in future infrastructure and transport system performance (including the effects of congestion) is important. There was also agreement that it is important to understand how accessibility changes by time of day.

Property developers highlighted that they are currently limited in their ability to understand how accessibility changes throughout the day, and more so to identify any future network or land use changes that may impact accessibility in the future.

While understanding temporal variation was considered important, only some survey respondents indicated that the accessibility tool needs to be able to interface with transportation models. Such an interface could incorporate both temporal variation and forecasting capability into the tool, however it may be that some respondents did not understand these potential benefits and the role of transportation models in this regard.

Metrics for utility, economic value of accessibility and mode choice

The online survey responses did not identify that metrics relating to utility and economic value of accessibility are important however a potential weakness of the survey was that the respondents were not prompted in this regard or may not understand the value of more complex metrics. Preferred indicators generally were limited to time based threshold measures of accessibility and visual representations of reach such as maps with isochrones. While metrics relating to mode choice were not identified, encouraging changes in mode share was highlighted as an important topic for the tool to address.

Potential indicators were discussed in the context of how they could address public sector accessibility needs. There was support for a variety of standard indicators available for different purposes. Several options were raised, including the time to nearest destination, number of opportunities, a utility index combining both time and the number of opportunities, economic value of access and a measure of trips not made. It was noted that supporting guidance on the uses, benefits and limitations of indicators should be provided. Indicators need to be valid for assessing changes and should therefore look backwards as well as forwards and not be limited to threshold indicators.

Identification of existing access difficulties and comparison of options

A decision support tool would satisfy user needs. Many participants mentioned a desire to be able to compare options. The public sector engagement supported the ability to undertake 'before and after' and 'what-if' analyses.

Identification of existing access difficulties was also considered important by many participants, in particular advocacy groups.

Outputs for visualising issues and economic value

There was strong support for a visualisation tool that could be interpreted by practitioners and decision makers from a range of disciplines. However, the ability to calculate economic value or proxy for economic value was not raised in the online survey responses or property developer interviews.

Much of the public sector's accessibility assessment needs relate to communication with the public. As such, it is important that indicators are widely understandable. It was noted that the public can be suspicious of converting time to dollars. However, the sector is interested in having more technically accurate indicators for different uses and audiences, provided that a simplified indicator is also provided. Potential uses include multi-criteria and business case analysis to support investment. Regardless of the indicator type, outputs need to be user friendly and meaningful, for example graphical and map-based displays. Visualisation should be able to be applied to various scales, including individual locations, neighbourhoods, zones, TLAs, regions and nationally. It is also important that the outputs allow visualisation of before and after scenarios for the public and key decisionmakers.

Scale of Analysis

While much of the private sector's analysis would be on a smaller scale, the public sector engagement showed a need for accessibility analysis on a range of scales. A tool needs to be fine grained enough to provide for walking networks and undertake public transport catchment analysis. It also needs to be able to be aggregated and produce accessibility metrics for any size zone up to at least regional for performance reporting.

Hosting and Availability

Both the private and public sector supported the idea of a Waka Kotahi accessibility tool for New Zealand. The public sector supported that Waka Kotahi would be the lead agency providing a tool for accessibility analysis for all of government application. It would assist them in their work and they appreciate Waka Kotahi being the lead agency. Private developers expressed a reluctance to pay for an accessibility tool and a preference for a publicly available tool. Waka Kotahi expressed an intention to make the tool widely available for the industry.

5. Summary of User Types

The user respondents can be categorised into six general 'user types' on the basis their uses, needs and requirements for an accessibility tool. It is noted that the consultant sector has an important role as users of accessibility modelling tools, however their needs would generally align with those of their client and will differ from project to project. As such, consultant's requirements are noted under the corresponding client user type. This section is intended as a high-level overview of the requirements of each user type, focusing primarily on the modes and metrics which are of interest to each sector.

Property developers

The residential developer market has a particular interest in accessibility for walking, cycling and public transport, as this is important to their clients and is considered in both the site selection process and marketing the development, as an accessible site is more attractive. Accessibility assessments may also (in the context of development applications) be required where these are included in Integrated Transport Assessment (ITA) guidelines. Incorporating an accessibility assessment into ITAs is more of a focus at Plan Change stage rather than resource consent stage, as there is a greater focus on alignment with the relevant policy framework which frequently cites accessibility as a priority area. It is noted that the private consultant sector would generally undertake these assessments in preparing ITAs.

Simpler measures of accessibility such as travel time by mode to key destinations (such as shopping, employment, education) and accompanying visual tools such as travel time isochrones are generally sufficient to meet the requirements of residential property developers.

Although there was limited feedback from the commercial development market, there is expected to be a greater focus on vehicle driver travel above public transport, walking and cycling, due to the requirement (in many cases) to use personal vehicles to transport bulky, heavy and/or refrigerated goods. However, there remains a requirement through resource management processes to assess accessibility by mode when Integrated Transport Assessments are prepared. As above, the private consultant sector would generally undertake these assessments in preparing ITAs.

Central and Local Government investment

Accessibility has an important role in investment at both central and local government level. In business case development to support investment, particularly those with a multi-modal focus, accessibility may be the focus of problem and benefit statements and/or investment objective measures. Where accessibility is linked to investment objectives there is value in having transparent and consistent measures, and whilst simpler metrics such as time-based outputs may be valuable there is scope to include more complexity through accessibility scoring or utility-based metrics.

Accessibility is not monetised under Waka Kotahi's current investment framework, including the Economic Evaluation Manual (EEM), although it is noted that this manual is intended to be replaced by the Monetised Benefits and Costs Manual (MBCM) and supplemented with a Non-Monetised Benefits Manual towards the end of 2020. A lack of applied research ascribing value to accessibility appears to be the main limitation with respect to monetising accessibility, however it remains an important consideration with respect to policy, and public transport accessibility is listed among the non-monetised benefits under the Waka Kotahi Benefits Framework June 2020 technical paper².

In order to monetise accessibility, more complex multi-modal metrics are likely to be required and there is an important task among the research community to support central and local government investment in this regard.

Central and Local Government policy

Inclusive Access is one of five transport outcome areas under the draft Government Policy Statement (GPS) on Land Transport 2021/22 – 2030/31. The GPS sets out guidance on investment in the National Land Transport Fund (NLTF) and how Waka Kotahi assess Regional Land Transport Plan (RLTP) and NLTF activities. As such, policy and investment are interlinked and there is a requirement to report on accessibility and how accessibility changes over time by transport mode to the Ministry of Transport through a range of accessibility metrics.

² <https://www.nzta.govt.nz/assets/planning-and-investment/docs/benefits-framework-june-2020.pdf>

The needs of central government are extensive and require a truly multi modal approach with both simple and more complex metrics.

Consenting Authorities

As noted for property developers, accessibility assessments may be required for development applications which are generally lodged with Local Government to fulfil Resource Management Act requirements. Incorporating an accessibility assessment into ITAs is more of a focus at Plan Change stage rather than resource consent stage but will usually be included in more complex ITAs. It is noted that the private consultant sector would generally undertake these assessments in preparing ITAs, however consenting authorities have an important role in reviewing development applications so must be able rely on the assessment or independently check the accessibility analysis. This task would be considerably easier if metrics and tools were available to assess applications on a comparable and consistent basis.

As with developers, local government resource management needs are multi-modal and simpler measures of accessibility such as travel time by mode to key destinations (such as shopping, employment, education) and accompanying visual tools such as travel time isochrones are generally sufficient to meet their requirements.

Advocacy groups for transport disadvantaged and mobility impaired

There are a broad range of advocacy groups in New Zealand with an interest in transportation, including those focused specifically on walking and cycling. Of note there is an interest in accessibility from groups representing mobility-impaired persons especially for walking and cycling modes. This extends beyond standard measures of access by active modes to consider the unique challenges faced when using the transport system.

There may be a need to extend beyond the traditional range of accessibility metrics, including consideration of barriers to movement and typical walk speeds acknowledging that there are a broad range of extents of mobility impairments. Integrating an accessibility tool with New Zealand and overseas research would be valuable to, and welcomed by, these groups.

Research sector

The focus of the research community is to continue to develop accessibility modelling to meet the needs of the wider industry. By improving awareness around user requirements, academic and commercial researchers can better support public sector and private sector users. As such the needs of the research sector would generally be an aggregation of the needs of all other users in order to be applied and relevant research.

The development and/or endorsement of a nationwide tool and accompanying industry guidance will be helpful in targeting the effort of researchers. It is important to ensure that any such tool(s) and accompanying datasets and resources are openly available to the research community to support their role.

6. Conclusions and next steps

The purpose of this report is to define the user requirements for an accessibility modelling tool. This has been considered through engagement with public and private sector professionals and advocacy groups. The engagement has been undertaken through an online survey and a series of interviews. Six broad user types have been established and the requirements of each user group analysed with respect to modes, metrics and specification.

Collectively, the public sector roles of supporting investment and policy (and corresponding roles of the consulting sector in delivering on public sector requirements, and researchers in expanding knowledge and capability), provide a strong base for the development of a sophisticated accessibility modelling tool (or tools). The needs of other user types are generally lesser and simpler, but provide a supportive narrative for future investment in accessibility tools and can be used to guide investment by highlighting those areas which deliver most value across the spectrum of public and private sector uses for accessibility outputs. The consistent themes from engagement show there is strong interest in the availability of a tool (or tools) which:

- is publicly available and easy-to-use;
- supports a broad range of public sector investment and policy functions, private sector due diligence and resource management requirements, and assist the needs of transport disadvantaged and mobility impaired sectors of the community;
- includes for a broad range of metrics from threshold based through to more complex measures such as utility-based metrics and the ability to monetise accessibility;
- can be used at a nationwide scale but could also inform regional and neighbourhood level assessments;
- addresses all key transport modes, but most importantly walking, cycling and public transport;
- has visibility of future infrastructure and transport system performance (potentially through linkages to transport models);
- has the flexibility to integrate with external data sets where required including demographic data; and
- includes friendly and meaningful graphical displays and maps.

The user requirements deliver on the first research question, which is “What users want from an accessibility tool?” and are a key input into an internal report which completes the requirements of this research project. The internal report addresses the following two research questions “How well existing tools meet these needs?” and “What additional development is required to address the gap (if any) between existing tools and the identified user requirements?”.

Waka Kotahi have expressed an interest in being the lead agency to provide a tool for accessibility analysis for all of government application and to be widely accessible for use by local government and industry. This report and the accompanying internal report are intended to be used to inform future investment in the development of accessibility modelling tools.

Appendix A
Engagement Plan



A1 Accessibility Tool Research Engagement Plan

Prepared for: Tim Hughes, Waka Kotahi NZ Transport Agency
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Introduction

Abley has been commissioned by Waka Kotahi NZ Transport Agency to undertake research to define the required and desirable elements of an accessibility modelling tool. The research is based on engagement with 'users' and 'suppliers' of accessibility tools to understand existing tools and what would make a tool useful from a user's perspective. This technical note provides an engagement plan for the research, including suggested participants, the proposed method and timing of engagement, and questions for engagement.

Private sector engagement was undertaken by Abley and public sector engagement by Waka Kotahi.

Participants

User participants were defined as people who (would) use an accessibility tool, specify accessibility tools to be used, or use the outputs of accessibility tools. These participants included consultant practitioners, property developers, public sector organisations including district councils and government agencies, and research institutions.

Supplier participants were defined as people who supply an accessibility tool and/or use transport models to assess accessibility. These participants included suppliers of 'off-the-shelf' and bespoke GIS based accessibility tools.

A range of 'user' participants from both public and private institutions and 'supplier' participants were identified to engage with in the engagement stage of this research project. There is some overlap between suppliers and consultant users.

'User' Participants

- Consultant practitioners
- Public sector
 - Local Government
 - Waka Kotahi NZ Transport Agency
 - Ministry of Transport
 - Ministry of Urban Housing and Development
 - Ministry of Social Development
 - Ministry of Health
 - Ministry of Education
- Developers
 - Property developers
 - Retail and commercial developers
- Research Institutions
- Industry representatives

- Engineering New Zealand MUGS technical group

'Supplier' Participants

- Suppliers of off-the-shelf accessibility tools
- Developers of bespoke GIS accessibility tools
- Developers/users of transportation model that consider accessibility
- Consultant practitioners
- NZ Modelling User Group (MUGS) members

Method of Engagement

Given the defined list of participants and their expertise, videoconference/call interviews were selected as the primary form of engagement, in light of participants being located throughout New Zealand, and the Covid-19 situation at the time.

An online survey was sent out to the participants identified above and members of the NZ Modelling User Group (MUGS). The survey provided an introduction to explain the intent of the research project and gave participants the opportunity to respond to and/or think about their responses prior to the formal interview. Circulating a survey with MUGS gathered wider feedback from people who build and use accessibility models and people who interpret the results of these models. Logic integrated into the survey ensured only relevant questions were asked for each user type.

One-on-one interviews have also been undertaken with developers and public sector professionals to supplement the online engagement findings.

Engagement Resources

The engagement focused firstly on the consultee's existing practice and knowledge, and also on their information requirements and limitations. For users, that meant determining what problems an accessibility tool could help them solve. For those who have previously used or supply an accessibility tool, understanding what makes a successful tool includes consideration of data quality, sources of data inputs, broader access to the tool, and ongoing management and maintenance. The overarching research questions are:

- 1) What do users want from an accessibility tool?
- 2) How well do existing tools meet these needs?
- 3) What additional development is required to address the gap (if any) between existing tools and meet user requirements?

Several more specific avenues of inquiry were identified to determine required and/or desirable attributes of an accessibility tool. Some of the questions are best pitched to accessibility tool users, others are more appropriate for suppliers and some are relevant for both.

The questions included in the online survey for both users and suppliers are shown below. Some participants answered both sets of questions, depending on their area of expertise.

Users

- 1) Why is accessibility important and how important is it?
- 2) What problems do you require measures of accessibility to solve? Is understanding accessibility critical to resolving these problems?
- 3) What work do you or your organisation do that is relevant to accessibility?
- 4) In what ways do/would you use accessibility tools?
- 5) How important is accessibility for the work you do?

- 6) What problems would measurement of accessibility assist you to understand and solve?
- 7) How helpful would measurement of accessibility be to understand and solve these issues?
- 8) For which of the following topics is it important to understand accessibility, and how important is each (very/moderately/not)?
 - i) Location of activities,
 - ii) Routing of services (e.g. public transport),
 - iii) Social inclusion and equity considerations,
 - iv) Transport disadvantaged,
 - v) Car ownership and availability,
 - vi) Encouraging changes in mode share,
 - vii) Anything we have missed?
- 9) How important is understanding how accessibility changes by time of day?
- 10) How important is understanding how accessibility changes between now and into the future?
- 11) What accessibility outputs and indicators are helpful to you?
- 12) How important is it to consider accessibility and its relationship with demographic data and other data that may influence modal choice?
- 13) What modes are important and how important are they?
 - i) Private vehicles,
 - ii) Public Transport,
 - iii) Walking,
 - iv) Cycling,
 - v) Freight,
 - vi) Micro-mobility,
 - vii) Other?
- 14) How important is it that an accessibility tool can interface with transportation models?
- 15) Are there any other tools or datasets that accessibility tools should interface with?
- 16) Have you (or your organisation) used accessibility indicators in your work? If so, what accessibility packages are you familiar with? Please summarise any strengths and limitations associated with these packages.

Suppliers

- 1) What tool (may be a software platform or transportation model) have you developed/do you use?
- 2) Is this an open source or licensed product?
- 3) What tools are available for editing and undertaking what-if analysis, and what level of expertise is required to do so?
- 4) What visualisation tools are available for communicating accessibility outputs?
- 5) How should temporal variation in accessibility be addressed?
- 6) Can the tool identify existing barriers to accessibility and be used to compare options?
- 7) What standardised accessibility indicators are available? Are these quantitative or qualitative?
- 8) How is the relative attractiveness of destinations managed, for example the attractiveness of the second closest activity (such as employment centre, school or supermarket) relative to the closest activity? Is this represented through accessibility outputs or indicators?
- 9) How are different modes managed, e.g. walking? Is there flexibility to consider new modes such as electric personal mobility devices and taxis?
- 10) Is there flexibility to introduce new/alternate indicators in an assessment?
- 11) How do the tools incorporate demographic elements that may influence modal choice?
- 12) Can the tool be scaled for use at a national and/or regional strategic planning level?
- 13) Is the tool suitable for a detailed neighbourhood-level assessment?

- 14) What resolution (e.g. zones, nodes) are the modelling outputs in the tools you use/supply? If your tool uses zones, what zone sizes are used and are there issues associated with this?
- 15) Can the accessibility tool interface with other models, for example traditional transportation models?
- 16) What are the abilities for understanding the likely effect on accessibility to changes in:
 - i) Information systems,
 - ii) Transport infrastructure
 - iii) Public transport services,
 - iv) Land use changes,
 - v) Travel Demand Management (or behaviour change),
 - vi) Digital disruption, and
 - vii) New modes (e.g. micro-mobility)
 - viii) Anything we have missed?
- 17) What data does the tool require?
- 18) What data issues do you have (including for multi-modal assessments)? To what extent are data needs constraining possibilities?
- 19) What assumptions and parameters do you use for calibration? Please describe calibration frequency, modality and scale (i.e. smaller regional centre or main urban centre).

The interviews with suppliers were also based on the above questions, with more specific avenues of inquiry based on the participants' survey responses.

Engagement with property developers was based on an open conversation, pre-empted by sharing a definition of and examples of accessibility. The conversations included the following avenues of inquiry:

- Current practice for site selection and accessibility appraisal
- What accessibility factors are important for property development
- What limitations/challenges could a Waka Kotahi accessibility tool help to address
- Preferences for accessing a tool, e.g. free access or subscription-based pricing.

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