



Measuring Winnipeggers' Convenient Access to Public Transit

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The Importance of Public Transportation

Public transit is a key component of sustainable urban development. It enables access to services and opportunities and provides mobility to those who choose to use public transit and to those who have no other choice. Public transportation can reduce the environmental impact of private vehicles, promote compact development, generate economic growth and have a positive effect on individuals' well-being (American Public Transportation Association, 2007; Canadian Urban Transit Association, 2010). However, these benefits are characteristic of a public transit system that is convenient, accessible, affordable and well connected. When transit systems are vexing, costly, difficult to reach and unreliable, they discourage use among those choosing public transit and make it burdensome for those with no other option.

Public Transit, Sustainable Cities and the SDGs

Recognizing the important role public transit plays in cities, the United Nations included "convenient access to public transit" as an indicator among the 17 Sustainable Development Goals (SDGs), linked to target 11.2.¹ and indicator 11.2.1.² Specifically, convenient access to transit monitors progress made towards the goal of developing human settlements that are inclusive, safe, resilient and sustainable. Despite public transit's inclusion in the SDGs, there is currently no standard method to measure what convenient access to public transit looks like. The International Institute of Sustainable Development's (IISD) SDGs Knowledge Program provides information and analysis in support of the United Nations' Sustainable Development Goals. As part of this work, IISD is tracking internationally accepted indicators, monitoring SDG implementation and developing indicators where no suitable international indicators have been agreed upon at a community level in an effort to localize the SDGs. Localizing the SDGs means developing indicators and narratives that link the concerns and actions of communities to the global objectives laid out in the SDGs. Localizing the SDGs is important, as sustainable development is most meaningfully achieved when ideas, policies and solutions are identified, explored and implemented at the local level. As such, IISD has developed a method to track convenient access to public bus transit in Winnipeg, and in other cities in Canada and globally.

¹ SDG Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.

² SDG Indicator 11.2.1: Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities.



The Importance of Measuring Public Transit In Winnipeg

The importance of measuring the convenience of public transit is highlighted by recent headlines oriented around service cuts, service reductions and fare increases for the City of Winnipeg’s public transit system (Kives, 2017a). While these changes in policy and funding can be expected to affect the convenience of Winnipeg’s public transit, without a method to quantify and monitor convenient access to public transit, it is impossible to measure impact. By proposing a method to measure convenient access to public transit, this brief highlights how localizing SDGs can advise policy, inform local narratives and guide sustainable development.

What Is Convenient Access to Public Transit?

Convenient access to public transit is not to be confused with access to public transit. Typically, access to public transit refers only to spatial measures—for example, how far away a bus stop is from your house or place of work. Conversely, *convenient* access to public transit also includes a temporal measure—it refers to how long you may need to wait at a bus stop before a bus arrives (headway), how many buses come each hour (frequency) and how long that bus will take to get to your destination (duration of trip). Including a measure of convenience is important because, although an individual may live in close proximity to a bus stop, the frequency of the service and directness of route affects the utility of public transit to riders.

Measuring Convenient Access to Transit

To determine Winnipeggers’ convenient access to public transit, these spatial and temporal components were combined into a singular metric. Although perceptions of access and convenience are subjective, this analysis defines access as adequate if an individual lives within 500 metres of a bus stop—approximately a 6 minute walk. To include the temporal component, the analysis suggests that **access is convenient if the sum of stops to which people can adequately walk have, on average, at least one bus departing every 15 minutes.**³ The convenience of access can then be further categorized based on a range of frequencies (Table 1). Individuals who are unable to reach a bus stop by walking 500 metres are characterized as having no access to public transit.

Table 1. Convenient access to public transit by category and frequency of departure

	Convenient access to public transit			Inconvenient access to public transit		
Category of Convenience	Very High	High	Moderate	Low	Very Low	No Access
Frequency of Bus Departures from Accessible Stop (500m)	>6 Min.	6-10 Min.	10-15 Min.	15-30 Min.	30+ Min.	N/A

³ When calculating convenient access, the frequency of buses departing stops was divided by two. This was done to eliminate the potential of “convenient access” being inflated by bus routes heading in opposite directions. It is assumed that a person will make a choice as to which stop to use based on their destination, which means that buses running in the opposite direction of their destination do not increase convenience of access. This does, however, make the assumption that north and south or west and east-bound buses have their stops on opposite sides of the same street and are both accessible by a 500-metre walk. While this is often the case in Winnipeg, where the majority of bus lines are linear rather than circular, it may not be the case for one-directional streets. However, since a large number of one-way streets are located in the downtown, and access is still high in this area, it may not affect the category of convenient access that people are in. This is a limitation of the method that can be improved through further research.



Using Winnipeg Transit data,⁴ this analysis looked at the average number of buses departing every bus stop per hour between 6 a.m. and 8 p.m. on a weekday—this is considered peak service time. Using this information, a service area of 500 metres (walking distance) was drawn around each bus stop⁵ and these service areas were characterized by convenience based on their corresponding bus stop information—frequency of buses between 6 a.m. and 8 p.m. Where two or more service areas overlapped, their properties were summated, as it signified that individuals could access multiple stops. By combining population data with these service areas, it was then possible to determine the number of people who had convenient access to public transit.^{6,7}

Winnipeggers’ Convenient Access to Transit

Based on the above criteria, **just over half of Winnipeggers (53 per cent) had convenient access to public transit** (Table 2). The majority of individuals with convenient access to public transit lived in close proximity to the downtown or along the Southwest Transitway Rapid Transit Corridor (Figure 1). When looking at community area geographies, Downtown, Point Douglas and River Heights had the most convenient access to public transit. These three areas also had the highest percentage of individuals using public transit as their primary mode of transportation at 24.58 per cent, 21.6 per cent and 16.61 per cent respectively (Statistics Canada, 2011). This relationship between convenient access and ridership should be further explored in future transit planning.

Table 2. Convenient access to public transit by category

Category of Convenience	Convenient access to public transit			Inconvenient access to public transit		No Access
	Very High	High	Moderate	Low	Very Low	
Frequency of Bus Departures from Accessible Stop (500m)	>6 Min.	6–10 Min.	10–15 Min.	15–30 Min.	30+ Min.	N/A
Population (#)	126,039	121,226	100,301	146,643	68,086	93,521
Per cent (%) of Population	19.21%	18.48%	15.29%	22.36%	10.4%	14.3%

Furthermore, **32.76 per cent of Winnipeggers had inconvenient access to transit**. This means that, although these individuals could walk less than 500 metres to a transit stop, **22.36 per cent may have to wait 15–30 minutes for a bus, while 10.4 per cent may have to wait for longer than 30 minutes**. Not only is this inconvenient from a productivity perspective, but it may also be intolerable in the winter, especially at stops without shelters. In addition to those with inconvenient access to public transit, **14.3 per cent of Winnipeggers had no convenient access to transit**—no bus stop within a 500-metre walk of their home. The population without convenient access to transit lives

⁴ This data is publicly available from Winnipeg Transit’s open data web service upon request. This data is available in the General Transit Feed Specification (GTFS) format.

⁵ Service areas were created using Esri’s Better Bus Buffers tool, which was developed specifically for GTFS data. The Better Bus Buffers tool used a network distance to calculate service areas of 500 metres.

⁶ To disaggregate service areas to a geographical boundary where the population could be counted, dissemination block areas and population counts were used. Dissemination blocks were then given service area characteristics based on the majority of the service area covering that dissemination block.

⁷ In instances where people could walk to two or more separate bus stops serving the same bus route, that bus route was only counted once to avoid double counting. This eliminated the potential of “convenient access” being inflated by an area serviced by a dense number of bus stops for the same route.



primarily on the periphery of the city. It should be reiterated that the figures in Table 2 represent average wait times until any bus arrives, no matter which route. Wait times are likely longer for a specific bus route at bus stops serviced by multiple routes. Individuals can identify their convenient access to public transit and bus stop information by entering an address into an [online platform](#).

Although transit riders likely align their trips with scheduled departure times—reducing undesired wait times—infrequent access presents serious concerns in instances where individuals miss their bus or connection. It is also inconvenient if individuals want to run quick trips or last-minute trips and must adjust their journeys to accommodate a narrow window of service availability. Without convenient access to public transit, individuals with the ability to choose their means of transportation may opt to drive, while those who depend on transit are forced to take onerous and complicated trips or spend more money to use private services.

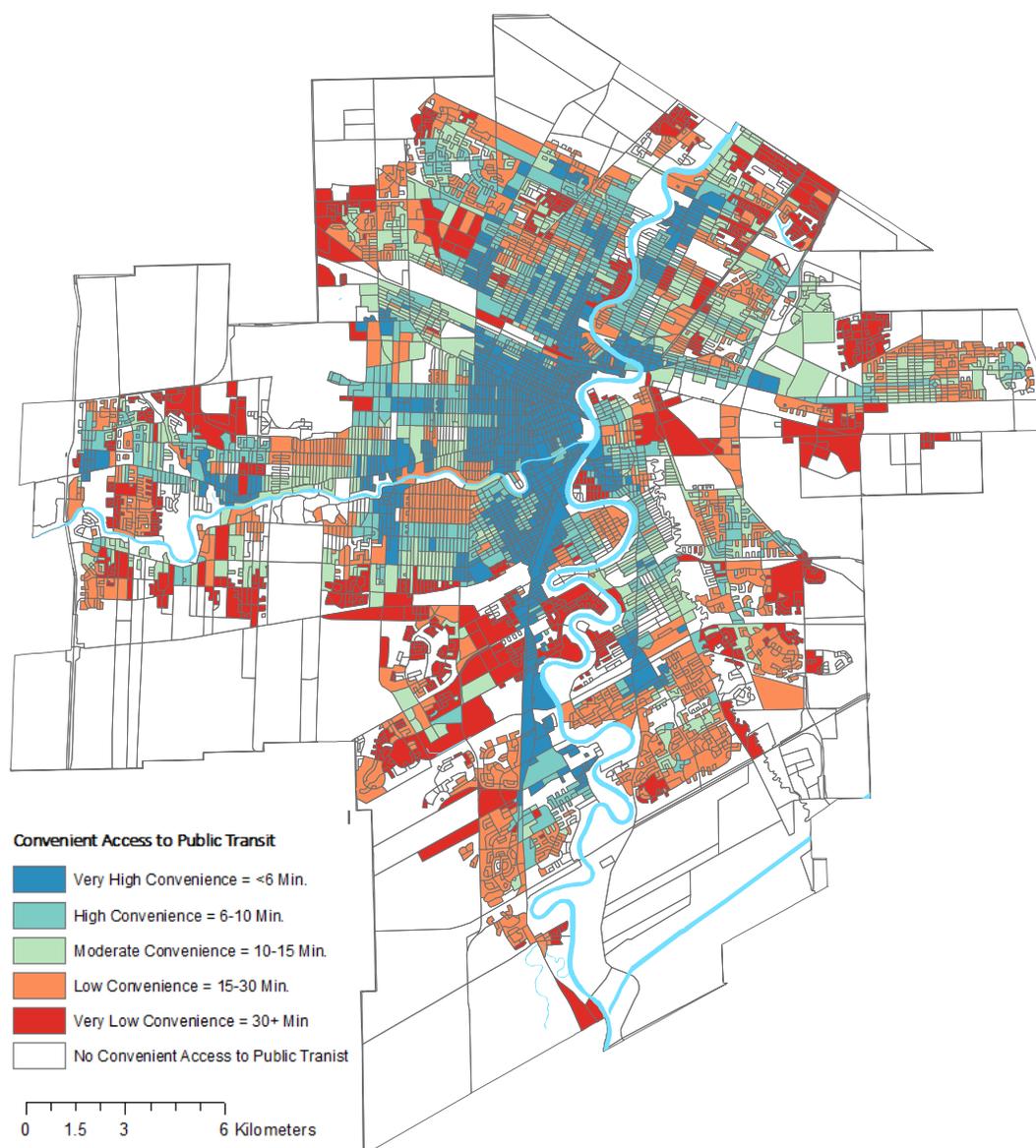


Figure 1. Convenient access to public transit



Convenient Access Based on a Specific Destination/Origin

Beyond determining an individual’s convenient access to transit, it is also important to identify if buses service desirable destinations within a convenient duration of time.⁸ To do so, this analysis calculated the duration of time it would take for an individual to leave their home around 8 a.m. and arrive downtown by a combination of walking and public transit.^{9,10} As a proxy for access to downtown, Bell MTS Place was used as a final destination given its central location and proximity to services. Trip lengths were considered convenient if they were less than 30 minutes long and inconvenient if they exceeded 30 minutes.¹¹

Using this analysis, only **46.95 per cent of Winnipeggers could arrive downtown in less than 30 minutes if leaving their home around 8 a.m.** (Table 3). Conversely, this means that **over half the population of Winnipeg could not reach the downtown by public transit in less than 30 minutes and 21.73 per cent of Winnipeggers could not make it to downtown in 40 minutes.** Given Winnipeg’s sprawling nature, it is intuitive that those with longer commutes generally live farther from the downtown. However, what this analysis adds to the public transit conversation is that it quantifies this level of convenience—similar assessments could be conducted for any destination or origin.

Table 3. Convenient access to downtown (Bell MTS Place) at around 8 a.m.

Convenient Duration Category	Convenient trip duration			Inconvenient trip duration	
	Very High Convenience	High Convenience	Moderate Convenience	Low Convenience	Very Low Convenience
Duration of Trip (Minutes)	0-10 Min.	10-20 Min.	20-30 Min.	30-40 Min.	40+ Min.
Population (#)	15,553	80,002	212,382	205,361	142,518
Per cent (%) of Population	2.37%	12.2%	32.38%	31.31%	21.73%

⁸ While this additional layer of analysis exceeds the reporting requirements for SDG 11.2.1, it enhances information about convenient access to public transit.

⁹ To conduct this analysis, the research used Esri’s GTFS to a Network Dataset tool. For the tool, dissemination block centroids were used as the proxy for individual access. The tool is limited in its ability to determine true travel time to a location since it requires a particular time-of-day for travel. This means that if you select 8 a.m. as a travel time, and the bus came at 7:59, you would have to wait for the next available bus to come, or walk to another bus route. To mitigate the effects of this limitation, two separate analyses were done each with a different time-of-day—one at 8 a.m. and one at 8:10 a.m.. The shorter of the two travel times was then used to more accurately reflect an individual’s decision to depart and partake on a journey at a specific time.

¹⁰ Walking distance speeds were set at 4.8 km/hour.

¹¹ Unlike convenient access to transit, walking distance thresholds to bus stops did not equate to no access. Instead, a long walk to a bus stop would just increase the duration of time to complete a trip.

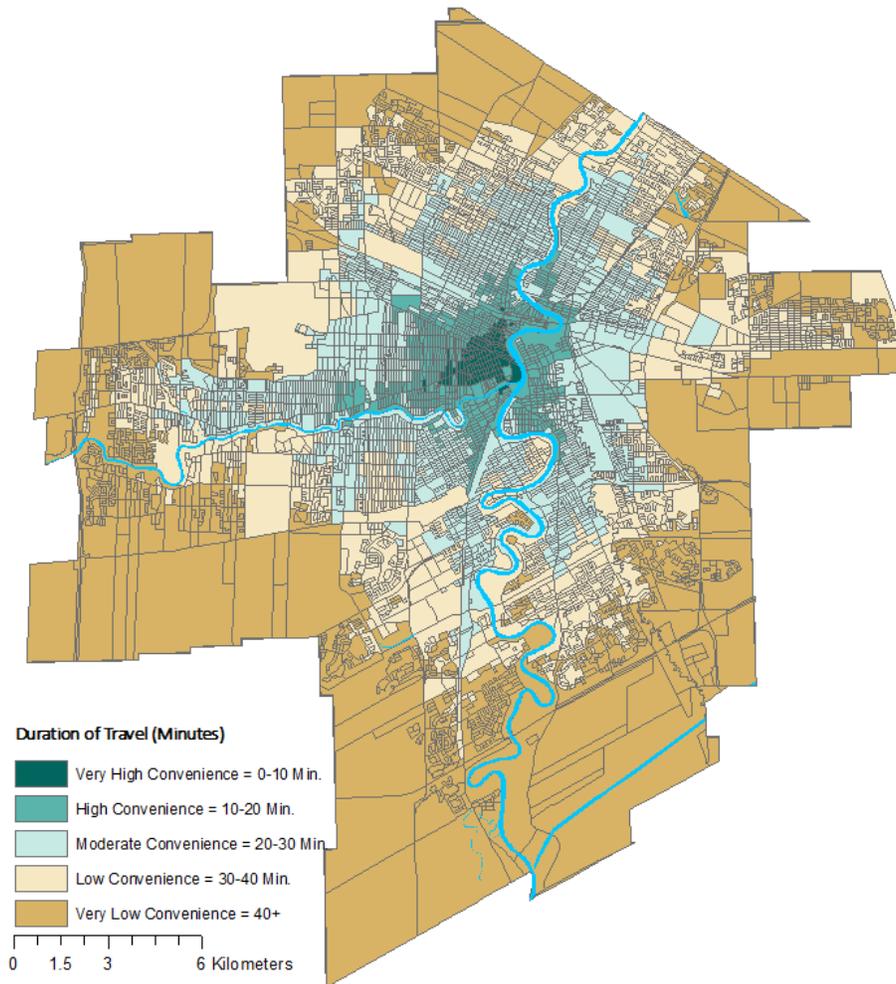


Figure 2. Duration of travel to downtown (Bell MTS Place) by dissemination block (8 a.m.)

The percentage of inconvenient trips also increases when measuring how long it takes people to get home from the downtown outside of peak service hours. Again, Bell MTS Place was used as a departure origin. At around 11 p.m.,¹² only **40.15 per cent of Winnipeggers are able to get home in under 30 minutes if they left the downtown at 11 p.m.** (Table 4). It would take **37.65 per cent of Winnipeggers more than 40 minutes to get home.**

Table 4. Convenient access from downtown (Bell MTS Place) at around 11 p.m.

Convenient Duration Category	Convenient trip duration			Inconvenient trip duration	
	Very High Convenience	High Convenience	Moderate Convenience	Low Convenience	Very Low Convenience
Duration of Trip (Minutes)	0-10 Min.	10-20 Min.	20-30 Min.	30-40 Min.	40+ Min.
Population (#)	12,945	96,659	153,705	145,588	246,919
Per cent (%) of Population	1.97%	14.74%	23.44%	22.2%	37.65%

¹² Similar to the previous analysis, two separate calculations were done each with a different time-of-day—one at 11 p.m. and one at 11:10 p.m.. The shorter of the two travel times was then used.



The ability to measure convenient trips based on different times has significant policy implications. Changes in access between day and evening may influence people's willingness to take public transit to the downtown if they have to make a return trip via public transit outside of peak hours. This would not only effect ridership but also add additional stress to downtown parking and peak-time traffic flows. Similarly, being able to determine the percentage of the population that is able to access destinations and origins in a conveniently provides insight into potential transportation habits.

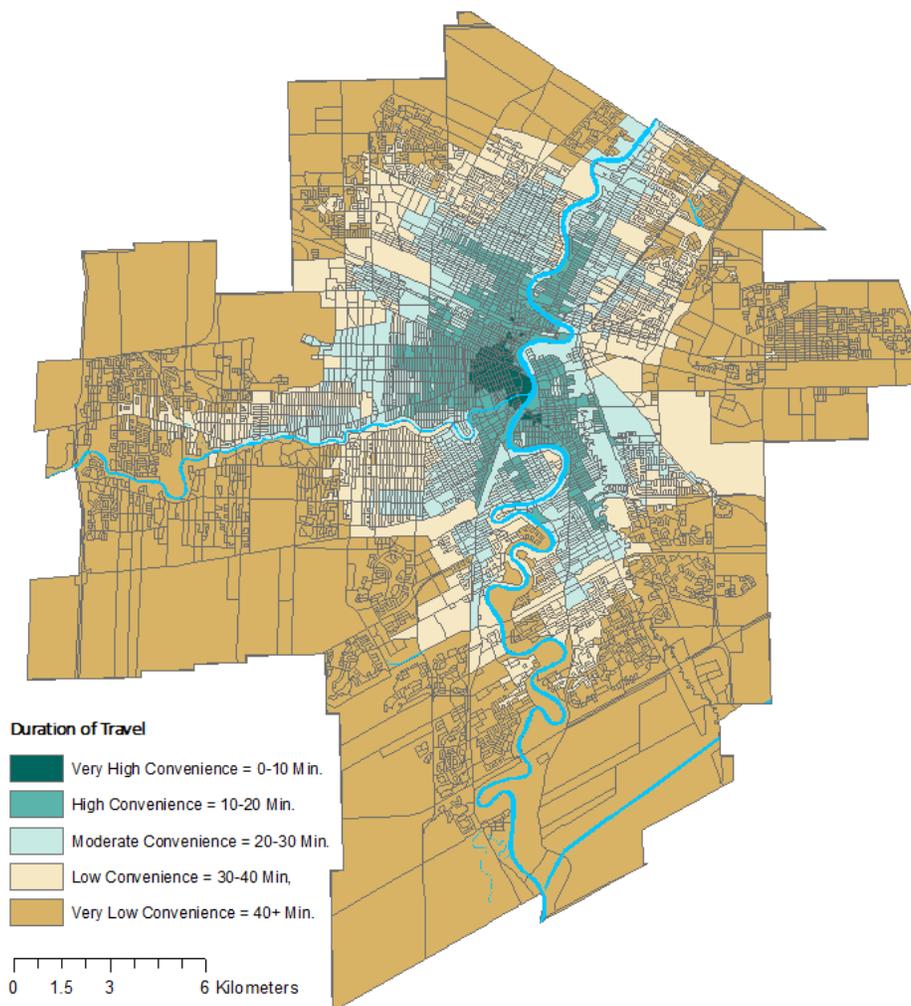


Figure 3. Duration of travel from downtown (Bell MTS Place) by dissemination block (11 p.m.)

Why Is Measuring Convenient Access to Public Transit Important?

Measuring convenient access to public transit **now** allows cities to assess the impacts of service changes and policies in the **future**. This is a pertinent issue in Winnipeg given the recent conversations around public transit, including provincial funding cuts to Winnipeg Transit operating costs, proposed service cuts to 22 routes and increases in transit fares. Although the service cuts and service reductions to 22 routes are no longer on the table (Kives, 2017b), by being able to measure convenient access to public transit we can gauge the potential impacts these cuts would have had by removing the 22 routes from the analysis.

If all 22 routes were to be completely eliminated, 5.6 per cent of Winnipeggers would lose convenient access to transit (Table 5; Figure 4). This means that, of those 36,845 Winnipeggers currently riding buses by choice, some may



opt for a more convenient option in the midst of their changing situation. A further **5.54 per cent would have lost all access to public transit**, meaning they could no longer walk to a bus stop within 500 metres. This would have been a substantial step in the wrong direction towards achieving SDG 11.2.1.

Table 5. Convenient access to public transit before and after service cuts

Degree of Convenience	Convenient trip duration			Inconvenient trip duration			No Access		
	Current Services	After Service Cuts	Change (After - Current)	Current Services	After Service Cuts	Change (After - Current)	Current Services	After Service Cuts	Change (After - Current)
Population (#) in Area	347,566	310,721	-36,845	214,729	215,001	272	93,521	130,094	36,573
Per cent (%) of Population	53%	47.38%	-5.6%	32.74%	32.78%	0.04%	14.3%	19.84%	5.54%

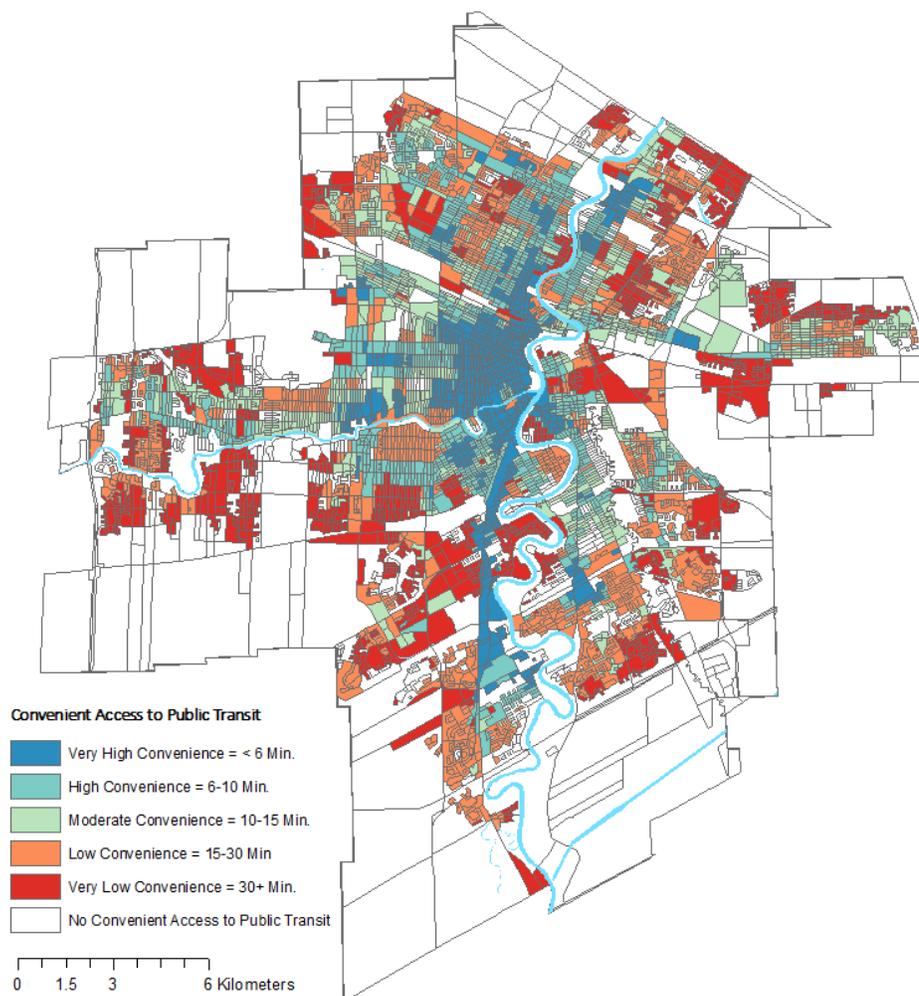


Figure 4. Convenient access to public transit following proposed service cuts to 22 routes



Conclusion

As this method has shown, a large percentage of Winnipeggers do not have convenient access to public transit, even during peak service hours. These numbers are also likely to increase when looking at holiday and weekend scheduling. Without convenient access to public transit many individuals may opt to drive a personal vehicle. This puts a strain on infrastructure and parking, and contributes to congestion. While using public transit may be a choice for some, for the many others who depend on public transit, inconvenience results in onerous or costly journeys. By being able to monitor convenient access to public transit, it is possible to develop informed decisions and target policies to improve ridership and riders' experiences.

This method, however, should not be interpreted as advocating for equitable convenient access to transit for all areas of the city. Decisions regarding the frequency and accessibility to public transit must be influenced by an area's population, population density and land-use. To provide the same degree of service to less-dense suburban areas compared to more densely populated urban areas is costly and may not substantially increase ridership. Instead, the results from the method should be used in conjunction with additional data to inform future transit planning.

While this study presents an innovative method¹³ for monitoring convenient access to public transportation at a local level, it does have limitations. With any indicator, figures have a finite ability to capture and quantify the complexities of systems. While future research could improve such an analysis by incorporating additional factors that influence public transit systems (e.g., housing sprawl, urban density, funding availability, connection with active transit routes, etc.) and ridership (e.g., disincentives for drivers, income levels, place of work, etc.), this work proposes a relatively simple and replicable model to serve as a basis for monitoring and evaluation of municipal public bus systems. Beyond its utility to Winnipeg, this method can be replicated among any of the thousands of cities with public bus transit and GTFS data. This not only standardizes monitoring and reporting mechanisms on convenient access to public transit, it presents a path forward to achieving the SDGs at a local level.

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¹³ The method improves on the Better Bus Buffers tool developed by Esri by connecting it to population data to determine populations in a particular service area and characterizes those areas based on measures of frequency and access.

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